Water-Supply and Irrigation Paper No. 177 Series P, Hydrographic Progress Reports, 53

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

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REPORT

OF

PROGRESS OF STREAM MEASUREMENTS

FOR

THE CALENDAR YEAR 1905

PREPARED UNDER THE DIRECTION OF F. H. NEWELL

PART XIII.—Great Basin and Pacific Ocean Drainages in California, and Colorado River Drainage below Gila River

BY

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WASHINGTON

GOVERNMENT PRINTING OFFICE

1906

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PART XIII.

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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 semi-arid sections." (28 Stat. L., p. 398.)

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

Annual appropriation for hydrographic surveys, 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 systematized 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. 165–178, 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.

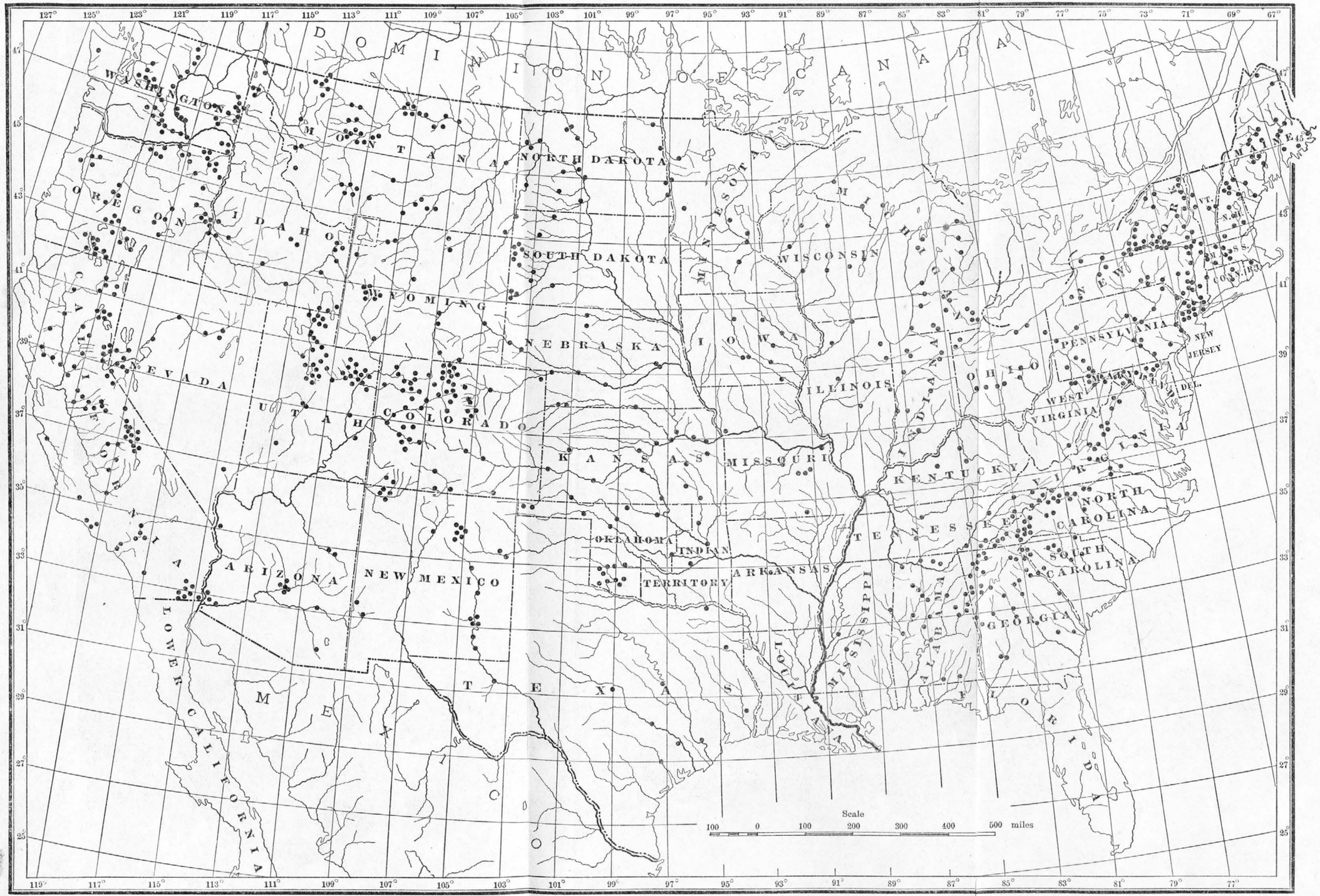
List of drainage basins in the United States.

NORTHERN ATLANTIC DRAINAGE BASINS.

St. John.
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 "discharges," 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 quantity of water flowing in a stream 1 foot wide, 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 quantity of water that passes 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. In most States the California miner's inch is used, which is the fiftieth part of a second-foot.

"Second-feet per square mile" is 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 area of cross section, the mean velocity, the gage height, 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, and it 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 closely as the data on 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 1 square mile 1.131 feet deep, 13.572 inches deep.
1 second-foot for one year equals 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 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-eighths 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.
1½ horsepowers equal about 1 kilowatt.

To calculate water power 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 of 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, $v=c\sqrt{R\,s}$. 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 $Q=cbh^{\frac{3}{2}}$, or some similar standard weir formula, are known (see Water-Supply Paper No. 150); (*f*) either no flash-boards 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.

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 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 practicaliy 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 semi-permanent 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 it 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.

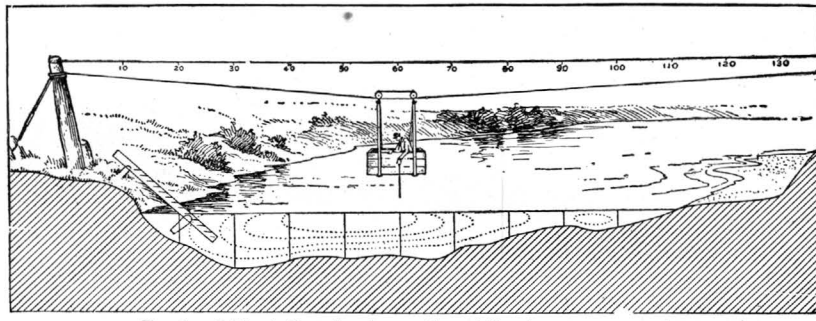


FIG. 1.—Cable station showing section of the river, car, gage, etc.

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 conditions 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. Assuming 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 freqeunt 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, the varying thickness of ice. Such data as are available in regard to this subject are published in Water-Supply Paper No. 146, pages 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 a 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 the 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 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 hortzontal 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 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

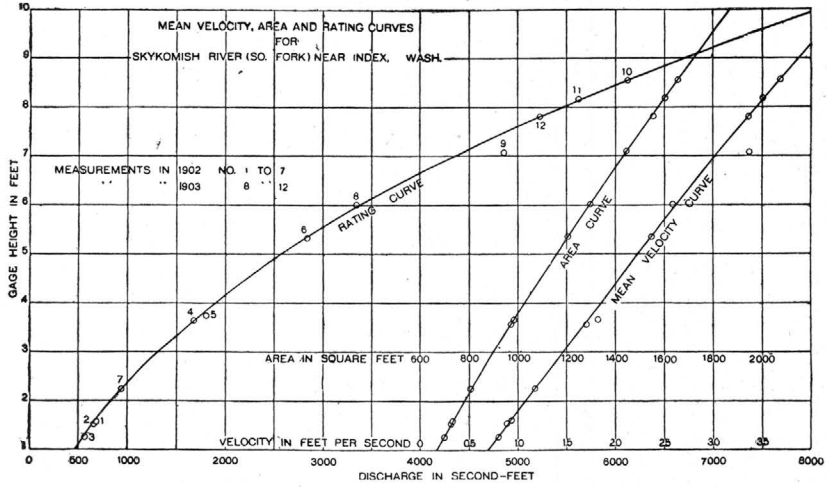


FIG. 2.—Discharge mean-velocity and area curves for South Fork of Skykomish River near Index.

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 be either 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 the 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 due to each of these persons, and thanks are extended to other persons and corporations who have assisted local hydrographers or have cooperated in any way, either by furnishing records of the height of water or by assisting in transportation.

The hydrographic work of the United States Geological Survey in California is being carried on in cooperation with the State, in accordance with acts of the State legislature approved March 16, 1903, and March 20, 1905.

The act of March 16, 1903, which covered the period from July 1, 1903, to June 30, 1905, is in substance as follows:

> The State board of examiners are hereby empowered to enter into contracts with the Director of the United States Geological Survey for the purpose of making topographic maps to the extent of twenty thousand dollars; also for the purpose of gaging streams, surveying reservoir sites and canal locations, for the conservation and utilization of the flood or storm waters of the State, to the extent of fifteen thousand dollars, [etc.]

The act of March 20, 1905, is in substance the same as previous act, the appropriations being increased to $30,000 for topography and $20,000 for hydrography, and covering the two fiscal years July 1, 1905, to June 30, 1907.

The State board of examiners is composed of the following members: George C. Pardee, governor; C. F. Curry, secretary of state; U. S. Webb, attorney-general.

Although the portions of these bills referring to hydrographic work provide for making surveys of reservoir sites and canal locations, none of the State money has been expended for this purpose. The Geological Survey has made these investigations on Puta Creek, Cache Creek, Sacramento River, Pit River and tributaries, Feather River and tributaries, Owens River, and Colorado River, and has paid the entire expense from its own funds.

The State appropriation of $15,000, which was available between July 1, 1903, and June 30, 1905, was used exclusively for gathering general stream-flow data. The Survey also apportioned $20,000 for the same purpose during the same period. The data being accumulated have a specific value in connection with the future development of the resources of the State. The information will be invaluable in designing and making estimates of cost for storage, irrigation, power and drainage works, and for use in litigation.

The work in California is under the direction of Supervising Engineer J. B. Lippincott,[a] assisted by Engineer W. B. Clapp, who has immediate charge of the accumulation of hydrographic data. Acknowledgments are also due to the following individuals and corporations for assistance rendered and data furnished: To J. C. Pierson, city surveyor of Sacramento, Cal., for river-stage and turbidity records of Sacramento River at Sacramento; to the Kern County Land Company, through A. K. Warren, engineer in charge of water measurements, for the record of Kern River; to the city of Santa Barbara for cooperation in gaging Santa Ynez River; to the Bay Cities Water Company, through Edwin Duryea, jr., chief engineer, for precipitation and run-off data; to the Southern Pacific Company, through its chief engineer, William Hood, for river-stage records of San Joaquin River at Herndon, Cal., and for transportation furnished the supervising engineer and assistants; and to the officials of the Santa Fe Railway for transportation furnished to the supervising engineer and assistants.

The work in the extreme eastern portion of California was carried on under the direction of Henry Thurtell,[b] State engineer of Nevada, assisted by W. A. Wolf, J. T. Shaw, R. A. Craig, O. F. Heizer, and L. A. Wooley. Acknowledgment is due to the Southern Pacific Company for transportation furnished the district hydrographers and assistants.

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[b] Office, Carson, Nev.

COLORADO RIVER DRAINAGE BASIN BELOW GILA RIVER.

COLORADO RIVER AT YUMA, ARIZ.

This station is located in the town of Yuma, Ariz., 1½ miles below the mouth of Gila River and 10 miles, by river, above the Mexican boundary. Records of river height have been kept by the Southern Pacific Company since April 1, 1878, on the gage which was established by Arthur Brown, superintendent of the company's bridge and building department, during the summer of 1876.

The channel of the main river is straight for 600 feet above and 5,000 feet below the station. The right bank is low, wooded, and liable to overflow; the left bank is not subject to overflow. The bed of the stream is composed of silt and sand and is very unstable. At low water the channel has a width of 300 feet; at flood stages a large part of the water flows through an old channel and does not pass under the cable. The current is swift and the gaging section regular. At all stages of the river the depth and the velocity are uniform and there are no large eddies.

Prior to May 31, 1903, discharge measurements were made from the railroad bridge. On that date a cable station was established at a point 600 feet below the bridge, and all measurements are now made from a car, except during highest floods, when a boat is used. The cable is supported on masts and is equipped with a winch, by which it can be lowered for the passage of boats. The cable has a span of 650 feet. The initial point for soundings is the cable support on the south or left bank about 20 feet from the water's edge at high water. The water that flows in the old channel at flood stages is measured at the point where it passes under the railway trestle, one-third mile north of the main channel. During the flood of May and June, 1905, there were two breaks in the railroad grade at Araz, Cal., 4 miles from Yuma, and the water passing through these is included in each discharge measurement of the Colorado.

The gage, which was read twice each day during 1905 by W. D. Smith, the resident hydrographer, is in two sections. The lower section of the rod, reading from 15 to 25 feet, is nailed to the pile protection on the south bank of the river 50 feet below the Southern Pacific Railroad bridge. The upper section, reading above 24 feet, is a long pile on the north bank of the river 100 feet above the railway bridge, and is the original gage established in 1876. The bench mark is a standard United States Geological Survey bronze cap located at the railway bridge on the first pier from the south bank; elevation, 35.31 feet above the zero of the gage and 137.4 feet above sea level.

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 298–299; Bull 131, p 51; 140, pp 207–208; WS 16, p 151; 28, p 133; 38, p 324; 50, p 387; 66, p 104; 85, p 17; 100, pp 19–20; 133, pp 25–26.
Discharge: Ann 18, iv, p 299; Bull 131, p 51; 140, p 208; 66, p 104; 85, p 18; 100, pp 20–24; 133, pp 26–29.
Discharge, mean daily: WS 133, p 31.
Discharge, monthly: WS 85, p 20; 100, p 25; 133, p 32.
Evaporation record: WS 133, p 32.
Gage heights: Bull 131, p 52; 140, pp 208–210; WS 11, p 73; 16, p 151; 28, p 141; 38, p 325; 50, p 387; 66, p. 104; 85, p 19; 100, pp 24–25; 133, p 30.
Hydrograph: Ann 12, ii, p 290.
Rating table: WS 85, p 19.

