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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

OF

PROGRESS OF STREAM MEASUREMENTS

FOR

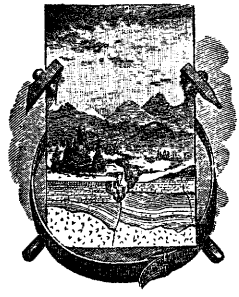
THE CALENDAR YEAR 1905

PREPARED UNDER THE DIRECTION OF F. H. NEWELL

PART X.—Western Gulf of Mexico and Rio Grande Drainages

BY

T. U. TAYLOR and JOHN C. HOYT



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PART X.

By T. U. TAYLOR and JOHN C. HOYT.

INTRODUCTION.

ORGANIZATION AND SCOPE OF WORK.

The hydrographic work of the United States Geological Survey includes the collection of facts concerning and the study of conditions affecting the behavior of water from the time it reaches the earth as rain or snow until it joins the oceans or great navigable rivers. These investigations became a distinct feature of the work of the Survey in the fall of 1888, when an instruction camp was established at Embudo, N. Mex. The first specific appropriation for gaging streams was made by the act of August 18, 1894, which contained an item of $12,500 "for gauging the streams and determining the water supply of the United States, including the investigation of underground currents and artesian wells in the arid and semiarid sections." (28 Stat. L., p. 398.)

Since that time the appropriations have been gradually increased, as shown by the following table:

Annual appropriations for hydrographic surveys for the fiscal years ending June 30, 1895 to 1906.

1895	$12,500	1901	$100,000
1896	20,000	1902	100,000
1897	50,000	1903	200,000
1898	50,000	1904	200,000
1899	50,000	1905	200,000
1900	50,000	1906	200,000

As a result of the increased appropriations the work has been greatly extended, and at the same time it has been more thoroughly systemized by the adoption of standard methods and by grouping the States into districts, in each of which a district hydrographer and a corps of assistants carry on a comprehensive study of the hydrographic resources.

The chief features of the hydrographic work are the collection of data relating to the flow of the surface waters and the study of the conditions affecting this flow. Information is also collected concerning river profiles, duration and magnitude of floods, water power, etc., which may be of use in hydrographic studies. This work includes the study of the hydrography of every important river basin in the United States, and is of direct value in the commercial and agricultural development of the country.

In order to collect the material from which estimates of daily flow are made, gaging stations are established. The selection of a site for a gaging station and the length of time it is maintained depend largely on the physical features and the needs of each locality. If the water is to be used for power, special effort is made to obtain

information concerning the minimum flow; if water is to be stored, the maximum flow receives special attention. In all sections of the country permanent gaging stations are maintained for general statistical purposes to show the conditions existing through long periods. They are also used as primary stations, and their records, in connection with short series of measurements, serve as bases for estimating the flow at other points in the drainage basin.

During the calendar year 1905 the Division of Hydrography has continued measuring the flow of streams on the same general lines as in previous years. Many new and improved methods have been introduced by which the accuracy and value of the results have been increased. Approximately 800 regular gaging stations were maintained during the year, and an exceptionally large number of miscellaneous measurements and special investigations were made. The Report of Progress of Stream Measurements, which contains the results of this work, is published in a series of fourteen Water-Supply and Irrigation Papers, Nos. 165 to 178, as follows:

No. 165. Atlantic coast of New England drainage.
No. 166. Hudson, Passaic, Raritan, and Delaware river drainages.
No. 167. Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages.
No. 168. Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Mexico drainages.
No. 169. Ohio and lower eastern Mississippi river drainages.
No. 170. Great Lakes and St. Lawrence River drainages.
No. 171. Hudson Bay, and upper eastern and western Mississippi River drainages.
No. 172. Missouri River drainage.
No. 173. Meramec, Arkansas, Red, and lower western Mississippi river drainages.
No. 174. Western Gulf of Mexico, and Rio Grande drainages.
No. 175. Colorado River drainage.
No. 176. The Great Basin drainage.
No. 177. The Great Basin and Pacific Ocean drainages in California.
No. 178. Columbia River and Puget Sound drainages.

These papers embody the data collected at the regular gaging stations, the results of the computations based on the observations, and such other information as may have a direct bearing on the study of the subject and include, as far as practicable, descriptions of the basins and the streams draining them.

For the purpose of introducing uniformity into the reports for the various years the drainages of the United States have been divided into eleven grand divisions, which have been again divided into secondary divisions, as shown in the following list. The Progress Report has been made to conform to this arrangement, each part containing the data for one or more of the secondary divisions. The secondary divisions have, in most cases, been redivided, and the facts have been arranged, as far as practicable, geographically.

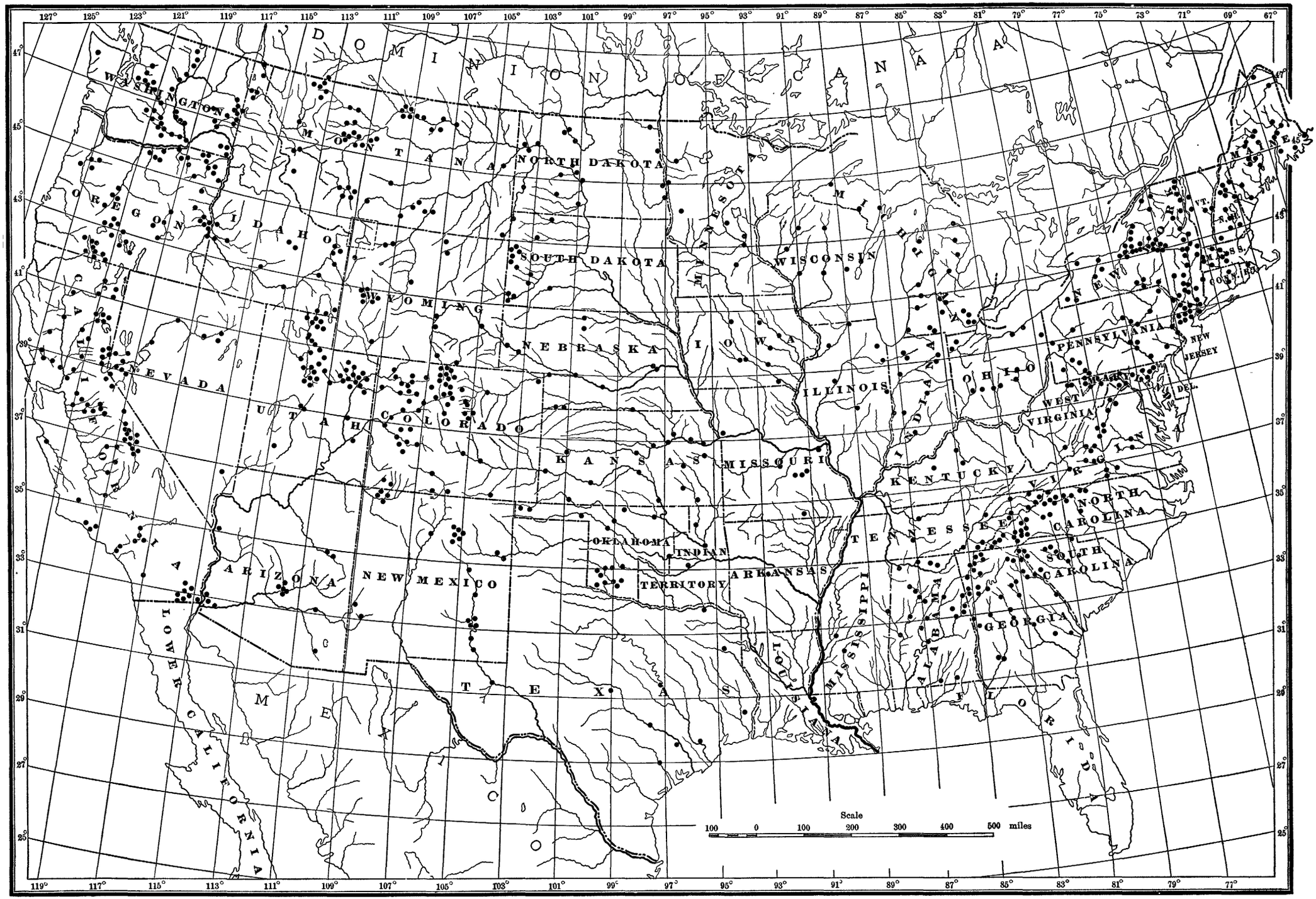
List of drainage basins in the United States.

NORTHERN ATLANTIC DRAINAGE BASINS.

St. Johns.
St. Croix.
Penobscot.
Kennebec.
Androscoggin.
Presumpscot.
Saco.
Merrimac.
Connecticut.
Blackstone.
Thames.
Housatonic.
Hudson.
Passaic.
Raritan.
Delaware.
Susquehanna.
Potomac.
Minor Chesapeake Bay.
Minor northern Atlantic.

SOUTHERN ATLANTIC DRAINAGE BASINS.

James.
Chowan.
Roanoke.
Tar.
Neuse.
Cape Fear.
Great Pedee (Yadkin).
Santee.
Savannah.
Ogeechee.
Altamaha.
Minor southern Atlantic.



MAP OF THE UNITED STATES, SHOWING LOCATION OF PRINCIPAL RIVER STATIONS MAINTAINED DURING 1905.

EASTERN GULF OF MEXICO DRAINAGE BASINS.

Suwanee.
Apalachicola.
Mobile.
Pearl.
Minor eastern Gulf of Mexico.

EASTERN MISSISSIPPI RIVER DRAINAGE BASINS.

Lower eastern Mississippi.
Ohio.
Upper eastern Mississippi.

ST. LAWRENCE RIVER DRAINAGE BASINS.

Lake Superior.
Lake Michigan.
Lake Huron.
Lake St. Clair.
Lake Erie.
Niagara River.
Lake Ontario.
Lake Champlain (Richelieu River).
Minor St. Lawrence.

WESTERN MISSISSIPPI RIVER DRAINAGE BASINS.

Upper western Mississippi.
Missouri.
Meramec.
Lower western Mississippi.
Arkansas.
Red.

WESTERN GULF OF MEXICO DRAINAGE BASINS.

Sabine.
Neches.
Trinity.
Brazos.
Colorado (of Texas).
Guadalupe.
San Antonio.
Nueces.
Rio Grande.
Minor western Gulf of Mexico.

COLORADO RIVER DRAINAGE BASIN.

THE GREAT BASIN.

Wasatch Mountains.
Humboldt.
Sierra Nevada.
Minor streams in Great Basin.

PACIFIC COAST DRAINAGE BASINS.

Southern Pacific.
San Francisco Bay.
Northern Pacific.
Columbia.
Puget Sound.

HUDSON BAY DRAINAGE BASINS.

DEFINITIONS.

The volume of water flowing in a stream—"the run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, gallons per minute, miner's inch, and run-off in second-feet per square mile; and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second, and is the rate of discharge of water flowing in a stream 1 foot wide and 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Gallons per minute" is generally used in connection with pumping and city water supply.

The "miner's inch" is the rate of discharge of water passing through an orifice 1 inch square under a head which varies locally. It has been commonly used by miners and irrigators throughout the West, and is defined by statute in each State in which it is used.

"Second-feet per square mile" is applied to the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work. There is a convenient relation between the second-foot and the acre-foot. One second-foot flowing for twenty-four hours will deliver 86,400 cubic feet or approximately 2 acre-feet.

EXPLANATION OF TABLES.

For each regular gaging station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of estimated monthly and yearly discharges and run-off, based on all the facts obtained to date.

The descriptions of stations give such general information about the locality and equipment as would enable the reader to find and use the station. They also give, as far as possible, a complete history of all the changes since the establishment of the station that would be factors in using the data collected.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, the name of the hydrographer, the gage height, the area of cross section, the mean velocity, and the discharge in second-feet.

The table of daily gage heights gives the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. At most stations the gage is read in the morning and in the evening.

The rating table gives discharges in second-feet corresponding to each stage of the river as given by the gage heights.

In the table of estimated monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest; this is the flow as given in the rating table for that mean gage height. As the gage height is the mean for the day there might have been short periods when the water was higher and the corresponding discharge larger than given in this column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow for each second during the month. On this are based the computations for the three remaining columns, which are defined above.

In the computations for the tables of this report the following general and special rules have been used:

Fundamental rules for computation.

1. The highest degree of precision consistent with the rational use of time and money is imperative.
2. All items of computation should be expressed by at least two and not more than four significant figures.
3. Any measurement in a vertical velocity, mean velocity, or discharge curve whose per cent of error is five times the average per cent of error of all the other measurements should be rejected.
4. In reducing the number of significant figures, or the number of decimal places, by dropping the last figure, the following rules apply:

(a) When the figure in the place to be rejected is less than 5, drop it without changing the preceding figure. Example: 1,827.4 becomes 1,827.

(b) When the figure in the place to be rejected is greater than 5, drop it and increase the preceding figure by 1. Example: 1,827.6 becomes 1,828.

(c) When the figure in the place to be rejected is 5, and it is preceded by an even figure, drop the 5. Example. 1,828.5 becomes 1,828.

(d) When the figure in the place to be rejected is 5, and it is preceded by an odd figure, drop the 5 and increase the preceding figure by 1. Example: 1,827.5 becomes 1,828.

Special rules for computation.

1. Rating tables are to be constructed as close as the data upon which they are based will warrant. No decimals are to be used when the discharge is over 50 second-feet.

2. Daily discharges shall be applied directly to the gage heights as they are tabulated.

3. Monthly means are to be carried out to one decimal place when the quantities are below 100 second-feet. Between 100 and 10,000 second-feet, the last figure in the monthly mean shall be a significant figure. This also applies to the yearly mean.

4. Second-feet per square mile and depth in inches for the individual months shall be carried out to at least three significant figures, except in the case of decimals where the first significant figure is preceded by one or more naughts (0), when the quantity shall be carried out to two significant figures. Example: 1.25; .125; .012; .0012. The yearly means for these quantities are always to be expressed in three significant figures and at least two decimal places.

CONVENIENT EQUIVALENTS.

1 second-foot equals 50 California miner's inches.
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers one square mile 1.131 feet deep, 13.572 inches deep.
1 second-foot for one year eqnals 0.000214 cubic mile; equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot falling 10 feet equals 1.136 horsepower.
100 California miner's inches equal 15 United States gallons per second.
100 California miner's inches equal 77 Colorado miner's inches.
100 California miner's inches for one day equal 4 acre-feet.
100 Colorado miner's inches equal 2.60 second-feet.
100 Colorado miner's inches equal 19.5 United States gallons per second.
100 Colorado miner's inches equal 130 California miner's inches.
100 Colorado miner's inches for one day equal 5.2 acre-feet.
100 United States gallons per minute equal 0.223 second-foot.
100 United States gallons per minute for one day equal 0.44 acre-foot.
1,000,000 United States gallons per day equal 1.55 second-feet.
1,000,000 United States gallons equal 3.07 acre-feet.
1,000,000 cubic feet equal 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 inch equals 2.54 centimeters.
1 foot equals 0.3048 meter.
1 yard equals 0.9144 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 1,760 yards; equals 5,280 feet; equals 63,360 inches.
1 square yard equals 0.836 square meter.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet; equals 4,840 square yards.
1 acre equals 209 feet square, nearly.
1 square mile equals 259 hectares.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons; equals 0.804 bushel.
1 cubic foot of water weighs 62.5 pounds.
1 cubic yard equals 0.7646 cubic meter.
1 cubic mile equals 147,198,000,000 cubic feet.
1 cubic mile equals 4,667 second-feet for one year.
1 gallon equals 3.7854 liters.
1 gallon equals 8.36 pounds of water.
1 gallon equals 231 cubic inches (liquid measure).
1 pound equals 0.4536 kilogram.
1 avoirdupois pound equals 7,000 grains.
1 troy pound equals 5,760 grams.
1 meter equals 39.37 inches. Log. 1.5951654.
1 meter equals 3.280833 feet. Log. 0.5159842.
1 meter equals 1.093611 yards. Log, 0.0388629.
1 kilometer equals 3,281 feet; equals five-eights mile, nearly.
1 square meter equals 10.764 square feet; equals 1.196 square yards.
1 hectare equals 2.471 acres.
1 cubic meter equals 35.314 cubic feet; equals 1.308 cubic yards.
1 liter equals 1.0567 quarts.

1 gram equals 15.43 grains.
1 kilogram equals 2.2046 pounds.
1 tonneau equals 2,204.6 pounds.
1 foot per second equals 1.097 kilometers per hour.
1 foot per second equals 0.68 mile per hour.
1 cubic meter per minute equals 0.5886 second-foot.
1 atmosphere equals 15 pounds per square inch; equals 1 ton per square foot; equals 1 kilogram per square centimeter.
Acceleration of gravity equals 32.16 feet per second every second.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.8 feet.
1⅛ horsepowers equal about 1 kilowatt.
To calculate waterpower quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel, realizing 80 per cent of the theoretical power.
Quick formula for computing discharge over weirs: Cubic feet per minute equals $0.4025 l \sqrt{h^3}$; l= length of weir in inches; h=head in inches flowing over weir, measured from surface of still water.
To change miles to inches on map:
Scale 1:125000, 1 mile=0.50688 inch.
Scale 1:90000, 1 mile=0.70400 inch.
Scale 1:62500, 1 mile=1.01376 inches.
Scale 1:45000, 1 mile=1.40800 inches.

FIELD METHODS OF MEASURING STREAM FLOW.

The methods used in collecting these data and in preparing them for publication are given in detail in Water-Supply Papers No. 94 (Hydrographic Manual, U. S. Geol. Survey) and No. 95 (Accuracy of Stream Measurements). In order that those who use this report may readily become acquainted with the general methods employed, the following brief description is given:

Streams may be divided, with respect to their physical conditions, into three classes—(1) those with permanent beds; (2) those with beds which change only during extreme low or high water; (3) those with constantly shifting beds. In estimating the daily flow, special methods are necessary for each class. The data on which these estimates are based and the methods of collecting them are, however, in general, the same.

There are three distinct methods of determining the flow of open-channel streams—(1) by measurements of slope and cross section and the use of Chezy's and Kutter's formulas; (2) by means of a weir; (3) by measurements of the velocity of the current and the area of the cross section. The method chosen for any case depends on the local physical conditions, the degree of accuracy desired, the funds available, and the length of time that the record is to be continued.

Slope method.—Much information has been collected relative to the coefficients to be used in the Chezy formula, $v=c\sqrt{Rs}$. This has been utilized by Kutter, both in developing his formula for c and in determining the values of the coefficient n which appears therein. The results obtained by the slope method are, in general, only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value for n to be used in Kutter's formula. The most common use of this method is in estimating the flood discharge of a stream when the only data available are the cross section, the slope as shown by marks along the bank, and a knowledge of the general conditions.

Weir method.—When funds are available and the conditions are such that sharp-crested weirs can be erected, these offer the best facilities for determining flow. If dams are suitably situated and constructed, they may be utilized for obtaining reliable estimates of flow. The conditions necessary to insure good results may be divided into two classes—(1) those relating to the physical characteristics of the dam itself, and (2) those relating to the diversion and use of water around and through the dam.

The physical requirements are as follows: (*a*) Sufficient height of dam, so that backwater will not interfere with free fall over it; (*b*) absence of leaks of appreciable magnitude; (*c*) topography or abutments which confine the flow over the dam at high stages; (*d*) level crests, which are kept free from obstructions caused by floating logs or ice; (*e*) crests of a type for which the coefficients to be used in $Q=c\,b\,h^{\frac{3}{2}}$, or some similar standard weir formula, are known (see Water-Supply Paper No. 150); (*f*) either no flashboards or exceptional care in reducing leaking through them and in recording their condition.

Preferably there should be no diversion of water through or around the dam. Generally, however, the dam is built for purposes of power or navigation, and part or all of the water flowing past it is diverted for such uses. This water is measured and added to that passing over the dam. To insure accuracy in such estimates the amount of water diverted should be reasonably constant. Furthermore, it should be so diverted that it can be measured, either by a weir, a current meter, or a simple system of water wheels which are of standard make, or which have been rated as meters under working conditions and so installed that the gate openings, the heads under which they work, and their angular velocities may be accurately observed.

The combination of physical conditions and uses of the water should be such that the estimates of flow will not involve, for a critical stage of considerable duration, the use of a head, on a broad-crested dam, of less than 6 inches. Moreover, when all other conditions are good, the cooperation of the owners or operators of the plant is still essential if reliable results are to be obtained.

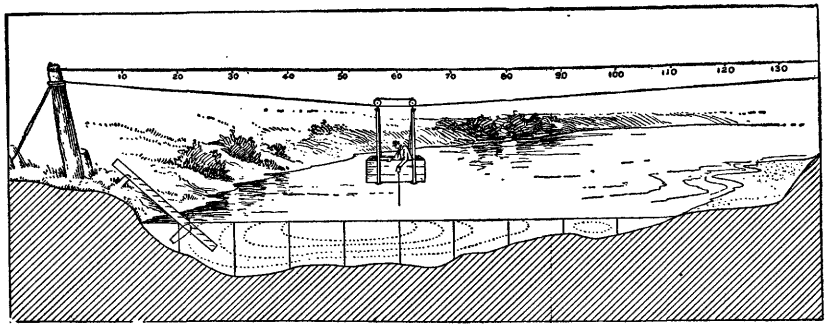


FIG. 1.—Cable station, showing section of river, car, gage, etc.

A gaging station at a weir or dam has the general advantage of continuity of record through the periods of ice and floods and the disadvantages of uncertainty of coefficient to be used in the weir formula and of complications in the diversion and use of the water.

Velocity method.—The determination of the quantity of water flowing past a certain section of a stream at a given time is termed a discharge measurement. This quantity is the product of two factors—the mean velocity and the area of the cross section. The mean velocity is a function of surface slope, wetted perimeter, roughness of bed, and the channel conditions at, above, and below the gaging section. The area depends on the contour of the bed and the fluctuations of the surface. The two principal ways of measuring the velocity of a stream are by floats and current meters.

Great care is taken in the selection and equipment of gaging stations for determining discharge by velocity measurements in order that the data may have the required degree of accuracy. Their essential requirements are practically the same whether the velocity is determined by meters or floats. They are located, as far as possible, where the channel is straight both above and below the gaging section; where there are no cross currents, backwater, or boils; where the bed of the stream is reasonably

free from large projections of a permanent character, and where the banks are high and subject to overflow only at flood stages. The station must be so far removed from the effects of tributary streams and dams or other artificial obstructions that the gage height shall be an index of the discharge.

Certain permanent or semipermanent structures, usually referred to as "equipment," are generally pertinent to a gaging station. These are a gage for determining the fluctuations of the water surface, bench marks to which the datum of the gage is referred, permanent marks on a bridge or a tagged line indicating the points of measurement, and, where the current is swift, some appliance (generally a secondary cable) to hold the meter in position in the water. As a rule, the stations are located at bridges if the channel conditions are satisfactory, as from them the observations can more readily be made and the cost of the equipment is small.

The floats in common use are the surface, subsurface, and tube or rod floats. A corked bottle with a flag in the top and weighted at the bottom makes one of the most satisfactory surface floats, as it is affected but little by wind. In case of flood measurements, good results can be obtained by observing the velocity of floating cakes of ice or débris. In case of all surface float measurements, coefficients must be used to reduce the observed velocity to the mean velocity. The subsurface and tube or rod floats are intended to give directly the mean velocity in the vertical. Tubes give excellent results when the channel conditions are good, as in canals.

In measuring velocity by a float, observation is made of the time taken by the float to pass over the "run," a selected stretch of river from 50 to 200 feet long. In each discharge measurement a large number of velocity determinations are made at different points across the stream, and from these observations the mean velocity for the whole section is determined. This may be done by plotting the mean positions of the floats as indicated by the distances from the bank as ordinates and the corresponding times as abscissas. A curve through these points shows the mean time of run at any point across the stream, and the mean time for the whole stream is obtained by dividing the area bounded by this curve and its axis by the width. The length of the run divided by the mean time gives the mean velocity.

The area used in float measurements is the mean of the areas at the two ends of the run and at several intermediate sections.

The essential parts of the current meters in use are a wheel of some type, so constructed that the impact of flowing water causes it to revolve, and a device for recording or indicating the number of revolutions. The relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter. This rating is done by drawing the meter through still water for a given distance at different speeds and noting the number of revolutions for each run. From these data a rating table is prepared, which gives the velocity per second for any number of revolutions.

Many kinds of current meters have been constructed. They may, however, be classed in two general types—those in which the wheel is made up of a series of cups, as the Price, and those having a screw-propeller wheel, as the Haskell. Each meter has been developed for use under some special condition. In the case of the small Price meter, which has been largely developed and extensively used by the United States Geological Survey, an attempt has been made to get an instrument which could be used under practically all conditions.

Current-meter measurements may be made from a bridge, cable, boat, or by wading, and gaging stations may be classified in accordance with such use. Fig. 1 shows a typical cable station.

In making the measurement an arbitrary number of points are laid off on a line perpendicular to the thread of the stream. The points at which the velocity and depth are observed are known as measuring points and are usually fixed at regular intervals, varying from 2 to 20 feet, depending on the size and condition of the

stream. Perpendiculars dropped from the measuring points divide the gaging section into strips. For each strip or pair of strips the mean velocity, area, and discharge are determined independently, so that conditions existing in one part of the stream may not be extended to parts where they do not apply.

Three classes of methods of measuring velocity with current meters are in general use—multiple point, single point, and integration.

The three principal multiple-point methods in general use are the vertical velocity curve, 0.2 and 0.8 depth, and top, bottom, and mid depth.

In the vertical velocity-curve method a series of velocity determinations are made in each vertical at regular intervals, usually from 0.5 to 1 foot apart. By plotting these velocities as abscissas and their depths as ordinates, and drawing a smooth curve among the resulting points, the vertical velocity curve is developed. This curve shows graphically the magnitude and changes in velocity from the surface to the bottom of the stream. The mean velocity in the vertical is then obtained by dividing the area bounded by this velocity curve and its axis by the depth. On account of the length of time required to make a complete measurement by this method, its use is limited to the determination of coefficients for purposes of comparison and to measurements under ice.

In the second multiple-point method the meter is held successively at 0.2 and 0.8 of the depth and the mean of the velocities at these two points is taken as the mean velocity for that vertical. On the assumption that the vertical velocity curve is a common parabola, with horizontal axis, the mean of the velocities at 0.22 and 0.79 of the depth will give (closely) the mean velocity in the vertical. Actual observations under a wide range of conditions show that this second multiple-point method gives the mean velocity very closely for open-water conditions where the depth is over 5 feet and the bed comparatively smooth, and moreover the indications are that it will hold nearly as well for ice-covered rivers.

In the third multiple-point method the meter is held at mid depth, at 0.5 foot below the surface, and at 0.5 foot above the bottom, and the mean velocity is determined by dividing by 6 the sum of the top velocity, four times the mid depth velocity, and the bottom velocity. This method may be modified by observing at 0.2, 0.6, and 0.8 depth.

The single-point method consists in holding the meter either at the depth of the thread of mean velocity or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined.

Extensive experiments by vertical velocity curves show that the thread of mean velocity generally occurs at from 0.5 to 0.7 of the total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, at which point the meter is held in a majority of the measurements. A large number of vertical velocity-curve measurements taken on many streams and under varying conditions show that the average coefficient for reducing the velocity obtained at 0.6 depth to mean velocity is practically unity.

In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the effect of the wind or other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocity taken at the subsurface to the mean has been found to be from 0.85 to 0.95, depending on the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is specially adapted for flood measurements, or when the velocity is so great that the meter can not be kept at 0.6 depth.

The vertical-integration method consists in moving the meter at a slow, uniform speed from the surface to the bottom and back again to the surface, and noting the number of revolutions and the time taken in the operation. This method has the advantage that the velocity at each point of the vertical is measured twice. It is well adapted for measurements under ice and as a check on the point methods.

The area, which is the other factor in the velocity method of determining the discharge of a stream, depends on the stage of the river, which is observed on the gage, and on the general contour of the bed of the stream, which is determined by soundings. The soundings are usually taken at each measuring point at the time of the discharge measurement, either by using the meter and cable or by a special sounding line or rod. For streams with permanent beds standard cross sections are usually taken during low water. These sections serve to check the soundings which are taken at the time of the measurements, and from them any change which may have taken place in the bed of the stream can be detected. They are also of value in obtaining the area for use in computations of high-water measurements, as accurate soundings are hard to obtain at high stages.

In computing the discharge measurements from the observed velocities and depths at various points of measurement, the measuring section is divided into elementary strips, as shown in fig. 1, and the mean velocity, area, and discharge are determined separately for either a single or a double strip. The total discharge and the area are the sums of those for the various strips, and the mean velocity is obtained by dividing the total discharge by the total area.

The determination of the flow of an ice-covered stream is difficult, owing to diversity and instability of conditions during the winter period, and also to lack of definite information in regard to the laws of flow of water under ice. The method now employed is to make frequent discharge measurements during the frozen periods by the vertical velocity-curve method and to keep an accurate record of the conditions, such as the gage height to the surface of the water as it rises in a hole cut in the ice, the thickness and character of the ice, etc.

From these data an approximate estimate of the daily flow can be made by constructing a rating curve (really a series of curves) similar to that used for open channels, but considering in addition to gage heights and discharge, varying thickness of ice. Such data as are available in regard to this subject are published in Water Supply Paper No. 146, pp. 141–148.

OFFICE METHODS OF COMPUTING RUN-OFF.

There are two principal methods of estimating run-off, depending on whether or not the bed of the stream is permanent.

For stations on streams with permanent beds the first step in computing the run-off is the construction of the rating table, which shows the discharge corresponding to any stage of the stream. This rating table is applied to the record of stage to determine the amount of water flowing. The construction of the rating table depends on the method used in measuring flow.

For a station at a weir or dam the basis for the rating table is some standard weir formula. The coefficients to be used in its application depend on the type of dam and other conditions near its crest. After inserting in the weir formula the measured length of crest and assumed coefficient, the discharge is computed for various heads, and the rating table constructed.

The data necessary for the construction of a rating table for a velocity-area station are the results of the discharge measurements, which include the record of stage of the river at the time of measurement, the area of the cross section, the mean velocity of the current, and the quantity of water flowing. A thorough knowledge of the conditions at and in the vicinity of the station is also necessary.

The construction of the rating table depends on the following laws of flow for open, permanent channels: (1) The discharge will remain constant so long as the conditions at or near the gaging station remain constant. (2) The discharge will be the same whenever the stream is at a given stage if the change of slope, due to the rise and fall of the stream, be neglected. (3) The discharge is a function of and increases gradually with the stage.

The plotting of results of the various discharge measurements, using gage heights as ordinates and discharge, mean velocity, and area as abscissas, will define curves which show the discharge, mean velocity, and area corresponding to any gage height. For the development of these curves there should be, therefore, a sufficient number of discharge measurements to cover the range of the stage of the stream. Fig. 2 shows a typical rating curve with its corresponding mean velocity and area curves.

As the discharge is the product of two factors, the area and the mean velocity, any change in either factor will produce a corresponding change in the discharge. Their curves are therefore constructed in order to study each independently of the other.

The area curve can be definitely determined from accurate soundings extending to the limits of high water. It is always concave toward the horizontal axis or on a straight line, unless the banks of the stream are overhanging.

The form of the mean velocity-curve depends chiefly on the surface slope, the roughness of the bed, and the cross section of the stream. Of these, the slope is the principal factor. In accordance with the relative changes of these factors the curve may be either a straight line, convex, or concave toward either axis, or a combination of the three. From a careful study of the conditions at any gaging station the

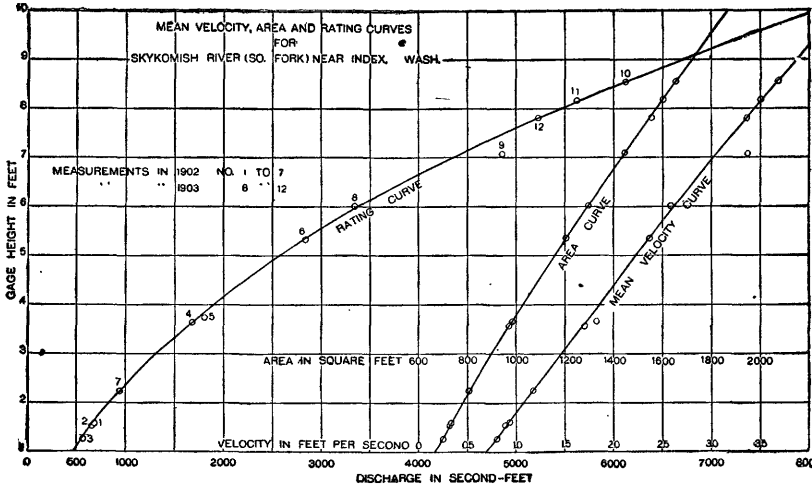


FIG. 2.—Discharge, mean-velocity, and area curves for South Fork of Skykomish River near Index, Wash.

form which the vertical velocity-curve will take can be predicted, and it may be extended with reasonable certainty to stages beyond the limits of actual measurements. Its principal use is in connection with the area curve in locating errors in discharge measurements and in constructing the rating table.

The discharge curve is defined primarily by the measurements of discharge, which are studied and weighted in accordance with the local conditions existing at the time of each measurement. The curve may, however, best be located between and beyond the measurements by means of curves of area and mean velocity. The discharge curve under normal conditions is concave toward the horizontal axis and is generally parabolic in form.

In the preparation of the rating table the discharge for each tenth or half tenth on the gage is taken from the curve. The differences between successive discharges are then taken and adjusted according to the law that they shall either be constant or increasing.

The determination of daily discharge of streams with changeable beds is a difficult problem. In case there is a weir or dam available, a condition which seldom exists

on streams of this class, estimates can be obtained by its use. In case of velocity-area stations frequent discharge measurements must be made if the estimates are to be other than rough approximations. For stations with beds which shift slowly or are materially changed only during floods, rating tables can be prepared for periods between such changes and satisfactory results obtained with a limited number of measurements, provided that some of them are taken soon after the change occurs. For streams with continually shifting beds, such as the Colorado and Rio Grande, discharge measurements should be made every two or three days, and the discharges for intervening days obtained either by interpolation modified by gage height or by Professor Stout's method, which has been described in full in the Nineteenth Annual Report of the United States Geological Survey, Part IV, page 323, and in Engineering News of April 21, 1904. This method or a graphical application of it is also much used in estimating flow at stations where the bed shifts but slowly.

COOPERATION AND ACKNOWLEDGMENTS.

Most of the measurements presented in this paper have been obtained through local hydrographers. Acknowledgment is extended to other persons and corporations who have assisted these hydrographers or have cooperated in any way, either by furnishing records of the height of water or by assisting in transportation.

The following list, arranged alphabetically by States, gives the names of the hydrographers and others who have assisted in furnishing and preparing the data contained in this report:

Colorado.—District and resident hydrographer, M. C. Hinderlider,[a] assisted by R. I. Meeker, Wm. A. Lamb, A. A. Weiland, Melvin Beeson, Thomas E. Brick, and F. L. Meeker. Acknowledgments are due the Colorado and Southern, Burlington and Missouri River, Union Pacific, and Chicago, Burlington and Quincy railroads for free transportation for hydrographers over their lines, also to the Denver Union Water Company for the free use of their reservoir for a rating station.

Louisiana.—District hydrographer, Thomas U. Taylor.[b]

New Mexico.[c]—The hydrographic work in the northern portion of this territory was carried on under the direction of M. C. Hinderlider, district hydrographer, assisted as follows: The work in the north central portion was in charge of R. I. Meeker, while the work in the northwestern portion was in charge of O. H. Timmerman. For many favors and courtesies in the form of free accommodations to hydrographers and for assistance in securing records of flow on Mora River acknowledgments are due D. C. Duel, Hugh Loudon, and J. J. Baer, of La Cueva, N. Mex., also to James D. Hand, of Los Alamos, N. Mex., for similar favors. Transportation in the form of annual passes was furnished Mr. Meeker by the Denver and Rio Grande and Atchison, Topeka and Santa Fe railroads. The work in the southern and eastern portion was under the direction of J. M. Giles, assisted by Earl Patterson. Acknowledgments are due the St. Louis and San Francisco, the Chicago, Rock Island and Pacific, the Southern Kansas, the Fort Worth and Denver City, and the Texas and Pacific railroads for transportation furnished Mr. Giles, and the Pecos Valley lines for transportation furnished Mr. Patterson.

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Special acknowledgment is due for the results of the data collected at certain stations in the Rio Grande drainage basin, to members of the International (Water) Boundary Commission as follows: Gen. Anson Mills, commissioner on the part of the United States; Señor Don Jacobo Blanco, commissioner on the part of Mexico, and W. W. Follett, consulting engineer on the part of the United States.

[a] Office of district hydrographer for Colorado, Kansas, Nebraska, northern New Mexico, and Wyoming, Chamber of Commerce Building, Denver, Colo.

[b] Office of the district hydrographer for Texas, Arkansas, and Louisiana, Austin, Tex.

[c] District hydrographer for southern and eastern New Mexico, southern Oklahoma, and southern Indian Territory, J. M. Giles, Carlsbad, N. Mex.

SABINE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Sabine River has its headwaters in Collin and Hunt counties, Tex., flows in a southeasterly direction to the State line, then south, forming the boundary between Texas and Louisiana, and empties into Sabine Lake, an arm of the Gulf, near Orange, Tex. The small tributaries in eastern Texas support many small water mills, and the Sabine itself is navigable for several hundred miles. The drainage area of the Sabine in Texas above Orange is 7,500 square miles and its total drainage area above Orange in Louisiana and Texas is 10,400 square miles.

SABINE RIVER NEAR LONGVIEW, TEX.

This station was established January 1, 1904, by Thomas U. Taylor. It is located at the bridge of the International and Great Northern Railroad, about 3 miles southwest of Longview Junction, Tex.

The channel is straight for 150 feet above and 400 feet below the station. The current is sluggish. The right bank is low and cleared along the right of way of the railroad. The left bank is high and composed in its lower half of sandstone; it is cleared above and wooded below the station. The bed of the stream is rocky and fairly permanent. Old piles left from the false work used in erecting the bridge give trouble in making measurements at low water.

Discharge measurements are made from the bridge. The initial point for soundings is the east face of the west abutment.

A standard chain gage is attached to the guard rail of the bridge. During 1905 the gage was read twice each day by John Wadsack. Bench marks were established as follows: (1) The top of abutment, northeast corner, marked "U. S. G. S. 42.08 B. M."; elevation, 42.08 feet. (2) The top of an iron rod buried in a vertical position in the yard of the bridge watchman, 6 feet from the southeast corner of his house, 3 feet from the second post east of the gate, and 8 inches from the wire fence; elevation, 47.00 feet. (3) The top of tie at the gage; elevation, 45.00 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 99, p 322; 132, pp 19–20.
Discharge: 99, p 322; 132, p 20.
Discharge, monthly: 132, p 23.
Gage heights: 132, p 21.
Rating table: 132, p 22.

Discharge measurements of Sabine River near Longview, Tex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
July 9	T. U. Taylor	3,660	3.08	30.1	11,270
July 10	do	4,150	3.67	32.6	15,240
July 11	do	4,316	3.85	33.4	16,630

Daily gage height, in feet, of Sabine River near Longview, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.0	7.65	16.15	17.65	28.9	32.4	24.9	25.95	7.1	7.4	12.3	9.8
2	7.5	7.65	15.3	18.5	30.2	31.7	23.35	26.15	7.1	7.4	11.2	10.8
3	7.25	7.7	13.75	23.85	31.85	31.15	21.75	26.4	7.1	7.3	10.3	10.8
4	7.15	7.8	11.65	24.7	32.6	30.55	22.15	26.5	7.0	7.3	9.4	10.7
5	7.1	7.8	10.1	24.35	32.55	29.55	24.15	26.35	6.95	7.3	9.0	11.5
6	7.0	7.8	9.4	23.35	32.2	28.5	25.2	25.65	6.9	7.2	9.3	12.6
7	7.0	8.25	9.05	22.55	32.15	26.75	26.6	23.65	6.9	7.2	9.5	13.0
8	6.9	10.05	9.35	21.05	32.55	24.1	28.1	19.45	6.9	7.1	9.8	13.3
9	6.95	11.75	10.8	21.65	33.0	20.6	29.95	15.0	7.0	7.0	10.2	13.3
10	7.0	12.55	13.95	21.65	33.9	15.85	32.8	11.4	7.0	6.9	10.9	12.9
11	7.45	12.55	14.4	22.1	34.05	11.6	33.4	10.3	6.9	6.9	11.7	12.0
12	9.3	12.1	14.2	22.95	34.3	9.8	33.15	9.9	6.8	6.8	12.9	11.0
13	11.4	11.4	15.15	23.95	33.25	9.6	32.7	9.25	6.8	6.8	14.2	12.5
14	11.15	10.8	15.6	24.6	34.1	9.45	32.2	8.95	6.9	6.8	15.3	15.0
15	10.8	10.6	16.2	24.85	33.45	9.3	31.7	8.55	6.9	6.8	16.4	16.4
16	10.25	10.75	17.15	24.7	33.1	9.4	31.25	8.35	6.9	6.7	17.1	17.8
17	9.4	11.05	17.4	23.45	33.6	9.25	31.1	8.15	6.9	6.9	17.7	19.4
18	9.0	11.3	20.45	21.65	34.9	9.05	31.1	7.95	6.8	7.1	18.2	21.3
19	8.85	13.95	27.8	21.95	35.05	9.7	31.15	7.8	6.9	7.2	18.7	25.6
20	9.35	17.15	27.45	23.2	34.9	10.5	30.7	7.7	7.05	7.9	18.9	28.2
21	9.3	17.75	27.15	24.15	34.45	10.2	30.25	7.55	7.55	9.1	18.6	28.4
22	8.95	17.05	27.05	24.15	34.05	11.15	29.65	7.4	8.05	10.6	17.0	29.4
23	8.45	16.35	26.25	23.85	33.55	16.0	29.4	7.4	7.95	11.9	14.0	30.0
24	8.05	16.0	25.0	24.0	33.4	13.85	28.35	7.3	7.7	12.1	11.1	33.6
25	7.8	16.9	23.45	27.15	33.6	13.7	27.15	7.25	7.95	11.7	9.7	33.8
26	7.7	16.05	21.6	27.65	34.25	15.05	26.1	7.25	7.95	10.2	9.3	33.6
27	7.55	16.35	19.4	27.5	34.7	21.6	25.5	7.1	7.8	9,5	9.1	33.2
28	7.5	16.45	16.1	27.5	34.65	27.15	25.05	7.1	7.7	10.1	9.0	32.8
29	7.4	.....	17.2	27.6	34.25	26.95	25.0	7.05	7.6	11.9	8.9	32.3
30	7.7	.....	18.65	28.15	33.65	26.15	25.25	7.0	7.45	13.2	8.9	31.8
31	7.65	.....	18.55	.....	33.05	.....	25.55	7.0	.....	13.4	.....	30.4

Station rating table for Sabine River near Longview, Tex., from January 1 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
6.00	44	7.90	300	9.80	660	13.40	1,461
6.10	53	8.00	317	9.90	680	13.60	1,509
6.20	63	8.10	335	10.00	700	13.80	1,557
6.30	74	8.20	353	10.20	742	14.00	1,605
6.40	85	8.30	371	10.40	784	14.20	1,653
6.50	97	8.40	389	10.60	826	14.40	1,701
6.60	109	8.50	407	10.80	869	14.60	1,750
6.70	122	8.60	426	11.00	913	14.80	1,800
6.80	135	8.70	445	11.20	957	15.00	1,850
6.90	148	8.80	464	11.40	1,001	15.50	1,975
7.00	162	8.90	483	11.60	1,045	16.00	2,103
7.10	176	9.00	502	11.80	1,090	16.50	2,233
7.20	190	9.10	521	12.00	1,136	17.00	2,366
7.30	205	9.20	540	12.20	1,182	18.00	2,640
7.40	220	9.30	560	12.40	1,228	19.00	2,938
7.50	235	9.40	580	12.60	1,274	20.00	3,310
7.60	251	9.50	600	12.80	1,320	21.00	3,746
7.70	267	9.60	620	13.00	1,366	22.00	4,230
7.80	283	9.70	640	13.20	1,413		

The above table is based on 23 discharge measurements made during 1904 and 3 made during 1905. It is well defined between gage heights 6 feet and 22 feet. Above 22 feet the discharge is only approximate. Below 19 feet the table is the same as for 1904.

Estimated monthly discharge of Sabine River near Longview, Tex., for 1905.

[Drainage area, 2,900 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
January	1,001	148	385	23,670	0.133	0.153
February	2,570	259	1,251	69,480	.431	.449
March	8,490	512	3,134	192,700	1.08	1.24
April	8,865	2,542	5,511	327,900	1.90	2.12
May	19,480	9,735	16,640	1,023,000	5.74	6.62
June	14,980	512	4,470	266,000	1.54	1.72
July	16,680	4,106	9,777	601,200	3.37	3.88
August	7,316	162	1,934	118,900	.667	.769
September	326	135	195	11,600	.067	.075
October	1,461	122	461	28,350	.159	.183
November	2,907	483	1,332	81,900	.459	.512
December	17,360	660	6,388	392,800	2.20	2.54
The year	19,480	122	4,290	3,138,000	1.48	20.26

NECHES RIVER AT EVADALE, TEX.

A gaging station was established on Neches River at Evadale July 1, 1904, by Thomas U. Taylor. It is located at the bridge of the Gulf, Beaumont and Kansas City Railway.

The clear span or water way under each arm of the draw span is 50 feet, and the bridge continues each way on trestles. The left bank is high, whence the name of the railroad station, Fords Bluff, but the right or west bank is low and the trestle work continues about half a mile from the river channel.

Discharge measurements are made from the bridge at ordinary and high stages. At low water the current is very sluggish, and discharge measurements are made at shoals above or below the station.

Gage readings are made by reading down from the top of the tie to the water surface by means of a tape. The zero of the gage is 40.00 feet below the top of the tie in the west arm of the draw span of the bridge. During 1905 the gage was read by W. H. Whittemore.

A description of this station and gage height and discharge data are contained in Water-Supply Paper No. 132 of the United States Geological Survey, pages 23–24.

Discharge measurements of Neches River at Evadale, Tex., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-feet.*
March 27	H. H. Fox	21.6	13,730
March 29	do	22.1	14,240
June 24	T. U. Taylor	15.2	3,389
July 3	do	18.1	7,130

Daily gage height, in feet, of Neches River at Evadale, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	19.2	16.6	19.4	21.5	21.0	22.1	20.0	18.7	11.1	7.9	8.6	14.7
2	19.2	16.6	19.3	21.3	21.1	21.9	18.4	18.2	10.8	7.9	8.6	14.1
3	19.0	17.2	19.2	21.1	21.3	21.7	17.8	17.6	10.3	7.8	8.7	13.3
4	18.5	17.0	19.1	21.1	21.5	21.7	17.5	17.1	10.0	7.8	8.8	13.6
5	18.0	16.5	19.0	21.4	21.8	21.6	17.2	16.9	10.0	7.8	9.2	14.1
6	17.8	16.0	18.8	21.6	21.8	21.5	17.3	16.8	9.6	7.8	9.6	14.1
7	17.8	16.0	18.7	21.8	21.8	21.3	17.5	17.1	10.3	7.8	10.0	14.1
8	17.9	16.6	18.5	22.0	21.8	21.1	17.9	18.6	11.8	7.8	11.4	14.2
9	17.9	17.0	18.3	22.3	21.7	20.6	18.7	19.0	11.3	7.8	12.8	14.3
10	17.9	17.3	18.2	22.5	21.7	20.0	19.4	19.3	10.6	7.7	13.9	14.0
11	17.8	17.7	19.6	22.6	21.7	19.2	19.7	19.2	10.0	7.7	15.1	14.0
12	17.7	18.0	19.1	22.6	21.8	18.1	20.0	19.2	9.4	7.6	16.0	14.1
13	17.5	18.5	19.4	22.5	21.9	17.2	20.3	19.2	9.1	7.6	16.9	14.5
14	17.3	19.0	19.7	22.3	22.0	16.8	20.7	19.1	9.0	7.5	17.2	14.8
15	17.5	19.6	19.9	22.0	22.0	16.1	20.9	18.9	9.0	7.4	18.0	15.2
16	17.2	19.3	19.7	21.7	22.1	15.7	21.1	18.5	9.1	7.5	18.0	16.6
17	17.5	19.3	19.6	21.5	22.2	15.4	21.4	17.8	8.7	7.5	17.9	16.8
18	16.7	19.0	19.6	21.3	22.3	15.2	21.6	17.0	8.5	7.4	17.9	17.0
19	15.9	18.6	19.9	21.1	22.6	14.9	21.7	16.1	8.5	7.4	17.7	17.1
20	15.0	18.4	20.2	21.0	22.9	14.5	21.9	15.4	8.5	7.4	17.5	17.2
21	14.7	18.4	20.5	20.9	23.1	14.0	21.8	14.7	8.5	7.2	17.6	17.2
22	14.6	19.0	20.8	20.6	23.4	13.4	21.6	14.1	8.4	7.2	17.6	18.0
23	14.3	19.4	21.0	20.4	23.6	13.7	21.4	13.6	8.4	7.2	17.7	18.4
24	14.1	19.6	21.1	20.5	23.6	14.6	21.2	13.1	8.4	7.0	17.5	18.6
25	14.0	19.5	21.5	20.4	23.5	17.9	21.1	12.5	8.4	7.0	17.4	19.1
26	13.7	19.7	21.5	20.3	23.3	18.5	20.7	11.9	8.3	7.3	17.1	19.7
27	13.6	19.7	21.6	20.3	23.1	18.7	20.4	11.4	8.2	7.6	16.7	19.9
28	13.6	19.6	21.7	20.3	23.0	19.1	20.1	11.0	8.1	7.9	16.1	20.1
29	13.4	.....	21.8	20.4	22.7	19.3	19.9	10.6	8.0	8.0	15.7	19.3
30	13.1	.....	21.8	20.8	22.5	19.1	19.2	10.8	7.9	8.3	15.2	19.8
31	15.0	.....	21.6	.....	22.4	.....	19.5	11.4	.....	8.6	.....	20.0

Station rating table for Neches River at Evadale, Tex., from July 1, 1904, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
5.00	180	6.70	429	8.80	854	12.00	1,800
5.10	191	6.80	447	9.00	900	12.50	2,010
5.20	202	6.90	465	9.20	948	13.00	2,248
5.30	214	7.00	484	9.40	997	13.50	2,508
5.40	226	7.10	503	9.60	1,047	14.00	2,790
5.50	239	7.20	522	9.80	1,098	14.50	3,110
5.60	252	7.30	541	10.00	1,150	15.00	3,480
5.70	266	7.40	560	10.20	1,204	15.50	3,890
5.80	280	7.50	580	10.40	1,260	16.00	4,350
5.90	295	7.60	600	10.60	1,318	17.00	5,410
6.00	310	7.70	620	10.80	1,378	18.00	6,660
6.10	326	7.80	640	11.00	1,442	19.00	8,270
6.20	342	7.90	660	11.20	1,509	20.00	10,100
6.30	359	8.00	680	11.40	1,578	21.00	12,090
6.40	376	8.20	722	11.60	1,650	22.00	14,300
6.50	393	8.40	765	11.80	1,724	23.00	16,750
6.60	411	8.60	809				

The above table is based on seven discharge measurements made during 1904-5. It is fairly well defined between gage heights 5.6 feet and 22 feet. Above 22 feet the discharge is approximate.

Estimated monthly discharge of Neches River at Evadale, Tex., for 1904 and 1905.

[Drainage area, 8,200 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
1904.						
July	1,232	503	1,027	63,150	0.125	0.144
August	1,922	411	879	54,050	.107	.123
September	640	326	463	27,550	.056	.062
October	503	202	291	17,890	.035	.040
November	266	202	209	12,440	.025	.028
December	7,590	280	1,043	64,130	.127	.146
The period				239,200		
1905.						
January	8,620	2,298	5,090	313,000	.621	.716
February	9,530	4,350	7,171	398,300	.875	.911
March	13,840	6,960	10,210	627,800	1.25	1.44
April	15,750	10,670	12,870	765,800	1.57	1.75
May	18,300	12,090	15,070	926,600	1.84	2.12
June	14,540	2,454	7,865	468,000	.959	1.07
July	14,070	5,640	10,180	625,900	1.24	1.43
August	8,800	1,318	5,127	315,200	.625	.721
September	1,724	660	986	58,670	.120	.134
October	809	484	606	37,260	.074	.085
November	6,660	809	4,217	250,900	.514	.574
December	10,290	2,402	5,312	326,600	.648	.747
The year	18,300	484	7,059	5,114,000	.861	11.70

TRINITY RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Trinity River rises in a network of small streams in the counties of Montague, Jack, Wise, Denton, and Parker, Tex., but their combined flow above Dallas is not sufficient to keep the bottom or bed of the stream moist in dry times. Below Dallas the Trinity flows through a wooded country, and consequently it is not subject to sudden floods with their quick run-offs.

TRINITY RIVER AT RIVERSIDE, TEX.

A gaging station was established on Trinity River at Riverside, Tex., in December, 1902, by Thomas U. Taylor. It is located at the bridge of the International and Great Northern Railroad.

The channel is straight for 300 feet above and 1,000 feet below the bridge. The current is sluggish at low and swift at high stages. The right bank is high and rocky. The left bank is lower than the right, a trestle being used to measure the overflow at flood stages. The bed of the stream consists of tough mud or clay.

Discharge measurements are made from the railroad bridge. The initial point for soundings is the north face of the south abutment for the south channel. For the north channel the north face of the pier is the initial point.

During 1905 the gage was read by G. W. Higdon. The zero of the gage is 66.00 feet below the top of the ties (or base of rail) in the north arm of the draw span of the International and Great Northern Railroad bridge. The elevation of the top of the pivot pier above gage datum is 56.50 feet, and that of the top of the channel of the lower chord of the arms of the draw span of the bridge is 62.90 feet. According

to the survey of the United States Army engineers the elevation of the top of the tie with reference to mean low tide of the gulf is 148.70 feet.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 84, pp 142–143; 99, pp 322–323; 132, p 25.
Discharge: 84, p 143; 99, p 323; 132, p 26.
Discharge, monthly: 99, p 325; 132, p 28.
Gage heights: 99, pp 323–324; 132, p 26.
Rating table: 99, p 324; 132, p 27.

Discharge measurements of Trinity River at Riverside, Tex., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Second-feet.*
July 4	T. U. Taylor	37.6	24,660
July 4	do	37.0	23,800
July 5	do	35.8	21,420
July 5	do	34.8	20,490
July 6	H. H. Fox	32.7	18,970
July 7	do	31.5	17,890
July 8	do	30.2	17,320

Daily gage height, in feet, of Trinity River at Riverside, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10.4	9.2	17.9	28.5	42.5	49.1	45.7	34.4	10.4	8.5	11.5	11.2
2	9.5	9.5	15.4	25.6	43.1	48.6	44.0	34.4	10.1	8.4	11.2	12.0
3	9.1	9.5	12.7	29.2	42.9	48.0	41.6	34.3	9.3	8.3	10.5	12.2
4	8.9	9.4	11.4	29.2	41.4	47.4	38.5	33.7	9.1	8.3	10.3	11.9
5	8.8	9.4	10.7	29.0	39.4	46.9	35.8	33.7	8.9	8.2	10.2	11.5
6	8.6	9.4	10.2	28.6	37.7	46.4	33.5	32.2	8.9	8.1	10.3	11.1
7	8.5	9.7	10.0	27.5	36.3	46.1	31.8	31.9	8.9	8.1	11.1	12.5
8	8.4	10.7	10.0	26.6	35.8	45.9	30.3	31.4	8.8	8.0	12.3	12.7
9	8.4	13.2	22.8	26.2	36.4	45.9	32.4	30.9	8.7	8.0	12.6	12.4
10	8.4	13.6	15.4	26.2	38.0	45.9	34.3	29.9	8.7	10.0	17.5	11.7
11	8.3	13.3	16.4	26.2	38.6	45.8	35.2	28.5	8.6	13.0	17.6	11.0
12	9.5	14.0	23.3	26.7	39.0	45.6	35.7	26.3	8.5	13.5	17.9	10.5
13	11.7	14.3	20.1	27.2	39.6	45.0	35.5	18.7	8.5	12.9	17.7	10.5
14	11.4	15.0	18.8	27.7	40.6	44.2	34.5	14.0	8.4	11.9	17.3	12.8
15	10.6	15.1	19.4	27.8	43.3	43.6	33.7	11.9	8.4	10.7	17.9	17.2
16	9.9	14.5	20.0	27.8	46.6	41.8	32.7	11.4	8.4	10.0	17.7	18.6
17	10.0	13.6	20.0	27.8	48.5	38.0	31.9	11.2	8.3	9.4	19.4	20.0
18	11.9	12.5	22.6	27.4	49.8	29.7	31.0	11.2	8.3	9.0	19.5	20.5
19	12.7	15.7	27.0	27.2	50.0	19.7	31.0	11.0	8.2	8.9	19.7	22.5
20	12.7	19.7	27.3	26.7	52.4	15.7	29.5	10.5	8.7	9.2	19.6	26.7
21	11.9	19.4	28.1	25.4	48.9	14.0	32.1	10.3	9.0	13.5	19.4	29.8
22	10.9	19.9	29.2	22.1	48.0	16.4	29.0	10.0	9.0	14.1	18.7	31.9
23	10.2	18.9	27.5	18.3	47.1	18.8	29.2	10.0	9.2	13.8	17.1	32.5
24	9.7	18.0	26.7	17.4	46.2	18.8	30.0	10.0	9.2	14.0	15.7	32.3
25	8.7	18.0	27.2	32.9	46.5	18.1	30.1	9.7	9.7	14.7	15.7	31.8
26	9.1	18.5	26.4	36.4	46.6	18.8	30.5	9.7	9.8	14.2	14.7	31.5
27	9.0	18.8	28.2	37.7	47.7	37.7	30.5	9.5	9.5	13.2	14.1	31.5
28	8.9	18.6	29.0	36.3	48.9	44.8	31.0	8.4	9.3	12.2	13.6	32.0
29	8.8	.....	32.1	34.2	47.7	47.0	33.8	8.3	9.0	12.4	12.6	32.3
30	8.8	.....	31.1	40.6	49.9	46.8	34.1	8.3	8.7	12.2	11.8	32.7
31	8.8	.....	30.3	.....	48.7	.....	34.1	10.6	.....	12.5	.....	33.6

Estimated monthly discharge of Trinity River at Riverside, Tex., for 1905.

[Drainage area, 16,000 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
January	2,779	441	1,108	68,130	0.069	0.080
February	8,081	761	4,064	225,700	.254	.264
March	18,580	1,150	9,716	597,400	.607	.700
April	26,730	6,138	15,310	911,000	.957	1.07
May	38,500	22,020	30,260	1,861,000	1.89	2.18
June	35,200	3,630	24,180	1,439,000	1.51	1.68
July	31,800	15,780	20,070	1,234,000	1.25	1.44
August	20,680	441	8,136	500,300	.508	.586
September	1,375	413	682	40,580	.043	.048
October	4,127	360	1,848	113,600	.116	.134
November	7,923	1,261	4,613	274,500	.288	.321
December	19,950	1,433	9,270	570,000	.579	.668
The year	38,500	360	10,770	7,835,000	.673	9.17

NOTE.—Above estimates subject to large error for low and medium stages owing to the inconsistent data on which the rating table was based.

BRAZOS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

This river has its source in the Staked Plains region of western Texas and has a general southeasterly course, emptying into the Gulf of Mexico south of the mouth of Trinity River. Its drainage basin is entirely within the State of Texas.

BRAZOS RIVER AT WACO, TEX.

This station was established September 14, 1898, by Thomas U. Taylor. It is located at the suspension bridge on Bridge street, Waco, Tex.

The channel is straight for 1,000 feet above and 300 feet below the station. There is a good current at all stages. The right bank is composed of limestone and does not overflow. The left bank is high, but overflows during floods. The bed of the stream is composed of sand, free from vegetation, and slightly shifting. A single-span truss bridge crosses the river at an angle of 76° about 300 feet above the suspension bridge.

Discharge measurements are made from the suspension bridge. The initial point for soundings is the edge of the right abutment.

An inclined gage in three sections is located on the left bank under the bridge. During 1905 the gage was read twice each day by W. J. Cassaday. Bench marks were established as follows: (1) The top of the water table on the top of the south pier of the abutment of the suspension bridge, about 3 inches above the floor, marked "U. S. G. S. B. M."; elevation, 44.33 feet above the datum of the gage. (2) United States Coast and Geodetic Survey bolt in the side of Patton's feed store; elevation, 55.60 feet above the datum of the gage and 413.18 feet above mean low tide. (3) The floor of the truss bridge above the suspension bridge, at the foot of the down-stream batter brace on the Waco side; elevation, 45.40 feet above the datum of the gage.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 28, p 118; 37, p 272; 50, p 333; 66, p 58–59; 84, pp 143–144; 99, pp 325–326; 132, pp 28–29.
Discharge: 28, p 129; 37, p 272; 50, p 334; 66, p 59; 84, pp 144–145; 99, p 327; 132, p 30.
Discharge, monthly: 75, pp 150–151; 84, p 146; 99, p 328; 132, p 31.
Gage heights: 28, p 121; 37, p 273; 50, p 334; 66, p 59; 84, p 145; 99, p 327; 132, p 30.
Rating tables: 66, p 173; 84, p 146; 99, p 328; 132, p 31.

Discharge measurements of Brazos River at Waco, Tex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
May 1[a]	W. J. Cassaday	450	11,350	7.75	29.0	88,000
May 2	H. H. Fox	450	4,055	4.02	12.5	16,320
May 2	do	450	3,540	3.78	11.4	13,400
May 2	do	450	4,660	4.22	13.9	19,680
May 3	do	440	2,800	3.40	9.7	9,520
May 3	do	445	3,100	3.51	10.4	10,880
May 4	do	440	2,390	3.26	8.8	7,780
May 8	do	480	10,420	7.11	26.7	74,110
May 9	do	460	6,820	5.59	18.8	38,090
May 9	do	450	5,210	4.44	15.3	23,140
August 10	T. U. Taylor	380	1,140	3.00	6.1	3,418
August 11	do	380	960	2.78	5.5	2,673
August 12	do	380	888	2.62	5.4	2,322
August 19	do	380	524	1.65	3.9	866
August 26	do	305	386	1.53	3.5	591

[a] Float measurement.

Daily gage height, in feet, of Brazos River at Waco, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	2.8	3.2	4.8	25.0	7.1	7.1	6.9	3.1	3.35	3.05	3.15
2	2.5	2.8	3.2	10.35	12.9	6.9	6.55	6.7	3.1	3.15	3.0	3.2
3	2.5	2.75	3.2	11.6	10.5	6.65	6.3	6.55	3.1	3.0	2.9	3.15
4	2.5	2.7	3.15	8.7	9.3	6.0	6.75	6.4	3.0	4.8	2.85	3.1
5	2.5	2.7	3.1	7.7	9.1	5.75	6.55	6.05	3.1	5.9	2.8	3.0
6	2.5	2.7	3.1	7.35	13.15	5.35	6.7	6.0	3.0	4.9	2.8	2.95
7	2.5	2.7	3.3	7.05	10.7	4.9	9.2	7.1	3.0	4.55	2.8	2.85
8	2.5	2.7	3.75	6.65	14.1	4.8	7.95	7.6	3.0	4.1	2.75	2.8
9	2.5	2.85	4.5	6.55	15.0	4.7	7.3	7.1	3.0	4.25	3.65	2.8
10	2.5	3.5	4.15	6.4	5.2	4.65	6.9	6.55	2.95	4.65	4.15	2.8
11	2.55	3.3	4.0	5.9	9.35	4.55	6.5	5.75	2.9	4.4	3.95	2.8
12	5.3	3.3	3.75	5.65	11.0	4.4	7.7	5.75	3.0	4.6	3.85	2.85
13	4.55	3.2	3.65	5.3	17.45	4.3	7.4	5.5	8.1	4.3	5.0	4.1
14	3.25	3.1	3.55	5.9	28.6	4.25	7.65	5.0	8.95	4.1	4.5	5.1
15	2.9	2.95	3.6	4.55	13.5	4.4	7.4	4.75	7.3	3.95	4.3	4.95
16	2.65	3.5	4.05	4.45	11.8	4.9	6.55	4.6	6.6	3.75	4.3	4.45
17	3.1	3.0	5.65	4.25	11.7	4.75	6.45	4.35	6.3	3.55	4.15	4.2
18	3.2	3.6	8.15	4.1	10.5	4.55	6.1	3.95	6.45	3.4	3.85	4.25
19	3.1	4.85	6.3	4.1	9.3	4.65	5.55	3.75	6.3	5.35	3.65	4.95
20	3.0	4.95	6.1	4.1	8.6	4.8	4.9	5.15	6.05	7.55	3.5	5.45
21	3.0	4.4	7.25	4.05	7.8	7.6	4.45	4.7	6.65	6.6	3.45	5.1
22	2.95	3.75	5.5	4.0	13.8	8.8	4.2	4.35	5.05	5.75	3.35	4.55
23	2.9	3.55	5.1	4.0	12.7	7.35	4.7	4.0	4.5	5.55	3.3	4.15
24	2.9	3.4	4.95	14.2	16.15	8.25	4.5	3.9	4.3	5.1	3.4	4.0
25	2.9	3.25	4.55	14.0	15.05	7.5	4.75	3.8	4.1	4.4	3.4	3.9
26	2.85	3.2	4.15	8.8	13.9	7.55	6.8	3.65	4.0	4.15	3.4	3.75
27	2.8	3.25	4.05	13.15	13.35	8.35	12.0	3.45	3.85	4.0	3.35	3.55
28	2.8	3.3	4.05	9.3	11.6	12.55	17.1	3.3	3.8	3.75	3.25	3.5
29	2.8	.....	5.1	10.1	9.0	8.65	12.9	3.25	3.65	3.55	3.2	3.45
30	2.8	.....	5.15	22.0	8.7	7.45	9.0	3.2	3.55	3.45	3.1	3.4
31	2.8	.....	4.7	.....	7.85	.....	7.55	3.1	.....	3.3	.....	3.5

Station rating table for Brazos River at Waco, Tex., from January 1 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.00	62	3.70	820	5.80	2,955	9.50	9,200
2.10	82	3.80	900	6.00	3,220	10.00	10,260
2.20	104	3.90	980	6.20	3,490	10.50	11,360
2.30	128	4.00	1,065	6.40	3,770	11.00	12,510
2.40	145	4.10	1,150	6.60	4,055	11.50	13,700
2.50	184	4.20	1,235	6.80	4,345	12.00	14,900
2.60	215	4.30	1,320	7.00	4,645	12.50	16,150
2.70	248	4.40	1,410	7.20	4,955	13.00	17,450
2.80	284	4.50	1,500	7.40	5,275	13.50	18,800
2.90	323	4.60	1,595	7.60	5,605	14.00	20,200
3.00	365	4.70	1,695	7.80	5,945	14.50	21,660
3.10	410	4.80	1,795	8.00	6,300	15.00	23,180
3.20	460	4.90	1,900	8.20	6,660	16.00	26,400
3.30	520	5.00	2,005	8.40	7,030	17.00	29,850
3.40	590	5.20	2,225	8.60	7,410	18.00	33,500
3.50	665	5.40	2,455	8.80	7,790		
3.60	740	5.60	2,700	9.00	8,190		

The above table is based on discharge measurements made during 1900 to 1905 and is well defined.

Estimated monthly discharge of Brazos River at Waco, Tex., for 1905.

[Drainage area, 30,750 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
Jannary	2,340	184	388	23,860	0.013	0.015
February	1,952	248	585	32,490	.019	.020
March	6,570	410	1,642	101,000	.053	.061
April	50,400	1,065	7,347	437,200	.239	.267
May	85,500	2,225	18,280	1,124,000	.594	.685
June	16,280	1,277	3,898	231,900	.127	.142
July	30,210	1,235	5,771	354,800	.188	.217
August	5,605	410	2,276	139,900	.074	.085
September	8,090	323	1,906	113,400	.062	.069
October	5,522	365	1,561	95,980	.051	.059
November	2,005	266	718	42,720	.023	.026
December	2,515	284	931	57,240	.030	.035
The year	85,500	184	3,775	2,754,000	.123	1.68

BRAZOS RIVER AT RICHMOND, TEX.

This station was established January 1, 1903, by Thomas U. Taylor. It is located at the bridge of the Southern Pacific Railroad.

The channel is straight for 200 feet above and 900 feet below the station, and has a width of about 175 feet at low water, without piers, and about 500 feet at ordinary high water, broken by three piers. During very high floods the left bank overflows and the width of the stream is 900 feet. The bed of the stream is sandy except around the piers, where it is stony, and is slightly shifting. The current is obstructed somewhat by old piles. Above and at Waco the river rises rapidly, and when it gets above gage height 30 feet overflows the bottom lands below the town. When

the floods spread out over the bottom lands, as they do from Waco to Richmond, the river stays up longer in its lower stretches than it does in the upper sections, as the bottoms and the lowlands serve as storage reservoirs for the backwater and are drained slowly as the river recedes. Above Waco the surface water rushes off into the stream more rapidly, and the river rises more suddenly and falls almost as suddenly. For this reason it is possible for the maximum discharge at Waco to be greater than it is at Richmond.

Discharge measurements are made from the bridge. The initial point for soundings is the east face of the pier under the west end of the middle span.

A standard chain gage is attached to the bridge; length of chain, 53.82 feet. During 1905 the gage was read once each day by J. E. Winston. Bench marks were established as follows: (1) The top of the tie at the downspout of the gage box in the central panel of the middle span on the downstream side of the bridge; elevation, 51.52 feet. (2) A point marked "R. F." on the southeast corner of the tie seat of west abutment; elevation, 51.11 feet. (3) The top of the north bolt in flange of hydrant at corner of Railroad and First streets, 6 inches below the top of the hydrant; elevation, 47.26 feet. (4) The top of the northeast corner of base stone of "Our Heroes" monument in the court-house square; elevation, 53.52 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 84, p 147; 99, p 329; 132, pp 32–33.
Discharge: 84, p 147; 99, p 330; 132, p 33.
Discharge, monthly: 99, p 332; 132, p 35.
Gage heights: 99, pp 330–331; 132, p 33.
Rating table: 99, p 331; 132, p 34.

Discharge measurements of Brazos River at Richmond, Tex., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Second-feet.*
July 25	T. U. Taylor	9.1	9,400
August 4	do	8.4	7,960

Daily gage height, in feet, of Brazos River at Richmond, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	6.1	5.6	10.1	28.1	18.1	19.5	13.6	3.4	3.1	3.4	3.1
2	3.2	6.0	5.4	9.9	28.2	18.1	19.1	10.3	3.3	3.0	3.2	3.0
3	4.1	5.8	4.8	9.2	28.3	15.1	18.9	9.3	3.4	3.0	3.3	3.0
4	2.9	5.6	3.6	15.9	30.2	14.0	17.4	8.4	3.4	4.9	3.2	3.1
5	2.7	5.1	6.0	18.1	31.9	13.8	17.1	7.8	3.6	2.5	3.2	3.2
6	2.6	6.1	9.7	17.1	33.0	13.6	15.6	7.8	3.0	2.5	3.3	3.2
7	2.3	5.9	10.1	15.0	32.9	13.5	15.2	6.2	2.6	2.5	3.4	3.3
8	2.6	6.0	9.5	13.2	32.2	11.8	14.8	6.3	2.6	2.5	3.6	3.3
9	3.1	6.1	8.8	12.0	31.2	11.5	14.5	6.35	2.6	2.6	3.7	3.5
10	3.1	6.0	11.9	11.7	32.1	11.0	14.3	6.5	2.6	2.8	3.8	3.3
11	3.1	6.1	11.4	11.1	31.1	11.0	14.3	6.7	2.6	3.2	4.0	3.2
12	3.1	5.6	10.9	10.9	31.0	9.9	14.2	7.0	2.6	3.4	4.1	3.3
13	3.1	6.1	10.6	10.8	31.3	8.6	14.1	7.1	4.3	3.2	4.2	3.3
14	3.1	6.4	9.6	10.6	31.5	9.1	14.0	6.0	4.8	3.2	4.2	3.4
15	3.1	6.3	7.7	10.1	31.5	8.6	14.0	5.1	5.7	3.2	4.3	3.5
16	3.1	8.0	10.1	9.1	31.8	8.4	13.8	5.2	6.2	3.2	4.3	3.7
17	3.6	10.6	8.3	8.1	32.1	8.2	13.6	5.4	6.5	3.2	4.5	4.6
18	5.4	10.8	11.1	8.0	32.1	8.2	11.3	5.1	6.7	3.2	4.5	6.3
19	3.9	9.8	16.1	7.8	31.6	8.2	11.1	4.9	7.0	3.2	4.3	8.0
20	3.8	10.1	17.1	5.0	31.65	8.3	10.8	4.7	6.3	3.1	4.2	8.4
21	3.5	9.1	17.1	2.8	28.6	8.2	9.7	4.0	4.3	3.1	4.0	8.4
22	3.0	9.3	15.4	2.5	28.6	8.4	9.2	4.0	4.4	4.2	3.8	8.7
23	2.8	10.1	13.9	2.1	29.0	9.9	9.1	4.0	4.6	5.7	3.5	8.8
24	3.0	7.8	14.9	2.2	27.8	11.8	9.1	4.0	5.3	6.3	3.6	8.0
25	3.0	7.1	13.3	20.1	25.7	11.8	9.1	4.0	5.3	7.1	3.4	7.1
26	5.1	5.9	12.8	20.6	25.5	12.1	6.5	4.0	4.2	6.3	3.4	7.3
27	6.1	5.0	10.8	21.7	25.0	22.0	8.0	3.9	4.4	5.3	3.3	7.5
28	6.1	5.1	9.1	23.6	24.7	20.8	11.4	3.9	4.2	4.8	3.3	7.3
29	6.0	.....	10.7	23.5	20.9	20.3	13.7	3.8	4.2	4.5	3.3	7.1
30	5.9	.....	13.4	25.1	18.3	19.9	14.3	3.6	3.4	4.3	3.1	6.1
31	6.1	.....	11.7	.....	18.1	.....	14.4	3.4	.....	4.0	.....	6.4

Station rating table for Brazos River at Richmond, Tex., from January 1, 1904, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
1.50	820	3.00	1,820	4.50	3,310	7.00	6,500
1.60	870	3.10	1,910	4.60	3,420	7.20	6,780
1.70	920	3.20	2,000	4.70	3,530	7.40	7,060
1.80	980	3.30	2,090	4.80	3,640	7.60	7,350
1.90	1,040	3.40	2,180	4.90	3,760	7.80	7,650
2.00	1,100	3.50	2,270	5.00	3,880	8.00	7,950
2.10	1,160	3.60	2,370	5.20	4,120	8.50	8,700
2.20	1,220	3.70	2,470	5.40	4,360	9.00	9,480
2.30	1,290	3.80	2,570	5.60	4,600	9.50	10,280
2.40	1,360	3.90	2,670	5.80	4,860	10.00	11,120
2.50	1,430	4.00	2,770	6.00	5,120	10.50	12,020
2.60	1,500	4.10	2,870	6.20	5,380	11.00	13,020
2.70	1,580	4.20	2,980	6.40	5,650	11.50	14,120
2.80	1,660	4.30	3,090	6.60	5,940	12.00	15,270
2.90	1,740	4.40	3,200	6.80	6,220	13.00	17,590

The above table is based on discharge measurements made during 1902–1905, and it is well defined. Above gage height 13 feet the rating curve is a tangent, the difference being 240 per tenth. Above 10 feet this table is the same as the 1903 table.

Estimated monthly discharge of Brazos River at Richmond, Tex., for 1905.

[Drainage area, 44,000 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
January	5,250	1,290	2,594	159,500	0.059	0.068
February	12,620	3,880	6,742	374,400	.153	.159
March	27,430	2,370	13,380	822,700	.304	.350
April	46,630	1,160	17,680	1,052,000	.402	.448
May	65,590	29,830	55,690	3,424,000	1.27	1.46
June	39,190	8,250	17,070	1,016,000	.388	.433
July	33,190	5,800	18,680	1,149,000	.425	.490
August	19,030	2,180	5,290	325,300	.120	.138
September	6,500	1,500	3,169	188,600	.072	.080
October	6,640	1,430	2,665	163,900	.061	.070
November	3,310	1,910	2,498	148,600	.057	.064
December	9,160	1,820	4,465	274,500	.101	.116
The year	65,590	1,160	12,490	9,098,000	.284	3.88

COLORADO RIVER (OF TEXAS) DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Colorado River rises in the extreme western portion of the State, within a few miles of the eastern boundary of New Mexico, and flows in a general southeasterly direction, emptying into the Gulf of Mexico in Matagorda County. The drainage area above Austin is 37,000 square miles and above Columbus 40,000 square miles, and it extends into the corner of New Mexico. Its main tributaries are the Concho, the San Saba, and the Llano. The Concho has a reliable flow and contributes a greater amount of water than the Colorado at their junction. The Concho furnishes water for irrigation and water power and supports in Irion and Tom Green counties some excellent irrigation systems, described in Water-Supply Paper No. 71. San Saba and Llano rivers are described in the same paper.

The Colorado at Austin emerges from a canyon. From Austin to the Gulf it traverses a rather flat country, and its waters are utilized for many power plants; 60,000 acres of rice were sowed during the season of 1902 in the counties of Colorado, Wharton, and Matagorda, under canals that obtained their water from the Colorado.

COLORADO RIVER AT AUSTIN, TEX.

This station was established December 21, 1897. It was originally located at the dam near Austin, Tex. On the failure of this dam the station was removed to the Congress Avenue Bridge, south of the city.

The channel is straight for 400 feet above and below the station. The velocity is moderately rapid. Neither bank has overflowed since the dam was washed away. The bed of the stream is composed of sand and is slightly shifting.

Discharge measurements are made by means of a cable and car 3 miles above Congress Avenue Bridge, about one-eighth mile above the ruins of the Austin dam and power house. The cable has a span of about 730 feet, but the width of the river at low water is less than half this distance.

Gage heights were first taken on the crest of the Austin dam August 13, 1895, and were continued from that date until the failure of the dam occurred in April, 1900. A staff gage consisting of upright posts driven into the bank of the river is located

near the bath house about 150 feet above the bridge. For higher gage heights the first pier from the north has been marked up to 40.00 feet. A standard chain gage is attached to the bridge at the same datum. During 1905 the gage was read twice each day by W. Peterson. Bench marks were established as follows: (1) A United States Coast and Geodetic Survey copper bolt on the top of the west end of the south pier of Congress Avenue Bridge, 475 feet above mean sea level and 48.00 feet above the datum of the gage. (2) A similar bolt in the southwest wall of the post-office at Austin, 508 feet above mean sea level; elevation, 81.00 feet above the datum of the gage. (3) On the first flange above the cribwork of the north pier of the bridge, marked "U. S. G. S. B. M. 4.78"; elevation, 4.78 feet above gage datum and 431.78 feet above mean sea level.

The low-water level at this point has been gradually falling for over a year. This has been caused by the erosion of the channel about 200 yards below the highway bridge. Under the highway bridge the water spreads out into a large pool, the outlet of which is through two contracted sections below, the main one of which being the one in which the erosion has taken place. The lowest level that the water has reached yet has been 0.70 foot by gage, but the corresponding discharge was no less than the minimum of 1902.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; Bull=Bulletin; WS=Water-Supply Paper):

Description: Bull 140, pp 82–83; WS 28, pp 118–119; 37, p 274; 50, pp 336–337; 66, p 64; 84, pp 149–150; 99, p 334; 132, p 36.

Discharge: Ann 18, iv, p 110; Bull 140, p 83; WS 28, p 129; 37, p 274; 50, p 337; 66, p 64; 84, p 150; 99, p 335; 132, p 37.

Discharge, monthly: WS 75, p 152; 84, p 152; 99, p 336; 132, p 39.

Gage heights: WS 28, pp 122–124; 37, p 275; 50, p 338; 66, p 64; 84, p 151; 99, p 335; 132, p 38.

Hydrograph: WS 75, p 152.

Rating tables: WS 66, p 173; 84, p 151; 99, p 336; 132, p 39.

Discharge measurements of Colorado River at Austin, Tex., in 1905.

Date.	Hydographer.	Gage height.	Discharge.
		Feet.	*Second-feet.*
July 15	H. H. Fox	2.7	1,760
July 17	do	2.2	1,111
July 21	do	1.7	520
August 19	do	1.1	240
September 3	do	.8	176
September 16	T. U. Taylor	.8	171

Daily gage height, in feet, of Colorado River at Austin, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.3	1.2	1.3	1.8	7.9	2.75	2.25	4.2	0.8	1.25	1.0	1.0
2	1.25	1.2	1.3	1.85	6.75	3.7	2.05	3.2	.85	1.15	1.1	1.0
3	1.2	1.2	1.25	2.95	5.35	3.15	1.85	2.75	.8	1.1	1.1	1.0
4	1.2	1.2	1.2	5.5	4.55	2.9	2.0	2.6	.8	1.0	1.1	1.0
5	1.2	1.2	1.2	4.8	4.2	2.65	1.8	2.45	1.0	1.0	1.1	1.0
6	1.2	1.2	1.2	3.5	3.85	2.5	1.7	2.4	1.25	1.0	.95	1.0
7	1.2	1.2	1.25	5.1	3.55	2.5	2.6	2.3	1.0	1.3	1.0	1.0
8	1.2	1.2	1.65	3.75	3.35	2.35	3.3	2.15	.9	2.15	1.0	1.0
9	1.2	1.2	1.6	3.05	10.5	2.2	4.0	1.85	.8	2.95	1.25	1.0
10	1.2	1.2	1.5	2.75	7.85	2.1	4.65	1.55	.8	2.45	1.85	1.0
11	1.2	1.2	1.5	2.55	6.6	2.0	3.95	1.9	.85	2.2	2.4	1.0
12	1.2	1.2	1.6	2.5	4.95	1.9	3.6	1.8	.95	2.05	2.9	1.0
13	1.2	1.6	1.65	2.4	3.9	1.8	3.25	1.65	.9	1.95	2.7	1.25
14	1.3	1.15	1.6	2.4	3.6	1.8	3.05	1.5	.8	1.75	2.25	1.15
15	1.3	1.25	1.6	2.3	4.75	1.8	2.7	1.35	.8	1.55	1.95	1.0
16	1.25	1.15	1.75	2.15	7.6	2.2	2.4	1.3	.8	1.45	1.75	1.0
17	1.2	1.2	2.95	2.0	8.1	2.3	2.2	1.2	1.7	1.3	1.65	1.0
18	1.2	1.25	3.3	2.0	5.6	2.25	2.05	1.2	2.5	1.3	1.4	1.1
19	1.25	1.3	5.7	1.85	3.9	1.9	1.9	1.15	2.2	1.2	1.3	1.35
20	1.2	1.3	3.75	1.8	3.25	1.8	1.8	1.05	2.05	1.3	1.2	1.5
21	1.2	1.3	3.55	1.8	3.0	1.7	1.7	1.0	2.4	2.2	1.2	1.6
22	1.2	1.4	3.55	1.8	2.85	1.75	1.65	1.0	2.15	3.35	1.1	1.5
23	1.2	1.5	3.0	1.7	2.6	2.0	1.55	1.0	1.9	2.55	1.1	1.4
24	1.2	1.5	2.6	4.25	2.55	1.9	1.45	.9	1.8	2.05	1.1	1.6
25	1.2	1.4	2.5	9.2	4.75	3.2	1.4	.9	1.9	1.7	1.1	1.6
26	1.2	1.4	2.4	7.3	4.55	3.15	1.4	.82	1.8	1.45	1.1	1.4
27	1.2	1.4	2.25	6.25	4.45	2.85	1.3	.8	1.7	1.3	1.1	1.2
28	1.15	1.3	2.15	5.75	3.7	2.7	1.3	.8	1.57	1.25	1.1	1.15
29	1.1	.....	2.05	7.65	3.5	2.7	1.8	.9	1.5	1.2	1.05	1.0
30	1.1	.....	1.9	15.05	3.9	2.5	3.6	.9	1.4	1.2	1.0	1.3
31	1.1	.....	1.9	.....	3.35	.....	5.95	.9	.....	1.15	.....	1.2

Station rating table for Colorado River at Austin, Tex., from January 1 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.80	175	1.90	790	3.00	2,260	4.20	5,170
.90	195	2.00	885	3.10	2,450	4.40	5,810
1.00	220	2.10	990	3.20	2,650	4.60	6,510
1.10	250	2.20	1,105	3.30	2,860	4.80	7,270
1.20	290	2.30	1,225	3.40	3,070	5.00	8,080
1.30	340	2.40	1,345	3.50	3,290	5.20	8,920
1.40	400	2.50	1,470	3.60	3,530	5.40	9,760
1.50	470	2.60	1,605	3.70	3,780	5.60	10,600
1.60	540	2.70	1,750	3.80	4,040	5.80	11,440
1.70	620	2.80	1,910	3.90	4,310	6.00	12,280
1.80	700	2.90	2,080	4.00	4,580	6.20	13,130

The above table is based on discharge measurements made during 1904-5. It is well defined between gage heights 0.8 foot and 6 feet. Above gage height 6.1 feet the rating curve is a tangent, the difference being 430 per tenth.

Estimated monthly discharge of Colorado River at Austin, Tex., for 1905.

[Drainage area, 37,000 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
January	340	250	293	18,020	0.0079	0.0091
February	540	270	335	18,600	.0091	.0095
March	11,020	290	1,461	89,830	.039	.045
April	51,190	620	6,557	390,200	.177	.198
May	31,620	1,537	8,267	508,300	.223	.257
June	3,780	620	1,404	83,540	.038	.042
July	12,070	340	1,949	119,800	.053	.061
August	5,170	175	775	47,650	.021	.024
September	1,470	175	488	29,040	.013	.014
October	2,965	220	689	42,360	.019	.022
November	2,080	207	505	30,050	.014	.016
December	540	220	299	18,380	.0081	.0093
The year	51,190	175	1,918	1,396,000	.052	.707

COLORADO RIVER AT COLUMBUS, TEX.

This station was established in December, 1902, by Thomas U. Taylor. It is located at the highway bridge east of Columbus.

The channel is straight for 200 feet above and 600 feet below the bridge, and has a width of 140 feet at low water, unobstructed by piers, and a width of 450 feet at ordinary high water, broken by two piers. At very high stages the left bank overflows for several hundred feet, but the water passes under the iron trestle approach to the bridge. The bed is composed of gravel and sand and is fairly permanent.

Discharge measurements are made from the three-span highway bridge at which the gage is located.

A gage is marked on the downstream side of the pier on the west side of the river. Gage datum is taken at 50 feet below the top of this pier, and the observer, W. E. Bridge, measures down from this point with a tagged chain and lead weight. Bench marks were established as follows: (1) The top of pier at the west end of the middle span of the bridge; elevation, 50.00 feet. (2) The east end of the top of the top stone step at the south door of the Columbus jail; elevation, 53.22 feet. (3) The north end of the top stone step at the east door of the Columbus court-house; elevation, 53.91 feet. (4) The top of the rail over the extreme west pier of the Southern Railway bridge crossing the river above the gaging station; elevation, 51.13 feet. Elevations refer to the datum of the gage.

A measurement made at this station August 5, 1905, by T. U. Taylor gave the following results: Gage height, 10.8 feet; discharge, 3,820 second-feet.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 84, p 149; 99, pp 332–333; 132, p 40.
Discharge: 84, p 149; 99, p 333; 132, p 40.
Discharge, monthly; 132, p 42.
Gage heights: 99, pp 333–334; 132, p 41.
Rating table: 132, p 42.

Daily gage height, in feet, of Colorado River at Columbus, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.45	5.8	6.4	7.9	30.75	12.25	10.5	7.5	6.8	7.3	7.7	7.0
2	6.4	5.8	6.3	8.9	33.0	12.1	10.05	14.15	6.8	7.2	7.7	6.9
3	6.4	6.0	6.2	14.1	30.7	11.3	9.6	13.5	7.2	7.15	6.9	6.75
4	6.4	6.0	6.2	11.4	21.15	11.15	10.05	11.85	7.1	7.1	6.9	6.7
5	6.2	5.8	6.0	9.1	17.4	11.85	10.25	10.6	6.9	7.05	6.9	6.7
6	6.2	5.8	6.0	13.55	15.6	11.05	9.65	9.75	6.8	7.0	6.9	6.6
7	6.2	5.8	6.0	13.2	14.3	10.4	8.9	9.05	6.8	6.9	7.15	6.5
8	6.2	5.8	10.5	11.95	13.25	9.9	8.55	8.55	6.8	6.9	7.0	6.5
9	6.0	6.0	12.45	14.0	12.6	9.6	11.75	8.35	6.8	6.75	8.5	6.5
10	6.0	6.1	11.4	12.35	16.6	9.55	14.8	8.5	6.9	6.7	9.05	6.6
11	6.0	6.2	9.55	11.0	24.5	9.4	15.0	8.5	6.9	6.6	8.4	6.6
12	6.0	6.2	8.4	10.25	21.75	9.1	14.0	8.2	6.8	9.05	7.8	6.6
13	6.0	6.4	7.85	9.7	17.95	8.65	12.85	8.1	6.7	8.7	7.5	7.8
14	7.2	6.4	7.35	8.7	16.8	8.65	12.2	8.1	6.65	8.15	8.0	7.6
15	7.05	6.2	9.5	9.05	21.1	8.5	11.3	8.0	6.6	8.05	8.0	7.25
16	6.4	6.2	14.45	8.75	18.25	8.5	10.95	7.75	6.6	7.7	8.45	7.1
17	6.4	6.0	10.1	8.65	17.0	8.45	10.4	7.55	6.6	7.6	8.35	7.1
18	6.2	5.9	13.9	8.5	22.75	8.95	9.7	7.5	6.6	7.6	7.9	7.0
19	6.2	15.5	18.5	8.35	20.2	9.35	9.2	7.5	6.6	7.3	7.6	8.2
20	6.2	12.0	16.0	8.1	16.05	9.25	8.6	7.25	6.6	7.3	7.45	8.4
21	6.0	9.75	15.6	8.0	13.8	8.9	8.6	7.4	7.25	7.2	7.4	8.1
22	6.0	8.25	18.75	7.85	12.1	9.5	8.5	7.2	8.1	7.2	7.35	7.6
23	6.1	7.5	14.9	7.7	11.8	11.75	8.3	7.05	8.05	7.15	7.2	7.3
24	6.1	6.85	16.6	22.25	14.75	9.4	8.15	7.0	8.15	7.45	7.1	7.2
25	6.0	6.65	11.05	24.45	13.25	8.5	8.1	6.95	8.35	9.85	7.1	8.0
26	6.0	6.55	10.25	24.25	12.3	10.8	8.05	6.9	7.9	9.2	7.15	7.5
27	5.95	6.4	9.65	21.65	12.35	24.75	8.0	6.95	7.65	7.9	7.45	7.3
28	5.85	6.4	9.15	19.0	14.25	17.0	8.0	6.85	7.45	7.7	7.1	6.95
29	5.8	.....	11.4	18.35	13.6	13.25	7.7	6.8	7.5	7.5	7.1	6.9
30	5.85	.....	9.2	26.25	12.7	11.5	7.6	6.8	7.5	7.3	7.0	7.0
31	5.8	.....	8.25	.....	12.45	.....	7.6	6.8	.....	7.2	.....	7.0

Station rating table for Colorado River at Columbus, Tex., from January 1, 1904, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
5.40	510	7.30	1,460	9.40	2,850	13.50	6,160
5.50	550	7.40	1,520	9.60	2,990	14.00	6,610
5.60	590	7.50	1,580	9.80	3,130	14.50	7,090
5.70	630	7.60	1,640	10.00	3,270	15.00	7,590
5.80	680	7.70	1,700	10.20	3,410	16.00	8,660
5.90	730	7.80	1,760	10.40	3,570	17.00	9,860
6.00	780	7.90	1,820	10.60	3,730	18.00	11,140
6.10	830	8.00	1,880	10.80	3,890	19.00	12,520
6.20	880	8.10	1,940	11.00	4,050	20.00	13,970
6.30	930	8.20	2,010	11.20	4,210	21.00	15,470
6.40	980	8.30	2,080	11.40	4,370	22.00	17,030
6.50	1,030	8.40	2,150	11.60	4,530	23.00	18,700
6.60	1,080	8.50	2,220	11.80	4,690	24.00	20,420
6.70	1,130	8.60	2,290	12.00	4,850	25.00	22,200
6.80	1,180	8.70	2,360	12.20	5,010	26.00	24,070
6.90	1,230	8.80	2,430	12.40	5,170	27.00	25.980
7.00	1,280	8.90	2,500	12.60	5,350	28.00	27,920
7.10	1,340	9.00	2,570	12.80	5,530		
7.20	1,400	9.20	2,710	13.00	5,710		

The above table is based on discharge measurements made during 1902–1905. It is well defined.

Estimated monthly discharge of Colorado River at Columbus, Tex., for 1905.

[Drainage area, 40,000 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
January	1,400	680	~~870~~ ~~885~~	~~53500~~ ~~55,030~~	0.022	0.025
February	8,110	680	~~1,044~~	~~72800~~ ~~57,980~~	~~.035~~ ~~.026~~	~~.03C~~ ~~.027~~
March	12,180	780	4,115	253,000	.103	.119
April	24,550	1,700	6,775	403,100	.169	.189
May	37,900	4,690	11,830	727,400	.296	.341
June	21,750	2,185	4,194	249,600	.105	.117
July	7,590	1,640	3,303	203,100	.083	.096
August	6,745	1,180	2,166	133,200	.054	.062
September	2,115	1,080	1,366	81,290	.034	.038
October	3,165	1,080	1,622	99,730	.041	.047
November	2,605	1,230	1,611	95,860	.040	.045
December	2,150	1,030	1,377	84,670	.034	.039
The year	37,900	680	~~3,358~~	~~2,444,000~~	~~.084~~	1.14

SAN SABA RIVER NEAR SAN SABA, TEX.

San Saba River rises in two springs near Fort McKavett, in the western part of Menard County, Tex., and flows in an easterly direction for over 100 miles to its junction with Colorado River (of Texas). It is fed by many springs between Fort McKavett and Menardville, the largest of which is the one that feeds or is the source of Clear Creek.

A gaging station was established on San Saba River at the suspension bridge, 1 mile northwest of the town of San Saba, Tex., December 30, 1904, by E. C. H. Bantel. The drainage area above the town of San Saba is 3,000 square miles.

Sixteen miles above the gaging station the river issues from the canyon section of the river and emerges into a very rich valley that offers exceptional advantages for irrigation. There are about 40,000 acres that could be brought under a supplemental irrigation system, and the water supply of the San Saba River at this point becomes of the utmost importance. The low-water flow at the "Narrows," 17 miles above the town of San Saba, is about 25 second-feet, and any irrigation on an extensive scale will have to be done by means of an impounding dam, which can be constructed across the river near the ranch of Hilliard Doran, forming the reservoir in the canyon section of the river. Four miles above the town of Menardville the Noyes ditch takes out the larger supply of water from the river and diverts it into an irrigation system that extends through Menardville and to a point 5 miles below. Two other smaller ditches below San Saba, the Maimee and the Kitchen, divert practically all the remainder of the low flow into irrigation systems. In addition to the gravity systems there are several pumping plants along the stream from Fort McKavett to the head of the canyons, about 12 miles below Menardville. Thus in dry times about the only water that could be relied on for a big irrigation system in the San Saba Valley would be the water that could be stored by an impounding reservoir. The topography, the flood discharges, the excellent site for a dam, the nearness of stone, the absence of alkali in the water, and the richness of the soil all point to the fact that this valley offers one of the best and most feasible irrigation problems in the State of Texas.

The channel is straight for 150 feet above and 1,000 feet below the station. The current is swift at high and sluggish at low stages. Both banks are high, but liable to overflow at high stages. The bed of the stream is composed of sand and gravel. There is but one channel at all stages.

Discharge measurements are made from the suspension bridge. The initial point for soundings is the north face of the south pier.

The elevations of the water surface are determined by measuring down by means of a tape from a certain casting on the upstream face in the flooring of the bridge, the zero elevation being 40.00 feet below the same. Bench marks were established as follows: (1) A large wire nail driven into a tree 50 feet from the south end of the bridge; elevation, 37.63 feet. (2) A wire nail driven into a water elm 70 feet from the north end of the bridge, on the east side of the road; elevation, 37.16 feet. (3) A wire nail driven into a live oak tree 200 feet from the south end of the bridge and 50 feet from the edge of the stream; elevation, 37.16 feet. Elevations refer to the datum of the gage.

A measurement made at this station August 18, 1905, by T. U. Taylor, gave the following results: Gage height, 7.2 feet; discharge, 27 second-feet.

A description of this station and gage height and discharge data are contained in Water-Supply Paper No. 132, United States Geological Survey, pp. 43–44.

Daily gage height, in feet, of San Saba River near San Saba, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.9	7.9	7.9	7.8	9.8	7.8	7.4	7.3	7.2	7.2	7.6	7.7
2	7.9	7.9	7.9	9.4	8.3	7.8	7.4	7.2	7.2	7.2	7.6	7.7
3	7.9	7.8	7.9	8.4	8.1	7.7	7.4	8.1	7.5	7.2	7.6	7.7
4	7.9	7.8	7.8	8.2	8.1	7.7	7.3	7.6	7.3	7.2	7.6	7.5
5	7.9	7.8	7.8	8.0	8.4	7.6	7.3	7.4	7.2	7.2	7.6	7.5
6	7.9	7.8	7.8	8.0	8.0	7.6	8.2	7.4	7.2	7.2	7.6	7.5
7	7.9	7.8	7.8	7.9	7.8	7.6	8.4	7.4	7.2	7.7	7.7	7.5
8	7.9	8.0	7.8	7.8	13.7	7.5	8.1	7.3	7.2	7.6	7.7	7.6
9	7.9	7.9	7.8	7.8	11.15	7.5	9.7	7.3	7.2	7.6	7.7	7.6
10	7.9	7.9	7.8	7.8	8.9	7.5	8.2	7.2	7.2	7.6	7.9	7.6
11	7.9	7.8	7.9	7.8	8.2	7.5	8.0	7.2	7.2	7.6	7.8	7.6
12	7.8	7.8	7.7	7.8	8.0	7.4	7.8	7.3	7.2	7.6	7.7	7.6
13	7.9	7.9	7.7	7.8	8.0	8.0	7.7	7.3	7.2	7.6	7.6	7.7
14	7.8	7.8	7.8	7.8	7.9	7.6	7.6	7.3	7.2	7.6	7.6	7.7
15	7.8	8.0	7.8	7.8	7.8	7.6	7.5	7.3	7.2	7.6	7.6	7.7
16	7.9	7.9	8.3	7.8	7.9	7.5	7.5	7.3	7.2	7.6	7.6	7.7
17	7.9	7.9	8.0	7.8	8.05	7.4	7.5	7.2	7.2	7.4	7.6	7.7
18	7.9	7.9	7.9	7.7	8.0	7.4	7.5	7.2	7.2	7.4	7.6	7.8
19	7.9	10.0	8.1	7.6	7.9	7.4	7.5	7.2	7.3	19.6	7.6	7.8
20	7.9	10.9	7.9	7.6	7.9	7.4	7.5	7.2	7.4	8.2	7.6	7.9
21	7.9	8.9	7.9	7.6	7.9	7.4	7.6	7.2	7.3	7.7	7.6	7.8
22	7.9	7.9	7.9	7.6	7.9	7.4	7.6	7.2	7.2	7.8	7.6	7.8
23	7.9	8.0	7.8	7.8	7.8	7.5	7.6	7.2	7.2	7.7	7.6	7.8
24	7.9	7.9	7.8	9.4	13.4	7.5	7.5	7.2	7.2	7.7	7.7	7.8
25	7.9	7.9	7.8	8.4	9.2	7.4	7.5	7.2	7.2	7.7	7.7	7.7
26	7.9	7.9	7.9	8.1	8.25	7.5	7.4	7.2	7.2	7.7	7.7	7.7
27	7.8	7.9	7.8	8.1	8.1	8.7	7.3	7.2	7.2	7.7	7.7	7.8
28	7.9	7.9	7.8	8.0	8.0	7.7	7.2	7.2	7.2	7.6	7.7	7.8
29	7.9	.....	7.8	7.8	7.8	7.5	7.3	7.2	7.2	7.6	7.7	7.8
30	7.9	.....	7.8	13.0	7.8	7.4	7.3	7.2	7.2	7.6	7.7	7.8
31	7.9	.....	7.8	.....	7.8	.....	7.4	7.2	.....	7.6	.....	7.8

BARTONS SPRINGS NEAR AUSTIN, TEX.

These springs are located about 2 miles from Austin and are similar in behavior and in flow to the Comal, San Felipe, and San Marcos. They respond in increased flow to the rainfall in the Edwards Plateau, but this response is always delayed for

some months. About a quarter of a mile from the head of the springs the Walsh spring was formerly active and operated a small mill, but it ceased flowing several years ago. In the wet season of 1900 it revived and continued flowing till the early part of 1901, when it again ceased, continuing dry till the early part of 1903. June 6, 1903, the flow of the Walsh spring was 8.5 second-feet, but it stopped flowing in the latter part of 1903 and has since remained dry.

Discharge measurements of Bartons Springs near Austin, Tex., 1894–1905.

Date.	Hydrographer.	Discharge.
		Second-feet.
1894	C. C. Babb	17
1895	do	25
March, 1898	T. U. Taylor	20
May, 1898	do	30
August, 1900	do	69
December, 1900	do	33
June, 1902	do	19
August, 1902	do	19
June, 1903	A. A. Cother	69
June, 1904	T. U. Taylor	43
July, 1905	H. H. Fox	65

GUADALUPE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Guadalupe River rises in the southern-central part of Texas, flows southeastward, and empties into San Antonio Bay. During the summer of 1902 its discharge was the least in its observed history, causing much loss above New Braunfels, where half a dozen power plants were forced to shut down or to run on short time. The flow at this time was so low that special efforts were made to obtain measurements at several points along its course.

GUADALUPE RIVER NEAR CUERO, TEX.

The Guadalupe, while the best water-power stream in Texas, has a drainage area above Cuero of only 5,100 square miles. Its efficiency is due almost entirely to the canal at New Braunfels. Below New Braunfels the largest tributary is San Marcos River.