Discharge measurements of Colorado River at Yuma, Ariz., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
January 4	W. D. Smith	18.60	3,985	April 26	W. D. Smitn	23.40	37,160
January 6	do	18.95	4,573	April 27	A. N. Kelly	23.95	41,630
January 9	do	18.65	4,170	April 29	W. D. Smith	23.95	34,990
January 10	do	21.10	16,090	May 1	do	25.00	41,520
January 11	do	19.20	6,401	May 4	do	24.25	37,280
January 13	do	19.25	6,348	May 6	do	24.55	37,410
January 17	J. S. Evans	22.30	20,420	May 8	do	25.10	40,050
January 18	do	23.95	27,450	May 10	do	26.10	49,200
January 20	do	21.00	12,170	May 13	do	25.40	38,840
January 23	W. D. Smith	20.20	7,863	May 16	do	25.00	37,320
January 25	J. S. Evans	19.80	7,055	May 18	do	24.70	33,910
January 28	do	19.55	5,727	May 20	do	24.30	34,580
January 31	do	19.30	5,278	May 23	do	24.90	38,390
February 2	do	19.60	6,054	May 26	do	25.80	45,300
February 4	do	19.70	6,632	May 29	do	26.80	54,810
February 6	do	21.40	16,600	May 31	do	27.40	59,020
February 8	do	28.00	67,730	June 3	do	28.00	68,160
February 9	do	28.75	82,820	June 6	do	28.45	67,600
February 10	do	26.20	39,580	June 8	do	28.30	72,930
February 11	do	24.10	32,120	June 12	do	28.25	72,590
February 16	do	21.50	18,610	June 14	do	28.70	82,020
February 18	W. D. Smith	21.40	16,490	June 19	do	29.15	94,320
February 20	do	25.10	47,000	June 22	do	29.10	92,400
February 22	do	25.80	54,730	June 26	do	28.55	77,610
February 23	do	23.70	32,990	June 29	do	27.60	64,370
February 24	do	22.05	21,990	July 3	do	25.90	50,640
February 25	do	21.50	18,860	July 5	do	25.45	44,950
February 27	do	23.45	27,730	July 10	do	23.35	32,980
March 1	do	23.95	29,070	July 13	F. R. S. Buttemer	22.05	30,870
March 2	do	24.90	39,260	July 15	do	21.90	27,710
March 3	do	26.70	70,170	July 18	do	21.75	25,300
March 6	do	24.80	44,310	July 19	do	21.30	22,320
March 9	do	24.10	36,400	July 21	do	20.90	22,000
March 11	do	24.20	38,625	July 24	do	20.50	20,800
March 13	do	24.45	38,870	July 26	do	20.35	20,460
March 15	do	24.00	36,720	July 28	do	20.05	18,910
March 16	do	26.10	60,640	July 31	do	19.95	16,750
March 17	do	27.35	65,820	August 2	do	19.90	15,790
March 19	do	28.00	73,440	August 4	do	19.80	13,560
March 20	do	30.25	110,800	August 7	do	20.20	15,940
March 22	do	28.90	91,200	August 9	do	20.30	16,770
March 23	do	27.75	76,930	August 11	do	20.40	16,960
March 24	do	25.60	58,600	August 14	do	20.10	15,960
March 25	do	24.10	43,050	August 16	do	19.60	13,800
March 27	do	23.10	31,020	August 19	W. D. Smith	19.10	9,757
March 30	do	22.00	24,390	August 21	do	18.85	8,690
April 1	do	21.50	20,690	August 23	do	18.75	7,795
April 3	do	21.30	19,480	August 26	do	18.65	7,241
April 5	do	21.60	21,000	August 28	do	18.70	7,013
April 7	do	22.50	29,840	August 30	do	19.60	10,290
April 13	do	25.30	45,800	September 1	do	18.50	6,440
April 14	J. N. Johannson	29.40	93,800	September 4	do	18.45	6,464
April 19	W. D. Smith	24.90	45,050	September 6	do	18.30	5,644
April 21	do	23.30	39,500	September 9	do	18.45	6,051
April 24	do	22.30	31,690	September 11	do	18.95	7,631

Discharge measurements of Colorado River at Yuma, Ariz., in 1905—Continued.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
September 13.	W. D. Smith	18.85	7,706	November 3	W. D. Smith	18.50	5,812
September 14.	do	19.40	9,667	November 6	do	18.35	5,709
September 16.	do	18.80	7,700	November 9	do	18.75	6,632
September 18.	do	18.60	6,743	November 13	do	18.75	6,308
September 20.	do	18.70	7,131	November 16	do	18.85	6,787
September 23.	do	18.45	6,063	November 23	do[a]	18.80	6,495
September 26.	do	18.20	5,260	November 27	do	19.00	6,652
September 29.	do	18.00	5,287	November 30	do	31.30	102,700
October 2	do	18.00	5,222	December 1	do	28.78	77,360
October 4	do	18.65	7,172	December 2	do	23.50	37,160
October 6	do	18.80	7,295	December 5	do	21.30	28,650
October 7	do	20.10	13,080	December 8	do	19.50	16,970
October 10	do	20.30	14,060	December 11	do	18.75	12,620
October 13	do	19.70	10,660	December 14	do	18.30	9,613
October 16	do	19.10	8,290	December 16	do	18.20	8,795
October 19	do	18.70	6,779	December 18	do	17.95	7,807
October 23	do	18.60	6,025	December 21	do	17.85	7,670
October 27	do	18.40	5,507	December 26	do	17.95	7,502
October 31	do	18.40	5,579	December 30	do	17.80	5,981

Daily gage height, in feet, of Colorado River at Yuma, Ariz., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	18.5	19.45	23.9	21.5	25.0	27.55	26.8	19.95	18.5	18.0	18.4	28.05
2	18.5	19.6	25.05	21.4	24.7	27.8	26.5	19.9	18.4	18.0	18.45	24.05
3	18.5	19.7	26.7	21.3	24.7	28.0	25.9	19.85	18.4	18.3	18.5	23.95
4	18.6	19.7	26.7	21.3	24.25	28.2	25.45	19.8	18.45	18.8	18.4	22.9
5	18.75	20.3	25.3	21.65	24.25	28.35	25.45	19.8	18.4	19.0	18.35	21.3
6	18.95	21.2	24.8	22.6	24.55	28.45	25.0	19.9	18.3	18.95	18.35	20.5
7	19.0	21.05	24.8	22.5	24.7	28.55	24.6	20.3	18.2	20.05	18.4	20.0
8	18.9	27.2	24.7	22.1	25.1	28.3	24.1	20.5	18.3	20.2	18.65	19.5
9	18.65	28.75	24.1	22.0	25.75	28.2	23.8	20.3	18.45	20.6	18.75	19.2
10	21.0	26.6	23.9	22.0	26.1	28.15	23.35	20.2	18.95	20.3	18.8	18.95
11	19.25	24.1	24.1	21.85	26.3	28.2	22.8	20.45	18.7	20.1	18.8	18.75
12	19.2	22.95	24.75	22.10	26.1	28.25	22.6	20.4	18.6	19.95	19.0	18.45
13	19.25	22.4	24.35	25.45	25.5	28.4	22.1	20.15	18.85	19.7	18.75	18.4
14	19.45	22.2	23.7	29.25	25.1	28.7	22.0	20.1	19.45	19.3	18.65	18.3
15	19.65	22.25	24.35	29.65	25.0	28.7	21.9	19.75	19.2	19.2	18.75	18.2
16	19.75	21.6	26.35	27.2	25.05	28.75	21.95	19.6	18.8	19.1	18.85	18.2
17	22.2	21.1	27.35	24.9	24.95	28.85	22.25	19.35	18.65	18.9	18.85	18.0
18	23.8	21.4	26.55	24.55	24.7	28.95	21.7	19.15	18.6	18.75	18.8	17.95
19	22.2	22.65	28.1	24.9	24.5	29.15	21.3	19.05	18.6	18.7	18.95	17.9
20	21.0	24.9	30.3	24.4	24.3	29.05	21.25	19.0	18.7	18.7	18.9	17.95
21	20.45	25.75	29.75	23.3	24.45	29.10	20.95	18.85	18.6	18.65	18.8	17.8
22	20.55	25.85	28.9	22.8	24.65	29.1	20.7	18.8	18.45	18.6	18.8	17.85
23	20.3	23.55	27.75	22.6	24.85	29.0	20.5	18.75	18.45	18.6	18.8	17.85
24	20.0	22.0	25.6	22.35	25.25	28.85	20.5	18.7	18.4	18.6	18.7	17.9
25	19.8	21.45	24.1	22.6	25.55	28.75	20.45	18.65	18.35	18.6	18.75	17.85
26	19.75	23.65	23.4	23.45	25.75	28.55	20.35	18.65	18.2	18.5	18.8	17.95
27	19.65	23.5	23.1	23.95	26.0	28.25	20.2	18.7	18.0	18.4	19.05	17.9
28	18.55	23.5	22.85	24.15	26.4	27.9	20.05	18.7	18.0	18.35	21.3	17.8
29	19.4	.....	22.4	23.95	26.8	27.6	19.95	18.65	18.0	18.4	26.2	17.8
30	19.35	.....	22.0	24.55	27.0	27.25	20.0	19.5	18.0	18.45	31.3	17.8
31	19.3	.....	21.9	.....	27.4	.....	19.95	18.8	.....	18.4	.....	17.8

Daily discharge, in second-feet, of Colorado River at Yuma, Ariz., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,750	5,800	29,070	20,690	41,520	61,500	57,800	16,400	6,440	5,240	5,620	77,360
2	3,750	6,054	39,260	20,100	39,700	65,300	55,500	15,790	6,280	5,220	5,720	37,160
3	3,800	6,500	70,170	19,480	39,700	68,160	50,640	14,700	6,250	6,140	5,810	40,200
4	3,985	6,632	70,200	19,450	37,280	67,900	45,000	13,560	6,464	7,170	5,750	35,000
5	4,300	9,800	51,100	21,000	37,100	67,600	44,950	12,900	6,160	8,250	5,700	28,650
6	4,570	16,590	44,310	30,100	37,410	67,600	42,400	14,200	5,644	7,300	5,710	23,300
7	4,700	9,400	44,100	29,840	38,000	69,500	40,100	15,940	5,060	13,080	5,860	20,100
8	4,500	62,080	43,100	25,800	40,050	72,930	37,200	17,450	5,560	13,560	6,360	16,970
9	4,170	82,820	36,400	24,800	46,000	70,300	35,500	16,770	6,051	15,500	6,630	15,000
10	16,090	52,580	34,400	24,900	49,200	69,600	32,980	16,200	8,000	14,060	6,680	13,700
11	6,400	37,320	38,620	23,000	52,000	71,000	32,100	16,960	7,631	12,950	6,550	12,620
12	6,300	29,700	42,000	26,100	48,000	72,590	31,720	16,900	6,900	12,100	6,950	10,500
13	6,350	22,800	38,870	45,800	38,840	76,000	30,870	16,150	7,706	10,660	6,310	10,200
14	7,000	21,900	32,000	93,800	37,800	82,020	29,500	15,960	9,667	9,100	6,050	9,610
15	8,370	22,500	36,720	97,500	37,300	82,000	27,710	14,500	8,900	8,650	6,500	9,100
16	8,600	18,610	60,640	70,100	37,320	83,000	28,300	13,800	7,700	8,290	6,790	8,800
17	20,100	14,600	65,820	45,000	37,000	86,000	31,100	11,900	7,000	7,500	6,640	8,100
18	27,500	16,490	62,400	43,600	33,910	88,500	25,300	10,300	6,743	6,950	6,560	7,810
19	19,300	31,500	73,440	45,050	34,200	94,320	22,320	9,757	6,720	6,780	6,320	7,750
20	12,120	47,000	110,840	43,400	34,580	91,500	22,250	9,350	7,131	6,700	6,240	7,720
21	9,300	54,200	103,500	39,500	35,700	92,400	22,000	8,690	6,700	6,400	6,320	7,670
22	10,170	54,730	91,200	35,900	37,000	92,390	21,500	8,100	6,080	6,100	6,400	7,640
23	7,863	32,990	76,930	33,900	38,390	89,800	20,900	7,796	6,063	6,020	6,500	7,600
24	7,900	21,990	58,600	31,690	41,500	84,800	20,800	7,550	5,890	6,000	6,520	7,560
25	7,025	18,850	43,050	33,000	43,700	82,000	20,650	7,380	5,740	5,970	6,550	7,540
26	6,770	30,500	34,600	37,160	45,290	77,610	20,460	7,241	5,260	5,750	6,580	7,500
27	6,250	27,730	31,020	41,630	47,600	73,500	19,700	7,240	5,270	5,510	6,650	7,200
28	5,730	25,000	29,500	39,000	51,100	68,500	18,910	7,013	5,280	5,400	24,500	6,700
29	5,400	.....	26,900	34,990	54,810	64,370	17,200	6,850	5,287	5,540	62,500	6,400
30	5,070	.....	24,390	38,700	56,300	61,500	17,500	10,290	5,260	5,670	102,700	5,980
31	4,900	.....	23,500	.....	59,020	.....	16,750	7,500	.....	5,580	.....	5,900

NOTE.—Daily discharge obtained by indirect method.

Estimated monthly discharge of Colorado River at Yuma, Ariz., for 1905.

[Drainage area, 225,000 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	27,500	3,750	8,130	499,900	0.036	0.042
February	82,820	5,800	28,100	1,561,000	.125	.130
March	110,800	23,500	50,540	3,108,000	.225	.259
April	97,500	19,450	37,830	2,251,000	.168	.187
May	59,020	33,910	42,170	2,593,000	.187	.216
June	94,320	61,500	76,470	4,550,000	.340	.379
July	57,800	16,750	30,310	1,864,000	.135	.156
August	17,450	6,850	12,100	744,000	.054	.062
September	9,667	5,060	6,495	386,500	.029	.032
October	15,500	5,220	8,037	494,200	.036	.042
November	102,700	5,620	12,000	714,000	.053	.059
December	77,360	5,900	15,400	946,900	.068	.078
The year	110,800	3,750	27,300	19,710,000	.121	1.64

Yearly maximum and minimum gage heights, in feet, of Colorado River at Yuma, Ariz., 1878 to 1905.

[Compiled from the records of Capt. Isaac Polhamus, the Southern Pacific Railroad, and the United States Geological Survey.]

Year.	Maximum.		Minimum.		Year.	Maximum.		Minimum.	
	Height.	Date.	Height.	Date.		Height.	Date.	Height.	Date.
1878.....	23.0	June 24	14.7	Dec. 31	1892.....	25.5	July 3	15.5	Dec. 31
1879.....	20.0	May 12	13.2	Oct. 14	1893.....	25.2	May 28	15.5	Jan. 2
1880.....	24.0	May 31	14.9	Dec. 8	1894.....	23.7	June 14	15.9	Jan. 23
1881.....	23.5	June 14	15.0	Jan. 25	1895.....	28.2	Jan. 20	16.8	Feb. 13
1882.....	22.6	June 18	15.5	Dec. 20	1896.....	24.5	Sept. 30	17.4	Dec. 17
1883.....	24.5	July 3	14.0	Dec. 14	1897.....	26.1	June 9	17.9	Dec. 21
1884.....	[a]28.5	June 27	14.2	Dec. 5	1898.....	23.6	June 27	17.5	Jan. 8
1885.....	24.7	June 13	13.7	Feb. 8	1899.....	27.0	July 1	17.0	Oct. 17
1886.....	26.8	June 6	14.4	Jan. 19	1900.....	26.0	June 10	16.4	Sept. 10
1887.....	23.5	June 10	14.9	Jan. 26	1901.....	27.2	May 31	16.2	Jan. 14
1888.....	21.8	June 25	14.8	Jan. 4	1902.....	24.5	May 26	16.6	Sept. 28
1889.....	22.4	June 7	15.4	Sept. 27	1903.....	27.7	June 26	16.8	Jan. 13
1890.....	25.5	June 5	16.4	Jan. 29	1904.....	26.3	June 5	18.3	Dec. 27
1891.....	[b]33.2	Feb. 26	16.4	Sept. 22	1905.....	31.3	Nov. 30	17.8	Dec. 31

[a] Said to be highest flood for 17 years preceding.

[b] Highest flood recorded.

COLORADO RIVER BELOW HEADING NO. 3 OF THE IMPERIAL CANAL.

Measurements at this point were begun July 12, 1905, as so much water was at that date going down the canal that it was simpler and more economical to measure the water in the old channel of the Colorado than to continue the measurements on the canal itself.

In the center of the river, opposite heading No. 3, is an island nearly a mile long. The channel on the west side of the island is about 600 feet wide; that on the east side is about 800 feet wide. At first the discharge was measured at a point below the island, but by August 15 a sand bar had formed from the island to the west bank of the river below the heading, and all water passing down on the west of the island entered the canal. August 31 a gage was established above the head of the island, and after that date all discharge measurements were made at the head of the island. Measurements were not made at one certain point, but at any favorable cross section among the shifting bars of mud and quicksand that could be reached and measured by boat or by wading.

The old channel continued to silt up gradually and the new one to scour deeper, and October 20, 1905, all the water was carried by the new channel, i. e., the Imperial canal. The California Development Company made a serious and expensive effort to turn the water back by constructing a dam of piles, brush mats, brush, and sand bags. By the latter part of November this dam had progressed sufficiently to raise the height of the water 2.5 feet, and about 300 second-feet of water flowed down the old channel. Most of the great flood of November 29 at its crest went down the old channel; but by the time it had receded the dam was washed away, the old channel was silted up higher than before, and the new channel was scoured still deeper.

The gage is a vertical rod nailed to the root of a large willow stump on the east bank of the river. It is located at a point nearly opposite the upper end of the upper row of piling, extending from the head of the island obliquely upstream to the west bank, and is opposite station 425 of the Yuma Valley levee line. The bench mark is a nail in a willow tree 20 feet above the gage and 25 feet from the bank; elevation, 13.05 feet above the zero of the gage. Levels from the levee line show the elevation of the zero of the gage to be 109.19 feet above sea level.

Discharge measurements of Colorado River, below heading No. 3 of Imperial canal in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 12	W. D. Smith		11,610	October 18	W. D. Smith	1.50	25
July 30	L. B. Brainard		2,484	October 25	do	1.00	[a] 0
August 3	F. R. S. Buttemer		1,999	October 30	do	.95	[a] 0
August 10	do		2,218	November 4	do	.95	[a] 0
August 18	W. D. Smith		1,169	November 11	do		[a] 0
August 24	do		769	November 18	do	2.10	87
August 31	do	2.90	557	November 25	do	2.45	205
September 7	do	1.80	90	November 30	J. A. Tolin		[b] 70,000
September 14	do	3.80	1,232	December 7	W. D. Smith		878
September 22	do	2.10	175	December 13	do		[c] 0
September 28	do	1.60	37	December 17	do		[c] 0
October 11	do	3.50	1,014	December 23	do		[a] 0

[a] No discharge October 20 to November 11. [b] Estimated. [c] No discharge December 13–31.

CANALS BELOW YUMA, ARIZ.

COLORADO VALLEY PUMPING AND IRRIGATION COMPANY'S CANAL AT YUMA, ARIZ.

This canal diverts water from the Colorado River at Yuma, Ariz., for the purpose of irrigating land in the upper part of Yuma Valley. The water is raised by a large centrifugal pump operated by a steam engine of 125 horsepower. The lift varies from 2 to 12 feet in ordinary seasons. The expense of pumping is about $0.60 per acre-foot, not including interest on investment and deterioration of plant. The amount of water used during 1904 was accurately determined by W. D. Smith, and reported in Water-Supply Paper No. 134, page 42, under the head of "Duty of water and seepage investigations." Measurements made in 1903 are reported in Water-Supply Paper No. 100. During 1905 the zanjero used the same "irrigating head" as for the year preceding, his measurements being made by weirs. This was checked by a meter gaging on September 26, which gave a discharge of 34.1 second-feet. The engineer, H. H. Alexander, kept a record of the number of irrigating heads pumped every hour the pump was in operation during 1905. The following table is based on his record. The rainfall data were furnished by S. H. Hackett, of the United States Weather Bureau.

Monthly duty of water of the Colorado Valley Pumping and Irrigation Company's canal and rainfall at Yuma, Ariz., for 1905.

	Duty of water (acre-feet).			Rainfall (inches).
	Total.	Per acre, gross area.	Per acre, net area.	
January	220	0.03	0.10	1.15
February	250	.04	.11	3.43
March	0	.00	.00	3.33
April	1,180	.18	.51	.16
May	1,470	.23	.64	.00
June	1,240	.19	.54	.00
July	1,260	.19	.55	.00
August	1,550	.24	.67	.02
September	1,310	.20	.57	.52
October	530	.08	.23	.02
November	350	.05	.15	2.44
December	300	.05	.13	.32
Total irrigation	9,660	1.48	4.20	11.39
Total, including rainfall			5.15	

Mixed crops: Alfalfa, 1,350 acres; grain, 470 acres; corn and sorghum, 250 acres; miscellaneous, 230 acres. Total net area, 2,300 acres; total gross area, 6,500 acres; number of irrigators, 75. Average annual rainfall at Yuma, 3 inches.

The above includes loss by seepage.

FARMERS' CANAL NEAR YUMA, ARIZ.

This canal, the property of the Yuma Valley Union Land and Water Company, diverts water from Colorado River at a point 1 mile below Yuma, Ariz., for the purpose of irrigating lands in Yuma Valley.

Measurements have been made at the heading immediately at the river since May, 1903, by means of a boat and cable or by wading. As the point of gaging is above the controlling head gate, gage heights would be of no value for the purpose of constructing rating tables and no gage has been established. The height at any date may be obtained approximately by subtracting 1 foot from the gage reading at Yuma.

The canal is heavily silted, and during 1905 has been dry much of the time.

Results of measurements made in previous years are contained in Water-Supply Papers Nos. 100 and 134 of the United States Geological Survey.

Discharge measurements of Farmers' Canal near Yuma, Ariz., for 1905.

Date.	Hydrographer.	Area of section.	Mean velocity.	Discharge.
		Sq. feet.	*Ft. per sec.*	*Sec.-ft.*
January 13	W. D. Smith	31	0.71	22
March 7	do	31	.58	18
May 11	do	67	1.91	128
June 30	do	37	2.27	84

LUDY CANAL NEAR YUMA, ARIZ.

This canal is the property of the Irrigation Land and Improvement Company. It diverts water from Colorado River at a point 3 miles below Yuma, Ariz., for the purpose of irrigating lands in Yuma Valley.

Miscellaneous measurements have been made at the heading since March, 1903. June 6, 1905, a gage was established and a nilometer placed on the canal by W. D. Smith, at the

second gate and bridge, which is 1 mile from the river. No water is taken from the cana above this gate. The gage is nailed to the west wall of the flume below the bridge. The bench mark is a nail driven into the top of the west end of an 8 by 8 inch timber at the lower side of the bridge. Its elevation is 15.00 feet above the zero of the gage. The elevation of the top of the floor of the bridge at the southwest corner is 16.10 feet above the zero of the gage. Discharge measurements are made from the lower side of the bridge. The initial point is the east end of the 8 by 8 inch timber referred to above. The canal is straight both above and below the gate. The velocity of the cross section is fairly uniform. The gage height is not affected by any gates farther down the canal.

The canal is badly silted up and is dry much of the time at low water. During the floods of 1905 the banks were overflowed and considerably damaged.

Discharge measurements of Ludy canal near Yuma, Ariz., for 1905.

Date.	Hydrographer.	Area.	Mean velocity.	Gage height.	Discharge.
		Sq. ft.	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 21	W. D. Smith	405	0.90	.....	365
April 6	do	128	.18	.....	23
May 5	do	104	.64	.....	67
June 6	do	174	1.97	.....	343
June 17	do	799	2.42	12.60	1,932
July 11	do	235	1.15	10.40	271
July 15	do	152	.19	9.30	29

IMPERIAL CANAL AT HEADINGS IN UNITED STATES AND MEXICO.

General statement.—The original heading of the Imperial canal, designated in the following tables as heading No. 1, is located about 10 miles by Colorado River below Yuma, Ariz., on the California side, immediately above the international boundary line and opposite Pilot Knob Mountain. The California Development Company is now constructing a permanent gate on bed rock at a spur of this mountain in place of the wooden one now in use. During the summer of 1904 a second heading was made immediately below the boundary line, and in October of the same year an opening was made to the river at a point 4 miles below the boundary. This last opening is designated as heading No. 3. No gage was placed at either heading No. 2 or No. 3. The canal runs parallel to the river for the first 4 miles of its course, so that it was necessary to cut a channel only one-half mile long.

The first 12 miles of the canal was constructed; the remaining 40 miles is an old natural channel, called Alamo River. The whole length of the canal lies in the Colorado River delta, which is composed of loose, sandy soil, covered with a heavy growth of mesquite, willow, and arrowwood. The canal as a whole had a greater fall per mile than the river, but for the first 15 miles the fall was less than that in the river, and for this reason the canal had to be dredged constantly to keep it open. The exceptional floods of January, February, March, and April, 1905, scoured it out to a channel of considerable depth, and during the regular annual flood of May and June, which was unusually high and long, this scouring was continued to such an extent that when the flood began to recede and the river again began to deposit mud, the velocity in the canal was much greater than in the river below heading No. 3. The result was that the old river channel silted up heavily while the new channel, the canal from heading No. 3 down, was still scouring. As the old river channel filled with silt a greater proportion of the water went down the canal, increasing the velocity; and as the canal scoured deeper the amount and velocity of the water going down the old channel were decreased. These reactions were so great that the process of scouring a new channel, which had been going on slowly for several months, began to make rapid progress. The canal was widened in a few days from 100 to 300 or 400 feet. June 30 the total discharge of the river was 61,500 second-feet, 22 per cent of which went down the canal; July 8 the total

discharge was 37,200 second-feet, 67 per cent of which went down the canal. All efforts to stop the flood proved ineffectual.

Meter measurements have been made weekly during the year to determine the total amount of water diverted by the canal, the amount diverted in the United States, the amount diverted in Mexico, and the amount going down the old river channel.

Besides miscellaneous gagings farther down the canal, measurements were made at five points, as follows: Heading No. 1, heading No. 2, heading No. 3 above its junction with the original canal (giving discharge of heading No. 3 alone), heading No. 3 below the junction (giving the total discharge of the canal), and the old channel of the Colorado below heading No. 3. At all of these stations except the last the conditions are constantly changing. The banks are washing away or being filled in, and the bed is silting up or scouring out and being dredged out. For these reasons it has been necessary to put in new gages often. The frequent passage of barges and dredges has rendered the maintenance of permanent cables impracticable, and a light cable has been stretched for each gaging. Measurements each week have been made at such points as would give the desired results, directly or indirectly, with the least expenditure of time and money.

The total discharge of the canal during 1905 was obtained as follows: From January 1 to March 10 by direct meter measurements at heading No. 3 below the junction; from March 11 to June 30 by adding discharges of headings Nos. 1, 2, and 3; from July 1 to December 31 by subtracting the discharge of the old channel below heading No. 3 from the discharge of Colorado River at Yuma. To obtain the discharge of the old channel below heading No. 3 on the dates when it was not measured directly, the total discharge of the canal was subtracted from the discharge of the Colorado at Yuma.

The mean discharge of heading No. 1 for each month was obtained by averaging results of meter measurements. The mean discharge of the whole canal for each month was obtained in the same way. Measurements for the first ten months are so well distributed that they are given equal weight. On account of the flood of November 29, the estimate for November and December is based on an interpolation of the percentage of the total flow of the river diverted by the canal. As the flood in the old channel lasted only five days, any error from this method of calculation is not great.