This station was established by Thomas U. Taylor December 26, 1902. The original location was at the dam at Carl Buchel's power house, 3 miles north of Cuero, Tex. As it proved impossible to measure flood discharges at this point, a new station was established in July, 1903, at the bridge of the San Antonio and Aransas Pass Railroad 3 miles west of Cuero.

The channel is straight and has a width of 125 feet at low stages. The right bank is low and overflows for several hundred feet at high stages. The section is deep and the flow is sluggish. The bed is composed of soft material and may change somewhat.

Discharge measurements are made from the highway bridge, 200 feet below the railway bridge, when the gage is above 8 feet, but at lower stages the discharge is measured on the crest of the Buchel dam, 3 miles upstream, where the owners cooperate by shutting off the turbines and forcing the water over the crest of the dam. The crest of this dam is 140 feet long and 4 feet wide, and the depth of the water at the upper edge of the crest of the dam is about 1 foot. The discharge at this stage

was found to be 407 second-feet. In the usual weir formula, where $Q=c\ b\ h^{\frac{3}{2}}$, this would give a value of 2.9 for C. The initial point for soundings at the bridge is the east face of the tubular pier under the west end of the highway bridge.

A standard chain gage is attached to the bridge; length of chain, 46.20 feet. During 1905 the gage was read twice each day by Robert Miller, jr. Bench marks were established as follows: (1) The top of the tie in the third panel from the east end of the bridge; elevation, 50.00 feet. (2) The seat of the valve, about 100 feet from the pump house, on the line of pipe that leads from the pump to the water tank; elevation, 44.85 feet. (3) The top of a vertical iron rod buried in the ground 4 feet east of a mulberry tree near the left end of the bridge; elevation, 42.18 feet. Elevations refer to the datum of the gage.

A measurement made at this station August 5, 1905, by T. U. Taylor, gave the following results: Gage height, 6.3 feet; discharge, 754 second-feet.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 84, p 156; 99, p 337; 132, pp 45–46.
Discharge: 66, p 62; 99, p 338; 132, p 46.
Discharge, monthly: 99, p 340; 132, p 49.
Gage heights: 99, pp 338–339; 132, p 47.
Rating table: 99, p 339; 132, p 48.

Daily gage height, in feet, of Guadalupe River near Cuero, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10.3	6.3	6.48	7.05	15.4	8.42	8.17	6.3	6.4	6.15	6.1	6.2
2	7.4	6.3	6.43	7.0	20.1	8.65	7.45	6.27	6.45	6.05	6.15	6.15
3	6.85	6.35	6.35	7.1	21.65	8.8	7.3	6.25	6.5	6.5	6.15	6.1
4	6.55	6.35	6.3	7.52	22.75	8.75	7.27	6.3	6.6	6.35	6.25	6.13
5	6.45	6.4	6.3	9.85	18.35	7.95	7.35	6.25	6.65	6.5	6.22	6.17
6	6.5	6.4	6.3	11.25	12.85	7.85	8.15	6.17	6.4	6.3	6.15	6.23
7	6.5	6.4	6.35	9.52	11.95	7.75	8.0	6.37	6.25	6.2	6.17	6.25
8	6.5	6.38	6.5	8.92	11.35	7.7	7.9	6.42	6.2	6.27	6.25	6.3
9	6.5	6.38	7.8	8.58	10.98	7.62	7.72	6.45	6.17	6.15	6.6	6.28
10	6.5	6.4	8.13	8.38	10.45	7.6	11.7	6.42	6.2	6.27	11.8	6.3
11	6.6	6.55	7.9	8.4	9.9	7.5	15.8	6.45	6.27	6.1	10.9	6.28
12	6.72	6.6	6.75	8.85	9.55	7.4	13.15	6.42	6.3	6.17	8.65	6.25
13	7.45	6.55	6.55	8.93	9.58	7.27	9.9	6.4	6.3	5.95	7.4	6.2
14	7.95	6.4	6.65	8.35	10.55	7.25	8.55	6.4	6.27	6.0	7.22	6.23
15	7.5	6.45	9.45	7.95	17.93	7.25	7.45	6.42	6.15	5.9	7.0	6.5
16	7.0	6.4	15.8	7.88	18.45	7.27	7.0	6.45	6.0	6.0	6.85	6.5
17	6.55	6.4	14.6	7.83	20.9	7.17	7.05	6.45	5.9	6.1	6.55	6.53
18	6.5	6.35	12.25	7.73	15.52	7.2	6.85	6.42	6.05	6.2	6.55	6.55
19	6.5	14.95	10.85	7.55	9.98	7.05	6.85	6.42	6.0	6.15	6.5	6.6
20	6.5	13.85	11.85	7.45	9.1	7.05	6.77	6.45	6.1	6.05	6.5	6.55
21	6.5	13.0	10.55	7.3	8.85	6.9	6.57	6.72	6.2	6.15	6.4	6.48
22	6.5	9.95	11.65	7.38	8.67	7.67	6.47	6.45	6.25	6.05	6.47	6.45
23	6.45	7.95	14.2	7.42	8.55	8.15	6.4	6.30	6.15	6.15	6.65	6.38
24	6.4	7.35	10.25	23.25	8.47	8.1	6.52	6.55	6.2	6.1	6.85	6.3
25	6.37	6.7	7.4	21.9	8.3	7.4	6.52	6.35	6.25	6.15	6.3	6.22
26	6.3	6.6	7.5	23.25	8.37	7.75	6.52	6.15	6.25	6.05	6.2	6.22
27	6.3	6.6	7.5	24.3	8.17	9.35	6.47	6.3	6.27	6.1	6.25	6.28
28	6.25	6.6	7.62	23.45	8.25	12.65	6.42	6.27	6.3	6.17	6.3	6.22
29	6.2	.....	7.92	24.9	8.37	14.87	6.4	6.25	6.25	6.1	6.35	6.15
30	6.2	.....	7.9	24.05	8.3	11.9	6.3	6.22	6.1	6.25	6.3	6.1
31	6.25	.....	7.5	.....	8.37	.....	6.27	6.27	.....	6.15	.....	6.15

Station rating table for Guadalupe River near Cuero, Tex., from January 1 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
6.00	580	8.00	1,280	10.00	1,980	14.00	3,400
6.10	615	8.10	1,315	10.20	2,050	14.20	3,480
6.20	650	8.20	1,350	10.40	2,120	14.40	3,560
6.30	685	8.30	1,385	10.60	2,190	14.60	3,640
6.40	720	8.40	1,420	10.80	2,260	14.80	3,720
6.50	755	8.50	1,455	11.00	2,330	15.00	3,800
6.60	790	8.60	1,490	11.20	2,400	15.50	4,000
6.70	825	8.70	1,525	11.40	2,470	16.00	4,200
6.80	860	8.80	1,560	11.60	2,540	16.50	4,400
6.90	895	8.90	1,595	11.80	2,610	17.00	4,650
7.00	930	9.00	1,630	12.00	2,680	17.50	4,900
7.10	965	9.10	1,665	12.20	2,750	18.00	5,150
7.20	1,000	9.20	1,700	12.40	2,820	18.50	5,440
7.30	1,035	9.30	1,735	12.60	2,890	19.00	5,740
7.40	1,070	9.40	1,770	12.80	2,960	20.00	6,340
7.50	1,105	9.50	1,805	13.00	3,030	21.00	7,040
7.60	1,140	9.60	1,840	13.20	3,100	22.00	7,840
7.70	1,175	9.70	1,875	13.40	3,170	23.00	8,680
7.80	1,210	9.80	1,910	13.60	3,240	24.00	9,630
7.90	1,245	9.90	1,945	13.80	3,320	25.00	10,690

The above table is based on one discharge measurement made during 1905 and measurements prior to 1904. It is well defined. The above table was used for 1903.

Estimated monthly discharge of Guadalupe River near Cuero, Tex., for 1905.

[Drainage area, 5,100 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
January	2,085	650	840	51,650	0.165	0.190
February	3,780	685	1,094	60,780	.215	.224
March	4,120	685	1,530	94,080	.300	.346
April	10,580	930	3,192	189,900	.626	.698
May	8,455	1,340	2,997	184,300	.588	.678
June	3,748	895	1,378	82,000	.270	.301
July	4,120	674	1,207	74,220	.237	.273
August	832	632	708	43,530	.139	.160
September	808	545	666	39,630	.131	.146
October	755	545	634	38,980	.124	.143
November	2,610	615	884	52,600	.173	.193
December	790	615	684	42,060	.134	.154
The year	10,580	545	1,318	953,700	.258	3.51

COMAL RIVER AT NEW BRAUNFELS, TEX.

Comal River has been fully described in Water-Supply Papers, Nos. 71 and 105. Its source is in the numerous big springs that issue from the foothills west of New Braunfels, Tex. The joint discharge of these forms Comal River at the junction of Comal Springs Creek and Comal Creek. The water from the head springs naturally flows down Comal Springs Creek, but a gravel dam deflects part of this flow into the

Landa mill race. These waters again join about 4 miles above the highway bridge north of the court-house, forming Comal River. The following table shows the result of current-meter measurements on Comal River at various times:

Discharge measurements of Comal River at New Braunfels, Tex., 1895–1905.

Date.	Hydrographer.	Discharge.	Remarks.
		Second-feet.	
1895	C. C. Babb	328	At highway bridge.
1898	T. U. Taylor	320	Do.
1899	do	310	In park.
1900	do	374	Do.
1901	do	343	Do.
1902	do	333	Do.
1903	do	412	In park (recent rains).
1904	do	375	In park.
1905	do	390	Do.

SAN ANTONIO RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

San Antonio River rises about 3 miles north of the mission of San Fernando, the geographic center of the city of San Antonio. The underground source of San Antonio River and of the artesian wells in the vicinity is the same. The flow of the headwaters is extremely variable, as is seen from the record at San Antonio.

SAN ANTONIO RIVER AT SAN ANTONIO, TEX.

About 1885 San Antonio River at San Antonio began to fail, and by the latter part of 1897 the flow above the city had entirely ceased. San Pedro Creek rises in San Pedro Park and has maintained a flow of 9 second-feet for several years. This joins San Antonio River just below the city and above the Hot Wells, where many of the measurements are made. This river has gone through the same experience as many of the big springs. There is no doubt that the river and the artesian wells have the same underground source, but the river regained its former efficiency in 1900 shortly after the celebrated flood (Water Supply Paper No. 105); in two years, however, the discharge has dropped to a third of the discharge in 1900. The following table shows the discharge measurements that have been made on this stream:

Discharge measurements of San Antonio River at San Antonio, Tex., 1895–1905.

Date.	Hydrographer.	Discharge.	Remarks.
		Second-feet.	
December, 1895	C. C. Babb	40	Upper canal.
November, 1896	do	41	Do.
December, 1897	T. U. Taylor	0	Lower canal.
December, 1897	do	11	Hot Wells.
March, 1898	do	0	Lower canal.
March, 1898	do	9	Hot Wells.
June, 1899	do	0	Lower canal.
June, 1899	do	10	Hot Wells.
September, 1900	do	103	Lower canal.
September, 1900	do	125	Hot Wells.
October, 1901	do	41	Do.
March, 1904	do	65	Do.
June, 1904	do	61	Do.
September, 1905	do	117	Do.

NUECES RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The two main forks of Nueces River rise in Edwards County, Tex., and flows southward through the rugged mountains of the Edwards Plateau, uniting about 14 miles from Uvalde and about 6 miles above the crossing of the Southern Pacific Railroad. On their way through the mountains both branches are fed by springs and carry perpetually running water from their sources, about 12 miles south of Rock Springs to their junction at the foot of the Edwards Plateau. At about the junction of the branches the usual flow sinks into gravel beds, occasionally reappearing in big, clear pools at points where the gravel has been washed off from the solid bed-rock bottom. Four or five miles below the Southern Pacific Railroad bridge flowing water again appears, the stream along its low land course being fed by numerous springs.

LEONA RIVER AT UVALDE, TEX.

The flow of Leona River at Uvalde is variable and the river has often stopped flowing altogether near Uvalde. It was dry in 1885, but soon revived and continued flowing till 1893, when it again ceased for a time. Its history at the brickyard crossing, 1½ miles below the town on the road to Pearsall, is given in the following table:

Discharge measurements of Leona River at Uvalde, Tex., 1885–1905.

Date.	Hydrographer.	Discharge.	Remarks.
		Second-feet.	
1885			Flowed.
1893			Did not flow.
December, 1895	C. C. Babb	11	
June, 1899	T. U. Taylor		Do.
September, 1900	do	5	
March, 1904	do	22	
August, 1905	do	13	

RIO GRANDE DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The source of the Rio Grande is in the snow masses of the high peaks of the continental divide in Hinsdale and Mineral counties in southwestern Colorado. The main stream flows in an easterly direction for about 75 miles, receiving numerous tributaries from the mountainous region through which it passes. At Del Norte the stream channel leaves a narrow canyon-like valley and enters the San Luis Valley. From Del Norte the general course is southeasterly for about 75 miles to a point 20 miles east of Antonito, where it crosses the Colorado-New Mexico State line. Four miles above the State line the Rio Grande enters a canyon, locally known as the Rio Grande Canyon, and continues through it to a short distance below Embudo, N. Mex., where the canyon walls retreat rapidly, especially on the west side, giving room for a border of irregular hills between the higher mesa walls and the flood plain adjacent to the river. This is the beginning of Espanola Valley, about 3 or 4 miles in width, which extends to White Rock Canyon, about 25 miles below, and through which the Rio Grande flows for 30 miles. Again the canyon walls recede, and the river enters Albuquerque Valley, which averages from 1 to 3 miles in width and continues down to about Socorro, N. Mex. Throughout its course in New Mexico the general direction of the Rio Grande is southward to El Paso; thence it is southeasterly to the Gulf of Mexico.

From the high mountains which surround this basin come a large number of small streams, some of which unite into creeks of considerable size, while others sink and gradually disappear into the coarse soil of the valley bottom. Below Del Norte few streams of importance enter the river with the exception of the Chama in New Mexico and the Pecos in Texas, as nearly all those which issue from the mountains lose their water, except in flood periods, in the sandy plains before they reach the main channel. Rio Conchos is the principal tributary from the Mexican side.

The limited data on precipitation collected by the United States Weather Bureau show the mean annual rainfall to be 25 inches in the mountainous portion of the drainage. This diminishes to 10 inches in the foothills and lower portions of the drainage.

The determination of the amount of water in the Rio Grande is of importance, both on account of its use in irrigation and from its bearing upon interstate and international distribution of water. Most of the New Mexico and Texas stations down to Eagle Pass are maintained by the United States section of the International (Water) Boundary Commission. The data are collected by W. W. Follett, consulting engineer for the Commission, and have been furnished through the courtesy of Gen. Anson Mills, Commissioner. On account of the shifting character of the river beds at the International (Water) Boundary stations, no rating tables have been prepared. The estimated monthly discharges are from daily discharges computed by Mr. Follett directly from the discharge measurements.

The five stations from Laredo down (Laredo, Roma, Brownsville, Salado near Guerrero, and San Juan at Santa Rosalie Ranch) are maintained by the Mexican section of the Commission.

RIO GRANDE NEAR DEL NORTE, COLO.

Measurements and observations were first begun in the vicinity of Del Norte in 1889 by George T. Quinby. The object of the measurements was to obtain the flow of the river before water was diverted for the agricultural region of San Luis Valley, and by a comparison of this with the figures obtained at Embudo to acquire data as to the effect of the numerous ditches taking out water between the two points. The river 25 miles above Del Norte flows out of the canyon at Wagon Wheel Gap. Little water, however, is diverted until the edge of the San Luis Valley is reached, the largest canal heading near the town of Del Norte. During freshets the river divides into a number of channels, making it difficult to obtain measurements near town. In order to avoid the expense of establishing a station during time of high water the first measurements—those about June 1—were made from several bridges crossing the numerous branches. The results were not wholly satisfactory, and June 25 a station was established above the branches. Later a locality about 2 miles farther up was chosen. Records are continuous for a period of sixteen years.

The station is about 2 miles west of Del Norte, above the main canal taking water from the Rio Grande, and is above all the irrigating ditches of importance.

The stream course, which is of uniform section, is straight for 100 yards both above and below the cable. The bed is composed of small bowlders and cobblestones, and hitherto has been considered permanent. However, the high water of June, 1905, altered the section considerably along the right side. The present section will probably be permanent for a long period of years and can change only during extreme high water. The left bank is low and of gradual slope, and is composed of cobblestones and gravel with a fringe of small cottonwood trees, and overflows at high water. The right bank is 6 feet above low water, of about 45° slope, and is composed of bowlders, cobblestones, and gravel. The extreme high water of 1905 overflowed this bank and extended over the entire bottom land to the right for a distance of half a mile. There is but one channel at all stages, and it is about 75 feet wide and of very regular section. Gage heights range from 1 to 5 feet save at extreme high water. The current is swift at low water, and exceptionally so during high water. Very accurate results may be secured at this station.

Discharge measurements were first made from a flatboat controlled by a cable across the river. They are now made by means of a cable, car, tagged wire, and stay wire. The initial point for soundings is on the right bank of river, and is indicated by a tag on the tagged wire, 22 feet from the tree to which the cable is anchored.

Several inclined gages have been used from time to time. The datum of each has been the same, and the location practically so. The lower part of the present gage is an inclined rod at the cable, and the upper part a vertical post, on the right bank. During 1905 the gage was read once each day by Richard D. Adams. The bench mark is a United States Geological Survey iron bench mark post set in the ground 25 feet south of the gage; elevation, 8.25 feet above the datum of the gage.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; Bull=Bulletin; WS=Water-Supply Paper):

Description: Ann 14, ii, pp 110–111; 18, iv, p 246; Bull 131, pp 41–42; 140, p 170; WS 16, p 127; 28, p 120; 37, pp 277–278; 50, p 347; 66, p 65; 84, pp 194–195; 99, pp 400–401; 132, p 52.

Discharge: Ann 18, iv, p 246; Bull 131, p 91; 140, p 170; WS 16, p 127; 28, p 129; 37, p 278; 50, p 347; 66, p 65; 84, p 195; 99, p 401; 132, p 53.

Discharge, monthly: Ann 11, ii, p 98; 12, ii, pp 349, 360; 13, iii, p 94; 14, ii, p 11; 18, iv, p 247–248; 19, iv, p 383; 20, iv, pp 358, 360–364; 21 iv, p 256; 22, iv, p 347; WS 75, p 153; 84, p 196; 99, p 402; 132, p 54.

Discharge, yearly: Ann 13, iii, p 99; 20, iv, p 57.

Gage heights: Bull 131, pp 42–43; 140, p 170; WS 11, p 64; 16, p 127; 28, p 126; 37, p 278; 50, p 347; 66, p 65; 84, pp 195–196; 99, p 401; 132, p 53.

Hydrographs: Ann 12, ii, p 250; 18, iv, p 249; 19, iv, p 384; 20, iv, p 365; 21, iv, p 256; 22, iv, p 348.

Rainfall and run-off relation: Ann 20, iv, p 359.

Rating tables: Ann 18, iv, p 247; 19, iv, p 383; WS 28, p 130; 39, p 450; 52, p 519; 66, p 173; 84, p 196; 99, p 402; 132, p 54.

Discharge measurements of Rio Grande near Del Norte, Colo., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
April 20	R. I. Meeker	132	184	3.46	2.08	638
June 28	do	156	550	6.23	3.90	3,428
July 25	do	137	224	3.32	1.70	744
September 18	do	122	130	2.15	1.00	280

Daily gage height, in feet, of Rio Grande near Del Norte, Colo., for 1905.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.5	3.8	6.25	3.2	1.95	1.2	1.9	1.1	1.0
2	1.45	3.9	6.7	3.05	1.9	1.2	1.6	1.1	1.0
3	1.5	3.2	6.9	2.9	1.9	1.2	1.5	1.1	1.0
4	1.45	2.9	7.0	2.75	1.8	1.25	1.5	1.1	1.0
5	1.45	2.8	7.05	2.55	1.85	1.25	1.4	1.1	1.0
6	1.75	2.6	6.1	2.35	1.9	1.3	1.4	1.1	1.0
7	1.7	2.7	6.2	2.3	1.9	1.25	1.35	1.1	1.0
8	1.8	2.9	6.45	2.25	1.85	1.2	1.3	1.1	1.0
9	2.5	3.4	6.4	2.2	1.75	1.2	1.25	1.1	1.0
10	2.5	3.25	6.3	2.15	1.6	1.25	1.25	1.1	1.0
11	2.1	2.8	6.0	2.1	1.7	1.2	1.2	1.1	1.0
12	2.0	2.9	5.9	2.0	1.75	1.15	1.2	1.0	1.0
13	1.95	3.1	5.7	2.0	1.6	1.1	1.2	1.0	1.0
14	2.0	3.1	5.7	1.95	1.55	1.1	1.2	1.0	1.0
15	2.1	3.7	5.65	1.95	1.45	1.1	1.2	1.0	1.0
16	2.15	4.2	5.55	1.8	1.4	1.05	1.2	1.0	1.0
17	2.15	4.9	5.2	1.85	1.35	1.0	1.2	1.0	1.0
18	2.1	5.1	5.0	1.85	1.3	1.0	1.25	1.0	1.0

Daily gage height, in feet, of Rio Grande, near Del Norte, Colo., for 1905—Continued.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
19	2.3	5.6	4.8	1.9	1.25	1.0	1.25	1.0	1.0
20	2.1	5.7	4.7	1.9	1.25	1.0	1.2	1.0	1.0
21	2.5	5.5	4.6	1.95	1.2	1.0	1.2	1.0	1.0
22	2.15	5.8	4.2	2.0	1.15	1.0	1.2	1.0	1.0
23	2.2	6.2	4.1	1.9	1.15	1.0	1.2	1.0	1.0
24	2.1	6.0	4.0	1.8	1.2	1.0	1.2	1.0	1.0
25	2.1	6.5	3.85	1.7	1.3	1.1	1.2	.8	1.0
26	2.1	6.0	3.75	1.65	1.25	1.2	1.2	.8	1.0
27	2.4	5.9	3.45	1.6	1.25	1.15	1.2	.8	1.0
28	2.6	6.0	3.9	1.7	1.2	1.1	1.2	.9	1.0
29	3.0	4.5	3.65	1.8	1.25	1.05	1.2	1.0	1.0
30	3.25	4.9	3.5	2.15	1.3	2.27	1.15	1.0	1.0
31	.....	5.6	.....	2.0	1.25	.....	1.15	.....	1.0

Station rating table for Rio Grande near Del Norte, Colo., from April 1 to June 5, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
1.40	290	2.60	1,135	3.80	2,400	5.00	4,010
1.50	345	2.70	1,225	3.90	2,520	5.20	4,330
1.60	405	2.80	1,315	4.00	2,640	5.40	4,650
1.70	465	2.90	1,410	4.10	2,760	5.60	4,990
1.80	535	3.00	1,510	4.20	2,890	5.80	5,410
1.90	605	3.10	1,610	4.30	3,030	6.00	5,890
2.00	675	3.20	1,710	4.40	3,170	6.20	6,450
2.10	745	3.30	1,810	4.50	3,310	6.40	7,100
2.20	815	3.40	1,920	4.60	3,450	6.60	7,850
2.30	890	3.50	2,040	4.70	3,590	6.80	8,730
2.40	970	3.60	2,160	4.80	3,730	7.00	9,760
2.50	1,050	3.70	2,280	4.90	3,870		

The above table is applicable only for open-channel conditions. It is based on discharge measurements made previous to the high water of June, 1905. It is not well defined. Below gage height 5.5 feet it is the same as the 1904 table.

Station rating table for Rio Grande near Del Norte, Colo., from June 6 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
[a]1.00	290	2.20	1,150	3.40	2,670	4.60	4,630
1.10	330	2.30	1,260	3.50	2,820	4.70	4,820
1.20	380	2.40	1,370	3.60	2,970	4.80	5,010
1.30	440	2.50	1,480	3.70	3,120	4.90	5,200
1.40	500	2.60	1,600	3.80	3,280	5.00	5,400
1.50	560	2.70	1,720	3.90	3,440	5.20	5,810
1.60	630	2.80	1,850	4.00	3,600	5.40	6,230
1.70	700	2.90	1,980	4.10	3,760	5.60	6,670
1.80	780	3.00	2,110	4.20	3,930	5.80	7,110
1.90	860	3.10	2,250	4.30	4,100	6.00	7,550
2.00	950	3.20	2,390	4.40	4,270	6.20	8,030
2.10	1,050	3.30	2,530	4.50	4,450	6.40	8,510

[a] 0.8 = 220; 0.9 = 255.

The above table is applicable only for open-channel conditions. It is based on three discharge measurements made during the latter part of 1905. Estimates based on this table are only approximate.

Estimated monthly discharge of Rio Grande near Del Norte, Colo., for 1905.

[Drainage area, 1,400 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
April	1,760	318	760	45,220	0.543	0.606
May	7,460	1,135	3,411	209,700	2.44	2.81
June	10,030	2,745	6,090	362,400	4.35	4.85
July	2,390	630	1,091	67,080	.779	.898
August	905	355	578	35,540	.413	.476
September	1,227	290	376	22,370	.269	.300
October	860	355	430	26,440	.307	.354
November	330	220	296	17,610	.211	.235
December	290	290	290	17,830	.207	.239
The period				804,200		

RIO GRANDE NEAR LOBATOS, COLO.

This station was established June 28, 1899, by A. L. Fellows, and is 13 miles east of Antonio, the nearest railroad station. It is located at the State highway bridge at a point near the Colorado-New Mexico State line, about 10 miles east of Lobatos post-office and in T. 33 N., R. 11 E. The record of flow at this station is of importance to the proposed Government irrigation project near Engle, N. Mex., and also from the fact that it gives the discharge of the river at the Colorado State line, so that it includes practically all of the Colorado drainage.

The cross section above and below the station is fairly uniform and the channel regular, being straight above and below for a considerable distance. The stream channel is a gash cut through the solid lava to a general depth of 40 feet at the bridge. The stream floor is fairly smooth, but is littered with angular fragments of lava that catch and hold a loose, shallow deposit of sand during low water, which prevails during the greater portion of the year. The right bank is a perpendicuar lava cliff. The left bank, composed of loose fragments of lava at the water's edge, slopes gradually up to the lava cliff. The channel can not overflow either bank at this section. At low stages there are usually two channels; during high water there is but one. Gage heights range from 1 to 10 feet. At low water the current is very sluggish; at high water very swift. The center pier obstructs the current very little during high water.

Discharge measurements at high water are made from the downstream side of the bridge, a double span steel structure with cylinder piers at the center of the stream and 300 feet in length.

The initial point for soundings is at the right end of the bridge, downstream side. At low water discharge measurements are made by wading either above or below the bridge.

The gage is a scale on the right side of the downstream pier of the bridge. During 1905 the gage was read twice each day by Román Mondragón. The bench mark is a chiseled point marked "B. M." on the face of the lava bluff at the west end of the bridge; elevation, 7.42 feet above the datum of the gage.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: WS 37, p 279; 50, pp 348-349; 66, p 65; 84, pp 192-193; 99, p 395; 132, p 55.
Discharge: WS 37, p 279; 50, p 349; 66, p 65; 84, p 193; 99, p 395; 132, p 55.
Discharge, monthly: Ann 21, iv, p 257; 22 iv, p 349; WS 75, p 153; 84, p 194; 99, p 397; 132, p 57.
Gage heights: WS 37, p 280; 50, p 349; 66, p 66; 84, p 193; 99, p 396; 132, p 56.
Hydrographs: Ann 21, iv, p 257; 22, iv, p 349.
Rating tables: WS 39, p 450; 52, p 519; 66, p 173; 84, p 193; 99, p 396; 132, p 56.

Discharge measurements of Rio Grande near Lobatos, Colo., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Feet per second.*	*Feet.*	*Sec.-feet.*
April 21	R. I. Meeker	234	433	1.85	2.45	801
June 23	do	249	1,029	3.23	4.25	3,343
July 26[a]	do	207	188	.36	1.12	67
September 22	do	200	166	.28	1.00	46

[a] Made by wading.

Daily gage height, in feet, of Rio Grande near Lobatos, Colo., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.6	2.75	3.00	2.0	3.6	6.25	2.9	1.25	1.2	1.0	1.3	1.9
2	2.6	2.8	3.15	2.0	4.4	6.5	2.7	1.35	1.1	1.0	1.3	1.9
3	2.6	2.8	3.2	2.0	4.65	7.05	2.55	1.7	1.15	1.0	1.3	1.9
4	2.6	2.8	3.2	2.0	4.55	7.85	2.2	1.7	1.2	1.5	1.4	1.9
5	2.6	2.8	3.2	1.95	4.25	8.25	2.1	1.7	1.2	1.5	1.4	1.9
6	2.6	2.8	3.15	1.9	3.65	8.75	2.0	1.7	1.2	1.4	1.4	1.9
7	2.6	2.8	2.1	1.9	3.45	8.85	1.85	1.6	1.2	1.5	1.4	1.9
8	2.6	2.8	2.3	1.9	3.3	9.05	1.7	1.6	1.2	1.5	1.5	1.9
9	2.6	2.8	2.5	1.95	3.4	8.85	1.6	1.65	1.2	1.4	1.5	1.9
10	2.6	2.8	2.5	2.05	3.55	8.6	1.5	1.6	1.2	1.4	1.5	2.0
11	2.6	2.8	2.5	2.1	3.7	8.45	1.4	1.6	1.2	1.3	1.6	2.0
12	2.6	2.8	2.6	2.4	3.5	8.1	1.4	1.6	1.2	1.3	1.6	2.0
13	2.6	2.8	2.6	2.4	3.4	7.6	1.4	1.6	1.1	1.2	1.6	2.05
14	2.6	2.8	2.5	2.4	3.6	6.8	1.3	1.45	1.1	1.2	1.6	2.2
15	2.6	2.8	2.4	2.3	3.6	6.7	1.3	1.4	1.1	1.2	1.6	2.2
16	2.6	2.8	2.45	2.2	4.1	6.4	1.3	1.35	1.1	1.1	1.6	2.2
17	2.6	2.8	2.45	2.25	4.7	6.3	1.3	1.3	1.0	1.1	1.6	2.2
18	2.6	2.8	2.45	2.3	5.1	6.05	1.3	1.3	1.0	1.1	1.6	2.2
19	2.6	2.8	2.4	2.4	5.9	5.8	1.3	1.3	1.0	1.1	1.6	2.2
20	2.6	2.8	2.4	2.5	6.6	5.15	1.2	1.2	1.0	1.1	1.6	2.2
21	2.6	2.8	2.4	2.5	7.0	4.9	1.2	1.2	1.0	1.1	1.6	2.2
22	2.6	2.8	2.3	2.55	7.2	4.5	1.2	1.2	1.0	1.1	1.6	2.2
23	2.6	2.8	2.2	2.6	7.7	4.0	1.2	1.2	1.0	1.1	1.6	2.2
24	2.6	2.8	2.1	2.6	7.95	3.65	1.2	1.2	1.0	1.1	1.7	2.2
25	2.6	2.8	2.0	2.6	8.0	3.55	1.2	1.2	1.0	1.1	1.7	2.2
26	2.6	2.8	2.0	2.6	8.4	3.5	1.2	1.3	1.0	1.1	1.7	2.2
27	2.6	2.8	2.0	2.6	8.15	3.5	1.2	1.2	1.0	1.2	1.7	2.2
28	2.6	2.85	2.1	2.7	8.0	3.3	1.2	1.2	1.0	1.3	1.9	2.2
29	2.6	.....	2.0	3.0	7.7	3.2	1.2	1.2	1.0	1.3	1.6	2.2
30	2.6	.....	2.0	3.3	7.1	3.0	1.2	1.2	1.0	1.3	1.85	2.2
31	2.6	.....	2.0	.....	6.7	.....	1.2	1.2	.....	1.3	.....	2.2

RIO GRANDE NEAR SAN ILDEFONSO, N. M.

This station was established February 3, 1895, by A. P. Davis, and is located at the Denver and Rio Grande Railroad bridge, 9 miles below Espanola and 2 miles from San Ildefonso. The station has been called by the following names: Rio Grande, Buckman, and Water Tank. The data at this station are of especial interest in connection with irrigation projects, owing to the fact that Mexican settlers of this valley divert a considerable volume of water for their cultivated lands. The method of application of water to land by these people is very wasteful. In recent years a number of important modern irrigation systems have been planned and built in the valley in the vicinity of Albuquerque, 40 miles below.

The channel is straight for 150 feet above and 500 feet below the cable. The bed of the stream at the cable is about 200 feet in width, and is composed of lava bowlders, with a shifting deposit of sand and silt, which scours out and changes during very high water and accumulates immediately on its recession. At low water ordinarily the channel finds a narrow passage through this deposit. The right bank is low and composed of lava bowlders with a silt deposit. It overflows at high water. The left bank is scattered with lava bowlders and is the steep side of a mountain partly covered with scattered cedars. There is but one channel at all stages. Gage heights range from 1.5 to 12 feet. During high water it is difficult to secure accurate measurements from the bridge on account of the high velocity of the current and the rough surface. In addition to this, the Denver and Rio Grande Railroad bridge does not cross the river at a right angle to the direction of the current.

At the cable section the water boils considerably at low water. At high water at both sections the velocity is close to 20 feet per second.

Discharge measurements are made from a cable with car and tag line 150 feet above the bridge, to which the gage is attached. At very high water measurements must be made from the railroad bridge. The initial point for soundings at the cable is at the end of the cable on the left side of the stream, where the cable is fastened to two small cedar trees.

The original gage at this station was located on the left bank, 180 feet above the bridge. The inclined portion read from 1 to 10 feet and the vertical portion from 10 to 16 feet. It was found that this gage was not well located, and March 30, 1904, a vertical rod was established on the downstream side of the north pier of the bridge, the datum being 2.019 feet higher than that of the original gage. During the flood of September, 1904, this rod was cut off from the water by the filling in of the channelr October 29, 1904, a standard chain gage was established on the downstream running board of the bridge, at the same datum as the new rod gage; length of chain, 23.28 feet. During 1905 the gage was read twice each day by Joseph Gomez. The bench mark is a United States Geological Survey tablet, set in the top of a granite bowlder, 5 feet square and 2 feet high, located in a clump of cedars on the right bank of the river, about 75 feet from the west end of the north pier of the railroad bridge; elevation, 11.37 feet above the datum of the new gage.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; Bull=Bulletin; WS=Water-Supply Paper):

Description: Ann 18, iv, pp 252–253; Bull 140, pp 175–176; WS 16, p 130; 28, p 120; 37, pp 281–282; 50 pp 350–351; 66, p 67; 84, pp 186–187; 99, p 387; 132, pp 57–58.

Discharge: Ann 11, ii, p 107; Ann 18, iv, p 253; Bull 140, p 176; WS 16, p 130; 28, p 129; 37, p 282; 50, p 351; 66, p 67; 84, pp 187–188; 99, pp 387–389; 132, p 59.

Discharge, monthly: Ann 18, iv, p 254; 19, iv, p 386; 20, iv, pp 358, 370; 21, iv, p 259; 22, iv, p 351; Bull 140, p 177; WS 75, p 154; 84, p 189; 99, p 390; 132, p 62.

Discharge, yearly: Ann 20, iv, p 58.

Gage heights: Bull 140, p 176; WS 11, p 66; 16, p 130; 28, p 127; 37, p 282; 50, p 351; 66, p 68; 84, p 188; 99, pp 389–390; 132, p 60.

Hydrographs: Ann 18, iv, p 255; 19, iv, p 387; 21, iv, p 260; 22, iv, p 351.

Rainfall and run-off relation: Ann 20, iv, p 359.

Rating tables: Ann 18, iv, p 253; 19, iv, p 386; Bull 140, p 176; WS 28, p 130; 39, p 451; 66, p 173; 132, p 61.

Discharge measurements of Rio Grande near San Ildefonso, N. Mex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
April 26	R. I. Meeker	130	709	5.82	5.45	4,126
June 9	do	132	484	6.0	4.45	2,905
June 30	do	132	434	5.72	4.25	2,481
July 28	do	115	171	3.77	2.15	644
July 29	do	115	162	3.16	2.0	512
September 21	do	80	102	2.25	1.62	230

Daily gage height, in feet, of Rio Grande near San Ildefonso, N. Mex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.31	2.4	3.88	3.62	7.85	9.3	4.05	3.25	1.6	2.1	1.9	2.3
2	2.36	2.45	4.38	3.72	8.45	9.1	3.85	2.65	1.6	1.9	1.9	2.3
3	2.36	2.55	4.33	3.77	8.95	9.2	3.65	3.1	1.6	1.9	1.9	2.2
4	2.26	2.8	4.48	3.72	8.75	9.5	3.5	2.8	1.6	1.8	2.0	2.2
5	2.26	2.55	4.98	3.57	7.6	10.2	3.25	2.7	1.9	1.8	2.0	2.2
6	2.26	2.55	4.78	3.62	7.4	10.5	3.05	2.8	2.0	1.8	2.0	2.2
7	2.26	2.4	4.88	3.77	7.3	10.45	2.85	3.0	1.9	1.8	2.2	2.2
8	2.36	2.45	4.93	4.22	6.65	10.7	2.65	2.9	1.8	1.8	2.0	2.2
9	2.36	2.45	4.58	4.42	7.6	11.1	2.5	2.6	1.8	1.8	1.9	2.2
10	2.46	2.4	4.38	4.87	7.45	10.4	2.45	2.4	1.8	1.8	1.9	2.2
11	2.36	2.49	4.38	4.96	6.8	10.05	2.25	2.6	1.8	1.8	1.9	2.2
12	2.46	2.49	4.43	4.96	7.05	9.65	2.2	2.5	1.7	1.8	2.2	2.3
13	2.36	2.24	4.08	5.16	7.2	9.4	2.05	2.4	1.7	1.8	2.2	2.3
14	2.16	2.19	4.18	5.06	7.4	9.05	2.0	2.3	1.7	1.8	2.2	2.3
15	2.06	2.24	4.73	4.91	8.2	8.45	2.0	2.2	1.7	1.7	2.2	2.3
16	2.31	2.54	4.63	4.86	8.8	8.15	1.9	2.0	1.7	1.7	2.2	2.3
17	2.31	2.49	4.58	4.96	9.65	7.7	1.85	1.9	1.7	1.7	2.2	2.3
18	2.46	2.44	4.48	5.06	10.5	7.5	1.8	1.8	1.6	1.7	2.2	2.3
19	2.36	2.44	4.08	5.36	11.1	7.15	1.8	1.6	1.6	1.7	2.2	2.2
20	2.36	2.49	4.03	5.46	11.6	6.85	1.85	1.5	1.6	1.7	2.2	2.2
21	2.35	2.54	4.17	5.31	11.5	6.45	2.1	1.3	1.6	1.7	2.2	2.2
22	2.4	2.54	4.17	6.01	11.45	6.3	2.2	1.0	1.6	1.7	3.0	2.3
23	2.35	2.59	4.02	6.01	11.5	5.95	2.2	.6	1.6	1.9	3.0	2.3
24	2.35	2.79	3.92	6.31	11.75	5.7	2.1	.6	1.6	1.9	2.5	2.3
25	2.4	3.04	3.82	5.36	11.8	5.45	2.2	2.0	1.8	1.9	2.4	2.3
26	2.35	3.49	3.87	5.41	11.5	5.15	2.2	1.8	2.0	1.9	2.4	2.1
27	2.3	3.64	4.12	5.61	11.25	4.9	2.05	1.8	2.1	1.9	2.3	1.9
28	2.3	3.69	4.17	6.26	10.9	4.75	2.2	1.7	1.9	1.9	2.3	1.9
29	2.35	.....	3.77	6.81	10.6	4.45	2.1	1.6	1.8	1.9	2.4	1.9
30	2.4	.....	3.67	7.31	10.5	4.25	2.75	1.6	1.8	1.9	2.3	1.9
31	2.4	.....	3.57	.....	9.4	.....	3.45	1.6	.....	1.9	.....	1.9

Station rating table for Rio Grande near San Ildefonso, N. Mex., from January 1 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.60	40	2.10	560	3.60	1,790	6.20	5,480
0.70	50	2.20	620	3.70	1,900	6.40	5,850
0.80	70	2.30	680	3.80	2,010	6.60	6,230
0.90	90	2.40	750	3.90	2,120	6.80	6,630
1.00	120	2.50	820	4.00	2,230	7.00	7,030
1.10	150	2.60	890	4.20	2,470	7.50	8,100
1.20	180	2.70	960	4.40	2,710	8.00	9,230
1.30	210	2.80	1,040	4.60	2,960	8.50	10,440
1.40	250	2.90	1,120	4.80	3,220	9.00	11,690
1.50	290	3.00	1,200	5.00	3,500	9.50	12,990
1.60	330	3.10	1,290	5.20	3,800	10.00	14,310
1.70	370	3.20	1,380	5.40	4,110	10.50	15,670
1.80	410	3.30	1,480	5.60	4,430	11.00	17,100
1.90	460	3.40	1,580	5.80	4,770	11.50	18,600
2.00	510	3.50	1,680	6.00	5,120		

The above table is based on six discharge measurements made during 1905 and three high-water measurements made in 1903. It is not well defined.

Estimated monthly discharge of Rio Grande near San Ildefonso, N. Mex., for 1905.

[Drainage area, 14,050 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
January	792	540	707	43,470	0.050	0.058
February	1,889	614	929	51,590	.066	.069
March	3,472	1,757	2,571	158,100	.183	.211
April	7,682	1,757	3,679	218,900	.262	.292
May	19,500	6,330	12,770	785,200	.909	1.05
June	17,400	2,530	9,625	572,700	.685	.764
July	2,290	410	874	53,740	.062	.072
August	1,430	40	629	38,680	.045	.052
September	560	330	389	23,150	.028	.031
October	560	370	422	25,950	.030	.035
November	1,200	460	638	37,960	.045	.050
December	680	460	617	37,940	.044	.051
The year	19,500	40	2,821	2,047,000	.201	2.74

RIO GRANDE NEAR SAN MARCIAL, N. MEX.

August 8, 1889, a station was established near San Marcial and a measurement was made which gave a discharge of 19 second-feet. Soon after this date, however, the river gage was destroyed and the locality was abandoned until January 29, 1895, when the station was reestablished by A. P. Davis at the bridge of the Atchison, Topeka and Santa Fe Railway, 1 mile south of San Marcial, N. Mex.

The channel is sandy and shifting. A number of bridge piers interfere with the current to a certain extent, but not with the observed gage heights. They sometimes affect the

discharge measurements. There is no overflow channel beyond the bridge. The section gives gravity flow.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the face of the bridge abutment on the left bank of the stream.

The inclined gage established January 29, 1895, was carried away in 1896 and a wire gage was put in its place. This gage has since been abandoned, and the gage heights are now measured with a graduated rod from the deck of the bridge, but using the old gage datum. The top of the ties on the bridge is at elevation 19.00 feet on the gage. The range between high and low water is about 8 feet. Bench marks were established as follows: (1) The top of the capstone on which the bridge truss rests; elevation, 15.00 feet. (2) The top of the extension of the pier to which the old vertical gage was fastened; elevation, 13.00 feet. Elevations refer to the datum of the gage.

The observations during 1905 have been made under the direction of the United States section of the International (Water) Boundary Commission. The various hydrographers at this station have also acted as gage readers.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; Bull=Bulletin; WS=Water-Supply Paper):

Cross section: Ann 18, iv, p 257.
Description: Ann 18, iv. pp 254–255; Bull 131, p 46; 140, p 177; WS 16, p 131; 28, p 120; 37, p 282; 50, pp 351–352; 66, p 68; 84, pp 183–184; 99, pp 382–383; 132, pp 62–63.
Discharge: Ann 11, ii, p 107; 18, iv, p 256; Bull 131, p 46; 140, p 177; WS 16, p 131; 28, p 129; 37, p 283; 50, p 352; 66, pp 68–69; 84, pp 184–185; 99, pp 383–385; 132, pp 63–64, 127.
Discharge, mean daily: WS 132, p 66.
Discharge, monthly: Ann 18, iv, p 257; 19, iv, p 388; 20, iv, pp 358, 371; 21, iv, p 261; 22, iv, 352; WS 75, p 155; 84, p 186; 99, p 386; 132, p 67.
Discharge, yearly: Ann 20, iv, p 58.
Gage heights: Bull 140, p 178; WS 11, p 66; 16, p 131; 28, p 128; 37, p 283; 50, p 352; 66, p 69; 84, p 185; 99, p 386; 132, p 65.
Hydrographs: Ann 19, iv, p 389; 20, iv, p 371; 21, iv, p 261; 22, iv, p 352.
Rainfall and run-off relation: Ann 20, iv, p 359.
Rating tables: Ann 18, iv, p 256; 19, iv, p 387–388; WS 28, p 131.

Discharge measurements of Rio Grande near San Marcial, N. Mex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second*	*Feet.*	*Second-feet.*
January 3	L. W. Broyles	259	2.04	7.8	528
January 6	do	325	2.10	8.0	684
January 9	do	238	2.39	7.9	568
January 12	do	297	3.10	8.1	922
January 15	do	203	3.38	8.0	686
January 18	do	184	2.95	7.9	543
January 21	do	193	3.37	8.0	651
January 24	do	176	3.05	7.9	536
January 27	do	211	2.80	7.9	590
January 31	do	197	3.43	8.0	675
February 3	do	237	3.50	7.9	830
February 6[a]	do	184	3.59	7.9	661
February 9	do	309	3.30	8.1	1,019
February 12	do	258	2.98	8.0	768
February 15	do	237	2.83	8.1	671
February 18	do	284	2.93	8.0	831
February 21	do	243	3.28	8.1	796
February 24	do	246	3.01	8.0	740
February 28	do	660	3.47	8.5	2,287
March 3	do	720	4.01	8.6	2,886

[a] Ice in river.