The monthly summary of the discharge of headings Nos. 2 and 3, showing total diversion made in Mexico, is obtained by subtracting the discharge of heading No. 1 from the total. The monthly summary of the discharge of the old channel below heading No. 3 is obtained by subtracting the total discharge of the canal from the discharge of Colorado River at Yuma.

No gage observer was obtainable for the three lower stations, but gage-height records were kept at headings Nos. 1 and 2.

June 15, 1904, a waste gage was put in operation at a point 12 miles below heading No. 1, called the Quail River waste gate. Water going through this gate passes through Quail River into Padrones River and thence into Volcano Lake. Volcano Lake has two outlets—New River, which discharges into Salton Basin, and Hardy River, which discharges into the Gulf of California through the old channel of the Colorado. March 20, 1905, the flood silted up the channel leading from the waste gate and no more water has been diverted from the canal at this point.

After the flood of November 29, 1905, a channel was dredged from the canal to Quail River from a point 15 miles below heading No. 1, and a considerable amount of water diverted to Padrones River and Volcano Lake. All the water going down the canal past this point discharges through Alamo and New rivers into Salton Basin, except what is lost by seepage and used for irrigation in the Imperial Valley.

The results of the discharge measurements made at the two waste channels mentioned above will be found in the list of miscellaneous discharge measurements.

Heading No. 1.—This station was established October 24, 1903. It is located half a mile from the river, 600 feet below the wooden head gates, and is 10 miles by river below Yuma, Ariz., on the California side.

The channel is straight for 600 feet above and 300 feet below the cable and has a width of 70 feet. The right bank is low and is liable to overflow; the left bank has an elevation of 6 feet above high water. The bed of the canal is composed of silt and sand, is free from vegetation, and is very unstable. There is but one channel at all stages, but when the gage at Yuma reads about 26 feet the river overflows into the channel below the gaging section. The current has a moderate velocity.

Discharge measurements are made by means of a boat and cable. The initial point for soundings is a charred post at the southeast corner of the corral about 150 feet west of the right bank.

A vertical gage, which is read twice each day by J. S. Carter, is located just above the international boundary line, on the right bank. The gage is referred to bench marks as follows: (1) A standard United States Geological Survey iron bench-mark post, located near monument 207 of the United States and Mexico boundary line, on a hill about half a mile west of the gaging station; elevation, 52.41 feet above the zero of the gage and 155 feet above sea level. (2) A nail in a tree on the right bank; elevation, 15.20 feet above the zero of the gage. (3) A nail in a post near the ground on the right bank near the corral; elevation, 14.90 feet above the zero of the gage.

The canal at this heading is filled with mud and has been temporarily abandoned, but some flood water passed through it during 1905 and was carefully measured.

Heading No. 2.—This heading diverts water from Colorado River at a point in Mexico 50 feet below the international boundary line, 400 feet below heading No. 1, and 10 miles by river from Yuma, Ariz. The station was established January 12, 1905, and weekly discharge measurements were made until August 31, 1905.

The channel is straight for 200 feet above and 600 feet below the cable and is about 80 feet wide. The bed and banks are composed of clay and silt and are unstable. There is but one channel at all stages, but when the gage in Yuma reads about 28 feet the river overflows into the canal below the gaging section. As the canal from heading No. 1 joins this canal about 800 feet below the gage rod, the two gages read about the same.

Discharge measurements are made by means of a boat and cable. The initial point for soundings is a clump of three willow trees growing near the north bank 200 feet below the gage.

A vertical rod gage, which is read daily by A. H. Chance, is driven into the north bank of the canal at a point 50 feet from the river. The bench marks and the elevation of the zero of the gage are the same as for heading No. 1.

Heading No. 3 (above the junction).—This heading or intake is in Mexico, 4 miles below the California-Mexico boundary line and 14 miles by Colorado River below Yuma, Ariz. The station was established March 8, 1905. The point of gaging is about one-half mile from the river and 150 feet above the junction of heading No. 3 with the original canal. Gagings at this point give the discharge of heading No. 3 alone.

The channel is straight for 500 feet above the point of gaging and nearly straight for 500 feet below. In the highest floods the banks are overflowed both above and below the station. The cross section is regular, the bed is unstable, and the current is swift. During July, 1905, the flood widened the channel from 100 to 300 feet and lowered the bed about 10 feet.

Discharge measurements are made by means of a boat and cable. The initial point for soundings, a willow stake on the north bank, was washed away by the flood in July, 1905.

The gage and bench marks are the same as for heading No. 3 below the junction, described below. The gage height is an indication of the total discharge of the canal and not of this heading alone.

Heading No. 3 (below the junction).—This station was established October 7, 1904. The point of gaging is about one-half mile from the river and 300 feet below the junction of heading No. 3 with the original canal. Gagings at this point give the total discharge of the canal.

The channel is straight for 300 feet above and 500 feet below the cable. The banks are subject to overflow. The cross section is regular. The bed of the canal is composed of silt and sand and is very unstable. During July, 1905, the canal, which at this point was about 100 feet wide, was scoured out to a width of 400 feet and the depth increased about 8 feet.

Discharge measurements are made by means of a boat and cable.

The gage is a vertical rod on the south bank and is referred to bench marks as follows: (1) A nail in the central one of three willow trees 20 feet from the bank and 100 feet above the gage; elevation, 15.83 feet above the zero of the gage. This bench mark was originally 2 feet above the surface of the ground but is now 2 feet below, as soil was deposited here to a depth of about 4 feet by the flood of March 20, 1905. (2) A nail on the north side of a large willow stump 100 feet south of the south bank and 500 feet upstream from the gage; elevation, 22.26 feet above the zero of the gage.

Information in regard to this canal is contained in the following Water-Supply Papers of the United States Geological Survey: 85, p. 77; 100, pp. 27–29; 134, pp. 26–39.

Discharge measurements made at the Imperial canal headings during 1905.

Date.	Heading No. 1.	Heading No. 2.	Heading No. 3.		Total discharge of canal.
			Above junction.	Below junction.	
January 12		380		900	900
January 26	90	350		990	990
February 8				6,690	6,690
February 14	460	900		2,480	2,480
February 28				3,100	3,100
March 8	1,110	1,530	1,180	3,600	3,600
March 18	1,270	2,200	1,530		5,000
March 21	2,590	2,240	1,920		6,750
March 28	530	1,180	1,750		3,460
April 6	450	1,190	1,650		3,290
April 20	760	1,190	2,610		4,560
April 27	460	1,100			
May 3	180	1,470	3,360		5,010
May 11		1,940	4,160		6,100
May 17		1,580	3,780		5,360
May 25		1,790	3,560		5,350
June 1		2,240	4,500		6,740
June 7		2,660	5,830		8,490
June 15		2,700	6,130		8,830
June 23		3,260	6,880		10,140
June 30	390	3,140	10,430		13,960
July 8				[a] 25,000	[a] 25,000
July 20		1,720	15,480		17,200
July 25			11,220		
August 3		840			
August 10		750			
August 18		480			
August 24		440			
August 31		470			

[a] Estimated.

NOTE.—Figures in first four columns represent measurements; figures in fifth column are derived from the preceding. For discharge of canal July 25 to December 31, see following table.

Portion of Colorado River diverted by Imperial canal during 1905.

Date.	Discharge of Colorado River in second-feet.		Diversion by Imperial canal.	
	At Yuma.	Below heading No. 3. of Imperial canal.	Second-feet.	Per cent.
January 12	6,300	5,400	900	14
January 26	6,770	5,780	990	15
February 8	62,080	55,390	6,690	11
February 14	21,900	19,420	2,480	11
February 28	25,000	21,900	3,100	12
March 8	43,100	39,500	3,600	8
March 18	62,400	57,400	5,000	8
March 21	103,500	96,750	6,750	7
March 28	29,500	26,040	3,460	12
April 6	30,100	26,810	3,290	11
April 20	43,400	38,840	4,560	11
May 3	39,700	34,690	5,010	13
May 11	52,000	45,900	6,100	12
May 17	37,000	31,640	5,360	14
May 25	43,700	38,350	5,350	12
June 1	61,500	54,760	6,740	11
June 7	69,500	61,010	8,490	12
June 15	82,000	73,170	8,830	11
June 23	89,800	79,660	10,140	11
June 30	61,500	47,540	13,960	23
July 8	37,200	12,200	a 25,000	67
July 12	31,720	11,610	20,110	63
July 20	22,250	5,050	17,200	77
July 25	20,650	a 8,150	a 12,500	61
July 30	17,500	2,480	15,020	86
August 3	14,700	2,000	12,700	86
August 10	16,200	2,220	13,980	86
August 18	10,300	1,170	9,130	89
August 24	7,550	770	6,780	90
August 31	7,500	560	6,940	93
September 7	5,060	90	4,970	98
September 14	9,670	1,230	8,440	87
September 22	6,080	180	5,900	97
September 28	5,280	40	5,240	99
October 11	12,950	1,010	11,940	92
October 18	6,950	25	6,925	99⅔
October 25	5,970	.....	5,970	100
October 30	5,670	.....	5,670	100
November 4	5,750	.....	5,750	100
November 11	6,550	.....	6,550	100
November 18	6,560	90	6,470	99
November 25	6,550	200	6,350	97
November 30	102,700	a 70,000	a 32,700	32
December 7	20,100	880	19,220	96
December 13	10,200	.....	10,200	100
December 17	8,100	.....	8,100	100
December 23	7,600	.....	7,600	100
December 31	5,900	.....	5,900	100

a Approximate.

Estimated monthly discharge of Imperial canal during 1905.

Month.	Heading No. 1, including total diversion in United States.		Headings Nos. 2 and 3, including total diversion in Mexico.		Total discharge.	
	Second-feet.	Total in acre-feet.	Second-feet.	Total in acre-feet.	Second-feet.	Total in acre-feet.
January	45	2,770	900	55,330	945	58,100
February	460	25,550	3,630	201,600	4,090	227,200
March	1,370	84,240	3,330	204,800	4,700	289,000
April	555	33,020	3,370	200,500	3,925	233,600
May	20	1,230	5,435	334,200	5,455	335,400
June	200	11,900	9,430	561,100	9,630	573,000
July	130	7,990	17,840	1,097,000	17,960	1,105,600
August	.....	.....	9,905	609,000	9,905	609,000
September	.....	.....	6,140	365,400	6,140	365,400
October	.....	.....	7,625	468,800	7,625	468,800
November	.....	.....	8,400	500,000	[a] 8,400	[a] 500,000
December	.....	.....	12,200	750,000	[a] 12,200	[a] 750,000
The year	232	166,700	7,350	5,348,000	7,582	5,514,000

[a] Approximate.

IMPERIAL VALLEY CANALS.

In July, 1904, stations were established on all canals entering the Imperial Valley, as follows: Holt canal, Hemlock canal, Alamo channel, Alamitos canal, Main canal, and Boundary canal. These stations are located on United States territory, and each is near the California-Mexico boundary line.

Discharge measurements are made from footbridges constructed at each station.

The gages are vertical 4 by 4 inch timbers substantially embedded in the ground. Automatic water-stage registers, from which the daily gage-height record is compiled, were placed at the first five stations mentioned above. These canals enter the valley east of Calexico, Cal.

In October a canal, known as canal No. 6, or Wisteria canal, was completed, which enters the valley west of Calexico, Cal. A station was established on this canal in November and weekly discharge measurements made. After April 11, 1905, the Holt canal supplied a much larger district than originally, covering territory which had been taking its supply from Alamo channel, near Eastside levee. A new canal, known as New Holt or No. 7, was built to replace the Holt, and a station was established in May. A station was also established on the Tamareck canal in June. The latter canal diverted water from New River to a district on the west side of New River below Imperial, which formerly obtained its supply from Main canal. Gages were established at both of these stations, but no automatic registers were placed on either canal.

The station on Alamo channel was inaccessible after the end of February on account of the flooded condition of the country. Water was not taken from the Alamo for irrigation after March. Discharge measurements were also made at Rockwood, on Alamo River, but no gage heights were kept. They show the amount of water flowing through this channel to Salton Sea.

Measurements were made at Brawley, on New River, for a similar purpose. They were made under such difficulties, however, that they are of little value. Measurements made at Calexico were used to determine the waste into Salton Sea, since the only diversion was through Tamarack canal. A large quantity of water was wasted from Main canal into New River below the gaging station at Calexico; this waste was measured and added to the discharge of New River in making estimate of total discharge of New River into Salton Lake.

A description of these stations, with gage height and discharge data, is contained in Water-Supply Paper No. 134, United States Geological Survey, pages 29–39.

Discharge measurements of Holt canal, near Calexico, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
January 4	W. V. Hardy	1.30	19.5	June 26	R. R. McCoslin	1.64	50
January 12	do	1.41	30	July 3	do	0.38	6.9
January 19	do	1.43	28	July 10	do	.33	6.1
January 26	do	1.23	19.5	July 17	do	.35	5.8
February 2	do	1.23	18.1	July 24	do	.36	4.8
February 9	do	1.07	13.5	July 31	do	.36	4.2
February 17	do	1.90	40	August 7	do	1.45	30
February 24	do	.93	11.1	August 14	do	1.25	38
March 13	R. R. McCoslin	1.88	51	August 21	do	.....	85
March 20	do	2.06	64	August 21	do	.039	5.1
March 27	do	2.84	118	August 28	do	2.62	133
April 3	do	2.81	131	September 4	do	2.67	131
April 10	do	1.13	21	October 10	W. V. Hardy	3.08	169
April 17	do	3.70	246	October 17	do	.25	2
April 24	do	3.70	256	October 23	do	2.65	128
May 1	do	3.37	202	November 6	do	1.40	21
May 8	do	2.76	143	November 13	do	1.51	35
May 15	do	2.91	163	November 20	do	1.33	40
May 22	do	2.92	169	November 29	do	1.31	22
May 29	do	2.70	128	October 30	do	2.55	124
June 5	do	2.86	150	September 11	do	2.88	159
June 12	do	3.02	177	September 25	do	2.75	128
June 18	do	1.69	57	October 2	do	2.80	137

Mean daily gage height, in feet, of Holt canal, near Calexico, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	(1.0)	1.25	1.4	2.85	3.3	2.8	0.0	0.35	3.05	2.8	2.0	1.3
2	(1.0)	1.25	1.3	2.9	3.25	2.85	.0	.35	3.0	2.8	1.7	2.6
3	(1.2)	1.25	(1.45)	2.8	3.3	2.8	.4	.35	2.75	2.8	1.7	2.8
4	(1.3)	1.25	(1.6)	2.5	3.2	2.8	.35	.5	2.65	2.85	1.7	3.0
5	(1.3)	1.25	(1.4)	2.6	2.9	2.85	.35	1.15	2.7	2.85	1.5	3.0
6	(1.5)	1.3	1.4	3.05	(2.75)	2.95	.35	1.45	2.9	2.95	1.4	2.95
7	(1.5)	1.15	1.55	(3.3)	(2.75)	3.0	.35	1.55	2.7	3.1	1.35	2.9
8	(1.5)	(1.1)	1.7	(3.25)	2.75	2.95	.35	1.65	2.5	3.1	1.35	2.9
9	(1.5)	1.05	1.8	(3.25)	2.75	3.0	.35	1.65	2.75	3.15	1.35	2.85
10	(1.5)	1.05	1.65	2.15	2.75	3.05	.35	1.65	2.85	3.05	1.4	2.7
11	(1.5)	1.05	(1.8)	3.6	2.75	3.0	.35	1.55	2.9	3.15	1.45	2.7
12	1.4	1.0	(1.9)	3.65	2.8	2.95	.35	1.35	3.0	1.25	1.5	.....
13	1.4	1.2	1.95	3.6	2.9	2.6	.35	1.3	3.1	.25	1.55	.....
14	1.35	1.4	2.0	3.55	2.9	2.5	.35	1.25	3.05	.25	1.7	.....
15	1.35	1.6	1.55	3.65	2.85	2.5	.35	1.1	3.0	.25	1.1	.....
16	1.35	1.75	1.3	3.65	2.9	2.5	.35	.95	3.1	.25	.95	.....
17	1.35	1.8	1.5	3.7	2.85	2.0	.35	.95	3.15	.25	.9	.....
18	1.35	1.35	1.55	3.8	2.85	1.75	.35	.95	3.1	.25	.9	.....
19	1.4	1.4	1.95	3.75	2.9	1.7	.35	1.0	2.6	.25	.85	.....
20	1.55	1.4	1.8	3.8	2.9	1.65	.35	1.0	2.3	1.2	1.05	.....
21	1.65	1.4	1.85	3.75	2.95	1.65	.35	1.05	2.75	1.3	.95	.....
22	1.7	1.4	2.05	3.75	2.95	1.6	.35	1.5	2.95	1.5	.9	.....
23	1.6	1.4	2.2	3.75	2.7	1.65	.35	1.95	2.9	2.65	.95	.....
24	(1.45)	.95	2.35	3.7	2.6	1.6	.35	2.0	2.8	2.65	1.0	.....
25	1.3	1.1	2.2	3.5	2.5	1.65	.35	2.0	2.0	2.7	.95	.....
26	(1.25)	1.4	(2.6)	3.35	2.45	1.65	.35	2.0	1.35	2.7	.95	.....
27	1.1	1.55	2.85	3.35	2.5	0	.35	2.0	2.25	2.7	85	.....
28	.95	1.5	2.8	3.35	2.55	0	.35	2.6	2.8	2.7	.8	.....
29	1.0	.....	2.6	3.35	2.9	0	.35	2.7	2.8	2.6	.9	.....
30	(1.1)	.....	2.7	3.35	2.7	0	.35	2.75	2.8	2.4	1.25	.....
31	(1.2)	.....	2.80	.....	2.65	.....	.35	2.85	.....	2.3	.....	.....

NOTE.—Gage heights in parentheses are estimated.

Estimated monthly discharge of Holt canal near Calexico, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	40	10	24.8	1,525
February	35	9	21.0	1,166
March	123	23	57.4	3,530
April	260	83	208	12,380
May	210	109	152	9,346
June	181	0	[a] 150	8,926
July	7	0	[a] 150	9,223
August	158	3	[a] 150	9,223
September	202	35	144	8,569
October	196	2	96.6	5,940
November	71	8	27.0	1,607
The period				71,430

[a] Estimated. Flood water used for irrigation. Beginning with March 6 Holt heading was used to divert water in No. 5 main canal, but its capacity was not sufficient until April 16.

Estimated monthly discharge of New Holt or No. 7 canal near Calexico, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
May			18	1,107
June			33	1,964
July			33	2,029
August			33	2,029
September			33	1,964
October			33	2,029
November			33	1,964
The period				13,090

NOTE.—The station record is of no value because most of the water used was obtained from flooded basins to the east. The mean discharge for the entire district covered by the canal was estimated in the field at 33 second-feet.

Discharge measurements of Hemlock canal near Calexico, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
January 4	W. V. Hardy	0.87	2.0	June 26	R. R. McCoslin	1.96	21.0
January 12	do	0.88	2.2	July 3	do	1.23	7.2
January 19	do	1.41	9.5	July 10	do	1.73	17.9
January 26	do	0.84	1.9	July 17	do	1.69	15.9
February 2	do	1.25	7.4	July 24	do	0.75	0.8
February 9	do	1.64	16.4	July 31	do	1.23	7.9
February 17	R. R. McCoslin	1.59	12.5	August 7	do	1.43	12.7
February 24	do	1.79	17.2	August 14	do	1.59	17.4
March 13	do	1.20	8.7	August 21	do	1.23	9.8
March 20	do	1.45	13.2	August 28	do	1.12	7.3
March 27	do	1.73	23.0	September 4	W. V. Hardy	0.97	4.4
April 3	do	1.85	20.0	September 11	do	1.42	13.3
April 10	do	1.42	12.7	September 25	do	0.82	2.1
April 17	do	2.45	36.0	October 2	do	1.11	7.3
April 24	do	0.70	1.6	October 10	do	1.30	8.3
May 1	do	1.10	6.4	October 17	do	1.12	8.0
May 8	do	2.04	20.4	October 23	do	1.20	8.4
May 15	do	1.94	18.6	October 30	do	1.04	5.2
May 22	do	1.75	14.5	November 6	do	0.90	4.0
May 29	do	1.54	12.1	November 13	do	1.00	6.4
June 5	do	1.81	16.9	November 20	do	0.70	2.0
June 12	do	0.78	2.1	November 29	do	0.89	3.1
June 18	do	1.7	13.2				

Mean daily gage height, in feet, of Hemlock canal near Calexico, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.0	1.0	0.9	(1.8)	1.1	1.55	1.6	1.2	1.15	1.0	1.1	1.0
2	.9	1.25	.9	1.9	1.05	1.55	1.5	1.2	1.1	1.1	1.15	1.0
3	.95	1.3	.9	1.85	1.2	1.6	1.25	1.2	.9	1.1	1.25	2.0
4	1.0	1.3	.9	1.8	1.35	1.7	1.2	1.3	.95	1.15	1.1	1.5
5	1.05	1.1	1.05	2.0	1.7	1.8	1.2	1.3	1.2	1.2	.95	1.5
6	1.15	.8	1.25	(2.0)	1.95	1.9	1.2	1.4	1.35	1.3	.9	1.7
7	1.3	.8	1.3	(1.9)	2.0	1.95	1.55	1.45	1.35	1.45	.9	1.65
8	1.4	1.0	1.3	(1.6)	2.1	2.05	1.75	1.4	1.35	1.45	.9	1.6
9	1.0	1.65	1.5	(1.5)	2.1	2.1	1.75	1.4	1.35	1.4	.95	1.55
10	.75	1.65	1.25	(1.4)	2.1	2.15	1.75	1.4	1.4	1.35	1.0	1.6
11	.75	1.55	1.25	(1.6)	2.1	2.15	1.75	1.5	1.4	1.4	1.05	.....
12	.75	1.35	1.3	(1.7)	2.1	.8	1.75	1.55	1.45	1.35	1.1	.....
13	.75	1.1	1.2	1.9	2.1	.8	1.7	1.55	1.5	1.5	1.05	.....
14	.75	1.15	1.05	1.8	2.1	.9	1.7	1.6	1.55	1.0	.95	.....
15	.75	1.4	.95	2.0	1.95	.9	1.7	1.4	1.55	1.15	.75	.....
16	.75	1.8	.9	(2.2)	2.0	.9	1.7	1.25	1.55	1.25	.8	.....
17	.75	1.6	1.05	2.45	1.95	1.4	1.7	1.2	1.55	1.1	.8	.....
18	1.0	1.75	1.0	2.5	1.85	1.7	1.8	1.2	1.3	1.0	.85	.....
19	1.4	1.75	1.05	2.2	1.85	1.65	1.85	1.2	.95	1.05	.8	.....
20	1.55	1.65	1.45	2.45	1.8	1.6	1.45	1.2	1.0	1.1	.7	.....
21	(1.4)	1.5	1.5	2.35	1.75	1.55	1.0	1.25	1.05	1.0	.8	.....
22	(1.3)	1.45	1.4	2.2	1.75	1.5	1.0	1.2	1.0	1.0	.9	.....
23	(1.2)	1.55	1.25	(2.0)	1.7	1.5	1.0	1.2	1.0	1.2	.85	.....
24	(1.0)	1.8	1.3	1.45	1.75	1.75	.75	1.2	.9	1.15	.75	.....
25	(.9)	1.65	1.55	1.45	(1.7)	1.95	.75	1.2	.95	1.05	.75	.....
26	.85	1.05	1.55	1.2	(1.65)	1.85	.75	1.2	1.0	1.05	.75	.....
27	1.0	.9	1.75	1.1	(1.6)	1.8	.75	1.2	1.0	1.1	.75	.....
28	1.0	.9	1.55	1.1	(1.55)	1.8	1.05	1.1	.9	1.1	.85	.....
29	.7	.....	1.15	1.1	1.5	1.75	1.25	1.1	.95	1.2	.95	.....
30	.6	.....	1.5	1.1	1.55	1.75	1.25	1.05	.95	.9	1.3	.....
31	.55	.....	1.9	.....	1.6	.....	1.25	1.0	.....	.85	.....	.....

NOTE.—Gage heights in parentheses are estimated.

Estimated monthly discharge of Hemlock canal near Calexico, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	12.0	0.4	4.3	264
February	17.4	2.0	10.0	555
March	23.0	3.3	10.7	658
April	39.0	6.6	19.3	1,149
May	21.6	5.4	15.7	965
June	25.2	1.8	14.1	839
July	18.4	0.8	10.9	670
August	17.5	5.2	10.4	639
September	14.0	3.3	8.1	482
October	12.6	2.4	7.5	461
November	9.6	1.4	4.6	274
The period				6,955

Discharge measurements of New River near Calexico, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
January 5	W. V. Hardy	2.00	12	May 23	R. R. McCoslin	9.24	3,097
January 13	do	3.20	82	May 30	do	9.38	3,400
January 20	do	3.30	99	June 6	do	9.77	3,817
January 27	do	5.20	323	June 13	do	10.85	4,958
February 3	do	4.00	126	June 20	do	11.81	5,949
February 10	do	5.70	451	June 27	do	12.70	10,810
February 18	do	6.90	986	July 5	do	13.21	11,940
February 23	R. R. McCoslin	7.14	1,063	July 12	do	13.34	13,640
March 2	do	7.48	1,461	July 18	Hardy and McCoslin	13.11	13,220
March 9	do	7.90	1,702	July 25	do	12.42	10,040
March 16	do	7.77	1,648	August 1	R. R. McCoslin	11.38	8,221
March 23	do	6.74	1,159	August 8	McCosland and Hardy	10.72	6,531
March 29	do	8.93	2,916	August 15	do	10.90	6,997
April 6	do	6.95	1,307	August 22	do	10.22	5,529
April 12	do	6.50	949	August 29	M. V. Hardy	9.42	4,308
April 18	do	6.80	1,149	September 5	Hardy and McCoslin	9.31	3,830
April 25	do	8.71	3,052	September 12	do	7.52	1,892
May 2	do	8.47	2,417				
May 9	do	8.80	2,890				
May 16	do	9.19	3,237				

Discharge measurements of Alamo Channel near Rockwood, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
January 7	W. V. Hardy	.....	49	May 17	R. R. McCoslin	6.00	990
January 14	do	.....	205	May 24	W. V. Hardy	6.37	1,562
January 21	do	.....	77	May 31	do	5.92	1,692
January 28	do	.....	112	June 7	do	6.28	2,110
February 4	do	.....	151	June 14	do	6.85	3,644
February 11	do	.....	61	June 21	do	.....	5,348
February 20	do	.....	530	June 28	do	9.60	3,253
February 25	do	.....	94	July 6	do	9.00	4,234
March 3	do	7.48	387	July 13	do	9.50	3,932
March 11	do	6.80	1,088	July 19	do	.....	3,501
March 17	do	7.15	1,379	July 26	do	.....	3,104
March 25	do	10.00	1,806	August 2	do	8.80	3,551
March 30	do	9.50	1,443	August 9	do	8.60	2,815
April 8	do	6.20	635	August 16	do	8.50	2,874
April 13	do	6.00	692	August 23	do	9.80	2,439
April 19	R. R. McCoslin	6.00	772	August 30	do	9.93	2,509
April 26	do	(a)	[a]632	September 6	Hardy and McCoslin	9.95	2,115
May 3	do	.....	1,044	September 13	do	10.45	3,500
May 10	do	.....	1,770				

[a] Gage washed out.