Discharge measurements of Rio Grande near San Marcial, N. Mex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
March 5	L. W. Broyles	929	5.46	9.0	5,073
March 8	do	979	4.70	8.9	4,598
March 10	do	697	6.88	9.2	4,795
March 12	do	664	5.04	8.6	3,344
March 15	do	554	5.64	8.4	3,125
March 18	do	833	4.57	9.3	3,806
March 21	do	717	3.79	8.8	2,721
March 24	do	731	4.07	9.0	2,972
March 27	do	630	3.49	8.6	2,198
March 31	do	652	4.18	8.7	2,724
April 3	do	852	3.91	9.2	3,331
April 6	do	589	3.07	8.5	1,808
April 9	do	584	3.34	8.7	1,950
April 12	do	972	4.02	9.6	3,911
April 15	do	1,026	3.90	9.6	4,006
April 18	do	954	4.03	9.1	3,840
April 21	do	997	4.30	9.4	4,288
April 24	do	1,769	5.50	10.2	9,726
April 30	do	1,571	4.68	10.2	7,356
May 3	do	1,558	5.03	10.7	7,829
May 5	do	2,318	5.03	11.4	11,650
May 7	do	1,833	5.98	10.7	10,955
May 9	do	1,868	5.92	10.0	11,058
May 11	do	1,597	5.44	10.3	8,694
May 13	do	1,656	6.37	10.2	10,543
May 15	do	1,684	6.15	10.3	10,361
May 17	do	2,063	6.18	10.9	12,758
May 19	do	2,474	6.51	11.6	16,097
May 21	do	2,621	6.72	12.5	17,607
May 23	do	4,093	6.55	12.8	26.810
May 25	do	4,294	5.62	12.7	24,142
May 28	do	4,642	5.51	13.2	25,577
May 31	do	2,847	7.12	13.1	20,264
June 3	do	3,154	6.33	11.9	19,973
June 6	do	3,298	5.09	11.6	16,780
June 9	do	2,821	5.34	12.7	15,071
June 12	do	3,341	5.74	12.5	19,162
June 15	do	2,660	4.40	10.9	11,702
June 18	do	2,744	5.00	9.7	13,726
June 21	do	1,976	4.55	9.4	9,000
June 24	do	1,340	4.74	8.7	6,345
June 26	do	983	4.34	8.4	4,271
June 28	do	882	3.97	8.2	3,505
June 30	do	722	3.66	8.0	2,641
July 3	do	527	3.03	7.6	1,598
July 6	do	350	3.18	7.4	1,143
July 9	do	385	2.04	7.2	784
July 12	do	209	2.23	6.8	466
July 15	do	176	1.56	6.6	274
July 18	do	141	1.33	6.4	188
July 21	do	117	1.51	6.2	177
July 24	do	108	1.46	6.3	158
July 27	do	97	0.84	6.3	81
July 31	do	35	1.91	5.9	67

Discharge measurements of Rio Grande near San Marcial, N. Mex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
August 3	L. W. Broyles	334	2.56	7.4	854
August 6	do	339	1.78	7.1	602
August 9	do	334	1.91	7.3	637
August 12	do	298	2.29	6.9	681
August 15	do	207	2.15	6.5	446
August 18	do	131	1.10	6.3	146
August 21	do	80	1.20	6.0	94
August 24	do	13	0.46	5.6	6
September 7	do	117	2.74	7.3	321
September 9	do	79	1.90	6.7	150
September 11	do	61	1.52	6.5	93
September 25	do	47	1.11	5.6	52
September 27	do	144	1.60	6.7	231
September 29	do	90	1.81	6.3	163
October 5	D. H. West	92	1.71	5.9	157
October 6	do	97	1.56	5.9	151
October 8	do	74	1.69	5.8	125
October 11	do	63	1.32	5.6	83
October 14	do	70	1.39	5.7	97
October 17	do	65	1.23	5.7	80
October 20	do	68	1.24	5.7	84
October 23	do	73	1.30	5.8	95
October 26	do	84	1.50	5.9	126
October 28	do	88	1.67	5.9	147
October 31	do	101	1.71	6.2	173
November 3	do	94	1.86	6.2	175
November 9	do	255	2.90	7.1	740
November 11	do	204	3.27	7.05	667
November 14	do	232	2.51	7.0	582
November 17	do	210	2.28	6.8	479
November 20	do	196	2.45	6.8	481
November 23	do	241	2.52	7.0	607
November 25	do	548	2.96	7.6	1,624
November 28	do	201	2.68	6.9	539
November 30	do	446	3.42	7.7	1,527
December 3	Geo. W. King	317	2.57	7.3	815
December 6	do	249	2.14	7.2	533
December 9	do	228	2.60	7.2	593
December 12	do	220	2.74	7.2	603
December 15	do	347	2.22	7.5	770
December 18	do	275	2.26	7.3	621
December 21	do	315	2.05	7.4	647
December 24	do	127	1.81	6.9	230
December 27	do	93	1.90	6.5	177
December 30	do	105	1.77	6.5	186

Daily gage height, in feet, of Rio Grande near San Marcial, N. Mex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.7	8.0	8.8	8.85	10.35	12.6	8.05	6.75	.....	6.4	6.1	7.7
2	7.7	7.9	8.75	8.9	10.5	12.2	7.75	6.9	.....	6.15	6.1	7.4
3	7.8	7.9	8.65	9.1	10.65	11.95	7.6	7.15	.....	6.1	6.2	7.3
4	7.95	8.0	9.1	8.85	11.25	11.5	7.5	7.15	.....	6.0	6.35	7.2
5	8.0	8.0	9.05	8.65	11.5	11.45	7.45	7.0	.....	5.95	6.45	7.2
6	7.95	8.05	8.95	8.5	11.45	11.55	7.4	7.15	6.8	5.95	6.5	7.15
7	7.8	8.65	8.9	8.4	10.7	11.9	7.35	7.0	7.3	5.9	6.65	7.25
8	7.9	8.45	8.95	8.5	10.15	12.3	7.3	7.05	6.7	5.8	6.9	7.25
9	7.9	8.15	9.25	8.75	9.9	12.7	7.2	7.4	6.7	5.7	7.05	7.15
10	8.05	7.95	9.25	9.05	10.1	12.55	7.05	7.2	6.85	5.6	6.75	7.3
11	8.15	7.9	8.85	9.45	10.3	12.5	6.9	7.0	6.5	5.6	7.05	7.3
12	8.1	8.0	8.6	9.65	10.45	12.35	6.8	6.95	6.1	5.7	7.0	7.2
13	8.1	7.8	8.8	9.95	10.1	11.9	6.8	6.8	5.4	5.7	6.9	7.3
14	8.05	7.65	8.75	9.65	10.3	11.3	6.7	6.75	5.3	5.7	6.95	7.3
15	8.0	8.0	8.6	9.55	10.25	11.0	6.6	6.55	.....	5.75	6.9	7.45
16	8.0	7.9	8.65	9.7	10.65	10.4	6.6	6.45	.....	5.7	6.8	7.5
17	8.05	8.0	8.95	9.2	10.85	10.05	6.5	6.4	.....	5.7	6.8	7.4
18	7.9	8.0	9.2	9.1	11.1	9.7	6.4	6.3	.....	5.7	6.8	7.3
19	7.9	8.1	9.15	9.15	11.45	9.3	6.3	6.2	.....	5.7	6.8	7.4
20	7.8	8.25	9.15	9.3	11.85	9.4	6.2	6.1	.....	5.7	6.8	7.4
21	8.0	8.15	8.8	9.4	12.35	9.35	6.2	6.0	.....	5.7	6.8	7.4
22	8.0	8.05	8.7	9.5	12.75	9.0	6.1	5.85	.....	5.8	6.9	7.25
23	7.95	7.95	8.75	9.7	12.95	8.8	6.2	5.7	.....	5.8	7.0	7.2
24	7.9	8.0	9.0	10.3	13.05	8.7	6.35	5.6	.....	5.75	8.65	6.9
25	7.9	8.8	8.9	11.0	12.65	8.55	6.2	.....	5.6	5.8	7.75	6.5
26	7.9	8.6	8.75	10.45	13.15	8.35	6.4	.....	7.55	5.9	7.6	6.4
27	7.9	8.45	8.6	10.15	13.2	8.2	6.25	.....	7.3	5.9	7.3	6.5
28	7.9	8.55	8.6	9.95	13.2	8.2	6.1	.....	6.2	5.95	6.95	6.5
29	7.95	.....	8.7	10.0	13.15	8.1	6.1	.....	6.7	6.05	6.95	6.5
30	8.0	.....	8.8	10.2	13.0	8.0	6.0	.....	6.55	6.05	7.7	6.5
31	8.0	.....	8.7	.....	13.0	.....	5.9	.....	.....	6.15	.....	6.5

NOTE.—No flow August 25 to September 5 and September 15–24

Daily discharge in second-feet of Rio Grande near San Marcial, N. Mex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	370	730	4,090	2,910	7,500	19,360	2,770	405	0	180	160	1,530
2	400	780	3,790	2,970	7,630	19,660	1,990	495	0	170	160	990
3	a 530	a 830	a3,190	a 3,210	a 7,790	a19,970	a1,600	a 645	0	165	a 175	a 815
4	650	930	5,620	2,560	10,830	17,110	1,375	645	0	160	220	680
5	685	930	a5,350	2,120	a12,200	16,350	1,260	570	0	a 160	260	610
6	a 625	a 970	4,840	a 1,810	12,120	a16,480	a1,145	a 645	180	a 155	285	a 505
7	470	2,760	4,600	1,730	a10,950	15,810	1,045	570	a 320	150	375	585
8	570	2,130	a4,630	1,810	10,010	15,440	965	580	150	a 125	550	605
9	a 570	a1,180	4,830	a 2,050	a10,560	a15,070	a 785	a 700	a 150	105	a 690	a 565
10	830	720	a4,920	2,720	9,630	15,930	665	670	195	85	450	655
11	1,005	670	3,950	3,600	a 8,690	17,390	545	645	a 95	a 85	a 665	655
12	a 920	a 770	a3,340	a 4,020	10,620	a18,460	a 465	a 710	50	95	580	a 605
13	920	500	3,560	4,690	a10,040	16,370	465	620	10	95	510	660
14	800	290	3,500	4,090	10,700	13,570	370	590	5	a 95	a 550	660
15	a 690	a 570	a3,340	a 3,900	a10,160	a12,170	a 275	a 470	0	95	530	a 740
16	690	560	3,370	4,200	11,760	11,880	275	350	0	85	480	770
17	760	740	3,540	3,900	a12,560	12,800	230	255	0	a 80	a 480	695
18	a 545	a 830	a3,600	a 3,840	13,710	a13,730	a 190	a 145	0	80	480	a 620
19	545	880	3,490	3,910	a15,380	10,950	185	125	0	85	480	645
20	440	980	3,490	4,140	16,550	10,170	180	110	0	a 85	a 480	645
21	a 650	a 840	a2,720	a 4,290	a17,350	a 8,810	a 175	a 95	0	85	480	a 645
22	650	770	2,600	4,840	23,400	7,480	170	60	0	a 95	540	515
23	590	710	2,660	5,950	a28,600	6,720	165	25	0	95	a 605	445
24	a 535	a 740	a2,970	a10,280	29,070	a 6,340	a 160	a 5	0	90	3,720	a 230
25	550	3,220	2,780	14,160	a23,540	5,300	120	0	a 50	105	a1,920	175
26	570	2,600	2,490	9,210	28,000	a 4,080	120	0	470	a 125	1,620	160
27	a 590	2,130	a2,200	7,210	27,100	3,500	a 80	0	a 400	135	1,160	a 175
28	590	a2,440	2,280	6,610	a25,580	a 3,500	70	0	145	a 150	a 620	180
29	630	.....	2,560	6,760	23,600	3,070	70	0	a 230	160	620	185
30	675	.....	2,840	a 7,360	20,430	a 2,640	65	0	210	160	a1,530	a 185
31	c 675	.....	a2,720	.....	a19,060	.....	a 65	0	.....	a 170	.....	185

a Meter measurements.

Estimated monthly discharge of Rio Grande near San Marcial, N. Mex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	1,005	370	636	39,114
February	3,220	290	1,150	63,868
March	5,620	2,200	3,544	217,904
April	14,160	1,730	4,695	279,392
May	29,070	7,500	15,649	962,221
June	19,970	2,640	12,004	714,268
July	2,770	65	582	35,782
August	710	0	327	20,093
September	470	0	89	5,276
October	180	80	120	7,349
November	3,720	160	713	42,397
December	1,530	160	559	34,344
The year	29,070	0	3,339	2,422,008

RIO GRANDE NEAR EL PASO, TEX.

This station was located at the pumping house of the smelter company, 3 miles north of El Paso, Tex. The bed of the stream here is composed of mud, constantly shifting and changing. May 1, 1897, the station was placed under the charge of W. W. Follett, consulting engineer, International (Water) Boundary Commission, and by him removed 1 mile farther up the river to Courchesne's limekiln.

The left bank of the river is formed by the loose rock fill of the Atchison, Topeka and Santa Fe Railway embankment and will not overflow. The right bank is not so good, being made ground and subject to overflow. The bottom of the river here has also proved unstable, scouring on a rise and filling on a fall of the river. During the spring flood of 1905 the right bank began to erode and receded about 60 or 80 feet. This has left a bad low-water section. There is a large shifting bar about mid stream. It is still the best site for a station in the vicinity of El Paso, however, as the entire bed is constantly shifting for many miles above and below. On account of the shifting bed the only accurate method of estimating the daily discharge is by taking a large number of measurements. In extreme high water the bottom overflows slightly for a width of 200 feet beyond the right cable support.

Discharge measurements are made by means of a cable of 410 feet span, car, tagged wire, and guy wire. The initial point for soundings is the cable support on the left bank.

River heights were measured at the masonry pump-foundation pier. The pier was torn down in October, 1902, so an inclined wooden gage was established some 60 feet upstream. This is a timber bolted to steel bars set with cement in holes drilled in solid rock. The range between high and low water is about 11 feet. The bench mark is a one-half inch iron bolt set in solid rock at the head of the gage; elevation, 13.00 feet above the datum of the gage.

The observations at this station during 1905 have been made under the direction of the United States section of the International (Water) Boundary Commission. The hydrographer is W. L. Follett and the gage reader is Valmore Courchesne.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; Bull=Bulletin; WS=Water-Supply Paper):

Cross section: Ann 18, iv, p 258.

Description: Ann 14, iv, p 114; 18, iv, pp 257–259; Bull 131, p 46; 140, p 178; WS 16, p 132; 28, p 120; 37, pp 283–284; 50, p 352; 66, p 70; 84, p 181; 99, pp 378–379; 132, pp 67–68.

Discharge: Ann 18, iv, p 259; Bull 140, p 179; WS 16, pp 132–133; 28, p 120; 37, p 284; 50, p 353; 66, p 70; 84, pp 181–182; 99, pp 379–381; 132, pp 68–69.

Discharge, mean daily: WS 132, p 70.

Discharge, monthly: Ann 11, ii, p 99; 12, ii, pp 350, 360; 13, iii, p 94; 14, iv, pp 114–115; 19, iv, p 390; 20 iv, pp 358, 372; 21, iv, p 262; 22, iv, p 353; WS 75, p 155; 84, p 183; 99, p 382; 132, p 71.

Discharge, yearly: Ann 11, ii, p 54; 13, iii, p 99; 20, iv, p 58.

Gage heights: Bull 131, p 47; 140, p 179; WS 11, p 67; 16, p 133; 28, p 128; 37, p 284; 50, p 353; 66, p 70; 84, p 182; 99, pp 381–382; 132, p 69.

Hydrographs: Ann 12, ii, p 280; 14, ii, p 114; 19, iv, p 390; 21, iv, p 263; 22, iv, p 353; WS 75, p 156.

Rating tables: Ann 19, iv, p 389; Bull 131, p 47.

Sediment observations: Ann 11, ii, p 57.

Discharge measurements of Rio Grande near El Paso, Tex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 3	Valmore Courchesne	224	1.64	6.4	367
January 8	do	228	1.68	6.3	384
January 11	do	316	2.42	7.2	765
January 14	do	395	2.57	7.6	1,014
January 18	do	314	2.45	7.2	769
January 21	do	267	2.34	7.0	625
January 24	do	225	2.05	6.4	461
January 28	do	226	2.38	6.7	538
January 31	do	210	2.18	6.5	458
February 3	do	222	2.20	6.6	488
February 7	do	223	2.20	6.6	490
February 10	do	268	2.49	7.0	668
February 12	do	404	2.52	7.6	1,017
February 15	do	274	2.14	6.8	587
February 19	do	293	2.46	7.2	721
February 21	do	464	2.71	8.0	1,258
February 25	do	360	2.45	7.4	881
February 28	do	438	3.11	8.15	1,364
March 3	do	588	4.36	9.2	2,562
March 8	do	861	4.21	9.9	3,625
March 12	do	1,126	4.36	10.8	4,911
March 15	do	670	5.14	9.8	3,445
March 18	do	582	4.78	9.8	2,782
March 21	do	801	3.96	10.3	3,170
March 24	do	690	3.34	9.7	2,307
March 31	do	629	2.69	9.3	1,694
April 3	do	808	2.55	9.9	2,060
April 6	do	737	3.01	9.9	2,222
April 9	do	516	2.76	8.9	1,423
April 14	do	798	3.67	10.35	2,932
April 17	do	804	4.23	10.6	3,397
April 20	do	757	3.92	10.3	2,971
April 24	do	820	4.39	10.9	3,596
April 29	do	1,295	5.42	12.75	7,014
May 2	do	912	5.67	11.4	5,170
May 6	do	1,253	5.18	12.5	6,490
May 9	do	1,633	5.97	13.5	9,755
May 12	do	1,063	5.50	11.5	5,847
May 16	do	1,385	4.40	12.0	6,098
May 20	do	1,201	5.05	12.3	6,065
May 23	do	1,715	5.67	13.9	9,717
May 25	do	1,870	5.27	14.6	9,859
May 28[a]	do	3,722	4.51	15.6	16,795
May 30[a]	do	4,094	4.62	15.9	18,924
June 2[a]	do	3,806	5.44	16.1	20,722
June 6	do	2,930	5.46	14.35	15,993
June 9	do	2,738	6.43	14.8	17,609
June 12	do	3,549	6.67	14.9	23,683
June 15	do	3,607	6.54	14.9	23,591
June 18	do	2,517	6.73	13.85	16,935
June 21	do	1,162	6.29	12.4	7,312
June 25	do	1,151	4.97	11.1	5,724
June 27	do	1,080	4.23	10.5	4,565

[a] Includes overflow sections.

Discharge measurements of Rio Grande near El Paso, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
June 30	Valmore Courchesne	1,031	3.30	9.5	3,398
July 3	do	937	2.55	8.9	2,388
July 7	do	669	2.07	8.1	1,383
July 10	do	502	2.04	7.6	1,024
July 13	do	363	1.91	7.4	694
July 16	do	299	1.58	7.1	471
July 19	do	239	1.74	6.8	415
July 22	do	216	1.79	6.7	386
July 25	do	263	1.65	6.8	435
July 28	do	223	1.84	6.8	410
July 31	do	174	1.50	6.5	261
August 3	do	149	1.33	6.3	198
August 7	do	369	1.97	7.3	726
August 10	do	307	1.86	7.0	572
August 12	W. L. Follett	481	2.04	7.7	979
August 15	W. W. Follett	270	1.81	6.8	488
August 18	do	197	1.52	6.4	300
August 21	do	156	1.28	6.2	199
August 24	do	123	1.19	6.0	146
August 27	do	97	1.02	5.8	99
August 30	W. L. Follett	75	0.75	5.6	56
September 2	do	52	0.67	5.4	35
September 5	do	34	0.91	5.4	31
September 8	do	35	0.91	5.4	32
September 11	do	33	0.82	5.3	27
September 12	do	113	1.24	6.2	140
September 14	do	88	1.27	5.9	112
September 17	do	68	1.13	5.7	77
September 20	do	32	1.47	5.5	47
September 23	do	20	0.95	5.25	19
September 26	do	16	1.00	5.2	16
September 29	do	92	1.66	6.2	153
October 2	do	113	1.76	6.45	199
October 5	do	85	1.53	6.0	130
October 8	do	72	1.25	5.8	90
October 11	do	45	1.31	5.6	59
October 14	do	38	1.16	5.5	44
October 17	do	28	0.86	5.4	24
October 20	do	23	1.00	5.3	23
October 23	do	27	1.15	5.35	31
October 26	do	30	1.30	5.4	39
October 29	do	34	1.15	5.4	39
November 1	do	35	1.03	5.5	36
November 4	do	58	1.26	5.65	73
November 7	do	83	1.37	5.85	114
November 10	do	148	1.36	6.2	202
November 15	do	216	1.83	6.75	395
November 18	do	217	1.58	6.7	342
November 21	do	208	1.49	6.6	309
November 24	do	222	1.51	6.6	335
November 27	do	569	2.51	8.05	1,426
November 30	do	772	2.06	8.35	1,588
December 3	do	659	2.05	8.2	1,349

Discharge measurements of Rio Grande near El Paso, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
December 6	W. L. Follett	426	1.62	7.25	691
December 9	do	374	1.45	6.9	541
December 12	do	375	1.59	7.0	595
December 15	do	352	1.63	7.0	572
December 18	do	335	1.73	7.0	581
December 21	do	334	1.65	6.95	550
December 24	do	304	1.49	6.9	454
December 27	do	300	1.62	6.9	486
December 30	do	201	1.38	6.3	278

Daily gage height, in feet, of Rio Grande near El Paso, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.4	6.5	9.05	9.6	11.55	16.05	9.35	6.5	5.45	6.65	5.5	7.75
2	6.4	6.55	9.2	9.9	11.4	16.1	9.15	6.4	5.4	6.4	5.6	7.65
3	6.4	6.55	9.15	9.85	11.6	15.95	8.9	6.35	5.4	6.25	5.6	8.2
4	6.3	6.5	9.4	9.65	11.7	15.4	8.7	6.3	5.4	6.1	5.65	7.9
5	6.25	6.5	9.7	9.7	12.15	14.95	8.6	6.3	5.4	6.0	5.7	7.55
6	6.25	6.5	9.6	9.9	12.45	14.25	8.45	6.4	5.4	6.0	5.7	7.25
7	6.3	6.6	9.95	9.6	12.9	13.85	8.2	7.3	5.4	5.9	5.85	7.1
8	6.3	6.6	9.95	9.25	13.3	13.85	8.05	7.15	5.4	5.8	6.0	7.0
9	6.3	6.7	10.1	8.9	13.5	14.75	7.85	6.95	5.4	5.8	6.05	6.9
10	6.85	7.25	10.8	8.85	12.9	14.5	7.65	7.05	5.3	5.65	6.2	6.8
11	7.2	8.05	10.8	9.0	11.75	14.5	7.6	7.0	5.3	5.6	6.3	6.85
12	7.2	7.65	10.8	9.2	11.5	14.9	7.6	7.65	5.9	5.6	6.35	7.0
13	8.05	7.3	10.4	9.75	11.65	14.75	7.45	7.4	5.95	5.55	6.65	7.05
14	7.7	7.0	10.05	10.35	12.05	14.9	7.3	6.95	5.9	5.5	6.7	7.05
15	7.5	6.8	9.9	10.8	12.2	14.85	7.2	6.8	5.9	5.45	6.7	7.0
16	7.4	6.8	9.9	10.85	12.05	14.85	7.1	6.65	5.8	5.4	6.7	7.0
17	7.3	6.7	9.9	10.6	11.9	14.35	7.0	6.5	5.7	5.4	6.7	7.1
18	7.2	6.45	9.7	10.6	12.05	13.9	6.9	6.4	5.6	5.4	6.7	7.0
19	7.0	7.2	9.7	10.55	12.2	13.35	6.8	6.3	5.55	5.4	6.6	7.15
20	7.0	8.05	10.1	10.35	12.35	12.8	6.75	6.2	5.5	5.3	6.6	7.05
21	6.95	7.95	10.3	10.3	12.7	12.4	6.7	6.2	5.4	5.3	6.6	7.0
22	6.7	7.6	10.3	10.3	13.3	12.0	6.7	6.05	5.35	5.3	6.55	6.95
23	6.6	7.75	10.05	10.7	13.9	11.85	6.9	6.0	5.25	5.3	6.55	6.85
24	6.4	7.65	9.75	11.0	14.3	11.4	6.95	6.0	5.2	5.4	6.6	6.9
25	6.4	7.45	9.55	11.35	14.65	11.1	6.8	5.95	5.2	5.4	6.8	6.95
26	6.55	7.5	9.55	12.15	15.0	10.7	6.65	5.8	5.2	5.4	6.9	6.9
27	6.75	7.65	9.75	13.0	15.3	10.5	6.6	5.8	5.2	5.4	7.8	6.8
28	6.7	8.05	9.6	13.1	15.55	10.15	6.7	5.75	5.8	5.4	8.25	6.55
29	6.6	.....	9.45	12.9	15.75	9.9	6.8	5.6	6.25	5.4	8.75	6.3
30	6.5	.....	9.3	12.15	15.9	9.6	6.55	5.55	6.05	5.45	8.3	6.3
31	6.5	.....	9.3	.....	15.9	.....	6.5	5.5	.....	5.5	.....	6.2

Daily discharge, in second-feet, of Rio Grande near El Paso, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	405	460	2,390	1,880	5,380	20,270	3,150	260	40	230	a35	1,035
2	385	475	2,560	2,060	a5,170	a20,720	2,810	230	a35	a195	60	965
3	a365	a475	a2,500	a2,030	5,410	20,320	a2,390	a215	35	170	60	a1,350
4	340	460	2,860	1,960	5,530	18,840	2,130	200	30	145	a75	1,140
5	330	460	3,320	2,040	6,070	17,620	2,000	200	a30	a130	85	895
6	340	460	3,170	a2,220	a6,430	a15,630	1,820	250	30	130	85	a690
7	370	a490	3,700	1,980	7,800	14,190	a1,510	a725	30	110	a115	625
8	a385	490	a3,700	1,700	9,100	14,190	1,350	645	a35	a90	150	585
9	385	550	3,910	a1,420	a9,760	a17,410	1,200	545	30	90	165	a540
10	620	a820	4,910	1,370	8,590	18,300	a1,060	a595	30	65	a200	500
11	a765	1,290	4,910	1,530	6,350	20,190	970	570	a25	a60	235	525
12	765	a1,050	a4,910	1,740	a5,850	a23,680	910	a950	a110	60	255	a595
13	1,290	860	4,330	2,310	5,960	23,050	a735	810	115	50	360	620
14	a1,075	695	3,810	a2,930	6,570	23,620	620	565	a110	a45	380	620
15	950	a585	a3,590	3,760	6,680	a23,270	545	a490	110	35	a380	a570
16	890	585	3,370	3,850	a6,200	23,270	a470	415	90	25	370	575
17	830	550	3,150	a3,400	5,740	20,100	450	345	a75	a25	355	630
18	a770	460	a2,700	3,400	5,880	a17,250	430	a300	60	25	a340	a580
19	630	a720	2,700	3,330	6,020	13,620	a415	250	50	25	310	655
20	625	1,290	3,020	a3,040	a6,180	9,970	400	200	a45	a25	310	605
21	a605	a1,220	a3,170	2,970	6,980	a7,310	385	a200	35	25	a310	a580
22	540	1,000	3,170	2,970	8,360	6,820	a385	160	30	25	305	530
23	515	1,100	2,810	3,380	a9,720	6,640	485	145	a20	a30	315	455
24	a460	1,035	a2,380	a3,780	9,800	6,090	510	a145	15	40	a335	a455
25	460	a910	2,080	4,430	a10,210	a5,720	a435	130	15	40	485	480
26	500	975	2,080	5,900	12,640	4,950	385	100	a15	a40	560	475
27	555	1,070	2,380	7,500	14,720	a4,560	360	a100	15	40	a1,240	a450
28	a540	a1,300	2,150	7,700	a16,450	4,150	a380	85	110	40	1,530	365
29	500	.....	1,920	a7,300	17,860	3,860	410	55	a165	a40	1,870	280
30	460	.....	1,690	5,900	18,920	a3,510	285	a50	140	40	a1,560	a280
31	a460	.....	a1,690	.....	a18,920	.....	a260	45	.....	40	.....	245

a Meter measurements.

Estimated monthly discharge of Rio Grande near El Paso, Tex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	1,290	330	584	35,920
February	1,300	460	780	43,309
March	4,910	1,690	3,065	188,489
April	7,700	1,370	3,326	197,911
May	18,920	5,170	8,879	545,950
June	23,680	3,510	14,304	851,147
July	3,150	260	956	58,800
August	950	45	322	19,785
September	165	15	56	3,322
October	230	25	69	4,225
November	1,870	35	428	25,458
December	1,350	245	610	37,478
The year	23,680	15	2,782	2,011,794

RIO GRANDE ABOVE PRESIDIO, TEX.

This station was established April 4, 1900, by the International (Water) Boundary Commission. It was 9 miles above Presidio and above the mouth of Rio Conchos, one of the principal tributaries of the Rio Grande, and about 200 miles below El Paso. The station was in a straight stretch of the river, but in the bight of a long bend. In 1903 the river began to erode a cut-off across this bend and the spring flood of 1905 deepened this channel to such an extent that more water passed through it than through the station, and it became necessary to abandon its location. In September, 1905, the station was moved 8 miles farther upstream and rebuilt. Its location is far enough above the mouth of Rio Conchos to be free from the effects of backwater from that stream.

The river is nearly straight for one-fourth mile above and below the new location. Both banks overflow slightly in extreme flood, but no large amount of water passes outside the measured section. The bed is shifting sand. The banks are fairly solid, but would erode if a heavy current should strike them.

Discharge measurements are made by means of a cable, car, tagged wire, and guy wire. The initial point for soundings is the cable support on the left bank.

The gage is an inclined scantling fastened to posts sunk in the ground. The bottom of the river was gage height 1.5 feet September 21, 1905, and marks showed high water to be 9.5 feet. The bench mark is the top of a mesquite post level with the ground back of the left guy-cable deadman; elevation, 9.35 feet above the datum of the gage.

The observations during 1905 were made under the direction of the United States section of the International (Water) Boundary Commission. The hydrographer was Jas. P. Hague, and the gage reader was Preciliano Spencer.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: WS 50, p 355; 66, p 72; 84, p 177; 99, p 373; 132, p 71.
Discharge: WS 50, p 355; 66, pp 72–73; 84, p 178; 99, pp 373–375; 132, p 72.
Discharge, mean daily: WS 132, p 74.
Discharge, monthly: Ann 22, iv, p 354; WS 75, p 157; 84, p 179; 99, p 376; 132, p 75.
Gage heights: WS 50, p 355; 66, p 73; 84, p 178; 99, pp 375–376; 132, p 73.

Discharge measurements of Rio Grande above Presidio, Tex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 3	Jas. P. Hague	158	2.04	3.55	323
January 6	do	145	2.03	3.4	295
January 9	do	143	1.96	3.4	280
January 12	do	140	1.91	3.3	267
January 15	do	167	2.07	3.6	346
January 18	do	213	2.98	4.2	634
January 21	do	205	2.70	3.95	554
January 24	do	186	2.52	3.8	469
January 27	do	171	2.29	3.7	392
January 30	do	163	2.28	3.55	371
February 2	do	169	2.09	3.55	354
February 5	do	171	2.35	3.7	401
February 8	do	155	2.06	3.5	320
February 11	do	159	2.13	3.5+	335
February 14	do	163	2.12	3.55	349
February 17	do	200	2.71	3.9	541
February 20	do	161	2.37	3.6	381
June 17[a]	do	1,489	4.10	8.8	6,109
June 21[a]	do	1,353	3.61	8.6	4,888

[a] Channel only. Bottoms overflowed. The channel was carrying less than 50 per cent of the total discharge at the station. The actual discharge was computed from daily gage heights, the flow of lower Presido station, and of Conchos River.

Discharge measurements of Rio Grande above Presidio, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
June 24[a]	Jas. P. Hague	1,322	3.34	8.5	4,411
June 27[a]	do	1,301	3.33	8.5	4,331
July 1[a]	do	1,269	2.97	8.2	3,771
July 5[a]	do	1,097	2.43	7.0	2,668
July 8[a]	do	917	1.93	6.2	1,774
July 11	do	671	2.13	5.0	1,432
July 14	do	422	2.91	4.2	1,226
July 17	do	526	3.48	5.6	1,830
July 19[b]	do	633	3.61	6.05	2,285
July 21	do	507	3.58	5.5	1,814
July 24	do	456	3.37	5.2	1,537
July 27	do	295	3.16	3.65	932
July 30	do	290	3.14	3.6	912
August 2	do	338	2.67	3.7	903
August 5	do	333	2.79	3.7	929
August 8	do	232	2.02	2.6	469
August 10	do	235	2.36	2.7	555
August 13	do	223	1.87	2.6	416
August 16	do	259	2.12	3.0	549
August 19	do	265	2.13	3.0	565
August 22	do	260	2.03	2.8	528
August 25	do	225	1.89	2.4	426
August 27	do	201	1.61	2.15	323
August 30	do	213	1.59	2.2	339
September 2	do	127	1.57	1.8	200
September 5	do	171	1.77	2.3	302
September 7	do	419	4.09	5.4	1,712
September 10	do	282	2.20	3.15	620
September 13	do	277	2.13	3.0	590
September 16	do	70	1.51	1.5	106
September 18	do	80	1.69	1.5	135
September 21	do	71	1.56	1.5	111
September 26[c]	do	75	1.57	3.0	118
September 29	do	65	1.66	2.9	108
October 2	do	63	1.52	2.75	96
October 5	do	54	1.44	2.7	78
October 8	do	63	1.41	2.7	89
October 11	do	66	1.39	2.7	92
October 14	do	53	1.38	2.7	73
October 17	do	56	1.30	2.7	73
October 20	do	62	1.29	2.7	80
October 23	do	58	1.31	2.7	76
October 29	do	45	1.16	2.6	52
November 1	do	46	1.11	2.6	51
November 5	do	33	1.09	2.5	36
November 8	do	48	1.23	2.65	59
November 11	do	136	1.66	3.4	226
November 14	do	164	1.59	3.5	260

[a] Channel only. Bottoms overflowed. The channel was carrying less than 50 per cent of the total discharge at the station. The actual discharge was computed from daily gage heights, the flow of lower Presidio station, and of Conchos River.

[b] Channel only. Bottoms overflowed. Overflow ceased at 5.5 feet on gage

[c] Station moved 8 miles farther up Rio Grande and new gage established 16 miles above mouth of Conchos. The new gage heights are not comparable with old.

NOTE.—No measurements were made during March, April, and May.

Discharge measurements of the Rio Grande above Presidio, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
November 17	Jas. P. Hague	135	1.72	3.4	232
November 20	do	109	1.31	3.1	143
November 23	do	101	1.29	3.0	130
November 26	do	98	1.31	3.0	128
November 29	do	90	1.29	2.9	116
December 3	do	213	2.07	3.8	441
December 6	do	320	2.54	4.4	813
December 9	do	291	2.50	4.3	728
December 12	do	328	2.67	4.4	875
December 16	do	227	2.52	4.0	571
December 19	do	204	2.34	3.8	478
December 22	do	251	2.31	4.2	581
December 24	do	228	2.49	4.15	567
December 28	do	216	2.55	4.15	551
December 31	do	192	2.57	4.0	494

Daily gage height, in feet, of Rio Grande above Presidio, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.7	3.45	4.05	6.25	7.8	7.85	8.15	3.3	1.7	2.8	2.6	3.2
2	3.7	3.55	4.35	6.0	7.85	8.0	7.9	3.95	1.65	2.75	2.6	3.4
3	3.55	3.5	4.75	5.75	8.0	8.1	7.6	2.85	2.0	2.7	2.6	3.8
4	3.5	3.5	4.5	5.95	8.0	8.2	7.3	3.25	2.1	2.7	2.5	4.3
5	3.4	3.65	5.8	6.3	7.9	8.25	6.8	3.6	2.45	2.7	2.55	4.4
6	3.4	3.7	6.3	6.45	8.1	8.5	6.6	2.9	1.7	2.7	2.6	4.4
7	3.4	3.65	6.6	6.25	8.1	8.6	6.45	2.85	5.95	2.7	2.6	4.45
8	3.4	3.55	7.45	6.2	8.1	8.75	6.15	2.7	4.15	2.7	2.65	4.3
9	3.4	3.5	7.25	6.1	7.9	8.8	5.75	2.85	5.6	2.7	3.55	4.3
10	3.4	3.55	7.4	6.25	7.75	8.85	5.3	2.65	3.15	2.7	3.5	4.2
11	3.4	3.55	7.8	5.85	7.65	8.9	4.95	2.55	2.8	2.7	3.4	4.25
12	3.3	3.4	7.9	5.5	7.7	8.85	4.7	2.6	3.05	2.7	3.6	4.35
13	3.3	3.5	8.0	5.3	8.0	9.05	4.5	2.9	2.95	2.7	3.55	4.1
14	3.3	3.6	8.15	5.0	8.0	9.05	4.15	2.6	2.25	2.7	3.45	4.0
15	3.45	3.55	8.2	4.9	8.1	8.8	7.65	2.6	1.7	2.7	3.75	4.05
16	3.6	3.8	8.0	5.15	8.05	8.75	5.8	2.9	1.55	2.7	3.65	3.95
17	3.95	3.9	8.2	5.6	8.2	8.8	6.7	3.9	1.65	2.7	3.45	3.8
18	4.25	4.0	7.95	6.15	8.15	8.5	4.75	3.35	1.5	2.7	3.5	3.85
19	4.15	3.75	7.85	6.9	8.2	8.75	6.45	2.95	2.15	2.7	3.4	3.8
20	4.0	3.6	7.8	7.65	8.25	8.7	8.05	3.1	1.65	2.7	3.15	4.15
21	3.95	3.7	7.55	7.6	7.65	8.65	5.2	2.8	1.5	2.7	3.1	4.25
22	3.9	3.6	7.3	7.75	7.8	8.8	4.0	2.7	1.4	2.7	3.1	4.2
23	3.8	3.55	7.45	7.7	7.65	8.65	4.85	2.6	1.2	2.7	3.0	4.2
24	3.8	3.4	7.65	7.45	7.5	8.55	5.5	2.35	1.2	2.7	3.0	4.15
25	3.75	4.25	7.65	7.4	7.5	8.5	6.55	2.25	1.2	2.6	3.0	4.15
26	3.7	4.25	7.55	7.4	7.5	8.45	4.45	2.0	[a]3.0	2.6	3.0	4.2
27	3.75	4.15	7.2	7.75	7.55	7.95	3.65	2.15	3.0	2.6	3.0	4.25
28	3.6	4.1	6.7	7.85	7.6	7.7	3.65	1.8	2.9	2.6	3.0	4.15
29	3.6	.....	6.4	8.0	7.5	7.55	3.6	1.9	2.9	2.6	2.95	4.1
30	3.55	.....	6.35	7.85	7.6	7.8	3.6	2.35	2.8	2.6	2.9	4.05
31	3.5	.....	6.3	.....	7.75	.....	3.6	1.85	.....	2.6	.....	4.0

[a] September 26 this station was moved 8 miles farther up the Rio Grande and a new gage was established. The new gage heights are not comparable with the old.

Daily discharge, in second-feet, of Rio Grande above Presidio, Tex., for 1905.

Day.	Jan.	Feb.	Mar.[a]	Apr.[b]	May.[c]	June.[d]	July.[e]	Aug.	Sept.	Oct.	Nov.	Dec.
1	355	330	580	1,580	2,750	5,850	f6,400	740	180	100	f50	225
2	355	f355	650	1,470	2,850	6,200	5,400	f1,000	f170	f95	50	295
3	f325	340	800	1,370	3,100	6,500	4,200	575	240	85	50	f440
4	315	340	700	1,510	3,200	6,900	3,600	745	260	80	35	755
5	295	f385	1,310	1,730	3,200	7,480	f2,970	f890	f330	f80	f40	815
6	f295	400	1,580	1,850	3,500	8,860	2,730	595	180	80	50	f815
7	290	380	1,760	1,730	3,600	9,640	2,580	575	f2,260	85	50	855
8	285	f340	2,310	1,700	3,700	10,620	f2,280	f510	1,070	f90	f60	730
9	f280	325	2,180	1,640	3,600	11,200	1,880	595	1,910	90	270	f730
10	280	345	2,270	1,730	3,550	11,780	1,610	f535	f620	90	255	670
11	280	f350	2,810	1,510	3,550	12,360	f1,420	460	550	f90	f225	735
12	f265	315	2,960	1,340	3,700	12,540	1,350	445	600	85	295	f835
13	265	335	3,110	1,240	4,100	13,700	1,300	f515	f575	80	280	645
14	265	f360	3,330	1,090	4,200	13,700	f1,210	415	350	f75	f245	570
15	f305	345	3,430	1,040	4,400	12,600	4,200	415	170	75	335	610
16	345	480	3,110	1,160	4,450	12,400	2,030	f515	120	75	305	f535
17	515	f540	3,430	1,390	4,700	f12,600	f3,150	915	165	f75	f245	480
18	f660	590	3,030	1,670	4,750	11,400	1,370	700	f135	75	260	505
19	615	460	2,880	2,120	4,900	12,300	f2,850	f545	320	75	230	f480
20	570	f380	2,810	2,640	5,050	12,100	5,000	600	160	f80	f160	570
21	f555	430	2,430	2,610	4,550	f11,900	f1,540	530	f110	80	145	595
22	525	380	2,220	2,710	4,800	12,500	1,070	f500	110	75	145	f580
23	470	355	2,320	2,680	4,750	11,900	1,410	475	100	f75	f130	580
24	f470	315	2,580	2,500	4,700	f11,500	f1,810	410	110	75	130	f565
25	430	680	2,580	2,470	4,800	10,800	3,000	f365	120	60	130	560
26	390	680	2,430	2,470	4,900	10,100	1,250	245	f120	55	f130	585
27	f430	640	2,150	2,710	5,050	f7,600	f930	f325	120	55	130	610
28	375	620	1,820	2,780	5,200	6,100	930	210	110	50	130	f550
29	375	.....	1,640	2,890	5,200	5,500	910	245	f110	f50	f120	530
30	f370	.....	1,610	2,780	5,400	6,000	f910	f390	100	50	115	510
31	355	.....	1,580	.....	5,650	.....	910	230	.....	50	.....	f495

[a] Discharge computed from former measurements and checked by discharge of the lower Presidio station.

[b] Discharge computed from measurements of June and July, 1903.

[c] Water flowing across bottoms during the whole month. Discharge computed from those of the lower Presidio station, due allowance being made for flow of Rio Conchos.

[d] Over 50 per cent of the water passing this station during June was outside of channel. Discharges obtained by combining gage heights with flow at the lower Presidio station and of the Conchos.

[e] Discharge for gage heights above 5.5 feet when water leaves main channel above station and flows across bottom was obtained by combining gage height with flow at the lower Presidio station and of the Conchos.

[f] Meter measurements.

Estimated monthly discharge of Rio Grande above Presidio, Tex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	660	265	384	23,613
February	680	315	421	23,395
March	3,430	580	2,206	135,669
April	2,890	1,040	1,937	115,259
May	5,650	2,750	4,253	261,521
June	13,700	5,500	10,154	604,225
July	6,400	910	2,329	143,207
August	1,000	210	523	32,152
September	2,260	100	382	22,760
October	100	50	75	4,631
November	335	35	160	9,511
December	855	225	595	36,605
The year	13,700	35	1,952	1,412,548

RIO CONCHOS NEAR OJINAGA, MEXICO.

Discharge measurements of Rio Conchas 2 miles above mouth, near Ojinaga, Mexico.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
1905.		*Square feet.*	*Feet per second.*	*Feet.*	*Second. feet.*
June 18	Jas. P. Hague	527	1.77	2.5	935
June 22	....do	472	1.26	2.2	594
July 4	....do	294	.97	1.5	285

NOTE.—Above measurements made to determine the inflow between the upper and lower Presidio stations.

RIO GRANDE BELOW PRESIDIO, TEX.

This station was established April 8, 1900, by the International (Water) Boundary Commission. It is 6 miles below Presidio; also below the mouth of Rio Conchos and about 215 miles below El Paso. It is at the west end of the canyon section of the Rio Grande. The discharge at this station minus the discharge at the station above Presidio, Tex., is the discharge of Rio Conchos, except at rare intervals, when some rain water enters the Rio Grande from the north.

The river is fairly straight at the station and for one-fourth mile above and below. The right bank is a rocky bluff. The left bank is an alluvial deposit and overflows for 750 feet back from the river, where gravel hills are found. The bed is shifting sand and is affected by a drainage line called Alamos Creek, which reaches the river one-fourth mile below the station. This is subject to torrential floods, which bring large quantities of bowlders and gravel into the Rio Grande, forming a temporary dam. This remains, throwing backwater onto the gage, until a flood in the river scours it out.

Discharge measurements are made by means of a cable, car, tagged wire, and guy wire. The tagged wire is extended across the bottom on the Texas side to the foot of the gravel hills. The initial point for soundings is the tagged-wire support at the hills on the left bank. A boat is provided for measuring flood flow across the bottom.

The gage is an inclined scantling bolted to posts sunk into the ground. There is an overflow gage at the gravel hills. This consists of a vertical staff nailed to a tree. The range between low and high water is about 23 feet. The highest recorded gage height is 26.35 feet, September 11, 1904. The extreme floods come from the Conchos. The bottom

overflows at 13 feet on the gage. The bench mark is the top of a pine post sunk in the ground at the foot of the gravel hills at the left end of the tagged wire; elevation, 13.55 feet above the datum of the gage.

The observations during 1905 were made under the direction of the United States section of the International (Water) Boundary Commission. The hydrographer is James P. Hague, and the gage reader, Felicitas Gonzales.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann = Annual Report; WS = Water-Supply Papers):

Description: WS 50, p 355; 66, p 74; 84, p 175; 99, p 368; 132, p 75.
Discharge: WS 50, p 356; 66, p 74; 84, pp 175-176; 99, pp 369-372; 132, pp 75-78.
Discharge, mean daily: WS 132, p 79.
Discharge, monthly: Ann 22, iv, p 355; WS 75, p 158; WS 84, p 177; 99, p 373; 132, p 79.
Gage heights: WS 50, p 356; 66, p 75; 84, pp 176-177; 99, p 372; 132, p 78.
Hydrograph: WS 75, p 159.

Discharge measurements of Rio Grande below Presidio, Tex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 2	Jas. P. Hague	851	1.62	6.9	1,376
January 5	do	772	1.40	6.7	1,078
January 8	do	766	1.43	6.65	1,096
January 11	do	756	1.42	6 55	1,071
January 14	do	730	1.33	6.5	971
January 17	do	741	1.34	6.55	995
January 20	do	878	1.71	7.05	1,502
January 23	do	859	1.64	6.9	1,407
January 26	do	751	1.57	6.8	1,176
January 29	do	656	1.49	6.6	978
January 31	do	690	1.34	6.45	925
February 3	do	656	1.37	6.4	899
February 6	do	638	1.33	6.4	848
February 9	do	611	1.30	6.35	795
February 12	do	595	1.30	6.25	774
February 15	do	580	1.25	6.1	724
February 18	do	838	1.63	6.9	1,366
February 21	do	976	1.99	7.5	1.945
June 20	do	2,582	4.86	11.25	12,541
June 23	do	2,568	4.86	11.2	12,473
June 26	do	2,320	4.58	10.45	10,622
June 29	do	1,867	3.46	9.3	6,456
July 3	do	1,680	2.37	8.3	3,980
July 7	do	1,582	2.03	7.9	3,219
July 10	do	1,321	1.57	7.5	2,073
July 13	do	1,224	1.37	7.2	1,677
July 16	do	1,346	1.64	7.65	2,202
July 18	do	1,752	3.57	8.85	6,249
July 20	do	2,294	4.41	10.2	10,128
July 22	do	2,229	4.45	10.1	9,910
July 25	do	2,652	5.55	11.2	14,715
July 28	do	2,705	6.05	11.65	16,355
August 1	do	2,259	4.62	10.3	10,432
August 4	do	1,548	2.78	8.6	4,303
August 7	do	1,540	2.80	8.6	4,305
August 9	do	1,468	2.61	8.4	3,836
August 12	do	1,467	2.70	8.5	3,966
August 15	do	1,857	5.02	10.0	9,319

Discharge measurements of Rio Grande below Presidio, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
August 18	Jas. P. Hague	2,767	5.89	11.7	16,301
August 21	do	1,888	4.72	10.0	8,906
August 24	do	1,783	4.52	9.7	8,058
August 26	do	1,722	4.74	9.75	8,164
August 28	do	1,568	3.82	8.9	5,994
August 31	do	1,300	2.51	8.1	3,261
September 3	do	914	2.68	7.6	2,449
September 6	do	944	2.78	7.6	2,622
September 11	do	2,313	4.82	10.65	11,150
September 14	do	2,303	4.70	10.55	10,827
September 17	do	1,780	4.59	9.8	8,179
September 20	do	1,085	3.81	8.55	4,135
September 23	do	2,933	7.06	12.3	20,719
September 27	do	2,407	5.20	10.95	12,520
September 30	do	2,430	5.34	11.05	12,984
October 3	do	2,718	5.72	11.45	15,550
October 6	do	2,553	5.38	11.1	13,728
October 9	do	1,641	4.05	8.95	6,645
October 12	do	1,588	3.59	8.6	5,703
October 15	do	1,056	2.88	7.9	3,042
October 18	do	1,126	2.48	7.7	2,791
October 21	do	1,164	2.06	7.5	2,402
October 24	do	1,002	1.85	7.2	1,857
October 28	do	972	1.54	7.0	1,501
October 31	do	954	1.41	7.0	1,347
November 3	do	866	1.50	6.75	1,295
November 7	do	1,489	3.69	8.75	5,501
November 10	do	2,265	4.83	10.75	10,940
November 13	do	1,547	4.73	9.4	7,319
November 16	do	1,420	4.63	9.15	6,568
November 19	do	1,489	4.80	9.3	7,143
November 22	do	1,377	3.72	8.65	5,119
November 25	do	1,131	2.66	7.9	3,008
November 28	do	1,076	2.59	7.65	2,787
December 2	do	1,548	4.45	9.2	6,891
December 5	do	1,312	4.04	8.6	5,306
December 8	do	1,140	3.49	8.2	3,975
December 10	do	1,016	3.17	7.9	3,224
December 14	do	908	2.82	7.6	2,558
December 17	do	1,438	4.39	9.1	6,318
December 20	do	1,491	4.68	9.2	6,974
December 23	do	1,610	4.82	9.45	7,760
December 27	do	1,317	4.12	8.6	5,430
December 30	do	1,262	2.91	8.1	3,677

Daily gage height, in feet, of Rio Grande below Presidio, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.9	6.4	7.35	7.75	8.15	9.3	9.45	10.3	7.95	10.5	6.9	7.7
2	6.85	6.4	7.3	7.6	8.3	9.35	8.8	9.75	7.85	11.4	6.8	9.3
3	6.8	6.4	7.35	7.6	8.45	9.4	8.4	9.1	7.6	11.2	6.75	9.4
4	6.8	6.4	7.15	7.5	8.3	9.6	8.3	8.8	7.6	10.6	6.7	8.7
5	6.75	6.4	7.4	7.45	8.35	9.85	8.2	8.75	7.75	10.75	6.95	8.55
6	6.7	6.4	7.85	7.65	8.45	10.05	8.15	8.6	7.75	11.3	7.7	8.45
7	6.7	6.5	7.95	7.7	8.5	10.35	7.9	8.55	9.4	11.0	8.8	8.25
8	6.65	6.45	8.1	7.65	8.55	10.5	7.6	8.5	9.55	9.75	9.8	8.15
9	6.6	6.35	8.15	7.65	8.5	10.75	7.65	8.35	11.35	9.05	10.3	8.0
10	6.6	6.3	8.1	7.65	8.65	11.15	7.55	8.5	11.3	8.85	10.7	7.85
11	6.55	6.3	8.15	7.6	8.6	11.55	7.5	8.6	10.75	8.65	11.6	7.8
12	6.5	6.25	8.25	7.45	8.55	11.7	7.3	8.55	10.7	8.6	10.75	7.75
13	6.5.	6.1	8.2	7.4	8.6	12.15	7.2	9.05	10.45	8.3	9.3	7.7
14	6.5	6.1	8.25	7.4	8.7	12.6	7.2	9.6	10.45	8.1	9.3	7.6
15	6.5	6.1	8.4	7.4	8.8	12.35	8.8	10.2	10.45	7.9	9.55	8.05
16	6.5	6.3	8.3	7.35	8.8	12.0	7.8	10.0	10.05	7.75	9.2	8.85
17	6.55	6.95	8.6	7.4	8.9	11.35	10.35	10.45	9.75	7.7	9.4	9.15
18	6.7	6.85	8.6	7.7	8.95	11.15	8.45	11.7	9.05	7.7	9.6	9.5
19	6.85	7.45	8.45	7.8	8.95	11.25	9.4	10.9	8.85	7.65	9.2	10.0
20	7.05	7.45	8.45	7.9	9.0	11.3	10.65	10.5	8.55	7.6	9.1	9.5
21	6.9	7.5	8.35	8.1	8.95	11.35	10.2	10.0	8.7	7.5	8.9	9.75
22	6.9	7.4	8.15	8.1	9.0	11.45	9.85	9.65	9.65	7.45	8.55	10.0
23	6.9	7.5	8.1	7.85	9.25	11.25	10.6	9.75	11.95	7.35	8.25	9.4
24	6.9	7.2	8.05	7.8	9.05	11.05	10.6	9.8	13.35	7.25	8.2	9.0
25	6.8	7.2	8.2	7.8	8.9	10.8	11.25	10.2	14.45	7.2	8.05	8.75
26	6.8	7.4	8.15	7.95	8.9	10.5	11.4	9.75	13.25	7.15	7.8	8.65
27	6.75	7.5	8.15	8.0	9.05	9.85	11.55	9.5	10.9	7.1	7.75	8.6
28	6.7	7.45	8.1	8.15	9.2	9.4	11.75	9.0	10.3	7.0	7.65	8.45
29	6.6	.....	7.9	8.1	9.1	9.3	11.05	8.5	10.35	7.0	7.55	8.35
30	6.5	.....	7.8	8.15	9.0	9.3	10.55	8.35	11.3	7.0	7.7	8.15
31	6.45	.....	7.7	.....	9.15	.....	10.3	8.15	.....	7.0	.....	8.0

Daily discharge, in second-feet, of Rio Grande below Presidio, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.[a]	May.[a]	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,360	900	2,050	2,630	2,970	6,400	6,830	[b]10,430	3,000	11,750	1,320	2,880
2	[b]1,330	900	1,980	2,410	3,270	6,580	5,220	8,440	2,850	15,200	1,300	[b]7,160
3	1,250	[b]900	2,050	2,380	3,650	6,770	[b]4,230	6,100	[b]2,450	[b]14,130	[b]1,290	7,420
4	1,220	880	1,750	2,230	3,270	7,510	3,980	[b]5,020	2,510	12,080	1,270	5,560
5	[b]1,130	860	2,130	2,140	3,390	8,450	3,790	4,840	2,810	12,570	1,710	[b]5,150
6	1,100	[b]850	2,840	2,350	3,650	9,210	3,690	4,300	[b]2,870	[b]14,530	3,300	4,810
7	1,120	950	3,000	2,390	3,800	10,330	[b]3,220	[b]4,190	7,680	13,400	[b]5,640	4,140
8	[b]1,100	900	3,250	2,290	3,940	10,800	2,360	4,070	8,100	9,280	8,360	[b]3,850
9	1,090	[b]800	3,330	2,260	3,800	11,400	2,500	[b]3,670	13,140	[b]6,970	9,720	3,480
10	1,080	790	3,250	2,260	4,230	12,360	[b]2,210	4,070	13,000	6,370	[b]10,810	[b]3,110
11	[b]1,070	790	3,330	2,200	4,090	13,410	2,070	4,300	[b]11,440	5,830	13,500	3,000
12	1,010	[b]770	3,500	2,020	3,940	13,880	1,810	[b]4,140	11,300	[b]5,700	10,940	2,890
13	990	720	3,420	1,960	4,090	15,410	[b]1,680	5,930	10,500	4,610	[b]7,020	2,780
14	[b]970	720	3,500	1,960	4,380	16,940	1,680	7,900	[b]10,500	3,820	7,020	[b]2,560
15	970	[b]720	3,760	1,960	4,670	16,090	6,080	[b]10,100	10,500	[b]3,040	7,770	3,680
16	970	880	3,590	1,900	4,670	14,900	[b]2,650	9,320	9,080	2,860	[b]6,720	5,680
17	[b]1,000	1,400	4,110	1,960	4,980	12,850	10,730	11,100	[b]8,010	2,790	7,440	[b]6,420
18	1,150	1,320	4,110	2,330	5,140	12,340	[b]4,910	[b]16,300	5,750	[b]2,790	8,040	7,460
19	1,300	1,900	3,840	2,460	5,140	12,560	7,830	12,600	5,100	2,690	[b]6,840	8,840
20	[b]1,500	1,900	3,840	2,600	5,310	[b]12,660	[b]11,930	10,900	[b]4,130	2,590	6,530	[b]7,720
21	1,410	[b]1,950	3,670	2,890	5,140	12,810	10,130	[b]8,910	4,610	[b]2,400	5,900	8,400
22	1,410	1,870	3,330	2,890	5,310	13,100	[b]9,160	7,920	8,790	2,310	[b]4,840	9,080
23	[b]1,410	1,990	3,250	2,530	6,210	[b]12,600	12,080	8,200	[b]19,140	2,130	4,000	[b]7,630
24	1,360	1,710	3,160	2,460	5,490	12,120	12,080	[b]8,340	23,870	[b]1,950	3,850	6,520
25	1,220	1,730	3,420	2,460	4,980	11,510	[b]14,900	9,700	27,170	1,860	[b]3,430	5,830
26	[b]1,180	1,950	3,330	2,670	4,980	[b]10,770	15,440	[b]8,160	22,130	1,770	2,920	5,560
27	1,130	2,070	3,330	2,740	5,490	8,470	15,990	7,520	[b]12,300	1,680	2,880	[b]5,430
28	1,080	2,040	3,250	2,970	6,030	6,810	[b]16,750	[b]6,250	9,540	[b]1,500	[b]2,790	4,900
29	[b]980	.....	2,920	2,890	5,670	[b]6,460	13,960	4,800	9,770	1,450	2,690	4,550
30	950	.....	2,760	2,970	5,310	6,460	11,960	4,120	14,130	[b]1,400	2,880	[b]3,850
31	[b]930	.....	2,600	.....	5,850	.....	10,960	[b]3,430	.....	1,350	.....	3,530

[a] Daily discharges computed from measurements of November, 1904, and June, 1905.
[b] Meter measurements.