Discharge measurements of Alamitos canal, Calexico, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
January 3	W. V. Hardy	1.48	30	June 12	R. R. McCoslin	1.32	37
January 11	do	1.54	39	June 18	W. V. Hardy	1.30	30
January 18	do	1.11	15.1	June 26	R. R. McCoslin	1.35	36
January 26	do	1.05	12.9	July 5	do	1.33	34
February 2	do	1.06	13.6	July 10	do	1.34	33
February 9	do	0.52	1.0	July 17	do	1.35	34
February 17	R. R. McCoslin	1.05	16.8	July 24	do	1.34	33
February 24	do	1.00	15.7	July 31	do	1.34	33
March 1	do	0.82	9.1	Aug. 7	do	1.12	22
March 8	do	.....	0	August 14	do	1.12	22
March 15	do	.....	0	August 21	do	1.17	24
March 22	do	.....	0	August 28	do	1.27	31
March 29	do	1.20	24	September 4	do	1.34	39
April 5	do	1.53	44	September 11	W. V. Hardy	1.42	43
April 11	do	1.63	50	September 25	do	1.23	36
April 17	do	1.67	57	October 9	do	1.30	40
April 24	do	1.39	40	October 16	do	1.32	45
May 1	do	1.10	26	October 23	do	1.27	38
May 8	do	1.15	28	November 13	do	.....	0
May 15	do	1.41	39	November 18	do	.....	0
May 22	do	1.34	35	November 30	do	0.42	5.4
May 29	do	1.37	36	October 30	do	0.90	18.3
June 5	do	1.35	36	November 6	do	.....	0

Mean daily height in feet, of Alamitos canal near Calexico, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.5	1.2	0.8	1.35	1.1	1.35	1.3	1.05	1.4	1.1	0.45	0.2
2	1.5	1.1	.8	1.5	1.1	1.35	1.3	.9	1.4	1.25	.45	.25
3	1.5	1.25	.6	1.6	1.1	1.35	1.35	1.05	1.35	1.15	.2	.25
4	1.45	1.1	.4	1.55	1.1	1.35	1.35	1.1	1.35	1.3	.1	.2
5	1.45	.95	.35	1.5	1.1	1.35	1.35	1.1	1.3	1.3	.0	.2
6	1.4	.95	.35	1.55	1.1	1.35	1.35	1.1	1.35	1.3	.15	.2
7	1.45	.95	.3	1.6	1.1	1.35	1.35	1.1	1.45	1.25	.25	.2
8	1.5	.9	.1	1.6	1.15	1.35	1.35	1.1	1.45	1.25	.3	.2
9	1.6	.7	.1	1.6	1.2	1.3	1.35	1.15	1.4	1.25	.3	.2
10	1.6	.5	.1	1.65	1.25	1.35	1.35	1.15	1.4	1.25	.3	.2
11	1.6	.5	.1	1.65	1.3	1.3	1.35	1.15	1.4	1.25	.25	.2
12	1.6	.5	.1	1.65	1.4	1.3	1.35	1.15	1.45	1.25	.3	.25
13	1.6	.5	.1	1.65	1.4	1.3	1.35	1.15	1.5	1.25	.3	.....
14	1.7	.5	.1	1.65	1.4	1.35	1.35	1.1	1.45	1.3	.25	.....
15	1.45	.55	.0	1.65	1.4	1.35	1.35	1.1	1.4	1.3	.3	.....
16	1.5	.65	.0	1.65	1.3	1.35	1.35	1.1	1.4	1.35	.3	.....
17	1.15	1.05	.0	1.65	1.2	1.3	1.35	1.1	1.4	1.35	.25	.....
18	1.1	1.05	.0	1.7	1.2	1.3	1.35	1.1	1.4	1.35	.2	.....
19	1.1	1.05	.0	1.75	1.2	1.3	1.35	1.15	1.35	1.25	.2	.....
20	1.1	1.05	.0	1.35	1.25	1.3	1.35	1.2	1.4	1.2	.2	.....
21	1.05	1.05	.0	1.4	1.35	1.3	1.35	1.2	1.45	1.2	.15	.....
22	1.1	1.05	.0	1.55	1.35	1.3	1.35	1.15	1.45	1.15	.15	.....
23	1.1	1.0	.15	1.45	1.35	1.3	1.35	1.2	1.4	1.25	.15	.....
24	1.1	1.0	.65	1.4	1.35	1.3	1.35	1.25	1.2	1.25	.2	.....
25	1.0	1.05	.7	1.4	1.35	1.35	1.35	1.25	1.25	1.2	.25	.....
26	1.05	1.1	.7	1.4	1.35	1.35	1.35	1.25	1.25	1.2	.25	.....
27	1.15	.8	.85	1.4	1.35	1.35	1.35	1.3	1.2	1.15	.35	.....
28	1.2	.75	.9	1.25	1.35	1.35	1.35	1.3	1.1	1.15	.4	.....
29	1.2	.....	1.3	1.15	1.35	1.35	1.35	1.3	1.15	1.15	.35	.....
30	1.2	.....	1.4	1.15	1.35	1.3	1.35	1.25	1.1	.9	.25	.....
31	1.25	.....	1.3	.....	1.35	.....	1.35	1.3	.....	.8	.....	.....

Estimated monthly discharge of Alamitos canal near Calexico, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	50	11	26.6	1,636
February	23	.5	11.4	633
March	36	0	4.9	301
April	65	28	45.6	2,714
May	40	25	31.8	1,955
June	38	30	34.4	2,047
July	35	32	33.9	2,084
August	34	11	23.9	1,470
September	49	28	40.8	2,428
October	47	18	35.8	2,201
November	6	0	2.7	161
The period	.....	.....	.....	17,630

Discharge measurements of Main canal near Calexico, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
January 3	W. V. Hardy	3.90	439	June 12	R. R. McCoslin	4.17	575
January 11	do	4.20	524	June 18	do	4.14	540
January 18	do	4.50	567	June 26	do	4.23	571
January 26	do	4.20	510	July 3	do	4.25	572
February 2	do	4.18	507	July 10	do	4.38	567
February 15	do	4.09	485	July 17	do	4.36	582
February 17	R. R. McCoslin	4.15	472	July 24	do	4.32	583
February 23	do	3.95	447	July 31	do	4.23	580
March 1	do	4.49	595	August 7	do	4.29	556
March 8	do	.....	0	August 14	do	4.33	562
March 15	do	.....	0	August 21	do	4.33	540
March 22	do	3.52	410	August 28	do	4.29	536
March 29	do	4.79	651	September 4	do	4.30	558
April 5	do	4.84	675	September 11	W. V. Hardy	.....	0
April 11	do	4.98	729	September 25	do	4.27	551
April 17	do	5.04	735	October 2	do	.....	0
April 24	do	4.91	725	October 9	do	4.29	559
May 1	do	4.47	648	October 16	do	4.30	546
May 8	do	4.42	623	November 3	do	2.90	298
May 15	do	4.34	586	November 6	do	3.60	380
May 22	do	4.24	562	November 13	do	3.60	380
May 29	do	4.32	595	November 18	do	3.55	378
June 5	do	4.19	566	November 30	do	3.50	376

Mean daily gage height, in feet, of Main canal near Calexico, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.9	4.05	4.5	4.7	4.45	4.2	4.25	4.2	4.3	(a)	2.3	3.4
2	3.95	4.2	4.45	4.85	4.4	4.2	4.25	4.2	4.3	(a)	2.9	3.45
3	3.9	4.25	4.05	4.95	4.4	4.2	4.25	4.2	4.3	(a)	3.22	3.75
4	3.85	4.15	(a)	4.9	4.4	4.2	4.25	4.25	4.3	(a)	3.55	3.5
5	3.85	3.95	(a)	4.85	4.45	4.2	4.25	4.25	4.3	3.95	3.45	3.9
6	3.75	3.8	(a)	4.9	4.4	4.2	4.25	4.25	4.3	4.2	(3.55)	3.95
7	3.7	3.8	(a)	4.95	4.4	4.2	4.3	4.3	(a)	4.25	(3.6)	3.95
8	3.75	3.8	(a)	4.95	4.45	4.2	4.35	4.3	(a)	4.2	(3.6)	3.95
9	3.95	3.85	(a)	5.0	4.45	4.2	4.35	4.3	(a)	4.3	(3.6)	3.95
10	4.2	3.85	(a)	5.0	4.4	4.2	4.35	4.3	(a)	4.3	(3.6)	3.6
11	4.2	3.85	(a)	5.0	4.4	4.2	4.35	4.35	(a)	4.3	3.6	.....
12	4.4	3.85	(a)	5.0	4.45	4.2	4.35	4.35	.5	4.3	3.6	.....
13	4.55	3.8	(a)	5.0	4.45	4.2	4.35	4.35	2.0	4.3	3.6	.....
14	4.4	3.95	(a)	5.0	4.4	4.25	4.35	4.35	2.5	4.3	3.6	.....
15	4.3	4.1	(a)	5.05	4.35	4.2	4.35	4.35	2.95	4.3	(3.6)	.....
16	4.35	4.2	(a)	5.05	4.3	4.2	4.35	4.35	3.1	4.35	(3.6)	.....
17	4.4	4.1	(a)	5.05	4.3	4.25	4.35	4.35	3.15	4.35	(3.6)	.....
18	(4.5)	4.05	(a)	5.1	4.3	4.2	4.35	4.35	3.15	4.35	3.6	.....
19	4.5	4.05	(a)	5.1	4.3	4.2	4.35	4.35	3.5	4.3	3.55	.....
20	4.55	4.0	(1.5)	5.0	4.3	4.2	4.35	4.35	3.9	4.3	3.4	.....
21	4.5	3.9	3.35	5.0	4.3	4.2	4.35	4.35	4.05	4.3	3.4	.....
22	4.55	3.9	3.5	5.0	4.25	4.25	4.3	4.3	4.2	4.3	3.4	.....
23	4.5	3.95	3.8	4.9	4.3	4.3	4.3	4.3	4.35	(a)	3.2	.....
24	4.35	4.1	4.15	4.95	4.3	4.3	4.3	4.3	4.35	(a)	3.05	.....
25	4.25	4.3	(4.5)	4.9	4.3	4.25	4.35	4.3	4.3	(a)	3.05	.....
26	4.2	4.4	(4.8)	4.9	4.3	4.25	4.3	4.3	4.25	(a)	3.05	.....
27	4.05	4.5	(4.8)	4.9	4.3	4.25	4.3	4.3	4.25	.1	3.05	.....
28	3.95	4.5	(4.8)	4.9	4.3	4.25	4.3	4.3	4.25	.8	3.05	.....
29	3.9	.....	(4.8)	4.8	4.3	4.25	4.3	4.3	4.25	.85	3.4	.....
30	3.85	.....	4.8	4.6	4.2	4.25	4.3	4.3	3.1	1.7	3.45	.....
31	3.85	.....	4.7	.....	4.2	.....	4.25	4.3	.....	1.7	.....	.....

a No flow.

NOTE.—Gage heights in parentheses are estimated.

Estimated monthly discharge of Main canal near Calexico, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	600	398	500	30,740
February	595	416	470	26,100
March	672	0	261	16,050
April	752	634	719	42,780
May	648	566	598	36,770
June	582	548	570	33,920
July	593	556	575	35,360
August	568	536	553	34,000
September	570	0	369	21,960
October	561	0	328	20,170
November	390	220	351	20,890
The period	.....	.....	.....	318,700

Discharge measurements of Boundary canal near Calexico, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
January 3	W. V. Hardy	0.80	6.4	June 12	R. R. McCoslin	0.35	0.22
January 11	do	.98	8.6	June 18	do	1.00	11.0
January 18	do	1.00	8.9	June 26	do	.91	7.5
January 25	do	.....	7.8	July 3	do	.93	6.4
February 2	do	.99	9.1	July 10	do	.78	4.8
February 9	do	.95	8.3	July 17	do	.77	4.2
February 17	R. R. McCoslin	.79	5.3	July 24	do	.96	6.6
February 23	do	.98	8.3	July 31	do	.87	5.3
March 1	do	1.00	10.0	August 7	do	.83	6.2
March 5	do	.....	0	August 14	do	.78	5.7
March 8	do	.....	0	August 21	do	.79	5.7
March 22	do	.88	7.8	August 28	do	.79	4.8
March 29	do	.80	6.2	September 4	do	.80	3.8
April 5	do	.85	8.5	September 11	do	.....	0
April 11	do	.99	10.4	October 2	W. V. Hardy	.....	0
April 17	do	1.00	11.7	October 6	do	.90	8.4
April 24	do	1.08	13.0	October 9	do	.87	5.3
May 1	do	.83	6.1	October 16	do	.80	5.0
May 8	do	.83	7.5	October 18	do	.25	0
May 15	do	.74	6.1	October 30	do	.85	8.0
May 22	do	.71	5.1	November 13	do	.90	8.4
May 29	do	.85	8.0	November 18	do	.95	7.0
June 5	do	.90	8.4	November 30	do	1.03	12.7

Estimated monthly discharge of Boundary canal near Calexico, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	8.9	6.0	8.1	498
February	9.8	5.1	7.8	433
March	10.0	0	3.6	221
April	13.0	7.0	10.2	607
May	8.0	5.1	6.5	400
June	11.0	.2	7.9	471
July	6.8	4.2	5.4	332
August	6.2	4.4	5.6	344
September	6.0	0	3.8	227
October	8.0	0	4.4	271
November	12.7	7.0	9.0	536
The period	.....	.....	.....	4,340

Discharge measurements of Wisteria canal near Calexico, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
January 5	W. V. Hardy	1.12	3.0	June 13	R. R. McCoslin	0.35	10.6
January 11	do	.15	0	June 19	W. V. Hardy	.57	13.5
January 18	do	.52	7.7	June 26	R. R. McCoslin	.38	10.6
January 25	do	.92	22	July 5	do	.30	9.4
February 1	do	.80	16.5	July 11	do	.96	32
February 10	do	.....	0	July 18	do	.66	17.8
February 18	do	.....	0	July 25	W. V. Hardy	.....	0
February 25	R. R. McCoslin	.....	0	August 1	do	.33	7.8
March 1	do	.....	0	August 8	do	.....	0
March 15	do	.....	0	August 15	R. R. McCoslin	.....	0
March 23	do	.....	0	August 22	W. V. Hardy	.....	0
March 29	do	.90	26	August 29	R. R. McCoslin	.....	0
April 6	do	1.65	64	September 5	W. V. Hardy	.....	0
April 12	do	1.29	47	September 12	do	.....	0
April 18	do	1.00	33	September 26	do	.....	0
April 25	do	.95	32	October 3	do	.....	0
May 2	do	.50	13.1	October 11	do	.....	0
May 9	do	.85	26	October 18	do	.60	12.8
May 16	do	.43	12.2	October 31	do	.60	14
May 23	do	.63	17.1	November 7	do	.40	12
May 30	do	.42	12.1	November 14	do	.....	0
June 6	do	.38	11.9	November 21	do	.15	0

[a] Estimated.

Daily gage height, in feet, of Wisteria canal near Calexico, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	0.95	0.8	0.25	1.5	0.3	0.4	0.3	0.35	0	0.0	0.6
2	.9	.8	.2	1.2	.4	.4	.3	.05	0	.0	.6
3	1.15	.8	.2	1.7	.4	.4	.3	.05	0	.0	.6
4	1.1	1.0	.2	1.8	.4	.4	.3	.05	0	.0	.6
5	1.1	.55	.2	1.6	.7	.4	.3	.0	0	.0	.0
6	1.1	.3	.2	1.65	.7	.4	.3	.0	0	.0	.4
7	1.25	.0	.2	1.7	.8	.4	.3	.0	0	.0	.4
8	1.3	.0	.15	1.6	.8	.4	.3	.0	0	.0	.75
9	.95	.0	.15	1.5	.8	.4	.3	.0	0	.0	.75
10	.95	.0	.15	1.45	.8	.3	.3	.0	0	.0	.0
11	.15	.0	.15	1.35	.5	.3	.95	.0	0	.0	.0
12	.1	.3	.35	1.15	.45	.3	1.8	.0	0	.0	.0
13	.1	.2	.35	1.1	.45	.3	1.1	.0	0	0.6	.0
14	.0	.25	.40	.95	.45	.25	1.0	.0	0	.6	.0
15	.0	.3	.35	1.0	.45	.25	1.0	.0	0	.6	.5
16	.0	.35	.3	1.0	.45	.3	.9	.0	0	.6	.0
17	.6	.25	.3	1.0	.45	.0	.6	.0	0	.6	.0
18	.2	.1	.3	1.0	.45	.0	.65	.0	0	.6	.0
19	.65	.0	.5	.8	.75	.4	.5	.0	0	.6	.0
20	.8	.0	.5	.7	.8	.4	.5	.0	0	.6	.0
21	.8	.0	.5	.65	.8	.4	.5	.0	0	.45	.15
22	.8	.0	.5	1.0	.7	.4	.45	.0	0	.45	.35
23	.8	.0	.8	.1	.6	.4	.0	.0	0	.0	.35
24	.9	.0	.8	.9	.6	.4	.0	.0	0	.0	.1
25	.9	.0	.8	1.1	.7	.4	.0	.0	0	.0	.0
26	1.0	.2	.65	1.15	.7	.4	.0	.0	0	.0	.0
27	1.1	.2	.6	.9	.65	.4	.0	.0	0	.05	.0
28	1.0	.3	.8	.45	.65	.3	.0	.0	0	.05	.0
29	1.0	.....	.9	.4	.4	.2	.0	.0	0	.6	.0
30	1.0	.....	1.0	.35	.4	.3	.1	.0	0	.6	.0
31	.8	.....	1.15	.....	.4	.....	.35	.0	0	.6	.....

Estimated monthly discharge of Wisteria canal near Calexico, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	40	0	17.9	1,100
February	25	0	3.8	211
March	32	0	7.1	436
April	75	0	39.5	2,325
May	25	0	16.7	1,027
June	12	0	9.6	572
July	80	0	14.2	873
August	11	0	.4	25
September	0	0	.0	0
October	14	0	5.4	332
November	25	0	5.6	334
The period				7,261

Discharge measurements of Tamarack canal near Imperial, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 25	W. V. Hardy	.....	52	October 19	W. V. Hardy	.....	[a] 40
June 1	R. R. McCoslin	1.70	51	October 26	do	.....	[a] 40
June 8	W. V. Hardy	1.80	56	November 2	do	.....	[a] 40
June 14	do	1.64	43	November 9	do	.....	[a] 40
June 22	do	14.50	14	November 16	do	.....	[a] 40
October 4	do	.....	[a] 40	November 23	do	.....	[a] 30
October 12	do	.....	[a] 40				

[a] Estimated.

Daily gage height, in feet, of Tamarack canal near Imperial, Cal., for 1905.

Day.	June.	Day.	June.	Day.	June.	Day.	June.	Day	June.
1	1.7	7	1.8	13	1.35	19	1.65	25	1.2
2	1.68	8	1.8	14	1.65	20	1.75	26	1.05
3	1.7	9	1.8	15	1.65	21	1.5	27	1.0
4	1.55	10	1.9	16	1.6	22	1.45	28	.9
5	1.65	11	1.95	17	1.65	23	1.35	29	.9
6	1.75	12	2.05	18	1.7	24	1.2	30	.7

Estimated monthly discharge of Tamarack canal near Imperial, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
June	.....	.....	34.3	2,041
July	.....	.....	(40)	2,460
August	.....	.....	(40)	2,460
September	.....	.....	(40)	2,380
October	.....	.....	(40)	2,460
November	.....	.....	(40)	2,380
The period	.....	.....	.....	14,180

NOTE.—Monthly means in parenthesis estimated in the field.

Total amount of water (in acre-feet) entering the Imperial Valley through irrigation canals at international boundary, January to November, 1905, inclusive.

Canal.	January.	February.	March.	April.	May.	June.
Hemlock	263	555	658	1,149	965	839
Boundary	249	216.5	110.5	303.5	200	235.5
Wisteria	1,100	211	436	2,351	1,027	572
Tamarack						2,041
New Holt, or No. 7					1,107	1,964
Main	30,744	26,102	16,048	42,783	36,770	33,917
Alamitos	1,636	633	301	2,714	1,955	2,047
Holt, or No. 5 Main	1,525	1,162	3,530	12,377	9,346	8,926
Alamo Channel	5,500	8,330	9,223			
Total	41,017	37,209	30,306	61,677	51,370	50,541

Canal.	July.	August.	September.	October.	November.	Total.
Hemlock	670	639	482	461	274	6,955
Boundary	166	172	113.5	135.5	268	2,170
Wisteria	873	25	0	332	334	7,261
Tamarack	2,460	2,460	2,380	2,460	2,380	14,181
New Holt, or No. 7	2,029	2,029	1,964	2,029	1,964	13,086
Main	35,355	34,003	21,957	20,168	20,886	318,733
Alamitos	2,084	1,470	2,428	2,201	161	17,630
Holt, or No. 5 Main	9,223	9,223	8,569	5,940	1,607	71,428
Alamo Channel						23,053
Total	52,860	50,021	37,893	33,726	27,874	474,494

Total amount of water (in acre-feet) entering Imperial Valley, including canals, New River, and Alamo Channel; also amount of waste water discharging into Salton Sea and amount used for irrigation, January to November, 1905, inclusive.

Month.	Total discharge Imperial canal at headings below Yuma, Ariz.	Total discharge into Imperial Valley.	Total discharge (waste) into Salton Sea.	Total amount of water used for irrigation.
	Acre-feet.	*Acre-feet.*	*Acre-feet.*	*Acre-feet.*
January	58,100	55,590	35,356	20,234
February	227,150	92,913	77,919	14,994
March	288,990	210,896	194,548	16,348
April	233,550	223,171	182,494	40,677
May	335,420	321,239	287,869	33,370
June	573,020	622,911	587,370	35,541
July	1,104,620	1,037,724	978,244	50,480
August	609,030	597,751	564,946	32,805
September	365,360	[a] 353,360	324,869	28,491
October	468,840	[a] 456,840	435,227	21,613
November	500,000	[a] 488,000	477,977	10,023
Total	4,764,080	4,460,395	4,155,819	304,576

[a] Estimated.

Total amount of irrigated land (as per examination made in March and April, 1905)...acres... 79,591
Amount of water used per acre (in acre-feet)..... 3.83

LANDS IRRIGATED IN THE IMPERIAL VALLEY.

In April, 1904, an examination was made to determine the amount of lands irrigated in the valley. The gross area under irrigation at that time was 66,741 acres. A second examination was made in September of the same year by W. V. Hardy, of the Reclamation Service, and showed the total area irrigated at that time to be 31,318 acres. Another examination by Mr. Hardy in March and April, 1905, gave a total irrigated area of 79,591 acres.

The examination of area of irrigated land made in March and April, 1905, is used in computing the amount of water per acre used during 1905. It is probable that this area was greatly reduced during the summer, as areas for the raising of hay and grain were not again used after the crops were harvested until the late fall months, when they were again seeded. Large areas of alfalfa and Kaffir corn were necessarily irrigated throughout the year.

DUTY OF WATER IN THE IMPERIAL VALLEY.

During the fall of 1904 rating flumes were placed on two canals in Imperial Valley for the study of the duty of water. Two types of soil were selected for these investigations, one known as "hard soil" and classified as "Imperial loam" as shown on soil map of Bureau of Soils, United States Department of Agriculture. The other type is known as "soft soil" and classified as "Imperial sandy loam."

The location of the investigation on "Imperial loam" is at the ranch of W. W. McKim, 7 miles east of Imperial, being the west half of sec. 8, T. 15 S., R. 14 E.

The location of the investigation on "Imperial sandy loam" is on lands of the California-Mexico Land Company, 3½ miles east of Mexicala in Mexican territory and directly south of the California-Mexico boundary line in T. 17 S., R. 15 E.

Permanent flumes were constructed at the head of each of these canals and a sufficient number of measurements were made throughout the year for rating them. Self-recording registers were placed at each of these stations, and the mean daily gage height was computed from the register records.

During 1905 the Imperial Valley received a very unusual rainfall. The precipitation at Imperial was 10.06 inches for the year. At Calexico the precipitation was 9.33 inches for the year. The mean annual rainfall will probably not exceed 3 inches in normal years.

M'KIM FLUME.

This station was established on September 23, 1904. The amount of land irrigated under this flume is 380 acres. The soil is classified as "Imperial loam." The crops raised during 1905 consisted of 100 acres in barley, which was sown in October, 1904. The crop was only fair and was used for the pasturage of hogs. The balance of the area, 280 acres, had been previously planted to alfalfa, 100 acres having been sown in October, 1902, and 100 acres in October, 1903. This area in alfalfa was in fair condition at the time the station was established. The crop of 1905 was fair and used only for the pasturage of hogs. The supply of water furnished for this area was not enough for thorough irrigation. Water was taken from Alamo channel until March, 1905, and up to this time the supply was sufficient for thorough irrigation. After March, 1905, water was taken from Alamitos canal on account of flood conditions in the Alamo channel which destroyed the levee at point where the diversion was made. The water supply received from the Alamitos canal was not enough for the thorough irrigation of this area and crops suffered considerably from lack of water after March.

The rainfall for this station is taken from the United States Weather Bureau records kept at Imperial, Cal.

Monthly duty of water under McKim flume during 1905.

Month.	Acre-feet.		Rainfall in inches.
	Total.	Per acre.	
January	24.6	0.06	1.50
February	16.7	.04	6.12
March	12.3	.03	1.05
April	114.0	.30	.15
May	85.6	.22	.00
June	108.0	.28	.00
July	79.4	.21	.07
August	61.0	.16	.00
September	71.9	.19	.04
October	49.2	.13	.00
November	17.9	.05	.83
December	49.2	.13	.30
Total irrigation	689.8	1.81	10.06
Total, including rainfall		2.64	

CALIFORNIA-MEXICO LAND AND CATTLE COMPANY'S FLUME.

This station was established November 28, 1904. It is located 3½ miles east of Mexicala. The total area irrigated under this flume is 575 acres. The soil is classified as "Imperial sandy loam." In December, 1904, the entire area was sown to barley, 75 acres were cut for hay, averaging 1¼ tons to the acre, the balance of the acreage was used for pasturage. The crop was equally as good over the entire area as that on the 75 acres which was cut for hay. In May, 1905, the entire area was sown to Kaffir corn. This crop was poor and scattering and used in the fall for pasturage. This area received an ample supply of water for the crops raised.

The rainfall for this station is taken from the United States Weather Bureau records kept at Calexico, Cal.

Monthly duty of water under California-Mexico Land and Cattle Company's flume during 1905.

Month.	Acre-feet.		Rainfall in inches.
	Total.	Per acre.	
January	67.6	0.12	1.50
February	5.6	.01	3.76
March	30.7	.05	.91
April	113.0	.20	.50
May	313.0	.55	.00
June	214.0	.37	.00
July	332.0	.58	.03
August	289.0	.50	.00
September	131.0	.23	.13
October	91.7	.16	.00
November	66.0	.11	1.96
December	104.0	.18	.54
Total irrigation	1,757.6	3.06	9.33
Total, including rainfall		3.84	

MISCELLANEOUS MEASUREMENTS IN COLORADO RIVER DRAINAGE BASIN.

The following miscellaneous measurements were made in canals in the Colorado River drainage basin by W. D. Smith during 1905:

Miscellaneous discharge measurements made in Colorado River drainage basin in 1905.