Estimated monthly discharge of Rio Grande below Presidio, Tex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	1,500	930	1,154	70,949
February	2,070	720	1,256	69,739
March	4,110	1,750	3,150	193,686
April	2,970	1,900	2,405	143,127
May	6,210	2,970	4,608	283,319
June	16,940	6,400	11,065	658,433
July	16,750	1,680	7,510	461,772
August	16,300	3,430	7,260	446,420
September	27,170	2,450	9,872	587,445
October	15,200	1,350	5,574	342,744
November	13,500	1,270	5,424	322,750
December	9,080	2,560	5,286	325,031
The year	27,170	720	5,380	3,905,415

RIO GRANDE NEAR LANGTRY, TEX.

This station was established in April, 1900, by the International (Water) Boundary Commission. It is located one-half mile south of Langtry station, on the southern Pacific Railroad, and is about 440 miles below El Paso, Tex., at the east end of the canyon section of the Rio Grande, and a short distance to the west of the mouth of Pecos River, one of the principal tributaries of the Rio Grande.

The river is nearly straight for 1 mile above and one-half mile below the station. The right (Mexican) bank is a rock bluff. The left bank is alluvial deposit for 200 feet back to a rock bluff. The bed of the river is shifting sand, as is also the left bank.

Discharge measurements are made by means of a cable of 490 feet span, car, tagged wire, and guy wire. The initial point for soundings is the pole supporting the cable on the left bank.

The gage is a vertical staff, bolted to the bluff on the right bank. It is read from the left bank with the aid of field glasses. The range between high and low water is about 36 feet. The highest recorded gage is 36.5 feet, September 13, 1904. The bottom begins to overflow at gage height 29.5 feet and the overflow extends 110 feet back from the cable pole. This bottom is densely wooded. The bench mark is a cross cut on a large bowlder at the bluff on the Texas side, in line with the cable; elevation, 40.56 feet above the datum of the gage.

Observations during 1905 were made under the direction of the United States section of the International (Water) Boundary Commission. The hydrographer was E. E. Winter and the gage reader was W. H. Dodd.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: WS 50, p 357; 66, p 75; 84, p 172; 99, p 365; 132, p 80.
Discharge: WS 50, p 357; 66, pp 75–76; 84, pp 172–173; 99, pp 365–367; 132, pp 80–81.
Discharge, mean daily: WS 132, p 83.
Discharge, monthly: Ann 22, iv, p 355; WS 75, p 160; 84, p 174; 99, p 368; 132, p 83.
Gage heights: WS 50, p 358; 66, p 76; 84, p 174; 99, pp 367–368; 132, p 82.

Discharge measurements of Rio Grande near Langtry, Tex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 2	E. E. Winter	658	2.36	1.6	1,552
January 6	do	642	2.30	1.55	1,474
January 11	do	618	2.02	1.4	1,248
January 14	do	625	1.93	1.3	1,207
January 19	do	585	1.88	1.1	1,097
January 23	do	628	2.06	1.4	1,296
January 28	do	587	2.10	1.5	1,234
February 2	do	607	1.72	1.3	1,045
February 6	do	568	1.62	1.2	922
February 10	do	571	1.59	1.2	909
February 14	do	531	2.02	1.1	1,070
February 18	do	520	1.95	1.0	1,012
February 25	do	713	2.71	1.9	1,932
March 6	do	840	2.49	2.2	2,091
March 10	do	1,162	3.28	3.1	3,810
March 15	do	1,187	3.21	3.3	3,810
March 19	do	944	3.00	3.0	2,831
March 23	do	968	3.07	3.0	2,976
March 28	do	883	2.83	2.7	2,496
April 3	do	732	2.46	2.3	1,800

Discharge measurements of Rio Grande near Langtry, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
April 7	E. E. Winter	789	2.62	2.0	2,068
April 11	do	774	2.84	1.9	2,200
April 15	do	777	2.94	1.9	2,283
April 20	do	791	2.99	1.7	2,365
April 24	do	956	2.99	2.4	2,860
April 27	do	889	2.97	2.4	2,640
May 2	do	957	3.14	2.6	3,005
May 6	do	1,037	3.59	2.7	3,728
May 10[a]	do	868	2.86	3.4	2,486
May 15	do	1,087	3.57	3.3	3,881
May 19	do	1,158	4.11	3.4	4,763
May 24	do	1,184	3.81	3.5	4,509
May 29	do	1,175	3.55	3.4	4,170
June 2	do	1,120	4.25	3.8	4,759
June 8	do	1,532	5.01	5.2	7,671
June 12	do	2,344	5.66	6.8	13,278
June 16	do	3,167	5.96	8.5	18,887
June 20	do	2,538	5.09	7.1	12,925
June 24	do	2,481	5.28	7.3	13,105
June 28	do	1,718	4.38	5.9	7,524
July 3	do	1,129	4.06	4.1	4,589
July 8	do	984	3.58	2.8	3,518
July 14	do	760	3.25	2.0	2,472
July 19	do	1,056	3.36	3.2	3,550
July 24	do	1,403	4.65	4.8	6,524
July 29	do	1,659	5.16	6.1	8,567
August 4	do	1,350	4.45	3.9	6,004
August 10	do	1,126	3.55	3.2	4,002
August 14	do	1,658	4.67	5.2	7,743
August 19	do	1,724	4.92	5.55	8,480
August 24	do	1,433	4.74	4.4	6,788
August 28	do	1,444	4.75	4.5	6,864
September 2	do	997	3.61	2.7	3,597
September 7	do	848	3.47	2.15	2,942
September 10	do	1,643	4.52	5.65	7,431
September 16	do	1,355	3.95	4.4	5,359
September 22	do	1,017	3.72	3.0	3,785
September 25	do	1,672	4.78	5.65	7,984
September 28	do	3,324	7.13	10.85	23,694
October 2	do	1,693	5.16	6.35	8,731
October 6	do	1,355	4.88	5.0	6,609
October 10	do	1,310	4.71	4.65	6,169
October 14	do	1,035	3.71	3.25	3,840
October 19	do	980	3.52	2.5	3,453
October 23	do	818	3.34	2.0	2,733
October 28	do	766	2.98	1.7	2,283
November 2	do	769	2.62	1.6	2,012
November 6	do	751	1.87	1.3	1,407
November 9	do	733	1.80	1.3	1,320
November 13	do	1,004	3.13	2.7	3,145
November 17	do	1,302	3.52	4.0	4,583
November 21	do	1,342	3.64	4.1	4,888

[a] Channel filled with mud washed in by local rains.

Discharge measurements of Rio Grande near Langtry, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square Feet.	*Feet per second.*	*Feet.*	*Second-feet.*
November 28...	E. E. Winter	942	3.74	2.4	3,523
November 30...	do	784	3.70	2.0	2,902
December 3....	H. F. Collins	839	3.87	2.1	3,248
December 9....	do	1,047	3.83	2.85	4,008
December 12...	do	931	3.75	2.2	3,493
December 17...	do	817	3.59	2.0	2,937
December 20...	do	1,500	5.62	4.2	8,434
December 25...	do	1,589	5.85	4.6	9,299
December 31...	do	990	4.19	2.7	4,144

Daily gage height, in feet, of Rio Grande near Langtry, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	1.4	1.9	5.4	2.45	3.5	10.2	5.2	2.95	5.5	1.6	1.9
2	1.7	1.25	1.9	2.6	2.6	3.85	5.35	4.8	2.65	6.75	1.6	1.9
3	1.6	1.2	1.9	2.4	2.6	3.8	4.2	4.1	2.55	7.3	1.55	2.05
4	1.6	1.15	1.95	2.25	2.6	3.9	3.7	3.9	2.5	6.4	1.5	3.2
5	1.6	1.05	2.3	2.15	2.65	3.9	3.65	3.75	2.55	5.4	1.45	3.85
6	1.55	1.15	2.3	2.0	2.7	4.05	3.55	3.5	2.15	4.9	1.3	3.55
7	1.5	1.05	2.3	2.0	2.7	4.55	2.8	3.45	2.15	5.7	1.3	3.4
8	1.5	1.1	2.5	2.0	2.8	5.25	2.8	3.35	2.7	6.65	1.3	3.15
9	1.5	1.2	4.35	2.05	5.1	5.7	2.65	3.2	2.9	5.55	1.3	2.85
10	1.45	1.15	3.05	2.05	3.45	5.65	2.4	3.2	6.25	4.6	1.3	2.55
11	1.4	1.1	2.8	1.95	3.2	5.8	2.25	3.1	9.5	4.15	1.3	2.4
12	1.4	1.1	2.8	1.9	3.7	6.95	2.2	2.9	5.4	3.75	1.3	2.25
13	1.3	1.1	2.9	1.9	4.0	7.0	2.1	5.95	5.1	3.6	2.0	2.2
14	1.3	1.1	2.9	1.9	3.95	7.7	2.0	5.1	4.5	3.15	4.3	2.1
15	1.3	1.1	3.35	1.9	3.35	8.15	1.95	5.35	4.4	2.95	7.0	2.1
16	1.25	1.0	3.1	1.9	3.25	8.65	1.9	5.75	4.4	2.85	4.55	2.0
17	1.2	1.0	3.0	1.8	3.3	8.3	2.15	6.3	4.95	2.8	4.0	2.0
18	1.2	1.0	3.0	1.7	3.3	7.1	3.25	5.55	4.8	2.5	4.5	2.55
19	1.1	1.0	3.0	1.7	3.35	7.35	3.25	6.25	3.95	2.45	4.6	4.0
20	1.1	1.0	3.05	1.7	3.4	7.15	3.75	6.7	3.5	2.25	4.15	4.25
21	1.1	1.2	3.25	1.7	3.5	7.3	3.9	7.05	3.05	2.1	4.05	4.2
22	1.1	1.4	3.1	1.7	3.5	7.2	4.65	5.95	2.9	2.0	3.7	4.0
23	1.25	2.0	3.0	2.35	3.5	7.25	5.35	4.65	2.7	1.95	3.2	4.5
24	1.7	1.9	2.9	2.4	4.15	7.25	4.85	4.35	2.7	1.9	2.8	5.25
25	1.65	1.85	2.75	2.4	3.7	7.1	7.55	5.65	5.6	1.8	2.55	4.6
26	1.6	1.8	2.7	2.4	3.5	7.0	5.4	5.15	8.4	1.8	2.4	3.9
27	1.6	1.8	2.7	2.4	3.5	6.3	5.3	4.95	10.4	1.75	2.4	3.6
28	1.5	1.8	2.7	2.75	3.4	5.65	5.5	4.5	10.3	1.7	2.35	3.25
29	1.5	.....	2.7	2.55	3.6	7.5	6.15	4.05	6.6	1.6	2.2	3.05
30	1.45	.....	2.7	2.4	3.45	11.1	6.4	3.65	5.65	1.6	1.95	2.85
31	1.4	.....	2.5	.....	3.5	.....	6.15	3.3	.....	1.6	.....	2.7

Daily discharge, in second-feet, of Rio Grande near Langtry, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,350	1,130	1,930	7,700	2,700	4,370	25,700	7,520	4,000	7,830	2,100	2,760
2	a1,550	a990	1,930	2,100	3,000	a 4,860	6,420	7,050	a 3,540	a9,930	a2,010	2,760
3	1,550	930	1,930	a1,900	3,130	4,760	a4,690	6,230	3,420	11,580	1,910	a 3,130
4	1,550	870	1,960	1,890	3,260	4,960	4,260	a6,000	3,360	8,880	1,810	4,350
5	1,550	760	2,190	1,930	3,490	4,960	4,220	5,600	3,420	7,240	1,710	5,000
6	a1,470	a 880	a2,190	1,920	a3,730	5,270	4,140	5,000	2,940	a6,480	a1,410	4,700
7	1,400	820	2,280	a2,070	3,730	6,310	3,520	4,800	a 2,940	7,800	1,380	4,550
8	1,400	850	2,660	2,130	3,930	a 7,770	a3,520	4,500	3,600	9,630	1,350	4,300
9	1,400	910	6,690	2,220	6,530	9,420	3,320	4,100	3,850	7,580	a1,320	a 4,010
10	1,320	a 880	a3,710	2,280	a2,590	9,250	3,000	a4,000	a 9,530	a6,090	1,300	3,770
11	1,250	910	3,130	a2,240	2,410	9,770	2,800	3,800	22,500	5,330	1,280	3,650
12	a1,250	960	3,050	2,220	3,730	a13,770	2,730	3,400	8,150	4,670	1,260	a 3,530
13	1,210	1,020	3,170	2,240	4,650	13,940	2,600	9,240	7,320	4,420	a2,240	3,490
14	a1,210	a1,070	3,090	2,260	4,870	16,250	a2,470	a7,540	5,640	a3,780	5,480	3,210
15	1,210	1,070	a3,910	a2,280	a3,980	17,730	2,420	8,050	5,360	3,680	13,880	3,210
16	1,180	1,010	3,310	2,340	3,950	a19,380	2,380	8,870	a 5,360	3,630	6,230	2,940
17	1,150	1,010	3,020	2,300	4,220	18,040	2,600	9,980	6,900	3,600	a4,580	a 2,940
18	1,150	a1,010	2,930	2,250	4,390	12,930	3,620	8,480	6,480	3,450	6,080	4,310
19	a1,100	1,010	a2,830	2,300	a4,660	14,000	a3,640	a9,880	5,200	a3,380	6,380	7,940
20	1,100	1,010	2,960	a2,360	4,670	a12,970	4,570	10,780	4,530	3,090	5,040	a 8,540
21	1,100	1,210	3,400	2,360	4,780	13,100	4,850	11,480	3,850	2,870	a4,850	8,430
22	1,100	1,420	3,140	2,370	4,690	13,010	6,240	9,530	a 3,670	2,730	4,570	8,000
23	a1,200	2,030	a2,980	2,820	4,600	13,050	7,540	7,230	3,450	a2,650	4,170	9,080
24	1,500	1,930	2,820	a2,860	a5,810	a13,050	a6,600	a6,700	3,450	2,580	3,850	10,700
25	1,430	a1,880	2,580	2,780	4,880	12,300	14,700	9,300	a 7,900	2,430	3,640	a 9,300
26	1,370	1,830	2,500	2,710	4,450	11,910	7,460	8,230	16 280	2,430	3,520	7,400
27	1,370	1,830	2,500	a2,640	4,420	9,120	7,300	7,800	22,340	2,350	3,520	6,590
28	a1,230	1,830	a2,500	2,990	4,190	a 7,020	7,620	a6,860	a22,030	a2,280	a3,440	5,640
29	1,230	.....	2,500	2,790	a4,570	14,600	a8,650	5,960	10,830	2,200	3,210	5,100
30	1,180	.....	2,500	2,640	4,270	29,300	9,170	5,160	7,980	2,200	a2,830	4,560
31	1,130	.....	2,180	.....	4,370	.....	8,670	4,460	.....	2,200	.....	a 4,140

a Meter measurements.

Estimated monthly discharge of Rio Grande near Langtry, Tex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	1,550	1,100	1,296	79,716
February	2,030	760	1,181	65,574
March	6,690	1,930	2,854	175,477
April	7,700	1,890	2,530	150,526
May	6,530	2,410	4,150	255,174
June	29,300	4,370	11,572	688,602
July	25,700	2,380	5,852	359,841
August	11,480	3,400	7,017	431,464
September	22,500	2,940	7,327	436,007
October	11,580	2,200	4,806	295,517
November	13,880	1,260	3,545	210,942
December	10,700	2,760	5,227	321,382
The year	29,300	760	4,780	3,470,222

RIO GRANDE BELOW MOUTH OF DEVILS RIVER, TEXAS.

This station was established in April, 1900, by the International (Water) Boundary Commission. It is alongside the Southern Pacific Railroad track, about a mile below the mouth of Devils River and about 480 miles below El Paso.

The river is nearly straight for 1 mile above and the same distance below the station. The right bank is alluvial deposit, overflowing in extreme high water for a distance of some 500 feet back from the river. The left bank is a loose rock fill along which runs the Southern Pacific Railroad. The bed is rock for a short distance from the left bank; the rest is shifting sand and gravel.

Discharge measurements are made by means of a cable, car, tagged wire, and guy wire.

The gage is an inclined scantling spiked to posts set in the ground. The highest flood on record showed watermarks of 36.5 feet on gage; it occurred April 6, 1900, about two weeks before this gage was established. The range between high and low water is about 33 feet. The bench mark is a cross cut on top of the coping stone of a culvert near the gage; elevation, 36.98 feet above the datum of the gage.

The observations during 1905 have been made under the direction of the United States section of the International (Water) Boundary Commission. The hydrographer is E. E. Winter and the gage reader is John Harrison.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: WS 50, pp 364–365; 66, p 80; 84, p 162; 99, p 345; 132, p 84.
Discharge: WS 50, p 365; 66, p 80; 84, p 162; 99, pp 345–347; 132, pp 84–85.
Discharge, mean daily: WS 132, p 87.
Discharge, monthly: Ann 22, iv, p 357; WS 75, p 161; 84, p 163; 99, p 348; 132, p 88.
Gage heights: WS 50, p 365; 66, p 81; 84, p 163; 99, pp 347–348; 132, p 86.

Discharge measurements of Rio Grande below mouth of Devils River, Texas, in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 4	E. E. Winter	1,267	1.99	3.9	2,524
January 10	do	1,225	1.99	3.8	2,439
January 13	do	1,185	1.91	3.7	2,264
January 18	do	1,171	1.87	3.6	2,187
January 21	do	1,155	1.82	3.6	2,104
January 26	do	1,218	1.98	3.9	2,411
January 31	do	1,175	1.89	3.7	2,225
February 4	do	1,160	1.78	3.6	2,060
February 9	do	1,190	1.78	3.7	2,123
February 13	do	1,150	1.74	3.6	2,005
February 17	do	1,342	1.64	3.6	2,197
February 22	do	1,392	1.72	3.85	2,401
February 28	do	1,566	2.23	4.4	3,485
March 7	do	1,607	2.17	4.6	3,487
March 14	do	1,746	2.51	5.3	4,378
March 18	do	1,887	3.56	6.0	6,715
March 22	do	1,926	3.73	6.2	7,193
March 26	do	1,703	2.64	5.6	4,494
March 31	do	1,602	2.29	5.1.	3,671
April 6	do	1,570	2.58	4.7	4,050
April 10	do	1,531	2.87	4.5	4,400
April 14	do	1,468	2.84	4.4	4,167
April 19	do	1,385	2.28	4.0	3,152
April 22	do	1,402	2.41	4.25	3,382
April 26	do	1,790	2.84	5.5	5,078

Discharge measurements of Rio Grande below mouth of Devils River, etc.—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
April 30	E. E. Winter	2,170	3.24	6.7	7,024
May 5	do	1,741	3.03	5.7	5,274
May 9	do	1,930	3.15	5.9	6,086
May 13	do	1,774	3.04	5.7	5,387
May 18	do	1,977	3.38	6.0	6,690
May 22	do	2,122	3.11	5.9	6,603
May 26	do	2,203	3.27	6.2	7,214
May 31	do	2,260	3.68	6.4	8,306
June 6	do	2,386	3.44	6.6	8,202
June 10	do	2,717	4.59	7.5	12,475
June 15	do	3,101	5.08	9.4	15,764
June 19	do	3,410	6.12	9.5	20,879
June 23	do	3,336	6.16	9.0	20,564
June 27	do	3,034	5.15	8.4	15,628
June 29	do	10,582	8.05	21.9	85,148
July 6	do	2,321	3.94	6.7	9,144
July 12	do	2,062	3.08	5.9	6,343
July 17	do	1,575	2.44	4.7	3,844
July 22	do	2,223	3.68	6.5	8,179
July 26	do	2,285	4.09	7.05	9,344
July 31	do	3,088	5.12	8.6	15,796
August 8	do	2,610	4.03	6.9	10,525
August 12	do	2,550	4.40	7.0	11,210
August 17	do	3,063	5.14	8.6	15,746
August 23	do	2,700	4.69	7.5	12,660
August 26	do	2,697	4.60	7.3	12,419
August 31	do	2,279	4.08	6.2	9,287
September 5	do	1,736	3.03	5.2	5,254
September 12	do	2,930	4.46	8.15	13,060
September 18	do	2,373	3.91	6.9	9,282
September 24	do	1,769	3.40	5.4	6,022
September 27	do	3,423	5.84	9.95	20,000
September 30	do	2,682	5.08	7.95	13,619
October 5	do	2,568	4.59	7.55	11,785
October 9	do	2,502	4.41	7.25	11,027
October 13	do	2,178	4.04	6.5	8,807
October 18	do	1,715	3.36	5.1	5,770
October 21	do	1,388	3.19	4.8	4,426
October 26	do	1,268	3.06	4.4	3,875
October 31	do	1,169	2.88	4.1	3,366
November 5	do	1,258	2.35	4.0	2,951
November 8	do	1,214	2.19	3.95	2,659
November 12	do	1,256	2.40	4.0	3,013
November 15	do	2,826	5.54	8.45	15,664
November 20	do	2,181	4.77	6.8	10,397
November 24	do	1,905	4.34	5.8	8,265
November 29	do	1,442	3.81	4.9	5,489
December 6	H. F. Collins	1,879	5.18	6.3	9,728
December 11	do	1,578	4.04	6.1	6,371
December 15	do	1,449	3.83	5.2	5,543
December 19	do	1,426	3.77	5.3	5,371
December 24	do	2,360	5.70	7.45	13,442
December 27	do	1,884	4.79	6.2	9,027

Daily gage height, in feet, of Rio Grande below mouth of Devils River, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.2	3.7	4.25	8.0	6.25	6.35	10.7	7.85	5.65	7.2	4.1	4.65
2	4.0	3.65	4.35	7.1	5.85	6.7	10.7	7.6	5.5	7.75	4.1	4.6
3	3.95	3.6	4.4	5.5	5.75	6.5	10.1	7.6	5.5	9.0	4.15	4.5
4	3.9	3.55	4.4	5.05	5.7	6.55	7.25	7.35	5.4	8.45	4.1	4.5
5	3.9	3.5	4.45	4.85	5.7	6.6	7.15	7.0	5.3	7.65	4.0	5.95
6	3.9	3.55	4.75	4.65	5.8	6.65	6.75	6.95	5.1	6.95	4.05	6.4
7	3.85	3.65	4.7	4.55	5.85	6.85	6.35	6.9	5.0	7.0	3.9	6.65
8	3.85	3.65	5.35	4.5	5.9	7.1	6.3	7.0	5.2	7.7	3.95	6.6
9	3.8	3.7	5.65	4.5	5.9	7.55	6.2	7.1	5.6	7.25	3.95	6.15
10	3.8	3.7	5.95	4.5	7.15	7.5	5.8	7.3	7.0	7.05	4.0	6.15
11	3.75	3.7	5.0	4.5	5.8	7.55	5.3	7.5	9.7	7.0	4.05	6.05
12	3.75	3.7	4.9	4.5	5.7	8.1	5.5	6.85	8.35	6.8	4.0	5.55
13	3.7	3.7	5.3	4.5	5.7	8.65	4.95	8.95	7.6	6.4	4.1	5.65
14	3.7	3.65	5.35	4.4	5.95	9.0	4.9	8.65	7.95	6.0	5.55	5.35
15	3.7	3.65	6.3	4.3	6.1	9.45	4.75	7.55	7.4	5.9	8.3	5.25
16	3.65	3.65	6.2	4.3	6.05	9.7	4.65	7.75	7.2	5.3	7.1	5.45
17	3.6	3.6	5.9	4.25	5.95	9.8	4.7	8.55	6.9	5.1	6.6	5.9
18	3.6	3.6	5.95	4.15	5.95	9.6	5.4	8.25	6.9	5.05	6.7	5.6
19	3.6	3.6	5.9	4.0	5.9	9.55	5.25	8.3	6.95	4.95	6.75	5.8
20	3.6	3.6	5.9	4.0	5.9	9.7	6.5	8.75	6.75	4.95	6.75	7.35
21	3.6	3.65	6.0	4.0	5.9	9.7	6.2	9.1	5.85	4.85	6.65	7.25
22	3.6	4.0	6.15	4.25	5.9	9.2	6.5	8.45	5.5	4.75	6.55	7.0
23	3.75	4.4	6.05	4.45	5.95	8.8	6.9	7.3	5.5	4.7	6.1	6.65
24	3.85	4.4	5.85	7.7	6.15	8.6	7.0	6.95	5.35	4.6	5.65	7.1
25	3.9	4.4	5.65	5.95	7.25	8.6	7.9	7.1	6.65	4.5	5.35	7.15
26	3.9	4.4	5.55	5.3	6.3	8.55	7.1	7.45	8.75	4.45	5.25	6.6
27	3.9	4.4	5.45	4.95	6.1	8.4	7.5	7.7	10.2	4.35	5.15	6.15
28	3.85	4.4	5.4	4.9	6.05	10.3	7.8	7.35	10.7	4.25	5.0	5.95
29	3.8	.....	5.35	5.0	6.1	21.1	8.5	6.9	8.7	4.2	4.95	5.75
30	3.75	.....	5.15	6.7	6.1	9.65	8.7	6.35	7.8	4.15	4.8	5.55
31	3.7	.....	5.05	.....	6.3	.....	8.5	6.1	.....	4.1	.....	5.4

Daily discharge, in second-feet, of Rio Grande below mouth of Devils River, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,730	2,220	3,240	10,900	6,230	8,040	29,140	13,470	7,060	10,300	3,320	4,750
2	2,590	2,140	3,340	8,200	5,530	8,970	29,140	12,700	6,460	12,700	3,280	4,580
3	2,550	2,060	3,370	5,400	5,360	8,250	26,140	12,700	6,460	18,450	3,330	4,280
4	a2,520	a2,030	3,330	4,630	5,270	8,280	11,890	11,920	6,050	15,920	3,190	4,280
5	2,520	2,000	3,360	4,290	a5,270	8,310	11,390	10,840	a5,650	a12,180	a2,950	8,670
6	2,520	2,030	3,740	a3,950	5,600	a8,430	a9,390	10,680	4,950	10,280	2,990	a10,030
7	2,480	2,090	a3,630	3,940	5,800	9,380	7,910	10,530	4,750	10,400	2,630	10,230
8	2,480	2,090	4,700	4,030	6,010	10,570	7,740	a10,830	5,150	12,380	a2,660	9,530
9	2,440	a2,120	5,300	4,220	a6,090	12,710	7,390	11,130	5,950	a11,030	2,720	7,630
10	a2,440	2,120	5,900	a4,400	9,010	a12,470	6,130	11,730	9,450	10,440	2,880	7,080
11	2,350	2,120	4,000	4,400	5,640	12,550	5,080	12,330	20,600	10,290	3,040	a6,220
12	2,350	2,120	3,870	4,400	5,390	13,500	a5,500	a10,790	a13,860	9,700	a3,010	5,190
13	a2,260	a2,120	4,380	4,400	a5,390	14,460	4,350	17,150	11,400	a8,590	3,210	5,960
14	2,260	2,110	a4,500	a4,170	6,120	15,060	4,250	15,950	12,450	7,720	6,960	5,530
15	2,260	2,160	6,940	3,920	6,610	a15,960	3,940	12,770	10,800	7,510	a15,210	a5,690
16	2,220	2,210	6,870	3,920	6,600	18,140	3,730	13,330	10,200	6,200	11,340	6,170
17	2,190	a2,200	6,310	3,790	6,460	19,720	a3,840	a15,600	9,280	5,770	9,960	7,400
18	a2,190	2,200	a6,600	3,540	a6,570	20,100	5,530	14,770	a9,280	a5,670	10,180	6,380
19	2,160	2,200	6,480	a3,150	6,600	a21,080	5,170	14,910	9,430	5,230	10,290	7,250
20	2,130	2,200	6,480	3,150	6,600	22,100	8,180	16,350	8,960	4,980	a10,290	13,060
21	a2,100	2,240	6,720	3,150	a6,600	22,520	7,460	17,750	7,000	a4,530	10,070	12,680
22	2,100	a2,690	a7,080	a3,380	6,600	20,940	a8,180	15,330	6,240	4,360	9,860	11,750
23	2,250	3,490	6,520	3,650	6,700	a19,760	9,030	a12,100	6,240	4,290	8,900	10,450
24	2,350	3,490	5,720	10,000	7,110	18,330	9,240	11,420	a5,920	4,150	a7,800	a12,130
25	2,410	3,490	4,930	5,980	9,860	17,700	12,740	11,850	9,870	4,010	6,870	12,380
26	a2,410	3,490	a4,410	a4,800	a7,460	16,860	a9,550	a12,850	16,340	a3,940	6,560	10,440
27	2,410	3,490	4,240	4,310	6,960	a15,630	11,220	13,560	a21,000	3,790	6,250	a8,860
28	2,360	a3,490	4,160	4,240	6,840	25,100	12,460	12,560	23,500	3,620	5,790	8,190
29	2,310	.....	4,080	4,380	6,960	a80,350	15,380	11,280	16,020	3,540	a5,640	7,520
30	2,260	.....	3,750	a7,020	6,960	21,900	16,210	9,720	a13,140	3,450	5,290	6,850
31	a2,220	.....	a3,590	.....	a7,760	.....	a15,390	a9,000	.....	a3,370	.....	6,350

a Meter measurements.

Estimated monthly discharge of Rio Grande below mouth of Devils River, Tex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	2,730	2,100	2,349	144,436
February	3,490	2,000	2,443	135,689
March	7,080	3,240	4,888	300,575
April	10,900	3,150	4,790	285,045
May	9,860	5,270	6,515	400,582
June	80,350	8,040	17,572	1,045,626
July	29,140	3,730	10,409	640,046
August	17,750	9,000	12,835	789,223
September	23,500	4,750	10,115	601,904
October	18,450	3,370	7,722	474,823
November	15,210	2,630	6,216	369,858
December	13,060	4,280	7,984	490,889
The year	80,350	2,000	7,820	5,678,696

RIO GRANDE AT EAGLE PASS, TEX.

This station was established in April, 1900, by the International (Water) Boundary Commission. It is a half mile above the highway bridge between Eagle Pass, Tex., and Ciudad Porfirio Diaz, Mexico, and about 540 miles below El Paso.

The river is practically straight for 1 mile above the station. Below it curves slowly to the right for about half a mile and then swings as slowly to the left. The right bank is alluvial deposit with a bottom back of it about 1,500 feet wide, which begins to overflow at gage height 22 feet. The left bank is shale rock rising abruptly from the river. The bed of the stream is shifting sand. At low water the depth is considerable and the velocity slow.

Discharge measurements are made by means of a cable, car, tagged wire, and guy wire. The initial point for soundings is the pole supporting the cable on the left bank.

The gage up to 10.5 feet is a vertical staff bolted to a shale cliff. Above 10.5 feet, it is inclined and spiked to posts set in the shale. The highest recorded flood reached gage height 34.6 feet, and occurred at midnight, June 29, 1905. The range between high and low water is 33 feet. The bench mark is the top of a nail driven into the shale at the gage; elevation, 10.40 feet above the datum of the gage.

The observations during 1905 were made under the direction of the United States section of the International (Water) Boundary Commission. The hydrographer is J. K. Wilson, and the gage reader Robert Boubel.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: WS 50, pp 365-366; 66, p 81; 84, p 158; 99, p 341; 132, p 88.
Discharge: WS 50, p 366; 66, pp 81-82; 84, pp 158-159; 99, pp 341-344; 132, pp 88-91.
Discharge, mean daily: WS 132, p 93.
Discharge, monthly: Ann 22, iv, p 357; WS 75, p 162; 84, p 160; 99, p 345; 132, p 94.
Gage heights: WS 50, p 366; 66, p 82; 99, p 344; 132, p 92.
Hydrograph: WS 75, p 163.

Discharge measurements of Rio Grande at Eagle Pass, Tex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 3	J. K. Wilson	2,609	1.68	3.3	4,373
January 7	do	2,557	1.58	3.1	4,048
January 11	do	2,464	1.31	3.1	3,221
January 14	do	2,498	1.26	3.1	3,158
January 17	do	2,464	1.37	3.0	3,370
January 21	do	2,479	1.38	2.8	3,416
January 24	do	2,467	1.32	2.8	3,259
January 28	do	2,473	1.40	2.95	3,462
January 31	do	2,542	1.33	3.1	3,390
February 3	do	2,530	1.28	3.0	3,229
February 7	do	2,472	1.27	2.7	3,131
February 11	do	2,444	1.41	2.9	3,452
February 14	do	2,499	1.30	2.8	3,254
February 17	do	2,450	1.32	2.8	3,239
February 21	do	2,484	1.29	2.8	3,213
February 24	do	2,529	1.59	3.25	4,024
February 28	do	2,551	1.62	3.2	4,126
March 4	do	2,548	1.63	3.2	4,143
March 6	do	2,657	1.69	3.4	4,498
March 9	do	2,947	2.42	4.1	7,126
March 10	do	3,729	4.25	5.4	15,851
March 14	do	2,931	2.53	4.0	7,406

Discharge measurements of Rio Grande at Eagle Pass, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
March 16	J. K. Wilson	3,600	4.15	5.1	14,945
March 19	do	2,965	3.00	4.6	8,902
March 23	do	2,982	3.09	4.7	9,226
March 27	do	2,893	2.37	4.15	6,850
March 31	do	2,823	2.38	4.0	6,715
April 1	do	3,695	3.66	5.5	13,534
April 2	do	4,270	6.34	6.75	27,061
April 6	do	2,955	1.96	3.8	5,792
April 10	do	2,611	1.99	3.6	5,207
April 13	do	2,576	2.04	3.7	5,250
April 17	do	2,535	1.98	3.5	5,010
April 20	do	2,483	1.80	3.35	4,478
April 24	do	3,817	4.82	6.4	18,395
April 27	do	2,622	2.43	4.0	6,370
April 30	do	2,974	2.79	4.25	8,298
May 4	do	2,827	2.99	4.4	8,447
May 8	do	2,791	2.93	4.5	8,188
May 11	do	2,767	2.85	4.5	7,895
May 15	do	3,119	3.20	4.9	9,994
May 18	do	2,758	3.02	4.4	8,341
May 21	do	3,038	3.26	4.5	9,905
May 25	do	3,109	3.66	5.05	11,370
May 28	do	3,062	3.97	5.25	12,150
May 31	do	3,093	3.74	4.8	11,580
June 3	do	3,116	3.40	5.1	10,593
June 7	do	3,389	3.36	5.05	11,395
June 10	do	3,573	4.48	5.95	16,014
June 13	do	3,727	4.95	6.35	18,445
June 17	do	4,326	5.54	7.4	23,980
June 20	do	4,255	5.13	7.2	21,834
June 23	do	4,206	5.01	7.1	21,090
June 27	do	4,269	4.58	6.9	19,559
July 10	do	4,533	2.76	4.8	12,529
July 14	do	3,918	1.89	4.0	7,418
July 17	do	3,837	1.88	4.0	7,214
July 21	do	4,183	2.65	5.0	11,082
July 25	do	3,977	2.08	4.3	8,261
July 28	do	4,061	2.91	5.25	11,815
July 31	do	4,401	3.99	6.7	17,575
August 4	do	3,874	3.73	6.0	14,458
August 7	do	4,052	3.52	5.4	14,247
August 10	do	3,816	3.53	5.6	13,488
August 16	do	3,773	3.95	5.7	14,915
August 19	do	4,011	3.99	6.0	16,000
August 23	do	4,052	4.20	6.0	17,014
August 26	do	3,723	3.63	5.5	13,512
August 29	do	3,665	3.71	5.4	13,614
August 31	do	3,607	2.99	4.8	10,782
September 4	do	3,371	2.47	4.4	8,329
September 7	do	3,099	2.14	3.8	6,646
September 11	Pedro Rosales	3,916	3.89	5.9	15,228
September 14	do	3,663	3.92	5.7	14,344
September 19	do	3,671	3.45	5.55	12,683

Discharge measurements of Rio Grande at Eagle Pass, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
September 22	Pedro Rosales	3,251	2.77	4.55	9,008
September 25	do	2,904	2.75	4.0	7,991
September 28	do	4,610	6.69	7.85	30,834
September 29	do	4,980	6.97	8.3	34,695
October 2	do	3,490	4.16	5.9	14,515
October 5	do	4,009	4.53	6.35	18,172
October 9	J. K. Wilson	3,939	4.75	6.3	18,728
October 17	do	2,733	2.55	3.9	6,973
October 20	do	2,458	2.17	3.5	5,344
October 24	do	2,377	2.00	3.3	4,752
October 27	do	2,275	1.97	3.2	4,484
October 31	do	2,252	1.99	3.0	4,472
November 4	do	2,436	2.27	3.3	5,526
November 7	do	2,310	2.00	2.9	4,622
November 11	do	2,226	1.85	2.7	4,127
November 15	do	3,254	3.70	5.0	12,039
November 18	do	2,940	4.10	4.85	12,041
November 22	do	3,954	3.73	4.9	14,756
November 25	do	2,548	2.66	4.2	6,768
November 28	do	2,420	2.57	3.7	6,216
November 30	do	2,321	2.33	3.6	5,419
December 4	do	2,510	2.17	3.3	5,438
December 8	do	2,609	2.87	4.3	7,498
December 11	do	2,629	2.39	3.8	6,273
December 14	do	2,371	2.44	3.7	5,785
December 18	do	2,367	2.36	3.6	5,584
December 21	do	3,152	4.07	4.8	12,817
December 26	do	4,011	4.05	4.95	16,242
December 28	do	2,492	3.10	4.4	7,718
December 31	do	2,631	2.40	3.85	6,327

Daily gage height, in feet, of Rio Grande at Eagle Pass, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.3	3.0	3.2	5.8	4.65	5.0	14.0	6.45	4.45	5.8	3.0	3.5
2	3.3	3.0	3.2	7.1	4.5	5.05	13.0	6.05	4.25	5.9	3.0	3.4
3	3.3	3.0	3.1	4.65	4.4	5.1	11.0	6.0	4.4	6.3	3.35	3.3
4	3.2	2.8	3.2	4.0	4.35	5.0	10.2	5.95	4.35	6.8	3.3	3.35
5	3.2	2.8	3.4	3.8	4.5	4.9	6.9	5.6	4.0	6.2	3.15	3.5
6	3.1	2.75	3.4	3.8	4.6	4.95	6.3	5.45	3.9	5.5	2.95	4.6
7	3.1	2.7	3.5	3.8	4.45	5.1	6.2	5.35	3.75	5.3	2.85	4.45
8	3.1	2.7	3.95	3.8	4.5	5.3	6.15	5.4	3.75	5.85	2.85	4.3
9	3.1	2.9	4.05	3.7	4.6	5.8	5.95	5.45	4.15	6.3	2.8	4.2
10	3.1	2.9	5.45	3.6	5.4	6.0	4.85	5.65	4.45	5.7	2.7	3.85
11	3.1	2.9	4.8	3.8	4.6	5.85	4.55	5.55	5.9	5.1	2.7	3.8
12	3.1	2.9	4.2	3.85	4.4	5.95	4.4	5.4	7.2	4.8	2.85	3.75
13	3.1	2.9	4.0	3.7	4.3	6.35	4.15	5.7	5.65	4.55	2.9	3.8
14	3.1	2.8	4.0	3.7	4.4	6.7	3.95	6.5	5.8	4.45	3.75	3.7
15	3.0	2.8	4.2	3.6	4.9	6.95	3.75	6.25	5.95	4.25	4.55	3.6
16	3.0	2.8	5.5	3.55	4.7	7.2	3.55	5.7	5.45	4.1	5.4	3.6
17	3.0	2.8	4.6	3.5	4.4	7.4	4.0	5.9	5.25	3.85	4.95	3.6
18	2.9	2.8	4.6	3.4	4.4	7.4	4.0	6.25	5.3	3.65	4.75	3.55
19	2.9	2.8	4.6	3.3	4.3	7.4	3.95	6.0	5.65	3.6	4.95	3.45
20	2.8	2.8	4.5	3.3	4.55	7.2	4.8	6.15	5.4	3.55	4.95	4.6
21	2.8	2.8	4.65	3.35	4.5	7.45	5.0	6.65	4.85	3.7	4.85	4.85
22	2.8	2.8	4.7	3.55	4.7	7.2	4.7	7.0	4.55	3.5	4.9	4.8
23	2.8	3.0	4.65	3.5	4.65	7.1	5.3	5.95	4.3	3.4	4.65	4.7
24	2.8	3.15	4.5	5.35	5.15	7.0	4.5	5.5	4.2	3.35	4.35	4.65
25	2.75	3.4	4.4	4.8	5.65	7.0	4.9	5.35	4.0	3.3	4.15	5.3
26	2.7	3.4	4.3	4.55	6.9	6.95	6.7	5.55	5.95	3.2	4.0	4.95
27	2.7	3.3	4.15	4.0	5.35	6.9	5.85	5.8	7.15	3.2	3.75	4.65
28	2.95	3.2	4.2	4.4	5.6	6.45	5.25	5.75	7.8	3.15	3.7	4.35
29	3.2	.....	4.1	4.05	5.0	16.8	5.65	5.35	8.1	3.1	3.6	4.2
30	3.1	.....	4.05	4.65	4.8	25.4	6.3	4.95	6.3	3.0	3.55	4.3
31	3.05	.....	4.0	.....	4.85	.....	6.7	4.75	.....	3.05	.....	3.85

Daily discharge, in second-feet, of Rio Grande at Eagle Pass, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,290	3,230	4,130	a15,200	9,450	11,650	75,500	16,460	8,640	14,010	4,470	5,350
2	4,330	3,230	4,130	a29,100	8,850	11,120	66,500	14,680	7,880	a14,510	4,470	5,280
3	a4,370	a3,230	3,950	9,000	8,450	a10,590	50,500	14,460	8,330	16,980	5,700	5,210
4	4,210	3,160	a4,140	6,390	a8,250	10,440	44,900	a14,210	a8,190	19,950	a5,530	a5,540
5	4,210	3,160	4,500	5,790	8,690	10,290	25,100	13,390	7,210	a17,420	5,190	5,850
6	4,050	3,140	a4,500	a5,790	8,930	10,740	21,500	13,570	6,930	14,120	4,740	8,120
7	a4,050	a3,130	4,750	5,790	8,160	a11,650	20,900	a14,000	a6,510	13,320	a4,500	7,810
8	3,840	3,130	6,530	5,790	a8,190	12,680	20,600	13,660	6,510	16,270	4,500	a7,500
9	3,630	3,450	a6,930	5,500	8,490	15,240	19,400	13,330	8,080	a18,730	4,370	7,250
10	3,420	3,450	a16,050	a5,210	12,500	a16,320	a12,830	a13,740	9,310	15,790	4,130	6,390
11	a3,220	a3,450	10,400	5,600	a8,300	15,410	10,930	13,390	a15,230	12,850	a4,130	a6,270
12	3,200	3,450	8,000	5,700	7,500	16,010	9,970	12,800	21,700	11,380	4,500	6,080
13	3,180	3,450	7,400	a5,250	7,100	a18,450	8,370	14,450	14,120	10,160	4,620	6,080
14	a3,160	a3,250	a7,400	5,250	7,500	20,300	a7,170	18,610	a14,840	9,670	7,170	a5,790
15	3,160	3,250	8,000	5,130	a9,990	21,620	6,480	17,510	15,400	8,690	a10,240	5,590
16	3,260	3,240	a16,550	5,070	9,330	22,930	5,710	a14,910	12,720	7,950	13,840	5,590
17	a3,370	a3,240	8,900	a5,010	8,340	a23,980	a7,210	15,640	11,540	a6,770	12,240	5,580
18	3,330	3,240	8,900	4,650	a8,340	23,980	7,210	17,250	11,610	5,960	a11,640	a5,480
19	3,390	3,230	a8,900	4,300	8,330	23,980	7,020	a16,000	a12,180	5,750	13,070	5,280
20	3,350	3,220	8,580	a4,300	9,720	a21,830	10,300	17,000	12,130	a5,550	13,700	11,610
21	a3,420	a3,210	9,070	4,480	a9,900	23,690	a11,080	19,750	10,110	6,140	13,930	a13,020
22	3,360	3,210	9,230	5,280	10,440	21,830	9,870	21,750	a9,010	5,340	a14,760	12,820
23	3,310	3,570	a9,010	5,080	10,310	a21,090	12,280	a16,660	8,550	5,050	12,130	12,420
24	a3,260	a3,840	8,360	a12,100	11,770	20,320	9,060	13,510	8,370	a4,900	9,100	12,220
25	3,210	4,320	7,930	9,570	a14,500	20,320	a10,500	12,760	a7,990	4,750	a6,720	17,300
26	3,160	4,320	7,500	8,570	20,900	19,940	17,600	a13,760	15,500	4,480	6,550	a16,240
27	3,160	4,220	a6,850	a6,370	12,900	a19,570	14,200	15,210	25,100	a4,480	6,280	11,590
28	a3,460	a4,130	6,970	7,970	a14,000	17,300	a11,810	15,160	a30,400	4,480	a6,220	a7,600
29	3,460	.....	6,840	6,570	11,830	166,600	13,400	a13,380	a33,000	4,480	5,670	7,220
30	3,470	.....	6,780	a9,900	11,580	238,300	15,980	11,480	17,200	4,350	a5,270	7,470
31	a3,340	.....	a6,720	.....	a11,780	.....	a17,580	a10,540	.....	a4,600	.....	a6,330

a Meter measurements.

Estimated monthly discharge of Rio Grande at Eagle Pass, Tex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	4,370	3,160	3,542	217,805
February	4,320	3,130	3,434	190,711
March	16,550	3,950	7,674	471,868
April	29,100	4,300	7,324	435,788
May	20,900	7,100	10,139	623,445
June	238,300	10,290	29,939	1,781,474
July	75,500	5,710	18,757	1,153,309
August	21,750	10,540	14,936	918,387
September	33,000	6,510	12,810	762,228
October	19,950	4,350	9,641	592,820
November	14,760	4,130	7,646	454,968
December	17,300	5,210	8,125	499,597
The year	238,300	3,130	11,164	8,102,400

RIO GRANDE NEAR LAREDO, TEX.

This station was established in April, 1900, by the International (Water) Boundary Commission. It was intended to measure the river from the highway bridge connecting Laredo with Nuevo Laredo, Tamaulipas, and the gage was established on the right bank just above the bridge. Measurements were kept up by the Mexican section of the Commission for five months, but the results were so conflicting that the station was abandoned. In July, 1903, a cable station was established by the Commission some 2 miles above Nuevo Laredo, crossing to the United States military reservation of Fort McIntosh, the cable landing just below the pump house. The station is about 670 miles below El Paso.

The river at the new section is nearly straight for one-half mile above and below the cable. The right bank is alluvial deposit, but is above high water. The left bank is the talus of a shale bluff going well above high water. The bed is shifting sand.

Discharge measurements are made by means of a cable, car, and guy wire. The initial point for soundings is the cable support on the right bank.

The gage is an inclined scantling fastened to posts and trees. Low water is about 1 foot on the gage. The highest flood recorded is 32.2 feet, on the night of June 30, 1905.

The observations during 1905 were made under the direction of the Mexican section of the International (Water) Boundary Commission.

Discharge measurements of Rio Grande near Laredo, Tex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 1	Luis Varela	2,183	1.84	2.3	4,023
January 5	do	2,015	1.71	2.2	3,453
January 10	do	1,978	1.69	2.2	3,339
January 17	do	1,940	1.60	1.8	3,096
January 21	do	1,942	1.56	1.7	3,036
January 24	do	1,977	1.59	1.65	3,140
January 28	do	1,946	1.52	1.6	2,956
February 5	do	1,958	1.56	1.6	3,064
February 11	do	1,831	1.53	1.5	2,797
February 15	do	1,826	1.56	1.5	2,851
February 18	do	1,840	1.60	1.5	2,944
February 23	do	1,827	1.57	1.5	2,876
February 27	do	1,857	1.58	1.5	2,927
March 1	do	1,815	1.58	1.5	2,870
March 6	do	2,010	1.69	2.2	3,404
March 10	do	2,231	2.32	3.1	5,169
March 15	do	2,250	2.18	3.2	4,909
March 17	do	3,054	3.81	4.95	11,642
March 24	do	3,550	3.72	3.9	9,480
March 28	do	2,190	2.23	3.0	4,889
May 1[a]	do	2,288	2.33	3.2	5,329
May 7	do	2,343	2.16	3.3	5,066
May 13	do	2,472	2.25	3.5	5,551
May 19	do	2,330	2.24	3.6	5,208
May 21	do	2,461	1.79	3.0	4,416
May 24	do	2,420	2.28	3.3	5,516
May 25[b]	do	2,521	2.40	4.2	6,049
May 27	do	3,800	4.54	7.55	17,256
June 10	do	2,806	4.86	5.8	13,646
June 12	do	2,785	3.85	5.0	10,710
June 14	do	2,677	5.18	6.0	13,867

[a] The record of measurements made during April was lost in a cyclone which occurred April 28.
[b] Gage height uncertain.

Discharge measurements of Rio Grande near Laredo, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
June 18	Luis Varela	2,852	5.18	7.0	14,760
June 23	do	3,229	5.39	7.75	17,407
June 25	do	2,701	5.19	6.6	14,005
July 2	do	5,370	5.73	12.2	30,749
July 3	do	4,944	5.67	11.9	28,044
July 13	do	2,622	3.19	6.3	8,369
July 16	do	2,554	2.59	5.8	6,603
July 23	do	2,358	2.56	5.5	6,025
July 26	do	2,322	2.48	5.4	5,751
July 27	do	2,664	3.70	7.2	9,854
August 8	do	2,538	2.53	5.0	6,426
August 11	do	3,787	5.70	8.2	21,602
August 15	do	3,809	3.23	6.45	12,318
August 16	do	3,648	3.86	6.6	14,091
August 21	do	3,647	3.29	5.4	11,993
August 27	do	3,179	3.74	6.2	11,893
August 29	do	3,490	3.66	6.5	12,777
September 2	do	3,017	2.94	5.1	8,869
September 7	do	3,212	2.69	4.2	8,627
September 13	do	4,723	4.96	8.35	23,416
September 16	do	4,314	3.76	7.0	16,227
September 22	do	3,102	3.31	5.8	10,256
September 27	do	3,315	3.61	6.55	11,981
September 29	do	4,634	5.02	9.9	23,270
October 4	do	3,321	4.82	7.0	15,998
October 10	do	3,410	5.14	7.25	17,534
October 17	do	2,514	2.97	4.85	7,456
October 18	do	2,456	2.89	4.8	7,101
October 26	do	2,302	2.42	4.3	5,574
October 30	do	2,247	2.06	3.9	4,627
November 3	do	2,104	2.11	3.8	4,438
November 12	do	2,028	1.81	3.1	3,671
November 15	do	2,135	2.23	3.9	4,760
November 17	do	3,012	4.60	6.65	13,855
November 24	do	2,620	3.75	5.5	9,823
November 30	do	2,247	2.32	4.4	5,221
December 3	do	2,145	2.42	4,3	5,201
December 8	do	2,709	2.51	5.3	6,807
December 14	do	2,439	2.80	4.7	6,823
December 16	do	2,239	2.48	4.5	5,549
December 22	do	2,941	3.34	5.8	9,812
December 26	do	2,816	4.19	6.2	11,793

Daily gage height, in feet, of Rio Grande near Laredo, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.3	1.6	1.5	2.9	3.55	4.5	18.6	7.25	5.6	7.2	3.9	4.45
2	2.3	1.6	1.6	4.25	3.6	4.15	11.2	7.05	5.15	6.65	3.95	4.45
3	2.25	1.6	1.7	6.65	3.75	4.2	10.5	7.05	4.8	6.5	3.7	4.25
4	2.2	1.6	1.75	3.2	3.55	4.2	9.8	7.15	4.4	7.4	4.2	4.25
5	2.15	1.65	1.9	3.2	3.5	4.45	9.3	6.85	4.65	8.2	4.05	5.3
6	2.0	1.7	2.2	3.0	3.35	4.5	8.1	6.45	4.8	6.8	3.9	5.3
7	2.0	1.7	2.3	2.9	3.3	4.45	7.75	5.65	4.55	6.35	3.85	5.35
8	2.05	1.7	2.45	2.9	3.65	3.75	7.5	5.1	4.6	6.15	3.6	5.35
9	2.2	1.7	2.5	2.8	3.55	4.25	7.25	7.05	4.7	6.55	3.35	5.3
10	2.2	1.6	2.8	2.6	3.7	5.2	7.05	7.0	4.55	7.15	3.55	5.3
11	2.15	1.5	4.1	3.15	3.85	5.0	6.8	8.25	5.1	6.9	3.5	5.35
12	2.0	1.5	3.3	2.9	3.85	5.0	6.3	7.5	6.9	5.95	3.05	4.45
13	1.9	1.5	3.3	2.8	3.55	5.05	6.25	6.85	7.9	5.55	3.25	4.9
14	1.9	1.5	3.25	2.6	4.1	6.0	6.05	6.7	7.25	5.35	4.0	4.75
15	1.9	1.5	3.2	2.6	5.1	6.1	5.95	7.15	7.25	5.2	3.95	4.7
16	1.85	1.5	4.45	2.5	4.1	6.7	5.75	6.8	7.0	5.0	5.15	4.65
17	1.8	1.5	4.65	2.45	3.65	7.3	5.6	6.8	6.65	4.9	6.8	4.6
18	1.8	1.5	3.65	2.4	3.7	7.0	5.55	7.2	6.2	4.75	6.2	4.55
19	1.8	1.5	3.0	2.3	3.45	7.45	5.6	7.15	6.1	4.55	6.35	4.4
20	1.7	1.5	3.5	2.25	3.05	7.45	5.4	6.25	6.65	4.55	5.9	4.4
21	1.7	1.5	3.7	2.25	3.15	6.95	5.0	5.6	6.35	4.6	6.0	4.4
22	1.7	1.5	3.7	2.45	5.0	7.7	5.3	6.1	5.6	4.4	5.85	5.8
23	1.6	1.5	3.85	2.95	3.75	7.25	5.55	5.55	5.1	4.4	5.45	5.85
24	1.6	1.5	3.85	2.9	3.85	7.4	5.85	5.25	5.0	4.5	5.45	6.15
25	1.6	1.5	3.5	4.25	4.5	6.55	5.95	5.2	4.75	4.45	5.1	6.0
26	1.6	1.5	3.5	4.1	5.6	6.55	6.1	5.1	4.85	4.25	4.9	6.3
27	1.6	1.5	3.35	3.55	7.1	6.7	7.2	6.1	6.6	4.1	4.7	5.7
28	1.6	1.5	3.1	3.2	6.1	6.55	7.4	6.15	9.2	3.9	4.65	5.0
29	1.6	.....	3.0	3.05	5.65	6.35	7.55	6.45	9.55	3.95	4.55	4.8
30	1.6	.....	3.0	3.35	4.3	23.0	7.55	5.45	8.75	3.85	4.45	4.6
31	1.6	.....	2.95	.....	4.0	.....	7.8	5.3	.....	3.95	.....	4.35

RIO GRANDE NEAR ROMA, TEX.

This station was established in 1900 by the International (Water) Boundary Commission. It is near Roma, Tex., 775 miles by river below El Paso.

The river is straight for 1 mile above and one-half mile below the station. The right bank is alluvial deposit and overflows in high water for a width of 250 feet. The overflow section is thickly covered with mesquite brush. The left bank is of hard material and does not overflow. The bottom is shifting sand.

Discharge measurements are made by means of a cable, car, and guy wire. The initial point for soundings is the cable support on the left bank.

The gage is an inclined scantling spiked to posts and trees. Low water is 1 foot on gage, and the highest recorded flood, September 16, 1904, marked 26.0 feet on gage.

The observations during 1905 were made under the direction of the Mexican section of the International (Water) Boundary Commission.

Discharge measurements of Rio Grande near Roma, Tex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 3	H. P. Guerra	3,026	2.13	3.8	6,452
January 6	do	2,811	2.01	3.5	5,644
January 14	do	2,042	2.05	3.1	4,193
January 17	do	1,815	2.06	2.9	3,740
January 20	do	1,854	2.14	3.0	3,959
January 24	do	1,704	2.07	2.8	3,532
January 27	do	1,693	1.93	2.7	3,262
February 8	do	1,644	1.88	2.5	3,089
February 11	do	1,684	1.90	2.6	3,205
February 14	do	1,653	2.12	2.6	3,512
February 17	do	1,690	1.83	2.5	3,100
February 20	do	1,758	2.07	2.7	3,642
February 23	do	1,590	2.05	2.5	3,257
March 3	do	1,912	2.23	3.2	4,263
March 6	do	2,332	2.44	4.0	5,689
March 7	do	3,683	4.24	7.05	15,600
March 13	do	2,277	3.39	4.5	7,716
March 17	do	2,748	4.49	5.4	12,331
March 23	do	2,324	3.47	4.6	8,066
April 4	do	3,251	4.40	6.7	14,303
April 7	do	2,040	3.34	4.1	6,811
April 11	do	1,929	2.73	3.8	5,260
April 18	do	2,009	2.87	3.9	5,760
April 24	do	2,242	3.07	4.4	6,876
April 26	do	2,801	4.43	5.6	12,422
April 27	do	2,487	3.62	4.8	8,991
May 2	do	2,467	3.05	4.6	7,528
May 9	do	2,575	3.05	5.0	7,858
May 12	do	3,097	4.11	6.1	12,740
May 16	do	2,786	3.87	5.6	10,770
May 23	do	2,736	3.88	5.55	10,628
May 26	do	3,606	4.80	7.4	17,312
May 31	do	3,385	4.56	6.9	15,450
June 2	do	3,584	4.64	7.3	16,624
June 6	do	2,836	3.72	5.6	10,546
June 13	do	3,290	3.74	6.2	12,308
June 16	do	3,645	4.25	6.9	15,481
June 19	do	4,033	4.66	7.8	18,803
June 22	do	4,252	4.93	8.3	20,966
June 27	do	4,557	5.26	9.0	23,973
July 3	do	8,374	5.14	17.0	43,041
July 5	do	5,682	5.22	11.5	29,642
July 7	do	4,368	5.17	8.7	22,568
July 10	do	3,923	3.67	7.3	14,387
July 14	do	4,004	2.82	6.1	11,289
July 17	do	3,850	2.74	5.7	10,531
July 20	do	3,685	2.61	5.3	9,633
August 8	do	3,155	3.94	6.2	12,437
August 11	do	3,299	4.13	6.6	13,641
August 15	do	4,058	4.38	7.7	17,767
August 17	do	3,796	3.76	7.2	14,267
August 22	do	3,433	4.05	6.9	13,912
August 24	do	4,143	4.61	7.9	19,116

Discharge measurements of Rio Grande near Roma, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
September 5	H. F. Guerra	2,902	3.11	5.2	9,016
September 8	do	2,751	3.01	4.9	8,277
September 13	do	4,083	4.60	7.8	18,789
September 19	do	6,224	5.38	12.7	33,475
September 21	do	4,933	4.82	9.7	23,783
September 23	do	3,763	4.42	7.1	16,643
September 29	do	4,246	4.59	8.1	19,481
October 5	do	4,482	4.74	8.5	21,263
October 7	do	3,816	4.42	7.2	16,878
October 9	do	3,425	4.11	6.8	14,079
October 13	do	3,294	3.63	6.1	11,944
October 17	do	2,981	3.37	5.5	10,047
October 20	do	2,836	2.60	5.1	7,382
October 24	do	2,530	2.64	4.5	6,688
November 7	do	2,334	2.52	4.4	5,893
November 10	do	2,138	2.05	4.0	4,390
November 17	do	3,031	4.07	6.0	12,322
November 20	do	3,294	4.01	6.6	13,200
November 25	do	2,814	3.51	5.5	9,866
November 28	do	2,618	3.29	5.0	8,622
December 9	do	2,706	3.47	5.3	9,394
December 11	do	2,557	3.08	4.9	7,872
December 14	do	2,358	3.19	4.7	7,531
December 20	do	2,244	3.13	4.4	7,027
December 23	do	2,938	3.53	5.8	10,370
December 28	do	2,891	3.29	5.5	9,514

Daily gage height, in feet, of Rio Grande near Roma, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.8	3.0	2.7	4.1	5.3	6.35	17.7	7.65	5.8	8.2	4.75	4.75
2	3.8	3.0	3.05	4.35	4.6	7.0	22.3	7.75	5.55	6.9	4.65	4.7
3	3.8	2.85	3.15	4.8	4.7	6.35	16.55	7.35	5.35	6.6	4.55	4.65
4	3.7	2.8	2.9	6.75	4.75	6.3	13.75	7.1	5.05	7.15	4.45	4.6
5	3.65	2.7	3.2	4.75	4.7	5.85	10.9	6.9	5.2	8.5	4.6	4.55
6	3.55	2.7	3.85	4.2	4.7	5.6	9.15	6.75	5.4	7.85	4.55	4.7
7	3.45	2.6	6.35	4.05	4.75	5.65	8.55	6.65	5.0	7.05	4.45	4.95
8	3.4	2.55	4.7	3.9	4.8	5.55	7.9	6.35	4.9	6.5	4.15	5.45
9	3.4	2.5	3.65	4.0	5.1	5.6	7.35	6.1	4.8	6.55	4.3	5.35
10	3.3	2.6	3.45	3.9	5.0	5.7	7.15	6.4	4.8	7.1	4.05	5.25
11	3.3	2.6	3.75	3.85	5.05	6.15	6.95	6.5	5.1	7.2	4.0	5.05
12	3.25	2.6	4.5	3.9	6.0	6.2	6.7	6.6	5.45	6.6	4.0	4.9
13	3.2	2.6	4.4	3.9	5.15	6.15	6.45	6.5	7.35	6.2	4.05	4.8
14	3.15	2.6	3.95	4.1	4.8	6.4	6.2	6.35	7.45	5.85	4.0	4.75
15	3.05	2.5	3.9	4.25	5.5	6.75	5.95	7.7	6.4	5.65	4.3	4.65
16	3.0	2.5	3.9	4.0	5.7	6.95	5.75	7.35	6.5	5.55	4.25	4.6
17	2.9	2.5	4.85	3.9	5.05	7.4	5.8	7.05	6.55	5.5	5.55	4.5
18	2.9	2.55	5.25	3.95	4.75	7.55	6.4	6.7	6.1	5.3	6.15	4.5
19	2.95	2.95	4.45	4.0	4.55	7.75	5.65	7.2	11.3	5.3	5.6	4.5
20	3.0	2.75	4.35	3.95	4.45	7.7	5.45	6.9	10.1	5.55	6.45	4.45
21	2.9	2.6	4.4	3.9	4.5	7.75	5.6	6.9	9.3	5.6	5.9	4.4
22	2.9	2.6	4.55	3.9	4.5	8.15	6.9	6.95	8.7	5.8	5.9	5.1
23	2.8	2.6	4.6	3.95	5.15	8.15	7.2	7.55	7.5	5.1	5.8	5.7
24	2.8	2.45	4.5	4.5	4.65	7.95	6.95	7.7	5.9	4.5	5.75	5.55
25	2.8	2.4	4.5	4.35	4.8	7.85	6.85	6.7	5.65	4.35	5.55	5.6
26	2.8	2.35	4.4	4.85	6.75	7.65	7.15	6.4	5.55	4.5	5.35	5.75
27	2.7	2.3	4.4	4.95	6.4	8.8	7.2	6.4	5.45	4.4	5.05	5.7
28	2.85	2.15	4.4	4.65	6.8	8.35	7.65	6.25	6.4	4.45	4.95	5.55
29	2.9	.....	4.3	5.1	6.55	8.0	6.9	6.75	8.3	4.3	4.85	5.4
30	3.0	.....	4.2	5.8	7.3	8.25	6.85	6.45	8.9	4.2	4.8	5.15
31	3.0	.....	4.2	.....	6.5	.....	6.95	6.2	.....	4.3	.....	5.0

RIO GRANDE NEAR BROWNSVILLE, TEX.

This station was established in 1900 by the International (Water) Boundary Commission. It is about 1 mile above Brownsville, Tex., and in front of Matamoros, Tamaulipas, and 960 miles by river below El Paso.

Between Roma and Brownsville there are many lagoons (old river beds) and lakes which take river water during moderate floods, and a large area overflows quite deeply in larger floods. Much of this water returns slowly to the river as the flood subsides, so that the flow passes Brownsville more uniformly than it does Roma. Large quantities of water also leave the river entirely, reaching the Gulf of Mexico through channels remote from the Rio Grande Local run-off, however, keeps the total water at Brownsville well up toward the combined flow of the San Juan and the Rio Grande at Roma. The river is nearly straight for one-half mile above and below the station. Both banks are alluvial and are just about level with high water. The right bank is protected by piling. The bed of the stream is shifting sand.

Discharge measurements are made by means of a cable, car, and guy wire. The cable is so constructed that it can be lowered and raised. The initial point for soundings is the cable support on the right bank.

The gage is a vertical scantling fastened to one of the protection piles. High water is 13 feet on the gage, and low water is —1.0.

The observations during 1905 were made under the direction of the Mexican section of the International (Water) Boundary Commission.

Discharge measurements of Rio Grande near Brownsville, Tex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 2	P. Guerra	2,886	2.60	5.3	7,492
January 6	do	2,712	2.59	4.7	7,036
January 10	do	2,588	2.41	4.3	6,230
January 14	do	2,531	2.34	4.1	5,935
January 18	do	2,381	2.33	3.8	5,545
January 22	do	2,318	2.32	3.5	5,384
January 26	do	2,301	2.30	3.4	5,295
January 30	do	2,247	2.16	3.2	4,853
February 3	do	2,252	2.24	3.4	5,053
February 7	do	2,276	2.29	3.5	5,204
February 11	do	2,138	2.20	3.0	4,711
February 16	do	2,112	2.17	2.9	4,583
February 24	do	2,230	2.22	3.1	4,961
February 27	do	2,122	2.17	2.8	4,595
March 3	do	2,172	2.21	2.9	4,796
March 7	do	2,283	2.30	3.5	5,259
March 13	do	2,321	3.30	5.2	7,653
March 17	do	2,468	3.41	5.7	8,414
March 20	do	3,141	3.36	7.6	10,548
March 25	do	2,926	3.44	6.5	10,058
March 29	do	2,964	3.43	6.5	10,163
April 2	do	2,734	3.31	5.8	9,043
April 6	do	4,010	4.55	9.25	18,251
April 11	do	2,835	2.19	5.1	6,206
April 16	do	2,735	2.19	4.9	6,001
April 24	do	2,535	2.03	4.0	5,135
April 28	do	3,528	3.22	6.8	11,362
May 2	do	3,117	3.49	7.65	10,885
May 6	do	2,635	3.33	6.3	8,771
May 10	do	2,524	3.18	6.0	8,024
May 14	do	3,086	3.44	7.5	10,623
May 18	do	4,015	3.27	7.9	13,120
May 22	do	2,566	3.35	6.1	8,596
May 26	do	3,575	3.12	6.8	11,162
May 30	do	4,980	4.67	10.5	23,258
June 3	do	5,282	4.60	11.2	24,294
June 6	do	5,136	4.03	10.8	20,716
June 11	do	4,268	3.65	8.4	15,583
June 15	do	4,508	3.72	9.0	16,772
June 20	do	5,516	4.42	11.7	24,397
June 24	do	5,967	4.78	12.7	28,515
June 28	do	5,716	4.63	12.2	28,485
July 2	do	6,103	4.60	13.1	28,091
July 6	do	6,274	4.65	13.5	29,168
July 10	do	6,105	4.11	13.3	25,099
July 12	do	5,148	3.64	11.0	18,734
July 18	do	4,290	2.79	8.8	11,949
July 22	do	4,521	3.20	9.5	14,452
July 26	do	4,071	3.50	9.3	14,231

Discharge measurements of Rio Grande near Brownsville, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
July 30	P. Guerra	4,899	3.73	11.65	18,275
August 3	do	4,806	4.42	11.3	21,236
August 7	do	4,561	4.03	10.5	18,382
August 11	do	4,038	3.64	9.4	14,697
August 15	do	4,118	3.68	9.6	15,135
August 19	do	4,621	3.99	10.6	18,435
August 24	do	4,723	4.11	10.8	19,390
August 28	do	4,008	3.59	9.25	14,399
September 1	do	4,756	3.32	9.6	15,773
September 6	do	4,169	2.39	7.5	9,946
September 10	do	4,039	2.21	7.1	8,937
September 14	do	4,091	2.27	7.3	9,301
September 18	do	4,899	3.32	9.8	16,287
September 21	do	6,069	4.77	12.8	28,944
September 25	do	6,202	5.00	13.1	31,029
September 29	do	3,448	2.97	8.1	10,259
October 3	do	5,260	4.39	12.8	23,081
October 7	do	5,407	4.95	13.1	26,749
October 11	do	4,714	3.55	11.3	16,714
October 15	do	5,127	3.14	10.7	16,121
October 20	do	4,416	2.30	8.1	10,171
October 24	do	4,582	2.50	8.5	11,476
October 29	do	3,627	1.88	6.5	6,802
November 2	do	3,622	2.03	6.1	7,338
November 6	do	3,407	3.22	7.9	10,956
November 8	do	3,462	3.38	8.1	11,697
November 14	do	3,827	2.15	6.7	8,237
November 18	do	3,630	2.16	6.5	7,833
November 22	do	4,972	4.02	10.1	20,002
November 26	do	3,607	3.74	8.7	13,500
November 29	do	3,272	3.37	7.9	11,011
December 3	do	3,724	2.41	6.6	8,970
December 8	do	3,453	2.21	6.3	7,638
December 12	do	3,216	3.27	7.8	10,506
December 17	do	3,813	2.46	6.9	9,394
December 21	do	3,596	2.16	6.3	7,767
December 25	do	3,460	3.32	8.0	11,487
December 29	do	4,025	3.56	8.6	14,349

Daily gage height, in feet, of Rio Grande near Brownsville, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.45	3.2	2.7	6.1	7.4	11.05	12.7	10.7	9.5	12.75	6.2	7.05
2	5.35	3.4	2.7	5.75	7.5	10.35	13.0	10.9	8.9	13.1	6.1	6.85
3	5.15	3.4	2.9	5.55	6.3	11.8	13.1	11.3	8.4	12.95	6.65	6.65
4	4.95	3.4	3.15	5.65	6.05	12.5	13.15	11.55	8.0	11.45	11.55	6.55
5	4.85	3.45	3.35	9.0	6.15	11.7	13.4	11.1	7.7	10.85	10.1	6.45
6	4.65	3.6	3.4	9.25	6.3	11.05	13.5	10.65	7.45	12.65	8.05	6.3
7	4.6	3.45	3.45	6.75	6.3	9.7	13.5	10.45	7.2	13.1	7.4	6.3
8	4.5	3.25	5.85	5.6	6.2	8.8	13.5	10.25	7.35	13.05	8.1	6.3
9	4.35	3.1	7.7	5.3	6.05	8.55	13.5	9.9	7.35	13.0	8.35	6.9
10	4.25	3.05	7.7	5.2	6.1	8.45	12.95	9.6	7.15	12.25	7.9	7.7
11	4.25	2.95	6.0	5.15	6.45	8.4	11.65	9.4	6.95	11.25	7.45	8.0
12	4.15	2.9	5.05	5.1	6.6	8.55	10.9	9.55	6.75	11.65	7.25	7.7
13	4.25	2.9	5.1	5.0	6.5	8.9	10.6	9.65	6.75	11.55	6.95	7.35
14	4.1	2.9	6.1	5.0	7.35	9.0	10.3	9.75	7.5	11.1	6.75	7.2
15	4.0	2.9	6.1	4.95	7.5	9.05	9.7	9.5	11.0	10.5	6.55	7.1
16	3.95	2.9	5.85	4.9	6.85	9.35	9.15	9.15	10.95	9.7	6.4	7.05
17	3.9	2.9	5.7	4.8	7.7	10.15	8.95	9.9	9.8	9.0	6.4	6.9
18	3.8	2.9	5.7	4.75	7.75	10.7	8.75	10.95	9.75	8.65	6.5	6.8
19	3.8	2.9	6.95	4.65	6.6	11.35	10.45	10.5	9.55	8.4	8.95	6.65
20	3.7	2.9	7.55	4.45	6.1	11.75	12.4	10.4	9.75	8.15	9.7	6.45
21	3.6	2.9	6.6	4.4	6.1	12.0	10.8	10.75	12.85	8.15	9.3	6.3
22	3.5	3.0	6.15	4.25	6.1	12.05	9.05	10.5	13.05	8.95	10.15	6.15
23	3.5	3.1	6.1	4.1	6.1	12.5	8.3	10.3	13.25	8.5	10.15	6.55
24	3.5	3.1	6.35	4.05	6.1	12.7	9.2	10.7	13.4	8.5	9.4	7.8
25	3.5	2.9	6.5	3.85	6.75	12.65	9.6	11.5	12.25	8.35	9.1	8.0
26	3.4	2.9	6.65	3.8	6.8	12.3	9.3	11.65	9.75	7.6	8.8	7.9
27	3.3	2.8	6.7	4.6	6.95	12.05	9.8	9.65	8.75	6.9	8.45	7.8
28	3.2	2.8	6.65	6.55	9.4	12.3	10.4	9.15	8.35	6.65	8.05	8.5
29	3.2	.....	6.5	6.55	9.75	12.75	11.7	8.6	8.1	6.45	7.75	8.55
30	3.2	.....	6.35	6.1	10.4	12.8	11.4	9.2	8.0	6.35	7.3	8.2
31	3.2	.....	6.15	.....	10.6	.....	10.9	9.7	.....	6.25	.....	7.6

RIO SALADO NEAR GUERRERO, TAMAULIPAS, MEXICO.

This station was established in 1900 by the International (Water) Boundary Commission. The Salado is a torrential stream entering the Rio Grande from the Mexican side about 60 miles below Laredo, or 730 miles by river below El Paso. The town of Guerrero is located on the Salado some 4 miles above its mouth, and the gaging station is 2 miles above the town.

The river is a series of pools and rapids. The best pool available was chosen for the station. The river curves to the left both above and below the cable. The banks are sandy clay, not subject to erosion. The bottom is mud. In low water the river is measured by wading among rocks below the station.

Discharge measurements are made by means of a cable, car, and guy wire. The initial point for soundings is the cable support on the left bank.

The gage is an inclined scantling fastened to posts sunk in the bank. Low water (no flow) is −1 on the gage. The highest recorded flood, on June 16, 1903, gave 17.7 on gage.

The observations during 1905 were made under the direction of the Mexican section of the International (Water) Boundary Commission.

Discharge measurements of Rio Salado near Guerrero, Tamaulipas, Mexico, in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 3	D. de Lassaulx	1,789	0.51	3.6	916
January 7	do	1,766	.49	3.5	871
January 11	do	1,747	.46	3.4	795
January 15	do	1,726	.42	3.3	727
January 19	do	1,481	.43	3.2	638
January 23	do	1,687	.36	3.1	609
January 28	do	1,665	.34	3.0	560
February 1	do	1,650	.29	2.9	485
February 5	do	1,628	.26	2.8	431
February 9	do	1,610	.25	2.7	404
February 13	do	1,615	.25	2.6	405
February 17	do	1,586	.25	2.5	397
February 21	do	1,585	.25	2.5	395
February 25	do	1,565	.24	2.4	369
March 1	do	1,556	.23	2.3	352
March 5	do	1,631	.26	2.7	419
March 7	do	2,050	1.01	4.8	2,067
March 11	do	1,890	.76	4.0	1,441
March 18	do	1,729	.40	3.3	683
March 24	do	1,685	.32	3.0	539
March 28	do	1,624	.27	2.8	435
April 1	do	1,601	.27	2.7	428
April 5	do	1,583	.26	2.6	415
April 10	do	1,560	.26	2.4	401
April 14	do	1,531	.24	2.3	366
April 18	do	1,510	.23	2.2	350
April 22	do	1,492	.18	2.1	265
April 26	do	1,489	.17	2.0	249
May 2	do	1,632	.32	2.9	518
May 6	do	1,471	.18	2.1	268
May 10	do	1,411	.16	1.7	219
May 12	do	1,707	.38	3.3	656
May 17	do	1,482	.18	2.1	266
May 21	do	1,452	.16	1.9	239
May 26	do	2,421	2.26	6.75	5,479
May 30	do	2,520	2.46	7.2	6,194
June 3	do	1,698	.89	4.0	1,506
June 7	do	1,580	.49	3.4	773
June 11	do	1,475	.42	3.0	624
June 15	do	1,446	.29	2.7	423
June 20	do	1,366	.25	2.3	337
June 24	do	1,416	.31	2.8	436
June 28	do	2,076	1.86	6.0	3,861
July 3	do	2,384	3.03	8.2	7,218
July 7	do	1,762	1.43	5.2	2,523
July 12	do	1,774	1.29	4.9	2,282
July 16	do	1,708	1.23	4.7	2,095
July 20	do	1,695	1.34	5.0	2,275
July 23	do	1,784	1.67	5.5	2,984
July 27	do	1,716	1.41	5.1	2,423
August 1	do	1,681	1.19	4.9	1,992
August 5	do	1,599	1.07	4.6	1,718
August 9	do	1,559	.98	4.4	1,530

Discharge measurements of Rio Salado near Guerrero, Tamaulipas, Mexico, in 1905—Cont'd.

Date.	Hydrographer,	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
August 13	D. de Lassaulx	1,535	0.90	4.3	1,382
August 18	do	1,488	.83	4.0	1,238
August 23	do	1,469	.74	3.8	1,082
August 28	do	1,427	.71	3.7	1,007
September 2	do	1,405	.66	3.6	933
September 7	do	1,405	.62	3.5	870
September 15	do	1,371	.57	3.4	783
September 20	do	1,973	2.43	6.4	4,798
September 22	do	2,618	3.82	9.3	10,003
September 25	do	1,427	.83	3.8	1,182
September 29	do	1,368	.65	3.5	883
October 4	do	2,031	2.61	7.0	5,291
October 8	do	1,389	.77	3.8	1,069
October 12	do	1,354	.69	3.6	935
October 16	do	1,296	.61	3.3	791
October 21	do	1,907	2.23	6.4	4,261
October 26	do	1,260	.52	3.1	660
October 29	do	1,243	.50	3.0	616
November 2	do	1,460	.93	4.0	1,361
November 6	do	1,246	.45	3.0	559
November 10	do	1,225	.42	2.9	509
November 14	do	1,202	.40	2.8	478
November 18	do	1,207	.39	2.8	476
November 22	do	1,280	.48	3.2	611
November 27	do	1,208	.38	2.8	464
December 1	do	1,172	.38	2.7	445
December 6	do	1,223	.41	2.9	505
December 10	do	1,152	.37	2.6	422
December 15	do	1,152	.37	2.6	422
December 19	do	1,220	.41	2.9	505
December 23	do	1,193	.36	2.7	435
December 28	do	1,164	.36	2.6	418

Daily gage height, in feet, of Rio Salado near Guerrero, Tamaulipas, Mexico, for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.6	2.9	2.3	2.7	2.7	4.8	3.95	4.85	3.55	3.5	4.05	2.7
2	3.6	2.9	2.3	2.7	2.85	4.7	6.9	4.8	3.55	3.4	4.0	2.7
3	3.6	2.9	2.3	2.6	2.45	5.2	8.35	4.75	3.5	3.4	3.6	2.7
4	3.5	2.8	2.45	2.6	2.25	5.4	9.4	4.7	3.5	7.1	3.2	2.7
5	3.5	2.8	2.7	2.6	2.15	4.1	5.9	4.6	3.55	5.9	3.0	2.6
6	3.5	2.8	4.55	2.6	2.05	3.7	5.45	4.6	3.6	4.65	3.0	2.85
7	3.5	2.7	4.75	2.5	2.0	4.0	5.2	4.5	3.5	4.0	3.0	2.75
8	3.5	2.7	4.1	2.5	2.1	4.0	5.15	4.5	3.5	3.8	2.9	2.7
9	3.5	2.7	3.2	2.5	1.8	3.4	5.15	4.5	3.5	3.75	2.9	2.65
10	3.5	2.7	3.8	2.4	2.5	3.25	5.05	4.4	3.4	3.65	2.9	2.6
11	3.4	2.7	3.85	2.4	3.4	3.0	5.0	4.45	3.4	3.5	2.8	2.6
12	3.4	2.7	3.25	2.4	3.15	3.0	4.9	4.3	3.4	3.8	2.85	2.65
13	3.4	2.6	3.0	2.4	2.8	2.9	4.9	4.3	3.4	3.55	2.85	2.7
14	3.3	2.6	3.0	2.3	3.0	2.8	4.8	4.2	3.4	3.4	2.8	2.7
15	3.3	2.6	2.9	2.3	2.55	2.7	4.8	4.15	3.4	3.3	2.8	2.6
16	3.3	2.5	2.9	2.3	2.4	2.6	4.7	4.1	3.4	3.3	2.8	2.6
17	3.3	2.5	3.15	2.2	2.1	2.5	5.9	4.1	3.3	3.3	2.8	2.6
18	3.3	2.5	3.3	2.2	2.2	2.4	4.85	4.0	3.3	3.2	2.8	2.65
19	3.2	2.75	3.25	2.2	2.2	2.35	5.4	4.0	4.7	3.2	4.3	2.85
20	3.2	2.55	3.15	2.2	1.9	2.3	4.9	3.95	6.7	3.6	4.6	2.85
21	3.2	2.5	3.5	2.1	1.85	3.05	5.7	3.9	7.75	6.2	3.15	2.85
22	3.2	2.5	3.85	2.1	1.8	3.2	5.75	3.9	9.3	6.2	3.3	2.95
23	3.2	2.5	3.3	2.1	1.7	2.95	5.45	3.8	4.95	4.05	3.05	2.85
24	3.1	2.5	3.05	2.1	1.7	2.7	5.35	3.8	4.25	3.45	2.95	2.7
25	3.1	2.4	3.0	2.1	3.9	2.5	5.25	3.8	3.85	3.3	2.9	2.7
26	3.1	2.4	3.0	2.0	7.1	2.35	5.2	3.7	3.75	3.1	2.85	2.6
27	3.0	2.4	2.9	2.0	4.3	3.6	5.1	3.7	3.65	3.1	2.8	2.6
28	3.0	2.4	2.8	2.2	4.7	5.9	5.05	3.7	3.55	3.0	2.8	2.6
29	3.0	.....	2.8	2.3	5.7	4.8	5.0	3.65	3.5	3.0	2.8	2.6
30	3.0	.....	2.8	2.0	7.3	4.0	4.9	3.6	3.5	3.0	2.7	2.6
31	2.9	.....	2.8	.....	5.6	.....	4.9	3.6	.....	3.0	.....	2.5

RIO SAN JUAN NEAR SANTA ROSALIA RANCH, TAMAULIPAS, MEXICO.

This station was established in 1900 by the International (Water) Boundary Commission. The San Juan is a long torrential stream entering the Rio Grande 15 miles below Roma and 790 miles by river below El Paso. Six miles above its mouth is the town of Camargo. The station was first placed 12 miles above Camargo, but in time of heavy flood in the Rio Grande backwater reached the station, and on July 14, 1902, it was moved 6 miles farther upstream to its present location. It is now above backwater.

Both banks are sandy clay which are above high water and do not erode. The bottom is sand, which erodes slightly in flood.

Discharge measurements are made by means of a cable, car, and guy wire. The initial point for soundings is the cable support at the right bank.

The gage is an inclined scantling spiked to posts and a tree. Low water (no flow) is 0 on the gage. The highest recorded flood, on September 16, 1904, reached 27 feet on the gage.

The observations during 1905 were made under the direction of the Mexican section of the International (Water) Boundary Commission.

Discharge measurements of Rio San Juan near Santa Rosalia ranch, Tamaulipas, Mexico, in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 4	S. Jaso	666	0.31	2.5	209
January 9	do	659	.25	2.5	165
January 14	do	626	.26	2.3	160
January 18	do	621	.19	2.2	117
January 21	do	618	.18	2.2	113
January 26	do	600	.12	2.0	74
January 30	do	614	.13	2.0	81
February 4	do	591	.13	2.0	77
February 8	do	601	.14	1.95	82
February 12	do	543	.11	1.7	58
February 16	do	545	.10	1.7	54
February 20	do	583	.12	2.0	69
February 24	do	636	.17	2.3	109
February 28	do	587	.11	2.0	63
March 4	do	567	.10	1.9	57
March 6	do	817	.72	3.4	586
March 8	do	1,839	1.82	7.2	3,345
March 13	do	609	.29	2.2	176
March 17	do	658	.40	2.6	264
March 21	do	630	.36	2.5	227
March 25	do	596	.33	2.2	194
March 29	do	552	.20	1.9	113
April 3	do	614	.32	2.4	198
April 7	do	453	.12	1.4	53
April 12	do	486	.15	1.6	74
April 20	do	434	.12	1.25	52
April 24	do	748	.58	3.35	436
April 28	do	493	.10	1.4	49
May 3	do	414	.12	1.3	49
May 8	do	1,466	1.51	6.45	2,191
May 9	do	877	.89	3.95	778
May 12	do	448	.16	1.7	72
May 17	do	344	.09	1.1	30
May 22	do	308	.08	.9	25
May 26	do	310	.08	1.0	26
May 31	do	2,431	2.53	10.25	6,142
June 2	do	3,736	3.92	15.65	14,663
June 3	do	2,794	2.41	11.7	6,741
June 5	do	1,283	1.98	5.65	2,541
June 9	do	541	.66	3.2	355
June 13	do	389	.34	2.3	132
June 17	do	307	.21	1.75	66
June 22	do	970	1.34	4.1	1,296
June 27	do	359	.44	2.55	158
July 3	do	312	.22	1.8	69
July 7	do	256	.10	1.3	25
July 11	do	219	.07	1.0	16
July 15	do	202	.07	.9	15
July 16	do	491	.74	3.0	361
July 18	do	3,883	4.04	16.35	15,676
July 19	do	1,748	2.58	10.1	4,518
July 25	do	288	.44	2.3	127

Discharge measurements of Rio San Juan near Santa Rosalia ranch, Tamaulipas, Mexico, in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
July 31	S. Jaso	190	0.14	1.5	27
August 4	do	167	.12	1.3	20
August 9	do	151	.08	1.1	12
August 11	do	371	.91	2.9	338
August 14	do	229	.29	1.8	66
August 18	do	153	.15	1.2	23
August 22	do	135	.08	.9	11
August 26	do	118	.08	.8	10
August 30	do	108	.06	.7	7
September 4	do	101	.06	.5	6
September 17	do	382	.90	2.8	345
September 19	do	626	2.16	4.85	1,354
September 20	do	3,955	4.57	16.5	18,071
September 21	do	2,521	3.35	13.15	8,444
September 25	do	653	1.77	5.05	1,155
September 29	do	231	.56	2.2	129
October 3	do	180	.30	1.7	54
October 4	do	1,485	2.68	6.55	3,973
October 7	do	2,620	3.52	13.65	9,230
October 8	do	1,761	3.28	10.2	5,781
October 9	do	1,386	2.35	8.0	3,262
October 11	do	605	1.45	4.7	875
October 13	do	1,481	2.63	8.6	3,899
October 16	do	580	1.30	4.5	756
October 21	do	470	.82	3.3	387
October 26	do	462	.82	3.2	378
November 3	do	2,170	3.77	14.7	8,179
November 6	do	1,661	3.39	11.2	5,625
November 9	do	1,614	2.54	8.75	4,102
November 13	do	1,083	1.92	6.6	2,077
November 18	do	954	1.87	5.9	1,786
November 21	do	1,844	2.41	10.75	4,445
November 27	do	917	1.42	4.9	1,305
December 3	do	960	1.15	4.4	1,104
December 9	do	1,050	1.72	5.45	1,801
December 14	do	709	1.40	4.3	990
December 18	do	712	1.23	4.2	875
December 22	do	638	1.14	3.9	727
December 27	do	600	.98	3.7	586
December 30	do	636	.76	3.6	485

Daily gage height, in feet, of Rio San Juan near Santa Rosalia Ranch, Tamaulipas, Mexico, for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.6	2.0	2.0	1.7	1.4	7.4	2.05	1.5	0.6	1.95	4.75	4.6
2	2.6	3.25	2.0	1.7	1.35	14.1	1.95	1.4	.6	1.75	19.3	4.55
3	2.6	2.3	1.9	2.2	1.3	10.4	1.75	1.4	.6	3.5	14.45	4.4
4	2.5	2.0	1.9	1.7	1.3	10.55	1.6	1.3	.5	6.6	9.95	4.3
5	2.5	1.9	2.6	1.6	1.3	6.0	1.5	1.3	.5	5.4	8.25	4.3
6	2.5	1.9	3.8	1.5	1.3	5.2	1.4	1.3	.5	4.55	10.35	4.35
7	2 5	1.9	4.1	1.4	1.25	4.35	1.25	1.2	.....	11.9	11.7	4.5
8	2.5	1.9	6.6	1.4	4.6	3.45	1.1	1.3	.....	11.3	10.95	4.7
9	2.5	2.0	4.2	1.45	3.5	3.05	1.1	1.1	.....	7.35	8.7	5.45
10	2.4	1.95	3.2	1.5	2.45	2.65	1.0	1.1	.....	5.45	9.35	5.3
11	2.4	1.85	2.45	1.6	1.95	2.55	1.0	2.95	.....	4.55	8.0	4.15
12	2.35	1.75	2.3	1.55	1.8	2.4	1.0	2.7	.....	6.9	6.9	4.5
13	2.3	1.7	2.2	1.5	1.65	2.25	.95	1.95	.....	8.5	6.6	4.4
14	2.3	1.8	2.2	1.5	1.45	2.15	.9	1.75	.....	5.65	6.6	4.3
15	2.2	1.8	2.65	1.4	1.3	1.95	.9	1.55	.....	4.9	6.65	4.3
16	2.2	1.7	2.5	1.4	1.2	1.85	2.9	1.45	.....	4.45	6.5	4.25
17	2.2	1.7	2.8	1.4	1.1	1.7	6.2	1.35	2.35	4.1	5.85	4.2
18	2.2	1.7	2.85	1.3	1.1	1.6	15.2	1.15	2.5	3.85	5.75	4.2
19	2.2	2.15	2.7	1.3	1.05	1.55	11.45	1.1	4.0	3.65	5.65	4.1
20	2.2	2.0	2.6	1.25	1.0	1.5	6.15	1.0	14.5	3.55	5.55	4.1
21	2.2	1.95	2.5	1.2	.9	1.7	5.1	.95	11.75	3.25	9.1	3.9
22	2.15	2.1	2.4	1.2	.9	5.65	3.25	.9	6.15	3.35	6.75	3.9
23	2.1	2.2	2.35	1.2	.9	4.85	2.75	.9	4.3	3.45	5.95	3.9
24	2.1	2.3	2.3	2.25	.9	3.6	2.45	.85	3.25	3.35	5.55	3.9
25	2.0	2.25	2.2	2.6	.95	3.3	2.25	.8	3.9	3.3	5.3	3.8
26	2.0	2.2	2.05	2.1	1.0	3.35	2.05	.8	3.85	3.2	5.2	3.7
27	2.0	2.1	2.0	1.4	1.0	3.35	1.9	.7	2.75	3.1	4.9	3.7
28	2.0	2.0	1.95	1.35	1.0	3.15	1.8	.7	2.35	3.1	4.8	3.7
29	2.0	.....	1.9	1.3	1.0	2.35	1.7	.7	2.15	3.0	4.7	3.6
30	2.0	.....	1.85	1.25	1.0	1.95	1.6	.7	2.0	3.0	4.6	3.6
31	2.0	.....	1.7	.....	8.5	.....	1.5	.7	.....	3.0	.....	3.6

NOTE.—No flow September 7-16.

CONEJOS RIVER NEAR MOGOTE, COLO.

Conejos River is the largest tributary of the Rio Grande in Colorado. Its source is the slopes of Conejos Peak and adjoining mountains, which have a general altitude of 12,000 feet. The general course is very irregular. Half of this course is in canyon, while the lower half is through the broad, almost level San Luis Valley. The lower basin is composed of gravelly mesas which merge into the level valley lands below. Rainfall data collected at Conejos by the United States Weather Bureau for a few months give the mean annual rainfall as 10 inches. The precipitation increases with the altitude to approximately 20 inches in the head waters. Irrigation as heretofore practiced has been very crude, and almost the entire normal flow of the river at low water is required for the numerous small ditches which render cultivation possible.

This station was established August 25, 1899, by A. L. Fellows, and is located 500 feet below the highway bridge 4 miles above Mogote, Colo., in T. 33 N., R. 7 W., New Mexico principal meridian. The nearest railroad station is Antonito, Colo., 12 miles east. This station was discontinued in the fall of 1900 and reestablished in the spring of 1903. The fact that Conejos River is the chief tributary of the Rio Grande in Colorado makes this station of importance, as it is above all diversions, of which there are a great many in Conejos Valley. A number of storage reservoirs are proposed for this basin.

The channel at the gage has a very gentle curve, and the bed is composed of small bowlders and cobblestones. The banks are low, of alluvial material, and will overflow during very high water. At extremely high stages, water passes through low depressions around both sides of the channel and is not registered on the gage. Such was the case during the extreme high water of June, 1905. The velocity is moderate at low water at this section. At the highway bridge above the gage the channel is 90 feet in width, with a 9-foot crib pier breaking the current at the center of stream. The section is not uniform, and is composed of bowlders and cobblestones. During the high water of June a considerable volume of water passed around the right end, running over the bridge to a depth of about 6 inches. This high water also eroded the channel greatly and changed its alignment for 1 mile above and many miles below. During August and the remaining portion of the year this section was partially obstructed by a temporary rock and log dam extending at a slight angle upstream and under the left span of the bridge. This dam was for the purpose of diverting water for irrigation and will probably go out with high water. At low water the velocity is moderate at the station, and at high stages it is very swift.

Discharge measurements are made at the gage rod during low water, and from the downstream side of the highway bridge during high water. The initial point for soundings is the face of the right abutment.

The gage is an inclined staff fastened to a large stump on the left bank of the river at Mr. King's ranch. Gage heights range from 1 to 6 feet on the gage. During 1905 the gage was read twice each day by Miss Nellie King. The bench mark is the center of three 20-penny nails driven into the base of a large cottonwood tree, 300 feet south of gage; elevation, 7.87 feet above the datum of the gage.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: WS 37, pp 278–279; 50, p 348; 99, p 397; 132, p 94.
Discharge: WS 37, p 279; 50, p 348; 99, p 398; 132, p 95.
Discharge, monthly: Ann 22, iv, p 348; 99, p 399; 132, p 96.
Gage heights: WS 37, p 279; 50, p 348; 99, p 398; 132, p 95.
Rating tables: WS 52, p 519; 99, p 399; 132 p 96.
Seepage computations: WS 50, p 306.

Discharge measurements of Conejos River near Mogote, Colo., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
April 21	R. I. Meeker	76	162	2.01	2.20	328
June 22	do	81	289	4.69	3.65	1,356
July 27	do	66	151	1.64	2.00	246
September 19[a]	do	65	61	1.02	1.30	62

[a] Wading at gage rod.

Daily gage height, in feet, of Conejos River near Mogote, Colo., for 1905.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	1.65	3.4	4.8	3.2	1.7	1.7	1.6
2	1.4	3.4	5.1	3.0	2.2	1.6	1.55
3	1.5	3.0	5.15	3.0	2.25	1.5	1.5
4	1.55	2.8	5.55	3.35	2.4	1.5	1.4
5	1.6	2.7	5.65	3.6	2.1	1.55	1.4
6	1.6	2.55	4.4	3.65	2.2	1.55	1.4
7	1.75	2.7	5.05	2.35	2.2	1.6	1.35
8	1.85	2.85	5.35	2.65	2.15	1.5	1.3
9	2.0	3.0	5.05	2.4	2.05	1.5	1.3
10	2.1	2.85	4.9	2.55	1.9	1.5	1.3
11	2.0	2.75	4.85	2.55	2.25	1.5	1.2
12	2.0	2.75	4.7	2.45	2.1	1.4	1.2
13	2.05	3.0	4.7	2.4	1.9	1.4	1.2
14	2.0	3.1	4.6	2.4	1.9	1.4	1.2
15	2.1	3.55	4.7	2.5	1.8	1.4	1.2
16	2.05	3.9	4.55	2.5	1.7	1.4	1.2
17	2.15	4.15	4.3	2.3	1.7	1.3	1.3
18	2.2	4.3	4.2	2.2	1.65	1.35	1.3
19	2.35	4.35	4.1	2.25	1.6	1.3	1.3
20	2.2	4.45	3.95	2.4	1.65	1.3	1.3
21	2.25	4.45	3.8	2.45	1.6	1.3	1.3
22	2.35	4.5	3.7	2.45	1.6	1.3	1.3
23	2.3	4.6	3.8	2.4	1.6	1.3	1.4
24	2.2	4.75	3.7	2.2	1.6	1.25	1.5
25	2.2	4.75	3.6	2.1	1.8	1.25	1.5
26	2.3	4.85	3.55	2.0	1.7	1.4	1.4
27	2.5	4.8	3.55	2.05	1.7	1.4	1.4
28	2.7	4.6	3.5	2.2	1.65	1.4	1.4
29	2.9	4.05	3.4	2.4	1.75	1.4	1.4
30	3.05	4.25	3.3	2.3	1.7	1.65	1.4
31	.....	4.5	.....	2.15	1.7	.....	1.4

Station rating table for Conejos River near Mogote, Colo., from April 1 to June 5, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
1.40	25	2.40	425	3.40	1,120	4.40	2,180
1.50	55	2.50	480	3.50	1,210	4.50	2,300
1.60	85	2.60	540	3.60	1,310	4.60	2,430
1.70	120	2.70	600	3.70	1,410	4.70	2,560
1.80	155	2.80	660	3.80	1,510	4.80	2,690
1.90	190	2.90	725	3.90	1,610	4.90	2,820
2.00	230	3.00	795	4.00	1,720	5.00	2,950
2.10	275	3.10	870	4.10	1,830	5.20	3,230
2.20	320	3.20	950	4.20	1,940	5.40	3,510
2.30	370	3.30	1,030	4.30	2,060	5.60	3,800

The above table is applicable only for open channel conditions. It is based on one discharge measurement made during 1905 and on 1904 measurements. It is not well defined.

Station rating table for Conejos River near Mogote, Colo., from June 6 to October 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
1.20	45	2.30	375	3.40	1,120	4.50	2,300
1.30	60	2.40	425	3.50	1,210	4.60	2,430
1.40	80	2.50	480	3.60	1,310	4.70	2,560
1.50	100	2.60	540	3.70	1,410	4.80	2,690
1.60	125	2.70	600	3.80	1,510	4.90	2,820
1.70	155	2.80	660	3.90	1,610	5.00	2,950
1.80	185	2.90	725	4.00	1,720	5.10	3,090
1.90	215	3.00	795	4.10	1,830	5.20	3,230
2.00	250	3.10	870	4.20	1,940	5.30	3,370
2.10	290	3.20	950	4.30	2,060	5.40	3,510
2.20	330	3.30	1,030	4.40	2,180		

The above table is applicable only for open channel conditions. It is based on three discharge measurements made during 1905. It is not well defined.

Estimated monthly discharge of Conejos River near Mogote, Colo., for 1905.

[Drainage area, 282 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
April	832	25	297	17,670	1.05	1.17
May	2,755	510	1,544	94,940	5.48	6.32
June	3,875	1,030	2,226	132,500	7.89	8.80
July	1,360	250	528	32,460	1.87	2.16
August	425	125	213	13,100	.755	.870
September	155	52	87.4	5,201	.310	.346
October	125	45	71.5	4,396	.254	.293
The period				300,300		

PECOS RIVER AT SANTA ROSA, N. MEX.

This station was established May 5, 1903, by H. C. Hurd. It was originally located at the bridge of the Chicago, Rock Island and Pacific Railway, but was moved later in the year to a point 335 feet above the railway bridge.

The bed of the river is solid rock, overlaid by quicksand to the depth of 2 or 3 feet in the long dry season. The current is never sluggish and becomes very swift during the time of floods. The channel is straight for one-fourth mile above and below the station. Both banks are high and can not overflow.

Discharge measurements are made by means of a cable. The initial point for soundings is the left end of the cable.

The original gage was a staff bolted to the masonry footing of the east tower. During the great flood of September 29 and 30, 1904, the upper portion of the gage rod was torn away, but the lower portion was left intact. A new gage was installed on the east side of the second pier to replace the one which was torn out. This new portion of the gage is bolted to the east face of the second pier from the north end of the bridge. The same flood cut away the earth from the face of the north abutment, leaving the bench mark about 25 feet above the ground and inaccessible, so in establishing the new gage reference was made to the old gage which had not been moved by the flood. During 1905 the gage was read once each day by L. M. Shely. Bench marks were established as follows: (1) A shelf cut in the east abutment; elevation, 29.70 feet. (2) A chiseled surface on the east side of the first pier from the north end of the bridge, near the top of the second stone from

the downstream end of the pier, in the second tier of stones from the bed rock, marked "B. M."; elevation, 6.41 feet. (3) The top of the downstream end of retaining wall on the east side of the river; elevation, 14.60 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 99, pp 363-364; 132, p 97.
Discharge: 99, p 364; 132, p 97.
Gage heights: 99, pp 364-365; 132, p 98.

Discharge measurements of Pecos River at Santa Rosa, N. Mex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage Height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second feet.*
May 2	J. M. Giles	96	236	5.61	2.50	1,321
June 2	E. Patterson	93	196	5.28	2.10	1,035
June 5	do	93	195	5.88	2.30	1,145
July 3	do	78	37	1.49	1.10	55
July 7	do	26	14	1.03	.80	14.5
August 21	Giles and Patterson	25	12	1.19	.72	14.8
August 23	E. Patterson	24	12	1.16	.71	13.9
October 8	do	24	11	1.09	.81	12
October 24	J. M. Giles	26	13	1.16	.80	15
November 17	E. Patterson	18	10	1.19	.87	12

Daily gage height, in feet, of Pecos River at Santa Rosa, N. Mex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.5	0.5	1.5	1.0	1.5	2.6	1.5	1.2	0.7	0.7	0.8	1.5
2	.5	.5	1.6	1.0	2.5	2.1	1.5	3.0	.7	.7	.8	1.0
3	.5	.5	2.0	1.0	2.5	2.0	1.5	2.5	.7	.7	.8	1.0
4	.5	.5	2.0	1.0	2.5	3.05	1.0	2.5	1.5	.7	.8	1.0
5	.5	.5	2.5	1.0	2.5	2.2	.9	2.0	1.5	.7	.8	.8
6	.5	.5	3.0	1.0	2.5	2.1	.8	2.0	1.0	.7	.8	.8
7	.5	.5	3.0	1.0	3.0	1.9	.8	1.5	.9	.7	.9	.8
8	.5	.6	2.0	1.5	2.5	2.0	.8	1.5	.9	.7	.8	.8
9	.5	.6	2.0	1.5	2.5	3.0	.8	1.5	.9	.8	1.0	.8
10	.5	.6	2.0	1.5	2.5	2.3	.8	1.5	.9	.8	1.1	.8
11	.5	.6	2.0	2.5	2.5	2.0	.7	1.5	.9	.8	.9	.8
12	.5	.6	1.5	2.5	2.5	2.5	.7	2.5	1.3	.8	.9	.8
13	.5	.6	1.5	1.5	2.5	2.5	.7	2.0	1.0	.8	.9	.8
14	.5	.6	1.5	1.5	3.0	2.0	.7	1.5	1.0	.8	.9	.9
15	.4	.6	1.4	1.5	2.5	1.7	.7	1.5	1.0	.8	.9	.8
16	.4	.6	1.4	1.5	2.5	1.7	.7	1.5	1.0	.8	.9	.6
17	.4	.6	1.4	1.5	2.5	1.0	.7	1.0	.8	.8	.9	.6
18	.4	.6	1.4	1.5	2.5	1.0	.7	.9	.8	.8	.9	.6
19	.4	.6	1.4	1.5	2.5	1.0	.7	.8	.8	.8	.9	.5
20	.4	.8	1.4	1.5	2.5	1.0	.7	.7	.7	.8	.9	.5
21	.4	.8	1.4	1.5	2.5	1.0	.9	.7	.7	.8	.9	.5
22	.4	1.0	1.4	1.5	2.5	1.0	2.5	.7	.7	.8	.9	.5
23	.4	1.5	1.4	3.5	2.5	1.0	1.5	.7	.7	.8	4.0	.5
24	.4	1.5	1.4	3.0	2.8	1.0	1.5	.7	.7	.8	2.5	.5
25	.4	3.0	1.4	3.0	3.0	1.0	1.5	.7	.7	.8	1.5	.6
26	.4	1.5	1.4	2.5	2.5	1.5	1.0	.7	.7	.8	1.5	.6
27	.4	1.5	1.4	2.5	2.5	1.5	1.0	.7	.7	.8	3.0	.6
28	.4	1.5	1.4	2.5	2.5	1.5	1.0	.7	.7	.8	1.0	.6
29	.5	.....	1.4	2.5	2.5	1.5	1.0	.7	.7	.8	2.0	.6
30	.5	.....	1.4	3.0	2.5	1.5	1.0	.7	7	.8	1.6	.6
31	.5	.....	1.4	.....	2.0	.....	1.0	.7	.....	.8	.....	.6

PECOS RIVER NEAR FORT SUMNER, N. MEX.

This station was established June 12, 1904, by Earl Patterson. It is located about 12 miles northwest of Fort Sumner, N. Mex., and 45 miles south of Santa Rosa, N. Mex., the nearest railway station. It was originally located 1 mile upstream from the spring, trees, and houses known as Arinosa, but was relocated July 5, 1905, near the spring.

Both banks are high and will not overflow except in extreme high water. The bed of the river is clean, shifting sand.

Discharge measurements are made by wading at or near the gage.

The gage is an inclined staff bolted to a ledge of sandstone on the right bank. During 1905 the gage was read twice each day by J. C. Pacheco. Bench marks were established as follows: (1) The head of a bolt set in the rock 14 feet upstream from gage; elevation, 7.48 feet. (2) A cross cut in the sandstone ledge 5 feet downstream from gage; elevation, 7.11 feet. Elevations refer to the datum of the gage.

A description of this station and gage height and discharge data are contained in Water-Supply Paper No. 132 of the United States Geological Survey, pp. 98101.

Discharge measurements of Pecos River near Fort Sumner, N. Mex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second feet.*
July 4	E. Patterson	84	68	1.56	1.40	107
July 6	do	91	55	1.55	1.30	86
August 22	Giles and Patterson	46	52	1.64	1.40	85
October 9	E. Patterson	75	62	1.48	1.45	92
November 18	do	80	59	1.60	1.50	95
(a)	J. M. Giles		200	1.76	2.00	352
(a)	do		405	2.70	3.00	1,093
(a)	do		615	3.36	4.00	2,066

[a] Computed from slope measurement, using Kutter's formula.

Daily gage height, in feet, of Pecos River near Fort Sumner, N. Mex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.4	0.3	2.95	1.3	2.3	2.3	1.4	1.8	1.4	1.4	1.55	1.75
2	.4	.3	2.6	1.35	2.4	2.2	1.7	1.5	1.4	1.4	1.5	1.8
3	.4	.3	2.25	1.3	2.45	2.25	1.55	2.0	1.4	1.4	1.55	1.75
4	.4	.8	2.0	1.3	2.4	1.95	1.45	1.72	1.4	1.4	1.65	1.65
5	.4	.8	.85	1.2	2.2	2.8	1.4	2.22	3.2	1.4	1.55	1.65
6	.4	.8	.75	1.3	2.15	2.3	1.3	1.87	1.6	1.4	1.6	1.65
7	.4	.8	.7	1.3	1.95	2.25	1.4	1.87	1.5	1.4	1.6	1.75
8	.4	.9	1.1	1.2	2.05	2.1	1.35	2.15	1.6	1.4	1.6	1.7
9	.4	.7	1.0	1.2	2.25	2.4	1.4	1.85	1.6	1.45	1.7	1.65
10	.4	.6	1.25	1.2	2.3	2.45	1.4	1.77	1.5	1.5	1.7	1.6
11	.4	.6	1.3	1.35	2.3	2.6	1.4	1.7	1.7	1.5	1.7	1.75
12	.4	.6	1.2	1.6	2.2	2.35	1.4	1.9	1.5	1.45	1.65	1.8
13	.4	.6	1.2	1.7	2.0	2.3	1.4	2.3	1.5	1.45	1.6	1.95
14	.4	.6	1.2	1.4	2.05	2.35	1.4	1.77	1.45	1.45	1.6	1.7
15	.4	.6	1.2	1.4	2.15	2.2	1.4	1.52	1.45	1.45	1.55	1.75
16	.4	.6	1.2	1.5	2.2	2.1	1.35	1.5	1.4	1.4	1.6	1.7
17	.4	.6	1.15	1.5	2.35	1.9	1.35	1.47	1.35	1.45	1.55	1.7
18	.3	.6	1.1	1.45	2.4	1.8	1.35	1.42	1.3	1.45	1.5	1.7
19	.3	.6	1.0	1.75	2.55	1.9	1.35	1.42	1.35	1.4	1.5	1.75
20	.3	.5	.9	1.6	3.1	1.8	1.35	1.4	1.35	1.4	1.55	1.75
21	.3	.6	.8	1.7	2.95	1.8	1.4	1.4	1.3	1.4	1.6	1.7
22	.3	.7	1.1	1.7	2.5	1.9	2.1	1.4	1.3	1.4	1.65	1.6
23	.3	1.3	1.0	2.7	3.3	1.75	2.0	1.4	1.35	1.45	2.2	1.5
24	.4	1.55	.9	2.95	2.75	1.7	1.7	1.45	1.35	1.45	2.7	2.25
25	.4	1.2	.8	2.95	2.9	1.7	1.6	1.45	1.35	1.5	2.1	1.95
26	.4	1.05	.8	2.4	2.25	1.7	1.6	1.4	1.35	1.5	1.75	1.85
27	.4	.9	.9	2.2	2.25	1.6	1.6	1.4	1.35	1.5	1.6	1.85
28	.4	.9	.95	2.45	2.5	1.6	1.5	1.4	1.45	1.5	1.7	1.8
29	.4	.....	1.0	2.45	2.4	1.6	1.5	1.4	1.4	1.5	1.85	1.8
30	.3	.....	1.1	2.35	2.4	1.5	1.52	1.4	1.5	1.6	2.1	1.75
31	.3	.....	1.0	.....	2.3	.....	1.45	1.4	.....	1.55	.....	2.4

Daily discharge, in second-feet, of Pecos River near Fort Sumner, N. Mex., for 1905.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	260	85	90	120	225
2	.....	120	85	90	110	260
3	.....	360	85	90	115	225
4	.....	220	85	90	135	180
5	105	490	1,250	90	110	180
6	85	295	170	90	120	180
7	105	295	130	90	115	225
8	95	450	170	90	110	200
9	105	285	170	95	130	180
10	105	245	130	105	130	140
11	105	210	215	105	130	210
12	105	310	130	95	120	240
13	105	550	130	95	110	325
14	105	245	117	95	110	200
15	105	128	117	95	100	210
16	95	120	105	90	105	200
17	95	110	95	95	100	200
18	95	90	85	95	95	200
19	95	90	85	90	95	210
20	95	85	95	90	100	210
21	105	85	85	90	105	190
22	420	85	85	90	115	140
23	360	85	95	95	480	95
24	215	102	95	95	825	500
25	170	102	95	105	420	325
26	170	85	95	105	230	265
27	170	85	97	105	157	265
28	130	85	117	105	210	240
29	130	85	105	105	280	240
30	130	85	130	160	420	210
31	117	85	.....	130	.....	600

NOTE.—Daily discharge determined by indirect method as applied to shifting channels. As no measurements were made prior to July 4, no estimates have been made for that period.

Estimated monthly discharge of Pecos River near Fort Sumner, N. Mex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
July 5-31	420	85	138	7,391
August	550	85	191	11,740
September	1,250	85	151	8,985
October	160	90	98.4	6,050
November	825	95	183	10,890
December	600	95	235	14,450
The period	.....	.....	.....	59,510

PECOS RIVER NEAR ROSWELL, N. MEX.

This station was established April 24, 1903, by W. M. Reed. It is located at the highway bridge 8 miles southeast of Roswell, N. Mex., and about 200 feet below the mouth of Hondo River.

The channel is straight for one-half mile above and below the station and has a width at low water of about 50 feet and at ordinary high water of 430 feet. The channel is broken by

two iron piers. The current is rapid except near the mouth of Hondo River, where it becomes sluggish. At high water the Pecos and the Hondo join above the bridge. The gage heights on the Pecos may be affected by back water at periods when the Pecos is low and the Hondo is high. Both banks are high and free from timber, but they overflow at extreme flood stages. The bed is sandy and shifting, and the cross section changes during each flood.

Discharge measurements are made from the highway bridge. The initial point for soundings is a zero marked on the guard rail at the west end and north side of the bridge.

The original gage is painted on the right side of the right pier of the bridge. September 15, 1905, a standard chain was bolted to the upstream fencing of the bridge 325 feet from the initial point for soundings; length of chain, 26.45 feet. During 1905 the gage was read twice each day by Miss Dovie Goldsmith. Bench marks were established as follows: (1) The top of the pier upon which the original gage is painted; elevation, 20.10 feet. (2) The top of angle bar connecting fencing with first upright east of pier on which the gage is painted; elevation, 25.17 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 99, p 360; 132, p 101.
Discharge: 99, p 360; 132, p 102.
Gage heights: 99, p 361; 132, p 102.

Discharge measurements of Pecos River near Roswell, N. Mex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
February 28	E. Patterson	290	433	2.10	2.90	910
March 28	F. S. Dobson	164	260	1.65	2.00	431
April 12	Giles and Mitchell	176	274	2.21	2.55	605
April 26	E. Patterson	317	729	4.53	4.50	3,305
April 28	do	304	415	3.13	3.40	1,300
May 23	do	364	682	4.48	4.50	3,059
June 14	do	362	535	2.92	3.70	1,565
July 10	do	106	74	.85	2.30	63
July 18	do	36	39	.81	1.90	32
July 24	do	370	765	4.74	5.80	3,631
July 25	do	371	1,300	5.25	6.80	6,821
July 27	do	223	618	4.47	4.50	2,761
August 2	J. M. Giles	210	377	1.90	3.40	721
August 9	E. Patterson	379	498	3.26	3.80	1,625
August 26	do	112	133	.80	1.80	106
August 28	do	120	108	.71	1.70	77
September 4	do	104	96	.76	1.70	74
September 6	do	219	1,063	5.88	5.90	6,259
September 7	do	204	541	2.45	3.50	1,327
September 8	do	214	430	3.10	3.60	1,336
September 9	do	150	198	2.38	2.80	472
September 11	do	137	187	2.19	2.75	409
October 4	do	102	113	1.35	2.45	153
October 13	do	101	85	1.04	2.25	89
October 13	J. M. Giles	90	92	1.14	2.25	105
October 23	E. Patterson	101	89	1.07	2.30	97
October 30	do	100	93	1.04	2.30	97
November 5	do	.....	270	1.23	3.00	333
November 10	do	.....	328	1.93	3.00	634
November 24	J. M. Giles	.....	710	3.20	4.10	2,273
November 25	do	.....	686	2.81	4.00	1,928
December 11	E. Patterson	180	308	1.28	2.60	398

Daily gage height, in feet, of Pecos River near Roswell, N. Mex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.2	1.2	2.5	2.3	3.3	3.5	2.5	3.3	1.8	2.1	2.5	3.5
2	1.2	1.2	2.5	3.0	3.35	3.4	2.5	3.0	1.8	2.1	2.5	3.2
3	1.2	1.2	2.3	2.45	3.2	3.4	2.5	4.0	1.8	2.2	2.6	3.2
4	1.2	1.2	2.3	2.3	3.2	3.4	2.5	3.3	1.8	2.4	3.0	3.0
5	1.0	1.3	2.9	2.3	3.2	3.4	2.5	3.2	1.8	2.4	3.0	2.8
6	1.0	1.3	2.3	2.35	3.2	4.5	2.5	3.2	7.5	2.3	3.0	2.6
7	1.0	2.0	2.5	2.45	3.45	5.0	2.4	3.2	3.7	2.3	3.0	2.6
8	1.0	2.0	4.0	2.45	3.35	4.0	2.4	3.0	3.6	2.3	3.0	2.6
9	1.0	2.2	3.0	2.4	3.35	3.5	2.3	3.8	2.9	2.2	3.3	2.6
10	1.6	2.2	3.0	2.4	3.2	3.5	2.3	3.4	3.7	2.2	3.0	2.6
11	2.0	2.0	3.9	2.45	3.1	4.0	2.3	3.4	3.0	2.2	3.0	2.7
12	2.0	2.0	3.0	2.5	3.5	4.0	2.3	3.3	2.5	2.2	3.0	2.7
13	2.6	2.4	3.0	2.5	3.45	4.4	2.2	3.2	2.45	2.2	3.0	2.7
14	2.0	2.4	2.9	2.45	3.35	3.7	2.2	3.2	2.45	2.1	2.8	2.7
15	1.1	2.0	2.9	2.45	3.25	3.5	2.2	3.2	2.45	2.1	2.8	2.7
16	1.6	2.6	2.8	2.45	3.25	3.5	2.0	2.8	2.4	2.1	2.8	2.7
17	1.4	2.8	2.6	2.45	3.3	3.5	2.0	2.6	2.4	2.1	2.8	2.7
18	1.0	2.7	2.6	2.45	3.45	3.5	2.0	2.5	2.4	2.1	2.8	2.5
19	1.0	2.5	2.3	2.45	3.45	3.5	6.2	2.3	2.3	2.1	2.6	2.5
20	1.6	2.3	2.2	2.45	3.5	3.5	3.3	2.3	2.2	2.1	2.6	2.5
21	2.0	2.6	2.0	2.45	3.8	3.5	3.0	2.0	2.2	2.1	2.6	2.5
22	2.4	2.6	2.0	2.45	4.45	3.5	3.0	2.0	2.2	2.1	2.6	2.5
23	2.4	2.0	2.0	5.35	4.45	3.5	10.0	2.0	2.2	2.1	2.6	2.5
24	2.4	2.0	2.0	5.0	4.45	3.3	6.0	2.0	2.2	2.1	4.75	2.5
25	2.0	2.6	2.0	4.0	4.45	3.3	6.7	1.8	2.1	2.1	3.85	2.5
26	2.0	3.6	2.6	4.45	4.45	3.3	5.6	1.8	2.1	2.3	3.5	2.5
27	1.1	3.0	2.4	3.75	4.45	3.3	4.3	1.8	2.1	2.3	3.3	2.5
28	1.8	2.5	2.0	3.3	4.0	3.3	3.8	1.8	2.1	2.4	3.0	2.5
29	1.3	.....	2.0	3.3	3.7	3.3	3.4	1.8	2.1	2.4	2.8	2.4
30	1.2	.....	2.0	3.3	3.7	3.0	3.4	1.8	2.1	2.45	3.5	2.4
31	1.2	.....	2.0	.....	3.5	.....	3.4	1.8	.....	2.45	.....	2.4

PECOS RIVER NEAR DAYTON, N. MEX.

This station was established March 24, 1905. It was located about 3 miles east of Dayton, N. Mex., 100 feet below the mouth of Penasco River and about 6 miles above McMillan dam at Lakewood, N. Mex. The gage was washed out September 6, 1905, and the station was relocated September 7, 1905, about one-half mile upstream.

The channel is straight for 200 feet above and 500 feet below the station. The right bank is high and the cable will be accessible until the river rises above 10 feet on the gage. The left bank is about the same height. The bed is clean shifting sand and the current good.

Discharge measurements were made by means of a cable at the original location until the new gage was established, when the cable was reerected about 100 yards below the new gage.

The present gage is a staff fastened to posts driven into the right bank. During 1905 the gage was read once each day by Eugene Lattion. The bench mark is a nail in the upstream side of the post under the cable on the right bank; elevation, 13.90 feet above the datum of the gage..

Discharge measurements of Pecos River near Dayton, N. Mex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
April 18	J. M. Giles	145	327	1.71	2.52	559
May 8	E. Patterson	188	516	3.04	4.60	1,572
May 15	J. M. Giles	149	409	2.80	4.18	1,145
May 28	E. Patterson	192	510	3.83	5.20	1,956
June 13	do	193	644	3.60	5.30	2,319
July 1	J. M. Giles	109	145	1.33	2.60	193
July 1	do	109	145	1.29	2.60	187
July 11	E. Patterson	72	96	1.05	1.95	101
July 15	do	71	84	1.07	1.90	91
July 23	do	196	744	3.25	5.60	2,422
July 23	do	196	789	3.32	5.80	2,623
July 23	do	196	823	3.64	6.00	3,004
September 1[a]	do	140	170	.80	1.50	137
September 6[a]	J. M. Giles	94	126	1.55	1.72	196
September 9	do	171	552	1.82	3.40	1,006
September 9	do	170	491	1.84	3.15	905
September 12	do	96	161	2.61	1.95	419
September 12	do	96	163	2.80	2.05	456
September 15	E. Patterson	96	108	2.14	1.50	236
October 4	J. M. Giles	109	142	1.62	1.65	230
October 4	do	109	143	1.68	1.67	240
October 15	E. Patterson	112	142	1.60	1.70	228
October 21	do	111	139	1.46	1.67	204
November 7	do	.....	204	1.71	2.26	359
November 23	J. M. Giles	.....	241	1.76	2.40	425
November 23	do	.....	238	1.79	2.40	427
November 26	do	.....	759	2.20	4.30	1,668
November 28[b]	do	.....	380	1.55	3.00	588
November 28[b]	do	.....	378	1.62	3.05	612
December 8	E. Patterson	.....	280	2.08	2.60	583
December 28	do	.....	202	1.63	2.30	329

[a] Measurement by wading. [b] Backwater from McMillan reservoir.

NOTE.—Measurements April 18 to September 1 made below the mouth of the Penasco; after September 1 made above mouth of Penasco.

Daily gage height, in feet, of Pecos River near Dayton, N. Mex., for 1905.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.85	5.1	4.6	2.5	3.4	1.5	1.4	1.6	3.5
2	.....	1.85	4.95	4.5	2.5	3.8	1.7	1.5	1.9	3.5
3	.....	2.5	4.9	4.3	2.4	3.9	2.2	1.6	1.5	3.5
4	.....	2.1	4.9	4.5	2.3	4.0	2.5	1.7	2.0	3.4
5	.....	2.65	5.1	4.2	2.3	3.6	2.3	1.7	2.2	3.4
6	.....	2.3	5.2	4.3	2.2	3.6	1.7	1.7	2.2	3.0
7	.....	2.3	5.2	5.6	2.1	3.4	4.5	1.7	2.2	2.9
8	.....	2.25	5.0	4.5	2.1	5.0	3.4	1.7	2.3	2.9
9	.....	2.25	5.4	4.4	2.2	4.8	3.3	1.6	2.4	2.7
10	.....	2.15	4.9	4.4	2.1	4.5	2.8	1.6	3.0	2.7
11	.....	2.15	4.7	4.6	2.1	3.8	2.5	1.6	2.9	2.7
12	.....	2.1	4.3	6.0	2.0	3.5	2.0	1.7	2.9	2.7
13	.....	3.0	4.3	5.4	2.0	3.3	2.2	1.8	2.7	2.7
14	.....	3.3	4.4	4.6	2.0	3.4	2.0	1.5	2.6	3.1
15	.....	3.0	4.2	4.7	2.0	4.0	1.5	1.7	2.5	3.0
16	.....	3.5	4.0	4.5	2.0	3.9	1.7	1.7	2.5	3.0
17	.....	3.55	4.2	4.6	1.9	3.0	1.8	1.7	2.6	2.9
18	.....	3.3	4.2	4.3	1.8	2.8	1.5	1.7	2.9	2.9
19	.....	3.5	4.0	4.2	1.8	2.9	1.3	1.7	2.3	2.9
20	.....	3.3	4.2	4.0	3.8	2.5	3.0	1.7	2.3	2.7
21	.....	3.25	6.5	3.7	3.0	2.3	2.0	1.7	2.3	2.7
22	.....	3.3	4.9	3.7	2.8	2.0	1.5	1.7	2.5	2.7
23	.....	4.1	5.2	3.6	10.9	2.2	1.4	1.7	2.4	2.7
24	2.5	5.6	4.5	3.4	.....	1.8	1.5	1.7	4.5	2.8
25	2.3	6.45	6.2	3.9	.....	1.7	1.5	1.6	5.4	3.2
26	2.25	5.7	5.4	3.2	.....	1.7	1.5	1.7	4.2	2.55
27	1.85	5.85	5.0	3.1	5.9	1.6	1.5	1.7	3.6	2.5
28	1.85	5.2	5.0	3.0	5.5	1.6	1.4	1.6	3.2	2.5
29	2.0	4.95	5.7	3.0	4.9	1.5	1.5	1.6	2.9	2.6
30	2.0	4.7	4.7	2.6	4.2	1.2	1.5	1.6	3.4	2.4
31	1.85	.....	4.7	.....	3.7	1.2	.....	1.6	.....	3.0

NOTE.—Water above gage July 24–26.

PECOS RIVER AT CARLSBAD, N. MEX.

This station was established May 20, 1903, by V. L. Sullivan. It is located at the Green Street Bridge, Carlsbad, N. Mex., and is about 500 feet below the station of the Pecos Valley and Northeastern Railway and 2,000 feet below the Hagerman power dam.

Both banks are high and not subject to overflow. The bed of the river is solid rock, much corrugated, which makes low-water measurements subject to considerable inaccuracy. The The channel is straight for some distance above and below the station. The current is swift at the station, but sluggish, both above and below.

Discharge measurements are made by wading when the stage of the river will permit, and from the lower side of the bridge during floods. The initial point for soundings is on the south side of the bridge at the west abutment.

The bridge and original gage were carried away by the flood of October, 1904. The new gage is in three sections: The first is a vertical section, reading from 0 to 6 feet, spiked to the abutment on the right bank. The second section, reading from 6 to 10 feet, is spiked to a post on the right bank. The third section, reading from 9 to 19 feet, is nailed to a pile in the railroad trestle over a ravine about 100 feet south of Green street and 100 feet from the river bank. The datum is the same as that of the original gage. During 1905 the gage was read twice a day by V. L. Sullivan, a civil engineer in the employ of the Pecos Valley Irrigation Company. The bench mark is the northeast corner of the stone threshold at the door of the men's waiting room of the Pecos Valley and Northeastern Railway depot; elevation, 25.63 feet above the datum of the gage.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 99, pp 358–359; 132, p 103.
Discharge: 99, p 359; 132, p 103.
Gage heights: 99, pp 359–360; 132, p 104.

Discharge measurements of Pecos River at Carlsbad, N. Mex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
February 24	F. S. Dobson	190	671	2.10	2.39	1,413
March 13	V. L. Sullivan	190	1,236	2.42	4.05	3,001
May 8	Murphy and Giles	212	765	3.84	4.10	2,941
May 9	do	202	608	4.51	3.95	2,740
May 13	J. M. Giles	165	169	1.98	1.25	334
July 5	do	103	113	2.30	1.13	261
July 10	do	120	185	3.66	1.76	678
July 25[a]	V. L. Sullivan	310	4,110	13.36	15.85	54,930
July 26[a]	do	290	3,151	12.29	12.60	38,730
July 27[a]	do	260	2,266	10.76	9.85	24,380
July 28	do	245	1,403	8.05	7.00	11,300
August 5	J. M. Giles	189	870	2.39	3.43	2,082
August 7	do	182	708	2.04	2.70	1,441
October 10	do	.....	86	2.36	1.07	203
October 11	do	78	87	2.36	1.07	207
November 27	do	.....	407	4.72	3.05	1,923

[a] Made by floats.

Daily gage height, in feet, of Pecos River at Carlsbad, N. Mex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.23	1.89	2.81	1.3	3.87	1.85	1.2	3.9	1.19	1.28	1.42	2.19
2	1.23	1.88	2.8	1.29	3.77	1.4	1.18	4.15	1.2	1.58	1.44	2.21
3	1.23	1.88	2.79	1.27	1.65	1.1	1.18	4.77	1.55	1.61	1.44	2.26
4	1.23	1.88	2.4	1.26	1.4	1.12	1.18	3.57	1.24	1.58	1.48	2.31
5	1.23	1.88	1.4	1.28	1.4	1.7	1.19	3.45	1.48	1.55	1.44	2.16
6	1.23	1.88	2.12	1.3	1.67	2.9	1.19	3.25	1.49	1.15	1.44	2.09
7	1.23	1.88	2.5	1.28	4.35	4.05	1.18	2.9	1.84	1.11	1.27	2.02
8	1.23	1.87	2.8	1.29	4.2	4.2	1.18	2.57	3.0	1.08	1.2	1.92
9	1.23	1.87	3.13	1.29	3.95	4.05	1.91	2.4	3.0	1.08	1.45	1.86
10	1.23	1.87	3.18	1.3	1.55	3.78	1.77	2.15	2.58	1.08	1.47	1.84
11	1.23	1.87	3.2	1.3	1.65	3.47	1.68	2.51	2.09	1.08	1.77	1.82
12	1.23	1.87	4.19	1.31	2.35	1.69	1.55	2.62	1.9	1.09	1.98	1.81
13	1.23	1.87	4.06	1.32	1.35	2.68	1.36	2.72	1.62	1.1	1.98	1.87
14	1.23	1.85	3.96	1.32	1.29	3.57	1.2	2.27	1.55	1.11	1.96	1.89
15	1.23	1.85	3.78	1.32	1.26	3.82	1.17	2.13	1.04	1.12	1.75	1.88
16	1.23	1.85	3.55	1.62	1.26	3.7	1.15	2.07	1.03	1.12	1.75	1.88
17	1.23	1.85	3.29	1.64	1.27	3.41	1.14	2.12	1.01	1.13	1.75	1.86
18	1.24	1.84	2.93	1.9	1.28	3.12	1.1	1.9	.99	1.13	1.75	1.82
19	1.24	1.84	2.65	1.91	1.29	2.75	1.0	1.7	.99	1.13	1.74	1.8
20	1.24	1.83	2.35	1.96	2.05	2.35	.99	1.65	1.0	1.14	1.73	1.75
21	1.24	1.83	1.2	2.0	3.6	2.1	1.48	1.52	1.0	1.14	1.72	1.68
22	1.24	1.83	1.18	2.1	3.52	1.23	1.54	1.47	1.04	1.14	1.71	1.62
23	1.24	1.83	1.19	2.05	3.6	1.23	2.77	1.45	1.06	1.14	1.7	1.6
24	1.24	2.39	1.22	2.5	2.4	1.23	8.67	1.43	1.06	1.15	1.69	1.64
25	1.24	2.38	1.23	4.3	3.8	1.22	14.39	1.37	1.08	1.15	1.69	1.68
26	1.3	2.36	1.25	4.38	4.2	1.22	12.42	1.31	1.1	1.15	2.61	1.61
27	1.6	2.35	1.28	4.28	3.91	1.21	10.0	1.25	1.18	1.16	3.11	1.6
28	1.9	2.6	1.3	4.15	3.77	1.2	7.0	1.28	1.22	1.16	2.95	1.58
29	1.9	.....	1.28	4.1	3.6	1.2	5.35	1.25	1.12	1.17	2.67	1.56
30	1.9	.....	1.28	4.02	3.6	1.2	4.5	1.22	1.12	1.17	2.45	1.55
31	1.89	.....	1.28	.....	3.6	.....	4.15	1.2	.....	1.17	.....	1.54

Station rating table[a] for Pecos River at Carlsbad, N. Mex., from May 29, 1903, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
.30	22	2.00	870	3.70	2,470	6.80	10,520
.40	35	2.10	950	3.80	2,610	7.00	11,300
.50	50	2.20	1,030	3.90	2,750	7.20	12,080
.60	70	2.30	1,110	4.00	2,900	7.40	12,870
.70	95	2.40	1,190	4.20	3,220	7.60	13,670
.80	125	2.50	1,275	4.40	3,570	7.80	14,500
.90	165	2.60	1,360	4.60	3,940	8.00	15,400
1.00	210	2.70	1,445	4.80	4,350	8.20	16,360
1.10	255	2.80	1,530	5.00	4,800	8.40	17,320
1.20	305	2.90	1,615	5.20	5,290	8.60	18,280
1.30	360	3.00	1,700	5.40	5,820	8.80	19,240
1.40	420	3.10	1,790	5.60	6,380	9.00	20,200
1.50	490	3.20	1,890	5.80	6,970	9.20	21,160
1.60	560	3.30	1,990	6.00	7,600	9.40	22,120
1.70	635	3.40	2,100	6.20	8,290	9.60	23,080
1.80	710	3.50	2,220	6.40	9,020	9.80	24,040
1.90	790	3.60	2,340	6.60	9,760	10.00	25,000

[a] The above table is not strictly applicable June 13 to 22, 1903, owing to a considerable change in the high-water section during the flood of October, 1904.

The above table is based on two discharge measurements made during 1903, three made during 1904, and 16 made during 1905. It is fairly well defined between gage heights 1 foot and 16 feet. Below 1 foot it is subject to error as high as 20 per cent.

Estimated monthly discharge of Pecos River at Carlsbad, N. Mex., for 1903.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
June[a]	15,640	119	1,959	116,600
July	390	110	164	10,080
August	110	82	92.7	5,700
September	85	82	82.8	4,927
October	82	80	81.5	5,011
November	82	80	81.7	4,862
December	82	80	80.3	4,938
The period				152,100

[a] See rating table footnote.

Estimated monthly discharge of Pecos River at Carlsbad, N. Mex., for 1904.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	161	80	99.4	6,112
February	141	90	94.0	5,407
March	137	22	85.0	5,226
April	90	88	88.1	5,242
May	110	0	84.3	5,183
June	122	75	91.4	5,439
July	107	95	96.5	5,934
August	420	104	132	8,116
September	224	107	152	9,045
October 1–2; 11–31	30,200	1,190	4,269	194,800
November	1,530	255	695	41,360
December 1–24	766	295	521	24,800
The period				316,700

Estimated monthly discharge of Pecos River at Carlsbad, N. Mex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	790	322	392	24,100
February	1,360	734	838	46,540
March	3,204	295	1,266	77,840
April	3,534	338	1,079	64,210
May	3,480	338	1,574	96,780
June	3,220	255	1,256	74,740
July	47,600	206	5,236	321,900
August	4,287	305	1,164	71,570
September	1,700	206	486	28,920
October	568	246	308	18,940
November	1,800	305	739	43,970
December	1,118	518	742	45,620
The year	47,600	206	1,257	915,100

PECOS RIVER AND MARGUERETTA FLUME NEAR PECOS, TEX.

This station was established January 1, 1898, by Thomas U. Taylor, and is located about 6 miles above Pecos, Tex., at the flume of the Barstow Irrigation Company (old Margueretta Canal Company). The canal diverts the water from Pecos River 3 miles above the flume from the west side of the river. The water, except about 10 second-feet taken by the West Valley ditch, is carried across to the east side by a timber flume supported on pile bents.

The channel is straight for 300 feet above and 100 feet below the measuring section. The river bed is sandy and shifting. In floods such as those of October, 1904, and July, 1905, a large volume of water passes down the West Valley, west of the canal. This water spreads over the country from the flume to Pecos and can not be measured with any accuracy.

Discharge measurements are made from a cable about 200 yards below the flume. The initial point for soundings is the post supporting the cable on the west bank. Measurements taken in the flume at the east end show the amount of water used for irrigation on the east side of the river.

The gage is a staff which is nailed to one of the piles under the upstream side of the flume. The gage in the flume is at the east end and has its zero at the bottom of the flume. During 1905 both gages were read by Lawrence Vauter, gate keeper for the irrigation company. Bench marks were established as follows: (1) The top of the west abutment on the north side of the flume, marked "U. S. G. S. B. M. 21.70;" elevation, 21.70 feet. (2) On the stone wall on the south side of the canal, under the window of the gate keeper's house, marked "U. S. G. S. B. M. 20.95;" elevation, 20.95 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann = Annual Report; WS = Water-Supply Paper):

Pecos River near Pecos, Tex.

Description: WS 28, p 119; 37, p 285; 50, p 358; 66, p 76; 84, pp 168–169; 99, p 355; 132, pp 104–105.
Discharge: WS 28, p 130; 37, p 385; 50, p 359; 66, p 77; 84, p 169; 99, p 356; 132, p 105.
Discharge, monthly: WS 84, p 172; 99, p 358; 132, p 109.
Discharge, yearly: Ann 20, iv, p 57.
Gage heights: WS 28, p 125; 37, p 286; 50, pp 360–361; 66, p 77; 84, p 170; 99, p 356; 132, p 106.
Rating tables: WS 84, p 171; 99, p 357; 132, p 108.

Margueretta flume near Pecos, Tex.

Description: WS 84, pp 168–169; 99, p 355; 132, pp 104–105.
Discharge: WS 50, p 360; 66, p 77; 84, p 169; 132, p 105.
Gage heights: WS 50, p 361; 84, p 171; 99, p 357; 132, p 107.
Rating table: WS 132, p 108.

Discharge measurements of Pecos River near Pecos, Tex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
May 10	Murphy and Giles	144	695	3.55	6.10	2,470
July 11	J. M. Giles	81	105	1.81	1.27	189
July 11	do	81	103	1.72	1.25	177
July 14	E. Patterson	99	150	2.50	2.20	376
August 11	J. M. Giles	172	496	2.66	3.25	1,318
August 12	do	170	463	2.82	3.20	1,304
August 31	E. Patterson	96	205	2.10	1.20	432
September 13	do	90	359	2.49	2.50	895
September 14	do	89	326	2.39	2.20	779
October 6	J. M. Giles	138	254	1.81	1.40	459
October 7	do	138	263	1.95	1.50	513
October 16	E. Patterson	82	92	1.45	0.20	134
October 20	do	80	88	1.30	0.10	115
November 8	do	.....	184	1.87	1.00	334
November 16	Grover and Giles	.....	413	2.12	2.22	873
November 17	J. M. Giles	.....	398	2.24	2.20	884
December 6	E. Patterson	169	444	2.37	2.80	1,055
(a)	J. M. Giles	.....	1,304	4.92	8.00	6,416
(a)	do	.....	2,024	6.32	12.00	12,790
(a)	do	.....	3,140	7.91	18.00	24,840

a Computed from slope measurement, using Kutter's formula.

Daily gage height, in feet, of Pecos River, near Pecos, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	2.5	4.3	2.1	5.0	5.5	2.5	7.6	1.4	.....	0.2	2.8
2	2.0	2.5	4.3	2.0	4.3	5.0	1.5	6.2	.....	.....	.2	2.6
3	2.1	2.5	4.3	1.9	3.0	3.9	1.5	5.65	.....	.....	.2	2.4
4	2.1	2.5	4.3	1.9	3.0	2.9	1.5	6.15	.....	.....	.4	2.3
5	2.1	2.5	4.1	1.9	3.0	2.0	1.5	5.85	.....	.....	.9	2.0
6	2.1	2.5	4.1	1.9	2.8	1.9	1.5	4.9	.....	1.4	.9	1.9
7	2.1	2.9	4.1	1.6	2.6	3.1	1.4	4.5	.....	1.5	1.0	2.0
8	2.1	3.0	4.1	1.6	2.6	4.0	1.4	4.0	.....	1.4	1.1	2.3
9	2.1	3.1	4.1	1.5	6.0	6.0	1.4	3.7	1.4	.9	1.0	2.4
10	2.1	3.2	4.1	1.4	6.1	6.2	1.2	3.6	4.5	.3	1.0	2.4
11	2.1	3.2	4.6	1.4	6.0	6.0	2.5	3.5	3.5	.3	1.0	2.4
12	2.1	3.1	4.6	1.4	3.0	5.8	2.3	3.2	3.2	.2	1.1	2 4
13	2.1	3.1	5.9	1.3	2.6	5.9	2.2	3.4	2.6	.2	1.4	2.1
14	2.1	3.1	6.6	1.1	3.6	4.9	1.9	3.6	2.2	.2	2.4	2.0
15	2.1	3.1	6.6	1.1	3.2	3.2	1.5	3.5	2.1	.2	2.3	2.0
16	2.1	3.1	6.5	1.1	2.5	5.0	1.4	3.0	2.1	.2	2.2	2.0
17	2.1	3.1	6.2	1.1	2.0	5.9	1.4	3.0	.....	.2	2.2	2.0
18	2.1	3.1	6.1	1.6	1.9	6.0	1.0	2.9	.....	.2	1.8	2.1
19	2.1	3.1	6.0	1.7	1.5	5.6	.9	2.9	.....	.2	1.8	2.1
20	2.1	3.0	5.0	1.8	1.0	4.9	.9	2.8	.....	.1	1.8	2.0
21	2.1	3.0	5.1	2.0	1.0	4.0	.9	2.8	.....	.1	1.8	2.0
22	2.0	3.0	5.1	2.1	2.0	3.8	.9	2.8	.....	.1	1.8	1.9
23	2.0	3.0	4.2	2.1	4.9	2.9	1.0	2.6	.....	.2	1.8	1.8
24	2.0	3.0	3.9	3.0	5.0	2.8	4.9	2.0	.....	.3	1.7	1.8
25	2.0	3.0	2.1	3.1	5.1	1.8	7.2	1.6	.....	.3	1.6	1.8
26	2.0	4.2	2.1	4.0	4.0	1.6	9.4	1.2	.....	.3	1.6	1.8
27	2.0	4.5	2.1	5.5	5.6	1.5	13.7	1.2	.....	.3	1.6	1.8
28	2.0	4.4	2.1	6.5	6.0	1.5	18.3	1.2	.....	.2	3.1	1.8
29	2.0	.....	2.1	6.6	5.6	1.5	17.2	1.2	.....	.2	3.5	1.8
30	2.0	.....	2.1	6.0	5.5	4.5	13.2	1.2	.....	.2	3.4	1.7
31	2.0	.....	2.0	.....	5.5	.....	10.2	1.2	.....	.2	.....	1.7

Station rating table for Pecos River, near Pecos, Tex., from January 1 to July 24, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.90	140	2.20	375	3.50	835	4.80	1,535
1.00	150	2.30	400	3.60	880	4.90	1,600
1.10	160	2.40	430	3.70	925	5.00	1,665
1.20	170	2.50	460	3.80	975	5.20	1,795
1.30	185	2.60	490	3.90	1,025	5.40	1,935
1.40	200	2.70	525	4.00	1,080	5.60	2,075
1.50	220	2.80	560	4.10	1,135	5.80	2,220
1.60	240	2.90	595	4.20	1,190	6.00	2,370
1.70	260	3.00	630	4.30	1,245	6.20	2,530
1.80	280	3.10	670	4.40	1,300	6.40	2,690
1.90	300	3.20	710	4.50	1,355	6.60	2,850
2.00	325	3.30	750	4.60	1,415		
2.10	350	3.40	790	4.70	1,475		

The above table is based on four discharge measurements made during 1905. It is no twell defined.

Station rating table for Pecos River, near Pecos, Tex., from July 25 to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.10	115	1.30	465	2.50	955	3.70	1,640
.20	135	1.40	500	2.60	1,000.	3.80	1,715
.30	155	1.50	535	2.70	1,050	3.90	1,790
.40	180	1.60	570	2.80	1,100	4.00	1,865
.50	205	1.70	610	2.90	1,150	4.20	2,030
.60	235	1.80	650	3.00	1,200	4.40	2,210
.70	265	1.90	690	3.10	1,250	4.60	2,390
.80	295	2.00	730	3.20	1,305	4.80	2,580
.90	325	2.10	775	3.30	1,365	5.00	2,780
1.00	360	2.20	820	3.40	1,430		
1.10	395	2.30	865	3.50	1,500		
1.20	430	2.40	910	3.60	1,570		

The above table is based on 13 discharge measurements made during 1905. It is well defined between gage heights 0.1 foot and 3.2 feet. Above gage height 3.2 feet it is based on three slope measurements.

Estimated monthly discharge of Pecos River, near Pecos, Tex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	350	325	340	20,910
February	1,355	465	682	37,880
March	2,850	325	1,372	84,360
April	2,850	160	596	35,460
May	2,470	150	1,091	67,080
June	2,530	220	1,243	73,960
July	25,500	140	3,548	218,200
August	5,800	430	1,664	102,300
September[a]				
October 6–31	530	115	189	9,747
November	1,500	130	592	35,230
December	1,100	615	764	46,980
The period				732,100

[a] No estimate.

NOTE.—For discharge of flume of Barstow Irrigation Company see following pages.

Discharge measurements of flume of Barstow Irrigation Company near Pecos, Tex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
May 10	Murphy and Giles	20.5	33	7.83	1.70	257
July 11	J. M. Giles	20.5	17.4	5.86	1.10	102
July 11	do	20.5	17.4	5.91	1.10	103
July 14	E. Patterson	20.5	18.5	6.21	1.15	115
September 14	do	20.5	26.6	7.07	1.40	188
October 6	J. M. Giles	20.5	29	7.62	1.60	219
October 7	do	20.5	27	7.57	1.50	202
October 16	E. Patterson	20.5	24	7.11	1.30	168
October 20	do	20.5	23	7.01	1.25	158
November 8	do	20.5	27	7.30	1.40	194
November 8[a]	do	20.5	33	4.25	1.70	148
November 16	J. M. Giles	20.5	26.6	4.97	1.30	132
November 16[a]	do	20.5	14	2.29	.80	32
December 6	E. Patterson	20.5	13.3	1.57	.65	21

[a] At lower end of flume.

Daily gage height, in feet, of flume of Barstow Irrigation Company near Pecos, Tex., for 1905.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.0	1.8	1.8	1.6	.....	.....	.....	1.3	0.8
2	.....	1.0	1.8	1.8	1.0	.....	.....	.....	1.3	.8
3	.....	1.0	1.8	1.6	1.0	.....	.....	.....	1.3	.8
4	.....	1.0	1.8	1.6	1.0	.....	.....	.....	1.3	.8
5	.....	1.0	1.8	1.8	1.0	.....	.....	.....	1.5	.8
6	.....	1.0	1.8	1.8	1.0	.....	.....	1.6	1.5	.8
7	.....	.9	1.8	1.9	1.0	.....	.....	1.5	1.5	.7
8	.....	1.0	1.8	1.9	1.0	.....	.....	1.4	1.5	.7
9	.....	1.1	1.8	1.9	1.0	.....	.....	1.4	1.5	.7
10	.....	1.3	1.8	1.9	1.1	.....	1.5	1.4	1.5	.7
11	.....	1.4	1.8	1.9	1.3	.....	1.5	1.3	1.5	.7
12	1.1	1.6	1.9	1.9	1.3	.....	1.5	1.3	1.5	.7
13	1.1	1.8	1.9	1.6	1.05	.....	1.5	1.3	1.5	.7
14	1.1	1.8	1.8	1.6	1.5	.....	1.4	1.3	1.5	.6
15	1.1	1.8	1.8	1.6	1.6	.....	1.4	1.3	1.3	.6
16	1.1	1.9	1.8	1.6	1.6	.....	1.4	1.3	1.3	.6
17	1.1	1.9	1.8	1.6	1.6	.....	.....	1.3	.8	.6
18	1.1	1.8	1.8	1.6	1.6	.....	.....	1.3	.8	.6
19	1.1	1.8	1.8	1.6	1.4	.....	.....	1.3	.8	.6
20	1.2	1.8	1.8	1.8	1.3	.....	.....	1.3	.8	.6
21	1.3	1.8	1.8	1.8	1.3	.....	.....	1.3	.8	.6
22	1.3	1.8	1.9	1.7	1.3	.....	.....	1.3	.8	.6
23	1.3	1.8	1.8	1.7	1.5	.....	.....	1.3	.8	.6
24	1.3	1.8	1.8	1.7	1.6	.....	.....	1.3	.8	.6
25	1.3	1.8	1.8	1.7	1.8	.....	.....	1.4	.8	.6
26	1.3	1.8	1.8	1.7	1.6	.....	.....	1.3	.8	.6
27	1.3	1.8	1.9	1.7	2.4	.....	.....	1.3	.8	.6
28	1.3	1.8	1.8	1.7	2.65	.....	.....	1.3	.8	.6
29	1.3	1.8	1.8	1.7	2.35	.....	.....	1.3	.8	.6
30	1.3	1.8	1.8	2.0	1.25	.....	.....	1.3	.8	.6
31	1.3	.....	1.8	.....	.6	.....	.....	1.3	.....	.6

NOTE.—November 1-16 water was being wasted from flume into river; hence gage heights at upper end of flume did not represent flow accurately.

Station rating table for flume of the Barstow Irrigation Company near Pecos, Tex., from March 12 to November 16, 1905.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.60	10	1.00	80	1.40	179	1.80	285
0.70	22	1.10	103	1.50	205	1.90	312
0.80	38	1.20	128	1.60	231	2.00	340
0.90	57	1.30	153	1.70	258		

[a] Not strictly applicable November 1–16, during which time water was being wasted from flume into river; hence gage heights at upper end of flume did not represent flow accurately.

The above table is based on 13 discharge measurements made during 1905. It is fairly well defined between gage heights 1.1 feet and 1.7 feet.

Estimated monthly discharge of flume of Barstow Irrigation Company near Pecos, Tex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
March 12–31	153	103	132	5,237
April	312	57	216	12,850
May	312	285	288	17,710
June	340	231	269	16,010
July	522	10	182	11,190
September 10–16	205	179	194	2,694
October 6–31	231	153	162	8,355
The period				74,050

PECOS RIVER NEAR MOORHEAD, TEX.

This station was established by the International (Water) Boundary Commission in April, 1900. It is near Moorhead, immediately above the high bridge of the Southern Pacific Railroad.

The station is in the bottom of a canyon about 300 feet deep. The river is straight for a mile or more both above and below the station. Both banks are of rock, but the bottom of the stream is mud. The river here consists of a series of pools connected by rapids. The best pool was chosen for the station.

Discharge measurements are made by means of a cable, car, and tagged wire. The initial point for soundings is the cable support on the left bank.

The gage is a scantling bolted to one of the piers of the bridge. Its painted face is read from the top of the cliff with the aid of field glasses. The highest known flood occurred April 6, 1900, about two weeks before this gage was established. The water marks showed that it reached 35.75 feet on the gage. The range between high and low water is 35 feet. The bench mark is a cross cut on solid rock above a spring about 600 feet above the bridge; elevation, 27.08 above the datum of the gage.

The observations during 1905 have been made under the direction of the United States section of the International (Water) Boundary Commission. The hydrographer is E. E. Winter and the gage reader is the section foreman for the railroad.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 50, p 362; 66, p 77; 84, p 166; 99, p 351; 132, p 109.
Discharge: 50, p 363; 66, p 78; 84, pp 166–167; 99, pp 352–353; 132, pp 109–111.
Discharge, mean daily: 132, p 113.
Discharge, monthly: 75, p 160; 84, p 168; 99, p 354; 132, p 114.
Gage heights: 50, p 363; 66, p 78; 84, p 167; 99, p 354; 132, p 112.

Discharge measurements of Pecos River near Moorhead, Tex., in 1905.

Date.	Hpdrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 3	E. E. Winter	773	0.98	1.75	758
January 7	do	774	.95	1.75	735
January 12	do	762	.80	1.65	611
January 16	do	756	.80	1.6	604
January 20	do	755	.74	1.5	557
January 24	do	724	.73	1.5	531
January 29	do	726	.73	1.5	532
February 3	do	762	.91	1.7	694
February 7	do	760	.93	1.75	710
February 11	do	775	1.02	2.0	787
February 15	do	790	1.03	2.0	811
February 20	do	807	1.07	2.2	861
February 23	do	782	1.01	2.1	791
February 26	do	795	1.01	2.05	806
March 8	do	924	1.97	3.4	1,817
March 11	do	849	1.39	2.7	1,180
March 16	do	893	1.72	3.2	1,532
March 20	do	1,004	2.20	3.7	2,212
March 24	do	824	1.26	2.4	1,041
March 29	do	770	1.03	2.1	795
April 4	do	861	1.18	2.5	1,018
April 8	do	821	.98	2.0	805
April 12	do	827	.93	1.9	772
April 17	do	790	.90	1.7	709
April 21	do	785	.89	1.6	702
April 25	do	921	1.47	3.0	1,356
April 28	do	845	1.01	2.2	854
May 3	do	1,023	2.24	3.5	2,288
May 8	do	1,000	2.16	3.4	2,155
May 11	do	981	1.62	3.1	1,594
May 16	do	1,010	2.02	3.4	2,040
May 20	do	883	1.12	2.2	991
May 24	do	950	1.72	2.8	1,633
May 29	do	883	1.13	2.2	999
June 3	do	1,011	1.61	3.2	1,623
June 9	do	948	1.23	2.6	1,166
June 12	do	857	.84	1.9	720
June 17	do	1,037	2.24	3.5	2,324
June 21	do	1,004	2.07	3.4	2,078
June 24	do	1,010	2.00	3.3	2,025
July 2	do	898	1.17	2.2	1,050
July 7	do	1,015	1.44	3.1	1,459
July 13	do	907	1.04	2.1	942
July 18	do	867	.85	2.0	734
July 23	do	874	.85	2.0	739

Discharge measurements of Pecos River near Moorhead, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
July 28	E. E. Winter	768	0.83	1.65	639
August 6	do	1,104	3.20	4.3	3,528
August 10	do	1,208	3.92	5.2	4,733
August 15	do	956	2.57	3.35	2,459
August 20	do	899	1.69	2.8	1,521
August 24	do	906	1.51	2.6	1,367
August 30	do	894	1.33	2.4	1,186
September 6	do	782	.96	1.9	753
September 11	do	775	.89	1.8	689
September 14	do	785	.93	2.0	728
September 22	do	803	1.08	2.2	870
September 25	do	774	.96	2.0	740
September 28	do	791	.97	1.9	767
October 3	do	774	.81	1.7	628
October 7	do	793	.91	1.9	719
October 10	do	803	.94	1.9	753
October 15	do	780	.84	1.75	652
October 20	do	774	.78	1.6	577
October 24	do	729	.73	1.5	531
October 29	do	724	.71	1.5	514
November 3	do	704	.72	1.4	510
November 7	do	707	.71	1.4	503
November 10	do	711	.71	1.4	505
November 14	do	743	.86	1.7	637
November 18	do	716	.75	1.6	534
November 22	do	792	1.12	2.2	886
November 25	do	783	1.12	2.2	875
December 2	H. F. Collins	772	1.15	2.0	890
December 8	do	827	1.53	2.4	1,267
December 13	do	831	1.51	2.4	1,257
December 22	do	805	1.52	2.3	1,227
December 25	do	788	1.44	2.3	1,138
December 29	do	783	1.45	2.2	1,138

Daily gage height, in feet, of Pecos River near Moorhead, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.75	1.6	2.05	6.7	2.6	3.0	2.2	3.5	2.4	1.8	1.4	2.0
2	1.75	1.65	2.1	3.75	2.6	3.15	2.2	3.55	2.35	1.7	1.4	2.0
3	1.75	1.7	2.15	3.0	3.45	3.2	2.3	3.8	2.45	1.7	1.4	2.2
4	1.75	1.7	2.2	2.5	3.5	3.2	2.65	3.9	2.45	1.8	1.4	2.65
5	1.75	1.7	2.25	2.3	3.55	3.2	2.35	4.1	2.25	1.8	1.35	2.7
6	1.75	1.75	2.3	2.2	3.6	3.2	2.3	4.15	1.95	1.85	1.35	2.6
7	1.75	1.75	2.4	2.1	3.55	3.2	3.1	4.55	1.9	1.9	1.4	2.55
8	1.7	1.8	3.45	2.0	3.4	3.05	4.1	4.85	1.95	1.9	1.4	2.4
9	1.7	1.85	2.75	2.0	3.35	2.65	4.4	4.9	1.9	2.0	1.4	2.4
10	1.7	1.9	2.6	2.0	3.2	2.05	3.55	5.1	1.9	1.95	1.4	2.45
11	1.65	2.0	2.65	2.0	3.15	2.0	2.7	5.5	2.0	1.8	1.6	2.5
12	1.65	2.0	2.6	1.9	3.1	1.9	2.35	5.6	1.8	1.8	1.7	2.45
13	1.65	2.0	2.6	1.9	3.1	1.75	2.1	5.4	1.9	1.75	1.7	2.4
14	1.6	2.0	2.6	1.85	3.2	1.7	2.0	4.9	2.05	1.75	1.8	2.4
15	1.55	2.0	5.2	1.8	3.2	2.15	2.0	3.6	2.65	1.75	1.8	2.4
16	1.5	2.0	3.25	1.7	3.4	3.0	2.0	3.5	2.9	1.75	1.8	2.3
17	1.5	2.1	3.2	1.7	3.3	3.45	2.0	3.25	2.75	1.7	1.8	2.3
18	1.5	2.15	3.35	1.7	3.15	3.5	2.0	3.0	2.4	1.65	1.7	2.3
19	1.45	2.2	3.55	1.7	2.8	3.5	2.0	2.8	2.3	1.65	2.0	2.3
20	1.45	2.2	3.7	1.6	2.25	3.5	2.0	2.8	2.3	1.6	2.1	2.3
21	1.45	2.2	3.2	1.6	2.35	3.4	2.1	2.8	2.2	1.55	2.2	2.3
22	1.45	2.1	2.85	1.6	2.75	3.4	2.0	2.7	2.2	1.5	2.2	2.3
23	1.45	2.1	2.65	8.95	2.7	3.4	1.95	2.6	2.2	1.5	2.2	2.3
24	1.5	2.1	2.45	3.05	2.8	3.2	1.7	2.6	2.2	1.5	2.2	2.3
25	1.5	2.05	2.25	2.95	2.85	3.05	1.7	2.6	2.05	1.5	2.2	2.3
26	1.5	2.05	2.7	2.7	2.55	2.9	1.6	2.5	2.0	1.5	2.1	2.3
27	1.5	2.05	2.7	2.25	2.4	2.65	1.65	2.5	2.0	1.45	2.1	2.3
28	1.5	2.0	2.5	2.2	2.4	2.95	1.65	2.5	1.95	1.45	2.1	2.2
29	1.55	.....	2.25	3.2	2.25	6.05	1.75	2.45	1.95	1.5	2.1	2.2
30	1.55	.....	2.05	2.65	2.6	2.25	3.1	2.4	1.9	1.45	2.0	2.1
31	1.45	.....	2.0	.....	2.9	.....	3.2	2.4	.....	1.45	.....	2.1

Daily discharge, in second-feet, of Pecos River near Moorhead, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	700	625	805	8,950	1,100	1,700	1,050	2,090	1,190	700	470	830
2	730	660	845	2,070	1,100	1,690	a1,050	2,180	1,140	630	490	a 890
3	a 760	a 695	880	1,320	a2,220	a1,620	1,095	2,630	1,230	a 630	a 510	1,080
4	750	695	920	a1,020	2,290	1,620	1,250	2,810	1,230	675	510	1,500
5	745	695	955	935	2,360	1,620	1,115	3,170	1,060	675	490	1,550
6	740	710	990	890	2,430	1,620	1,095	a3,260	a 800	695	490	1,460
7	a 735	a 710	1,065	845	2,360	1,620	a1,460	3,860	750	a 720	a 505	1,410
8	670	725	a1,855	a 805	a2,150	1,500	2,460	4,270	780	730	505	a 1,270
9	670	740	1,225	805	2,060	a1,200	2,760	4,330	750	805	505	1,270
10	670	755	1,090	805	1,780	810	1,910	a4,600	750	a 785	a 505	1,320
11	610	a 785	a1,135	805	a1,680	780	1,250	5,330	a 790	685	590	1,360
12	a 610	790	1,110	a 770	1,590	a 720	1,070	5,530	690	685	635	1,310
13	610	795	1,110	770	1,590	640	a 940	5,260	710	650	635	a 1,260
14	605	800	1,110	755	1,740	620	850	4,580	a 760	650	a 680	1,260
15	580	a 810	5,220	740	1,740	890	820	a2,810	1,320	a 650	660	1,260
16	a 560	810	a1,560	710	a2,040	1,740	790	2,710	1,570	650	645	1,230
17	560	835	1,530	a 710	1,950	a2,260	760	2,290	1,420	625	630	1,230
18	560	850	1,735	715	1,820	2,280	a 735	1,860	1,070	600	a 575	1,230
19	540	860	2,005	720	1,510	2,240	735	1,520	970	600	760	1,230
20	a 530	a 860	a2,210	700	a1,040	2,210	740	a1,520	970	a 575	820	1,230
21	520	860	1,760	a 700	1,150	a2,080	800	1,520	870	550	880	1,230
22	515	790	1,445	700	1,580	2,080	740	1,440	a 870	530	a 885	a 1,230
23	510	a 790	1,265	14,570	1,520	2,080	a 725	1,370	870	530	880	1,200
24	a 530	805	a1,085	1,390	a1,630	a1,930	650	a1,370	870	a 530	880	1,170
25	530	790	915	a1,320	1,690	1,780	650	1,370	a 770	530	a 875	a 1,140
26	530	a 805	1,310	1,170	1,370	1,630	625	1,280	770	525	825	1,160
27	530	805	1,310	885	1,210	1,380	640	1,280	800	500	825	1,180
28	530	775	1,130	a 855	1,210	a1,680	a 640	1,280	a 800	495	825	1,120
29	a 550	.....	a 915	1,480	a1,050	7,300	670	1,230	800	a 515	825	a 1,140
30	550	.....	755	1,140	1,420	1,040	1,460	a1,190	765	490	775	1,040
31	510	.....	715	.....	1,740	.....	1,560	1,190	.....	490	.....	1,020

a Meter measurements.

Estimated monthly discharge of Pecos River, near Moorhead, Tex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	760	510	605	37,170
February	860	625	772	42,893
March	5,220	715	1,354	83,226
April	14,570	700	1,668	99,273
May	2,430	1,040	1,681	103,379
June	7,300	620	1,745	103,855
July	2,760	625	1,068	65,643
August	5,530	1,190	2,617	160,919
September	1,570	690	938	55,805
October	805	490	616	37,884
November	885	470	670	39,838
December	1,550	830	1,220	74,995
The year	14,570	470	1,246	904,880

GALLINAS RIVER NEAR LAS VEGAS, N. MEX.

This station was established August 13, 1903, by E. G. Marsh. It is located at Las Vegas Hot Springs, 6 miles above Las Vegas, N. Mex. The establishment of this station was primarily for the purpose of determining the amount of water available for diversion and storage in the San Guyjuella basin about 6 miles northwest of Las Vegas.

The channel is straight for 50 feet above and 100 feet below the station. The bed is composed of bowlders with a loose deposit of sand and gravel during low water. The right bank is a vertical wall protecting the power house. The left bank is a vertical wall composed of bowlders embedded in binding material. There is but one channel at all stages. The velocity is moderate at low water and very swift during high water.

Discharge measurements are made from a single-span wooden bridge at the power house during high water; at low water discharge measurements are made at the same section by wading.

The original gage was bolted to the masonry wall on the right bank which protects Hot Springs Nos. 16 and 17. These springs are located about 300 feet above the power house and bridge from which discharge measurements are made. The gage was washed out by the flood of September 29, 1904, and was replaced by a similar rod October 19, 1904. The zero of the new rod is 0.71 foot lower than the zero of the old rod. During 1905 the gage was read twice each day by William Prager, except when rapid fluctuations make more frequent observations necessary. The bench mark is a leaded bolt in a granite outcropping on the right (south) bank of the river 200 feet above the gage rod; elevation, 19.17 feet above the datum of the new gage. The 7-foot mark on this gage is identical with the upper surface of the masonry wall to which it is attached.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 99, p 253; 132, pp 116–117.
Discharge: 99, p 254; 132, p 117.
Gage heights: 99, p 254; 132, p 118.

Discharge measurements of Gallinas River near Las Vegas, N. Mex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
February 5 [a]	R. I. Meeker	17	20	0.45	1.80	9
April 27 [b]	do	50	78	4.19	3.10	327
May 27 [b]	Meeker and Murphy	42	54	3.02	2.65	163
July 1 [a]	R. I. Meeker	24	23	1.04	1.90	24
August 2 [a]	do	24	25	1.20	2.00	30

[a] Made by wading under foot bridge. [b] Made from Hot Springs bridge.

Daily gage height, in feet, of Gallinas River near Las Vegas, N. Mex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	1.8	2.2	2.3	3.1	2.5	1.9	2.05	1.8	1.8	1.6	2.0
2	1.8	1.8	2.8	2.3	3.2	2.45	1.9	2.1	1.8	1.8	1.6	1.8
3	1.8	1.8	2.6	2.4	3.1	2.4	1.9	1.95	1.8	1.8	1.6	1.8
4	1.8	1.8	2.45	2.5	2.95	2.45	1.8	1.9	1.85	1.8	1.6	2.0
5	1.8	1.8	2.5	2.5	2.85	2.4	1.8	2.13	1.8	1.7	1.6	2.0
6	1.8	1.8	2.6	2.5	2.8	2.3	1.8	2.1	1.8	1.6	1.6	1.8
7	1.8	1.8	2.6	2.5	2.75	2.3	1.8	2.3	1.85	1.6	1.6	1.8
8	1.8	1.8	2.5	2.6	2.8	2.65	1.8	2.2	1.8	1.6	1.6	1.8
9	1.8	1.8	2.5	2.6	2.95	2.5	1.8	2.1	1.85	1.65	1.6	1.8
10	1.8	1.8	2.5	2.6	2.85	2.45	1.8	2.1	1.9	1.6	1.6	1.8
11	1.8	1.8	2.4	2.6	2.8	2.4	1.8	2.1	1.8	1.6	1.6	1.95
12	1.8	1.8	2.3	2.6	2.75	2.3	1.8	2.1	1.8	1.6	1.6	2.0
13	1.8	1.8	2.3	2.55	2.75	2.3	1.8	2.05	1.8	1.6	1.6	2.0
14	1.8	1.8	2.3	2.5	2.7	2.25	1.8	2.0	1.8	1.6	1.6	1.85
15	1.8	1.85	2.4	2.5	2.7	2.2	1.8	1.9	1.8	1.6	1.6	1.9
16	1.8	1.8	2.4	2.5	2.75	2.15	1.8	1.9	1.8	1.6	1.8	1.9
17	1.8	1.8	2.4	2.5	2.8	2.1	1.8	1.9	1.8	1.6	1.75	1.9
18	1.8	1.8	2.3	2.5	2.9	2.1	1.8	1.9	1.8	1.6	1.6	1.85
19	1.8	1.85	2.3	2.5	2.8	2.1	1.8	1.9	1.8	1.6	1.8	1.85
20	1.8	1.8	2.3	2.5	2.8	2.0	1.8	1.9	1.8	1.6	1.8	1.85
21	1.8	1.85	2.2	2.5	2.8	2.05	1.8	1.8	1.7	1.6	1.8	1.8
22	1.8	2.0	2.2	2.5	2.8	2.0	2.0	1.8	1.7	1.6	2.0	1.8
23	1.8	2.3	2.2	2.9	2.7	2.0	2.01	1.8	1.7	1.6	2.35	1.8
24	1.8	2.7	2.2	3.2	2.65	2.0	2.0	1.8	1.7	1.6	2.05	1.9
25	1.8	2.65	2.2	3.15	2.6	1.95	1.9	1.8	1.8	1.6	2.0	1.9
26	1.8	2.7	2.25	3.05	2.6	1.9	1.9	1.8	2.2	1.6	2.0	1.9
27	1.8	2.7	2.35	3.1	2.6	1.9	1.8	1.8	1.9	1.6	3.05	1.9
28	1.8	2.2	2.4	3.2	2.55	1.9	1.8	1.8	1.9	1.6	2.8	1.9
29	1.8	.....	2.3	3.1	2.5	1.9	1.8	1.8	1.85	1.6	2.35	1.9
30	1.8	.....	2.25	3.0	2.5	1.9	1.8	1.8	1.8	1.6	2.2	1.9
31	1.8	.....	2.25	.....	2.5	.....	2.3	1.8	.....	1.6	.....	1.9

Station rating table for Gallinas River near Las Vegas, N. Mex., from October 8, 1904, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
1.60	2	2.10	42	2.60	148	3.10	330
1.70	6	2.20	57	2.70	178	3.20	380
1.80	12	2.30	75	2.80	210		
1.90	20	2.40	97	2.90	245		
2.00	30	2.50	121	3.00	285		

The above table is based on five discharge measurements made during 1905. It is well defined.

Estimated monthly discharge of Gallinas River near Las Vegas, N. Mex., for 1904–1905.

[Drainage area, 90 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
1904.						
October 8-31	210	2	32.6	1,551	0.362	0.323
November	57	4	13.7	815	.152	.170
December	20	2	10.2	627	.113	.130
1905.						
January	12	12	12.0	738	.133	.153
February	178	12	40.1	2,227	.446	.464
March	210	57	93.3	5,737	1.04	.120
April	380	75	177	10,530	1.97	2.20
May	380	121	206	12,670	2.29	2.64
June	163	20	63.4	3,773	.704	.786
July	75	12	17.1	1,051	.190	.219
August	75	12	26.7	1,642	.297	.342
September	57	6	14.0	833	.156	.174
October	12	2	3.5	215	.039	.045
November	308	2	32.1	1,910	.357	.398
December	30	12	18.7	1,150	.208	.240
The year	380	2	57.8	42,480	.652	7.78

NOTE.—From January 1 to September 27, 1904, the discharge was practically nothing, the water not being sufficient for current meter measurements. Discharge from September 29 to October 7, 1904, inclusive, was 16,570 acre-feet. Taken from G. B. Monk's report of floods in northern New Mexico in 1904. See also Water-Supply Paper No 147, Destructive Floods in United States in 1904, by E. C. Murphy.

HONDO RIVER AT ROSWELL, N. MEX.

This station was established April 25, 1903, by W. M. Reed. It is located at the bridge at the intersection of Main and Vegas streets, Roswell, N. Mex.

The channel is nearly straight for 50 feet above and 450 feet below the bridge and has a width at ordinary high stages of 40 feet. The current has a moderate velocity. Both banks are low and overgrown with weeds, but are not liable to overflow. The bed of the stream is sandy loam, fairly permanent, and free from vegetation. There is but one channel at all stages.

Discharge measurements are made from the highway bridge. The initial point for soundings is a zero marked on the east stringer at the north end of the bridge.

In July, 1905, the channel of the river was widened at the street crossing and the original gage was torn out by the workman. August 8, 1905, a new inclined gage was placed on the left bank at the upstream side of bridge. It consists of a timber spiked to stakes driven in the bank, and the upper end is bolted to a sill of the bridge. During 1905 the gage was read by members of the Geological Survey office force at Roswell. Bench marks were established as follows: (1) The top of eyebar on west side of bridge; elevation, 7.45 feet. (2) The southeast corner of the cement sidewalk 25 feet northwest of bridge; elevation, 7.82 feet. (3) The top step near stone column at the entrance to the office of the Pecos Valley Lumber Company; elevation, 3.10 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in the following Water-Supply Papers the United States Geological Survey:

Description: 99, pp 361-362; 132, pp 118-119.
Discharge: 99, p 362; 132, p 119.
Gage heights: 99, p 362; 132, p 119.

Discharge measurements of Hondo River at Roswell, N. Mex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
April 13	J. M. Giles	11	6	1.07	0.10	6
April 25	E. Patterson	26	93	3.71	5.20	345
April 25	do	27	102	3.74	5.60	383
April 25	W. A. Wilson		98	4.36	6.00	429
April 26	E. Patterson	26	84	3.62	4.80	306
April 26	do	24	77	3.53	4.50	271
April 26	do	26	88	4.03	4.95	356
April 27	do	24	69	3.00	4.20	206
May 13	do	14	27	2.92	1.75	78
May 17	J. M. Giles	14	15	2.51	1.10	38
July 24	E. Patterson	30	131	4.20	5.00	551
July 24	do	24	82	3.79	3.20	311
July 25	do	30	134	4.09	5.00	550
July 26	do	32	159	4.27	5.90	682
July 26	do	32	156	4.15	5.60	648
July 27	do	30	125	3.95	4.75	495
July 28	do	27	110	3.72	4.00	409
July 31	do	22	49	3.41	2.00	166
August 2	J. M. Giles	24	65	3.59	2.50	234
August 2	do	20	54	3.10	1.85	169
August 8	E. Patterson	21	50	3.83	2.10	192
August 15	do	19	32	3.61	1.50	116
August 26	do	13	10	2.18	− .10	22
August 28	do	4	2	.64	−1.10	1.2
September 8	do	8	3	.93	− .90	3
September 11	do	14	23	2.94	.75	68
October 4	do	8	1.6	.71	−1.00	1.2
November 10	do		22	2.42	.80	52
November 29	do		103	3.82	3.95	394
December 3	do		36	3.50	1.35	124
December 9	do	21	20	2.58	.40	51
December 23	do	20	15	2.47	.20	36

HONDO RIVER AT HONDO RESERVOIR SITE, NEW MEXICO.

This station was established March 9, 1903, by W. A. Wilson. It is located at the first New Mexico reservoir dam site, 12 miles southwest of Roswell, N. Mex.

The channel is straight for 200 feet above and below the station. The current is swift at high water and sluggish at low water. Both banks are high, without trees, and liable to overflow. There is but one channel at all stages. The bed is composed of shifting sand and the cross section changes during each flood.

A footbridge has been constructed 75 feet below the dam, for the purpose of making discharge measurements. The initial point for soundings is 1 foot south of the north end of the west stringer of the bridge.

The gage is a vertical timber located 10 feet north of the footbridge. During 1905 the gage was read twice each day by Lee Hall. The bench-mark is on a ledge of rock which

bears S. 45° W., and is 650 feet distant from the gage; elevation, 19.10 feet above the datum of the gage.

Information in regard to this station is contained in the following Water-Supply Papers of the United States Geological Survey:

Description: 99, p 362; 132, pp 119–120.
Discharge: 99, p 363; 132, p 120.
Gage heights: 99, p 363; 132, p 121.

Discharge measurements of Hondo River at Hondo reservoir site, New Mexico, in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
February 24	H. C. Hurd	23	26	3.77	3.25	96
February 26	H. L. Eames	23	48	3.84	4.35	184
March 3	do	24	58	6.95	5.70	400
March 5	do	24	74	7.26	6.58	536
March 8	do	24	62	7.07	6.00	436
March 15	do	23	37	4.45	4.85	166
March 24	do	24	34	2.33	3.38	78
March 25	do	24	28	2.34	3.20	66
March 27	do	24	31	2.04	3.10	63
March 29	do	24	32	2.39	3.20	77
April 1	do	24	29	2.17	2.90	62
April 6	do	18	18	1.88	2.30	33
April 10	do	15	9.5	1.31	1.77	12
April 14	Giles and Eames	24	32	2.20	2.90	71
April 25	H. L. Eames	30	205	7.05	9.80	1,446
April 29	do	25	170	6.83	8.40	1,158
May 18	J. M. Giles	.....	45	2.32	3.22	105
July 26	E. Patterson	31	177	4.28	9.70	758
July 29	do	25	125	5.73	7.80	714
August 2	do	23	33	4.01	3.60	132
August 7	do	23	39	4.80	3.80	188
August 10	do	23	51	5.60	5.40	285
August 29	do	23	14	1.91	3.30	26
September 10	do	.....	13	2.54	3.40	33
September 16	J. M. Giles	.....	11	1.72	3.20	19
October 5	E. Patterson	20	9	1.96	3.12	18
October 14	do	12	6	1.09	2.95	7
October 14	J. M. Giles	11	7.2	1.47	2.97	10.6
October 24	E. Patterson	14	7	1.65	3.10	11.6
November 29	do	.....	106	5.23	8.00	556
December 1	do	.....	44	5.27	5.35	232
December 26	do	.....	.....	.....	5.00	[a] 20

[a] Estimated through ice and snow.

Daily gage height, in feet, of Hondo River at Hondo reservoir site, New Mexico, for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.95	.....	4.6	2.9	7.5	1.45	.....	6.55	2.9	3.1	3.1	5.35
2	.9	.....	5.0	2.8	7.95	2.05	4.3	3.75	2.9	3.2	3.05	4.9
3	.9	.....	5.7	2.65	8.0	1.75	4.0	7.9	2.8	3.25	3.0	4.55
4	.9	.....	6.65	2.6	7.3	1.75	3.9	4.5	3.15	3.25	3.0	4.4
5	.9	.....	6.6	2.4	6.85	2.0	3.8	3.95	3.25	3.1	3.0	4.05
6	.85	.....	6.2	2.3	6.35	1.8	.....	3.85	3.7	3.1	3.15	3.85
7	.9	.....	6.05	2.1	5.85	1.85	.....	4.1	3.4	3.05	3.35	3.6
8	.95	.....	5.9	1.95	5.45	1.7	.....	4.3	3.45	3.0	3.3	3.1
9	.85	.....	5.55	1.8	4.95	7.8	.....	6.75	3.35	3.0	3.45	3.3
10	.85	.....	5.25	1.9	5.0	7.95	.....	5.6	3.6	3.0	3.8	3.4
11	.9	.....	5.1	2.25	4.55	7.45	.....	5.85	3.95	3.0	3.85	3.35
12	2.3	.....	4.95	2.95	4.05	10.5	.....	7.05	3.5	3.0	3.8	3.4
13	1.9	.....	4.9	2.95	3.75	5.95	.....	4.7	3.3	3.0	3.65	3.4
14	1.65	.....	4.75	2.75	3.6	5.25	.....	5.4	3.2	3.0	3.65	3.35
15	1.55	.....	4.8	2.55	3.55	5.15	.....	5.05	3.2	2.9	3.5	3.2
16	1.55	.....	4.6	2.35	3.25	5.15	.....	5.3	3.15	2.9	3.45	3.1
17	1.5	.....	4.6	2.4	3.0	5.1	.....	4.65	3.05	3.0	3.4	3.1
18	1.4	.....	4.5	2.3	3.05	5.1	.....	4.4	3.05	2.9	3.3	3.0
19	1.3	.....	4.35	2.5	3.05	4.9	.....	4.15	2.95	2.95	3.35	3.0
20	1.3	2.65	4.1	2.85	3.15	4.9	.....	4.0	2.9	2.95	3.35	2.9
21	1.7	2.75	3.9	3.05	4.1	4.8	.....	3.95	2.95	3.0	3.35	2.9
22	1.2	2.95	3.75	2.75	3.55	4.7	.....	3.85	2.55	3.0	3.35	3.0
23	1.2	3.05	3.55	3.1	3.1	4.7	6.3	4.2	2.85	3.05	3.45	3.2
24	.....	3.25	3.3	3.2	2.9	4.55	8.05	4.2	2.9	3.05	3.3	4.0
25	.....	4.25	3.2	9.1	2.65	4.4	11.4	3.9	2.75	3.15	3.3	4.3
26	.....	4.25	3.1	7.4	2.55	4.35	9.2	3.6	3.65	3.1	3.3	4.7
27	.....	4.4	3.1	7.95	2.4	4.15	8.55	3.2	3.4	3.1	3.25	4.35
28	.....	4.6	3.15	8.8	2.25	3.9	7.0	3.2	3.6	3.05	6.7	4.2
29	.....	.....	3.2	8.45	2.15	3.75	6.5	3.15	3.45	3.1	8.7	4.5
30	.....	.....	3.2	8.25	2.05	.....	4.15	3.15	3.2	3.0	6.0	4.5
31	.....	.....	2.6	.....	1.75	.....	4.35	3.15	.....	3.05	.....	4.8

NOTE.—River dry on days of no gage height.

TAYLOR-MOORE DITCH NEAR ROSWELL, N. MEX.

This station was established March 23, 1905, and discontinued June 8, 1905. It is located between the diversion dam and reservoir site, 12 miles southwest of Roswell. The ditch takes water from Hondo River 2 miles above the Hondo River gaging station.

The channel is straight for 1,000 feet above and below the station and the current is swift. Discharge measurements are made by wading or from a plank thrown across the ditch at the gage. A staff gage is driven into the bank of the ditch. During 1905 the gage was read daily by H. L. Eames.

Discharge measurements of Taylor-Moore ditch near Roswell, N. Mex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
April 3	H. L. Eames	7	5.4	3.02	1.45	16.3
April 6	do	7	4.0	2.23	1.20	8.9
April 10	do	7	6.4	3.29	1.62	21.2
April 14	J. M. Giles	7	7.0	3.73	1.72	26.1

Daily gage height, in feet, of Taylor-Moore ditch near Roswell, N. Mex., for 1905.

Day.	Apr.	May.	June.	Day.	Apr.	May.	June.	Day.	Apr.	May.	June.
1	.....	.....	1.6	12	1.71	1.9	.....	23	1.88	1.5	.....
2	.....	.....	1.7	13	1.72	1.9	.....	24	1.9	1.5	.....
3	1.45	.....	1.8	14	1.72	1.9	.....	25	.....	1.4	.....
4	1.47	.....	1.9	15	1.75	1.9	.....	26	.....	1.3	.....
5	1.35	.....	1.9	16	1.72	1.8	.....	27	.....	1.2	.....
6	1.2	.....	1.9	17	1.72	1.81	.....	28	.....	1.15	.....
7	1.0	.....	1.9	18	1.75	1.82	.....	29	.....	1.1	.....
8	1.28	.....	1.9	19	1.78	1.92	.....	30	.....	.7	.....
9	1.6	1.5	.....	20	1.78	1.83	.....	31	.....	1.2	.....
10	1.63	1.92	.....	21	1.82	1.92	.....				
11	1.69	1.91	.....	22	1.84	1.6	.....				

NOTE.—Dam broke April 25; rebuilt May 8. Ditch dry April 25 to May 8. Dam washed out June 9; ditch dry.

Station rating table for Taylor-Moore ditch near Roswell, N. Mex., from March 23 to June 8, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.70	0.3	1.10	6.7	1.50	17.6	1.90	33
.80	1.7	1.20	8.9	1.60	21.2	2.00	37
.90	3.2	1.30	11.4	1.70	25		
1.00	4.8	1.40	14.4	1.80	29		

The above table is based on four discharge measurements made during 1905. It is well defined between gage heights 1.2 feet and 1.7 feet.

Estimated monthly discharge of Taylor-Moore ditch near Roswell, N. Mex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
March 23–31	16	6	12.1	216
April	33	0	17.9	1,065
May	34	0	16.7	1,027
June 1–8	33	21	30.0	476

NOTE.—March 23 to April 2 discharge estimated. Ditch dry April 25 to May 8 and after June 8.

PENASCO RIVER NEAR DAYTON, N. MEX.

This station was established September 12, 1905. It is located about 2 miles east and 1 mile north of Dayton and about 1 mile above the mouth of the river. Both banks are high, but are subject to overflow. The bed of the stream is composed of gravel and is slightly shifting. The current has a good velocity. Discharge measurements are made by wading near the gage.

The gage is in two sections: An inclined scale fastened to stakes driven into the left bank reads from 0 to 5.5 feet. A vertical section nailed to a post at the end of the inclined scale reads from 5.5 to 7.5 feet. During 1905 the gage was read once each day by Eugene Lattion. Bench marks were established as follows: (1) The top of post to which gage is fastened; elevation, 7.38 feet. (2) A nail in post at corner of fence on right bank opposite the gage; elevation, 9.82 feet. Elevations refer to the datum of the gage.

Discharge measurements of Penasco River near Dayton, N. Mex., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Square feet.*	*Feet per second.*	*Feet.*	*Second-feet.*
September 12	J. M. Giles	16	7.8	0.95	1.00	7.4
September 15	E. Patterson	8	4.4	1.00	.90	4.4
October 4	J. M. Giles	12	6.8	.68	.95	4.6
October 15	E. Patterson	13	7.7	.70	.95	5.4
November 23	J. M. Giles	.....	52	2.93	1.80	151
November 23	do	.....	34	2.08	1.47	71
November 23	do	.....	21	2.56	1.37	53
November 28	do	.....	22	1.67	1.15	20

Daily gage height, in feet, of Penasco River near Dayton, N. Mex., for 1905.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	0.9	1.0	1.6	12	1.0	1.0	1.0	1.4	23	.8	1.0	1.55	1.5
2	.....	.9	1.0	1.9	13	.8	1.0	1.0	1.4	24	.9	1.0	1.3	1.5
3	.....	1.0	1.0	1.5	14	.6	1.0	1.0	1.5	25	1.0	1.0	1.2	1.3
4	.....	1.0	1.3	1.6	15	.95	1.0	1.0	1.5	26	.9	1.0	1.2	1.2
5	.....	1.0	1.5	1.6	16	1.0	1.0	1.0	1.5	27	1.0	1.0	1.1	1.4
6	.....	1.0	1.0	1.6	17	1.0	1.0	1.0	1.5	28	.9	1.0	1.8	1.4
7	.....	.9	1.0	1.5	18	1.0	1.0	1.0	1.5	29	.9	1.0	1.7	1.3
8	.....	1.0	1.0	1.5	19	1.0	1.0	1.0	1.5	30	.9	1.0	1.7	1.2
9	.....	1.0	1.0	1.4	20	1.0	1.0	1.0	1.5	31	.....	1.0	.....	1.8
10	.....	1.0	1.0	1.4	21	1.5	1.0	1.0	1.5					
11	.....	1.0	1.0	1.4	22	.9	1.0	1.0	1.5					

Station rating table for Penasco River near Dayton, N. Mex., from September 12, 1905, to December 31, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.60	1	1.00	7	1.40	57	1.80	150
.70	2	1.10	15	1.50	77	1.90	180
.80	3	1.20	26	1.60	99		
.90	5	1.30	40	1.70	123		

The above table is based on eight discharge measurements made during 1905. It is well defined between gage heights 0.9 foot and 1.8 feet.

Estimated monthly discharge of Penasco River near Dayton, N. Mex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
September 12–30	77	1	9.3	351
October	7	5	6.8	418
November	150	7	28.3	1,684
December	180	26	75.3	4,630

DEVILS RIVER AT DEVILS RIVER, TEX.

This station was established in April, 1900, by the International (Water) Boundary Commission. It is opposite the Southern Pacific Railroad station at Devils River.

The river is about 50 miles in length, has a perennial flow, and during flood periods is subject to great fluctuations. No good location for a gaging station exists on this stream where it would be accessible from the railroad station. At the site chosen, the river is straight for one-fourth mile both above and below the station. The right bank is the talus of a cliff, the left bank is a bottom heavily timbered. The bed of the stream is nearly all a rock ledge, but seamed and faulted so as to be rough. The currents change in such a way at so give materially different discharges for the same gage height.

Discharge measurements are made by means of a cable, car, and tagged wire. The initial point for soundings is the cable support on the left bank.

The gage is a scantling spiked vertically to a tree. The highest water on record occurred April 6, 1900, about two weeks before this gage was established. It reached a height of 25.4 feet on the gage, but this is 8 feet higher than any other known flood. Low water is 2 feet on the gage. The bench mark is a nail in the side of the gate post near the railroad station; elevation, 31.26 feet above the datum of the gage.

The observations during 1905 have been made under the direction of the United States section of the International (Water) Boundary Commission. The hydrographer is E. E. Winter, and the gage reader is John Harrison.

Information in regard to this station is contained in the following publications of the United States Geological Survey (Ann=Annual Report; WS=Water-Supply Paper):

Description: WS 50, pp 363–364; 66, p 79; 84, p 164; 99, p 348; 132, p 122.
Discharge: WS 28, p 130; 50, p 364; 66, p 79; 84, p 164; 99, pp 349–350; 132, pp 123–124.
Discharge, mean daily: WS 132, p 125.
Discharge, monthly: Ann 22, iv, p 356; WS 75, p 161; 84, p 165; 99, p 351; 132, p 125.
Gage heights: WS 50, p 364; 66, p 79; 84, p 165; 99, pp 350–351; 132, p 124.

Discharge measurements of Devils River at Devils River, Tex., in 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
January 9	E. E. Winter	347	1.30	2.3	452
January 17	do	347	1.29	2.3	448
January 25	do	347	1.28	2.3	444
January 30	do	347	1.22	2.25	424
February 8	do	348	1.23	2.3	429
February 16	do	348	1.24	2.3	432
February 27	do	351	1.24	2.3	437
March 13	do	351	1.35	2.35	475
March 17	do	444	1.71	2.6	761
March 21	do	407	1.67	2.5	680
March 25	do	376	1.45	2.4	544
March 30	do	375	1.44	2.4	540
April 5	do	433	1.58	2.65	682
April 13	do	404	1.49	2.5	600
April 18	do	378	1.41	2.4	533
April 25	do	1,079	2.94	4.9	3,168
April 30	do	724	2.18	3.5	1,580
May 4	do	491	1.62	2.8	795
May 12	do	468	1.48	2.7	691
May 17	do	468	1.51	2.7	706
May 25	do	461	1.77	2.7	816
May 30	do	465	2.00	2.7	928
June 5	do	490	1.90	2.8	929

Discharge measurements of Devils River at Devils River, Tex., in 1905—Continued.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Square feet.	*Feet per second.*	*Feet.*	*Second-feet.*
June 14	E. E. Winter	461	1.78	2.7	822
June 22	do	462	1.78	2.7	823
June 26	do	459	1.74	2.7	797
June 30	do	518	2.02	2.9	1,045
July 6	do	457	1.82	2.7	830
July 11	do	446	1.65	2.65	736
July 16	do	403	1.50	2.55	606
July 21	do	411	1.42	2.55	582
July 27	do	404	1.39	2.5	562
July 30	do	401	1.38	2.5	553
August 7	do	406	1.40	2.5	567
August 11	do	407	1.39	2.5	565
August 16	do	402	1.35	2.5	541
August 22	do	401	1.39	2.5	559
August 25	do	402	1.43	2.5	574
August 30	do	403	1.38	2.5	558
September 4	do	552	1.80	3.0	996
September 18	do	405	1.67	2.5	675
September 23	do	403	1.66	2.5	670
September 26	do	403	1.63	2.5	657
September 29	do	405	1.62	2.5	658
October 4	do	403	1.54	2.5	621
October 12	do	403	1.45	2.5	586
October 17	do	402	1.41	2.5	566
October 25	do	396	1.23	2.45	486
October 30	do	401	1.27	2.5	511
November 4	do	396	1.28	2.5	508
November 11	do	396	1.27	2.5	501
November 16	do	401	1.26	2.5	505
November 24	do	396	1.23	2.5	489
November 30	do	396	1.60	2.5	634
December 5	H. F. Collins	372	1.54	2.45	573
December 10	do	372	1.59	2.45	592
December 18	do	365	1.62	2.45	591
December 26	do	365	1.62	2.45	593

Daily gage height, in feet, of Devils River at Devils River, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.3	2.3	2.3	6.0	4.1	2.85	2.95	2.5	2.5	2.7	2.5	2.45
2	2.3	2.3	2.3	3.65	3.5	2.8	2.8	2.5	2.5	3.1	2.5	2.45
3	2.3	2.3	2.3	2.9	3.0	2.85	2.8	2.5	3.2	2.85	2.5	2.45
4	2.3	2.3	2.3	2.8	2.85	2.95	2.7	2.5	3.1	2.55	2.5	2.45
5	2.3	2.3	2.3	2.7	2.8	2.8	2.7	2.5	2.7	2.5	2.5	2.45
6	2.3	2.3	2.3	2.7	2.8	2.8	2.7	2.5	2.6	2.5	2.5	2.45
7	2.3	2.3	2.35	2.6	2.7	2.7	2.7	2.5	2.5	2.5	2.5	2.45
8	2.3	2.3	2.35	2.6	2.7	2.65	2.7	2.5	2.5	2.5	2.5	2.45
9	2.3	2.3	2.35	2.55	2.7	2.6	2.6	2.5	2.5	2.5	2.5	2.45
10	2.3	2.3	2.35	2.55	2.7	2.6	2.6	2.5	2.5	2.5	2.5	2.45
11	2.3	2.3	2.35	2.55	2.7	2.6	2.65	2.5	2.5	2.5	2.5	2.45
12	2.3	2.3	2.35	2.5	2.7	2.6	2.6	2.5	2.5	2.5	2.5	2.45
13	2.3	2.3	2.35	2.45	2.7	2.65	2.6	2.5	2.5	2.5	2.5	2.45
14	2.3	2.3	2.35	2.5	2.85	2.7	2.55	2.5	2.5	2.5	2.5	2.45
15	2.3	2.3	2.35	2.5	2.75	2.7	2.5	2.5	2.5	2.5	2.5	2.45
16	2.3	2.3	2.7	2.5	2.7	2.7	2.55	2.5	2.5	2.5	2.5	2.45
17	2.3	2.3	2.6	2.45	2.65	2.7	2.55	2.5	2.5	2.5	2.5	2.45
18	2.3	2.3	2.6	2.4	2.5	2.7	2.55	2.5	2.55	2.5	2.5	2.45
19	2.3	2.3	2.6	2.4	2.5	2.7	2.55	2.5	3.8	2.5	2.5	2.45
20	2.3	2.3	2.6	2.4	2.5	2.7	2.55	2.5	2.75	2.8	2.5	2.45
21	2.3	2.3	2.5	2.4	2.5	2.9	2.55	2.5	2.5	2.5	2.5	2.45
22	2.3	2.3	2.5	2.4	2.5	2.7	2.55	2.5	2.5	2.45	2.5	2.45
23	2.3	2.3	2.5	2.55	2.5	2.7	2.55	2.5	2.5	2.45	2.5	2.45
24	2.3	2.3	2.5	3.1	2.75	2.7	2.55	2.5	2.5	2.45	2.5	2.45
25	2.3	2.3	2.4	4.9	2.7	2.7	2.55	2.5	2.5	2.45	2.5	2.45
26	2.3	2.3	2.4	4.9	2.8	2.7	2.55	2.5	2.5	2.45	2.5	2.45
27	2.3	2.3	2.4	2.9	2.9	2.7	2.5	2.5	2.5	2.45	2.5	2.45
28	2.3	2.3	2.4	2.7	2.85	2.8	2.5	2.5	2.5	2.45	2.5	2.45
29	2.3	.....	2.4	2.6	2.7	5.0	2.5	2.5	2.5	2.45	2 5	2.45
30	2.25	.....	2.4	4.2	2.7	3.25	2.5	2.5	2.5	2.5	2.5	2.4
31	2.25	.....	2.4	.....	3.25	.....	2.5	2.5	.....	2.5	.....	2.4

Daily discharge, in second-feet, of Devils River at Devils River, Tex., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	445	440	435	6,470	2,260	990	1,090	555	570	770	510	575
2	445	440	440	1,750	1,590	930	940	560	580	1,100	510	575
3	445	435	440	840	1,020	990	930	560	1,200	870	510	575
4	450	435	440	770	a 850	1,110	830	560	a 1,100	a 650	a 510	575
5	450	435	445	a 710	795	a 930	a 830	565	750	615	510	a 575
6	450	430	445	710	795	930	825	565	680	610	510	580
7	450	430	470	655	690	820	820	a 565	620	605	505	585
8	450	a 430	470	655	690	770	810	565	620	600	505	585
9	a 450	430	470	630	690	720	705	565	630	595	505	590
10	450	430	470	630	690	720	700	565	630	590	500	a 590
11	450	430	475	630	690	720	a 735	a 565	640	585	a 500	590
12	450	430	475	600	a 690	720	680	565	640	a 585	500	590
13	450	430	a 475	a 565	690	770	675	560	650	580	500	590
14	450	430	475	600	850	a 820	620	555	650	575	505	590
15	450	430	475	600	750	820	570	550	660	570	505	590
16	450	a 430	840	600	700	820	a 605	a 540	660	565	a 505	590
17	a 450	430	a 760	565	a 655	820	600	545	670	a 565	505	590
18	450	430	760	a 535	510	820	595	550	a 720	555	505	a 590
19	450	430	760	535	525	820	590	555	1,920	550	505	590
20	445	435	760	535	540	820	585	555	890	820	500	590
21	445	435	a 680	535	555	1,040	a 580	560	670	530	500	590
22	445	435	665	535	570	a 820	580	a 560	670	505	495	590
23	445	435	650	630	585	820	580	565	a 670	500	495	590
24	445	435	635	1,010	850	810	580	570	660	490	a 490	590
25	a 445	435	a 545	a 3,170	a 815	810	580	a 575	660	a 485	500	590
26	445	435	545	3,170	940	a 800	580	575	a 655	485	520	a 595
27	445	a 435	545	840	1,060	800	a 560	570	655	485	540	590
28	445	435	540	710	1,030	920	560	565	655	485	570	585
29	445	.....	540	650	910	3,280	555	560	a 660	485	600	580
30	a 425	.....	a 540	a 2,370	a 930	a 1,400	a 555	a 560	660	a 510	a 630	515
31	425	.....	540	.....	1,480	.....	555	560	.....	510	.....	510

a Meter measurement.

Estimated monthly discharge of Devils River at Devils River, Tex., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	450	425	446	27,441
February	440	430	433	24,040
March	840	435	555	34,126
April	6,470	535	1,107	65,861
May	2,260	510	851	52,354
June	3,280	720	945	56,251
July	1,090	555	677	41,653
August	575	540	561	34,483
September	1,920	570	736	43,825
October	1,100	485	594	36,545
November	630	490	515	30,635
December	595	510	582	35,763
The year	6,470	425	667	482 977

SAN FELIPE CREEK AT DEL RIO, TEX.

San Felipe Creek rises in four large springs northeast of Del Rio, and flows southward into the Rio Grande. The waters of these springs are used in two large irrigation systems, the one on the west side of the creek having been in use for many years, while the one on the east has only recently been constructed by G. Bedell Moore. The following table shows the discharge measurements that have been taken on the combined flow of the Madre ditch and the creek just south of the bridge of the Southern Pacific Railroad.

Discharge measurements of San Felipe Creek at Del Rio, Tex., 1895–1905.

Date.	Hydrographer.	Discharge.	Remarks.
		Second-feet.	
December, 1895	C. C. Babb	99	
March, 1899	T. U. Taylor	113	
September, 1900	do	149	Rainy season.
December, 1901	C. N. Campbell	150	After Brackett flood.
September, 1902	T. U. Taylor	115	
March, 1904	do	118	Includes 38 second-feet in ditch.
August, 1905	do	103	

LAS MORAS CREEK NEAR BRACKETTVILLE, TEX.

Las Moras Creek, like its sister springs of the Edwards Plateau, rises very suddenly. It is located near the twin towns of Brackettville and Fort Clark, and threads its way between the two. It flows south, supporting many irrigation systems, and finally empties into the Rio Grande 25 miles above Eagle Pass. Its flow is extremely variable, being a reflex barometer of the season preceding, and like the Leona at Uvalde, it gives a safe index of the rainfall of the Edwards Plateau for months before. The following table shows the discharge measurements that have been taken:

Discharge measurements of Las Moras Creek near Brackettville, Tex., 1895–1905.

Date.	Hydrographer.	Discharge.	Remarks.
		Second-feet.	
December, 1895	C. C. Babb	21	At footbridge, Brackettville.
June, 1899	T. U. Taylor	60	At Mulligans Bend.
September, 1900	do	51	Do.
September, 1902	do	11	Do.
September, 1902	do	11	Do.
March, 1904	do	28	Do.
August, 1905	do	14	Do.

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CLASSIFICATION OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY.

[Water-Supply Paper No. 174.]

The publications of the United States Geological Survey consist of (1) Annual Reports; (2) Monographs; (3) Professional Papers; (4) Bulletins; (5) Mineral Resources; (6) Water-Supply and Irrigation Papers; (7) Topographic Atlas of United States, folios and separate sheets thereof; (8) Geologic Atlas of United States, folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists may be had on application.

Most of the above publications may be obtained or consulted in the following ways:

1. A limited number are delivered to the Director of the Survey, from whom they may be obtained, free of charge (except classes 2, 7, and 8), on application.

2. A certain number are delivered to Senators and Representatives in Congress, for distribution.

3. Other copies are deposited with the Superintendent of Documents, Washington, D. C., from whom they may be had at practically cost.

4. Copies of all Government publications are furnished to the principal public libraries in the large cities throughout the United States, where they may be consulted by those interested.

The Professional Papers, Bulletins, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, General hydrographic investigations; N, Water power; O, Underground waters; P, Hydrographic progress reports.

Series P.—The hydrographic progress reports contain the results of stream measurements. A report is issued for every calendar year, containing the results of data collected during that year. These reports were first published as a part of the Director's annual report or as a bulletin; they are now published as water-supply and irrigation papers. The following is a list, by years, of the publications containing the progress reports of stream measurements. A detailed index of these reports (1888–1903) is published as Water-Supply Paper No. 119.

1888. Tenth Annual Report, Part II.
1889. Eleventh Annual Report, Part II.
1890. Twelfth Annual Report, Part II.
1891. Thirteenth Annual Report, Part III.
1892. Fourteenth Annual Report, Part II.
1893. Bulletin No. 131.
1894. Bulletin No. 131; Sixteenth Annual Report, Part II.
1895. Bulletin No. 140.
1896. Water-Supply Paper No. 11; Eighteenth Annual Report, Part IV.
1897. Water-Supply Papers Nos. 15 and 16; Nineteenth Annual Report, Part IV.
1898. Water-Supply Papers Nos. 27 and 28; Twentieth Annual Report, Part IV.
1899. Water-Supply Papers Nos. 35, 36, 37, 38, and 39; Twenty-first Annual Report, Part IV.
1900. Water-Supply Papers Nos. 47, 48, 49, 50, 51, and 52; Twenty-second Annual Report, Part IV.
1901. East of Mississippi River, Water-Supply Papers Nos. 65 and 75.
West of Mississippi River, Water-Supply Papers Nos. 66 and 75.
1902. East of Mississippi River, Water-Supply Papers Nos. 82 and 83.
West of Mississippi River, Water-Supply Papers Nos. 84 and 85.

1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
West of Mississippi River, Water-Supply Papers Nos. 99 and 100.
1904. East of Mississippi River, Water-Supply Papers Nos. 124, 125, 126, 127, 128, and 129.
West of Mississippi River, Water-Supply Papers Nos. 130, 131, 132, 133, 134, and 135.
1905. East of Mississippi River, Nos. 165, 166, 167, 168, 169, 170, and 171.
West of Mississippi River, Nos. 171, 172, 173, 174, 175, 176, 177, and 178.

The Geological Survey and the Reclamation Service have suboffices in different parts of the United States, from which hydrographic and reclamation work in the respective localities is carried on and where data may be obtained on application. These offices are located as follows:

Boston, Mass., 6 Beacon street; Utica, N. Y., 75 Arcade; Atlanta, Ga., 409 Temple court; Austin, Tex., University of Texas; Chicago, Ill., 876 Federal Building; Belle Fourche, S. Dak.; Cody, Wyo.; Denver, Colo., Chamber of Commerce Building; Salt Lake, Utah; Los Angeles, Cal., 1108 Braly Building; San Francisco, Cal., 432 Merchants' Exchange Building; Phoenix, Ariz.; Carlsbad, N. Mex.; El Paso, Tex.; Billings, Mont.; Great Falls, Mont.; Hazen, Nev.; Boise, Idaho; Spokane, Wash., 424 Peyton Block; Pendleton, Oreg.

Correspondence should be addressed to

THE DIRECTOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C.

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