Date.	Locality.	Width.	Area of section.	Mean velocity.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Sec.-ft.*
February 15 ...	Imperial canal in Mexico immediately below Quail River waste gate.[a]	.....	560	3.46	1,937
February 28 ...	.....do	.....	556	3.28	1,821
December 17...	Imperial canal in Mexico immediately below Quail River cut-off.[b]	170	1,640	3.21	5,265
December	Quail River cut-off in Mexico at point of diversion from Imperial canal.[b]	150	632	2.68	1,693

[a] Quail River waste gate is in Mexico, 12 miles below heading No. 1 of the Imperial canal. Gagings by means of boat and cable were made at this point February 15 and 28 to determine amount of water being carried to Imperial Valley by the canal.

[b] For location and significance of this gaging see general description of Imperial canal, page 21. A measurement was made by means of boat and cable.

THE GREAT BASIN DRAINAGE.

GENERAL FEATURES.

The Great Basin drainage in California is comprised within the subdrainages, Sierra Nevada and Minor Great Basin. Within the Sierra Nevada drainage is a limited area of arid country lying on the eastern slope of the Sierra Nevadas. This area includes the Susan and Owens River drainage basins. Within the Minor Great Basin drainage lies the Mohave River drainage basin. Having no outlet to the sea, the entire drainage of these basins is lost mainly through evaporation from the lakes and sinks in which the waters of these rivers collect.

SUSAN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Susan River has its source in the Sierra Nevada in northeastern California, and flows eastward, discharging into Honey Lake—one of the landlocked lakes of the Great Basin—of which it is the principal feeder. A considerable area of land is irrigated from the waters of the river below the gaging station, and during the last ten or twelve years several projects have been started for irrigating other extensive areas by the storage of its waters both above and below the town of Susanville.

SUSAN RIVER NEAR SUSANVILLE, CAL.

This station was established June 3, 1900, by L. H. Taylor. It is located about three-fourths of a mile southwest of Susanville, at the electric light plant.

The channel is straight for 150 feet above and 250 feet below the station. The current is swift. There is a riffle immediately above the cable. The right bank is high and is composed of clay covered with vegetation. It is not liable to overflow. The left bank is low, liable to overflow, and covered with a sparse growth of willows. The bed of the stream is composed of gravel and cobblestones and is permanent. A short distance above the station a small irrigating ditch, known as the "Masten ditch," is taken out on the right bank.

High-water measurements are made by means of a cable and car. Measurements at low and ordinary stages are made by wading. The initial point for soundings is a post in the fence in line with the cable, 34.8 feet from the cable support on the left bank.

On December 20, 1903, the station was reestablished, and the datum of the gage was raised 2.00 feet. A gage is also placed in the flume near the head of Masten ditch. During 1905 the gage was read once each day by James Branham. Bench marks were established as follows: (1) A nail in the fence post which is used as the initial point for soundings; elevation, 11.35 feet. (2) A nail in the cable post; elevation, 9.00 feet. (3) A nail in the cottonwood tree to which the cable is attached; elevation, 10.00 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: 51, p 408; 66, pp 115–116; 85, p 123; 100, pp 204–205; 133, p 197.
Discharge: 51, p 408; 66, p 116; 100, p 205; 133, p 197.
Discharge, monthly: 75, p 190; 133, p 198.
Gage heights: 51, p 408; 66, p 116; 85, p 124; 100. p 205; 133. p 198.
Rating table: 566, p 175.

Discharge measurements of Susan River near Susanville, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 21	J. Branham	44	92	4.79	6.60	441
May 12	do	29	48	3.27	5.40	157
June 12	do	25	31	2.32	4.70	72
June 25	do	24	18	1.66	4.20	30
July 23	do	18	10.8	1.19	3.85	12.8
August 29	do	14	8.1	0.85	3.75	6.9
September 26	do	19	13.6	1.13	4.00	15.4

Daily gage height, in feet, of Susan River near Susanville, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.95	5.2	5.25	6.15	5.95	5.15	4.1	4.1	3.8	3.8	4.0	4.0
2	4.8	5.2	5.25	5.95	5.9	5.1	4.1	4.1	3.8	3.8	4.0	4.0
3	4.75	5.2	5.25	5.95	5.8	5.05	4.45	4.1	3.8	3.9	4.0	4.0
4	4.7	5.2	5.25	5.9	5.8	5.05	4.8	4.1	3.8	3.95	4.0	4.0
5	4.65	5.15	5.25	5.9	5.65	5.0	4.6	4.1	3.85	3.95	4.0	4.0
6	4.6	5.05	5.25	6.0	5.55	5.0	4.4	4.1	3.85	3.95	4.0	4.0
7	4.6	4.85	5.25	6.1	5.5	5.0	4.25	4.1	3.85	4.0	4.0	4.0
8	4.55	4.85	5.25	6.1	5.5	4.9	4.1	4.0	3.85	3.95	4.0	4.0
9	4.55	4.75	5.2	6.1	5.5	4.85	4.1	3.9	3.85	3.9	4.0	4.0
10	4.55	4.8	5.2	6.2	5.45	4.75	4.0	3.8	3.85	3.9	4.0	4.0
11	4.55	4.7	5.2	6.1	5.4	4.7	4.0	3.8	3.9	3.9	4.0	4.0
12	4.6	4.65	5.4	6.1	5.4	4.7	4.0	3.8	3.9	3.9	4.0	4.0
13	4.65	4.55	5.9	6.1	5.35	4.65	3.95	3.8	3.9	3.9	4.0	4.0
14	4.7	4.5	5.9	6.1	5.3	4.65	4.2	3.8	3.85	3.9	4.0	4.0
15	4.7	4.45	6.05	6.1	5.3	4.6	4.2	3.75	3.85	3.9	4.0	4.0
16	4.7	4.45	6.1	6.1	5.4	4.5	4.2	3.75	3.8	3.9	4.0	4.0
17	4.7	4.5	6.05	6.05	5.4	4.5	4.0	3.75	3.8	4.0	4.0	4.0
18	4.65	4.55	6.0	6.05	5.4	4.4	4.0	3.75	3.8	4.05	4.0	4.0
19	4.65	5.05	6.6	6.05	5.4	4.4	4.1	3.75	3.9	4.0	4.0	4.0
20	4.65	5.35	6.25	5.95	5.4	4.4	4.05	3.75	3.9	4.0	4.0	4.0
21	4.65	5.35	6.45	5.8	5.4	4.3	3.9	3.8	3.95	4.0	4.0	4.0
22	4.8	5.25	6.15	5.8	5.4	4.3	3.9	3.8	3.95	4.0	4.0	4.0
23	5.5	5.1	6.1	5.8	5.35	4.25	3.85	3.8	3.95	4.0	4.05	4.0
24	5.4	5.1	6.05	5.85	5.35	4.2	3.85	3.75	3.95	4.0	4.05	4.0
25	5.2	5.2	5.85	5.9	5.3	4.2	3.85	3.75	3.95	4.0	4.1	4.0
26	4.95	5.2	6.9	6.0	5.3	4.2	3.85	3.75	4.0	4.0	4.1	4.0
27	4.9	5.25	6.3	6.0	5.3	4.2	3.8	3.75	3.9	4.0	4.1	4.0
28	4.9	5.25	6.1	6.0	5.25	4.2	3.8	3.75	4.0	4.0	4.05	4.0
29	4.85	.....	6.0	6.0	5.25	4.15	3.75	3.8	3.95	4.0	4.05	4.0
30	4.8	.....	6.1	6.0	5.2	4.15	3.75	3.8	3.9	4.0	4.0	4.0
31	4.8	.....	6.0	.....	5.2	.....	4.1	3.8	.....	4.0	.....	4.0

Station rating table for Susan River near Susanville, Cal., 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.*
3.75	7	4.60	59	5.50	168	6.40	356
3.80	9	4.70	68	5.60	185	6.50	382
3.90	13	4.80	77	5.70	203	6.60	410
4.00	18	4.90	87	5.80	222	6.70	440
4.10	24	5.00	98	5.90	242	6.80	470
4.20	30	5.10	110	6.00	262	6.90	500
4.30	37	5.20	123	6.10	284		
4.40	44	5.30	137	6.20	307		
4.50	51	5.40	152	6.30	331		

NOTE.—The above table is based on 11 discharge measurements made during 1904 and 1905 and is well defined.

Estimated monthly discharge of Susan River near Susanville, Cal., for 1905.

[Drainage area, 256 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	168	55	76.9	4,728	0.300	0.346
February	144	48	96.9	5,382	.379	.395
March	500	123	234	14,390	.914	1.05
April	307	222	264	15,710	1.03	1.15
May	252	123	160	9,838	.625	.721
June	116	27	61.3	3,648	.239	.267
July	77	7	23.4	1,439	.091	.105
August	24	7	12.1	744	.047	.054
September	18	9	12.3	732	.048	.054
October	21	9	15.7	965	.061	.070
November	24	18	19.0	1,131	.074	.083
December	18	18	18.0	1,107	.070	.081
The year	500	7	82.8	59,810	.323	4.38

WILLOW CREEK AT MERRILLVILLE, CAL.

This station was established June 18, 1904, by S. G. Bennett. It is located at the old bridge, 100 feet above the present wagon bridge at Merrillville.

The channel is straight above and below the bridge for 100 feet. The banks on each side are low, but not subject to overflow, and there is very little fluctuation in the discharge of the creek. The bed of the stream is composed of gravel and is not subject to much change.

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

The gage is a staff fastened vertically to the left end of the bridge. During 1905 the gage was read once each day by R. W. Hurlbut.

A description of this station and gage height and discharge data are contained in Water-Supply Paper No. 134, United States Geological Survey, pages 199–200.

Daily gage height, in feet, of Willow Creek at Merrillville, Cal., in 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.1	1.1	0.95	1.1	0.9	0.95	0.9	0.95	1.0	1.1	1.3	1.25
2	1.05	1.1	1.0	1.05	.9	.95	.9	.95	1.0	1.1	1.25	1.3
3	1.0	1.1	1.0	1.0	.95	.95	.9	.95	1.0	1.1	1.2	1.3
4	1.0	1.05	1.0	1.0	.95	.95	.9	.95	1.0	1.1	1.2	1.3
5	1.0	1.1	.95	1.0	.95	.95	.9	.95	1.0	1.1	1.2	1.3
6	1.0	1.05	.95	1.0	.95	.95	.9	.95	1.0	1.2	1.2	1.3
7	1.0	1.0	1.0	1.0	.95	.95	.9	.95	1.0	1.3	1.2	1.3
8	1.0	1.0	1.05	1.0	.95	1.0	.9	.95	1.0	1.2	1.2	1.3
9	1.0	1.0	1.0	1.0	.95	1.0	.9	1.0	1.0	1.2	1.2	1.3
10	1.0	1.0	1.0	.95	1.0	.95	.95	1.0	1.0	1.2	1.2	1.3
11	1.0	1.0	1.0	.95	1.05	.95	.95	1.0	1.0	1.2	1.2	1.3
12	1.0	1.0	1.0	.95	1.1	.95	1.05	1.0	1.0	1.2	1.2	1.3
13	1.0	1.0	1.05	1.0	1.05	.95	1.05	1.0	1.0	1.2	1.2	1.3
14	1.05	1.0	.95	1.0	1.0	.95	1.0	1.0	1.0	1.2	1.2	1.3
15	1.05	.95	1.05	1.0	.95	.95	1.0	1.0	1.0	1.2	1.2	1.3
16	1.05	1.0	1.1	1.0	.9	.95	1.0	1.0	1.0	1.2	1.2	1.3
17	1.05	1.0	1.1	1.0	.9	.95	.95	1.0	1.05	1.2	1.2	1.3
18	1.05	1.0	1.05	1.0	.9	.95	.95	1.0	1.05	1.2	1.2	1.3
19	1.05	1.25	1.1	1.0	.9	.95	.95	1.0	1.05	1.2	1.2	1.3
20	1.0	1.15	1.05	1.0	.9	.95	.95	1.0	1.05	1.2	1.2	1.3
21	1.05	1.05	1.05	1.0	.9	.95	.95	1.0	1.05	1.2	1.2	1.3
22	1.1	1.05	1.05	1.0	.95	.95	.95	1.0	1.05	1.25	1.2	1.3
23	1.1	1.05	1.05	.9	.95	.95	.95	1.0	1.05	1.25	1.2	1.3
24	1.1	1.0	1.0	.9	.95	.95	.95	1.0	1.05	1.25	1.2	1.3
25	1.05	1.0	1.0	.95	.95	.95	.95	1.0	1.05	1.25	1.2	1.3
26	1.0	1.05	1.1	.95	1.0	.95	.95	1.0	1.05	1.2	1.2	1.3
27	1.0	1.0	1.1	.95	1.0	.95	.95	1.0	1.1	1.2	1.2	1.3
28	1.0	1.0	1.0	.95	1.0	.95	.95	1.0	1.15	1.2	1.25	1.3
29	1.0	.....	1.1	.9	.95	.95	.95	1.0	1.2	1.2	1.25	1.3
30	1.0	.....	1.05	.9	.95	.9	.95	1.0	1.1	1.2	1.25	1.3
31	1.0	.....	1.05	.....	.95	.....	.95	1.0	.....	1.25	.....	1.3

Station rating table for Willow Creek at Merrillville, Cal., 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.*
0.90	16	1.10	20	1.20	22	1.30	24
1.00	18						

NOTE.—The above table is based on four discharge measurements made during 1904, and is fairly well defined.

Estimated monthly discharge of Willow Creek at Merrillville, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	20	18	18.5	1,138
February	23	17	18.8	1,044
March	20	17	18.6	1,144
April	20	16	17.6	1,047
May	20	16	17.1	1,051
June	18	16	17.0	1,012
July	19	16	16.9	1,039
August	18	17	17.7	1,088
September	22	18	18.7	1,113
October	24	20	21.9	1,347
November	24	22	22.2	1,321
December	24	23	24.0	1,476
The year	24	16	19.1	13,820

WILLOW CREEK NEAR STANDISH, CAL.

This station was originally established June 4, 1900. It was reestablished January 1, 1905, and discontinued December 31 of the same year. It is located at the bridge on the road from Susanville to Hot Springs and is about 1½ miles above the junction of the creek with Susan River. It is about 4 miles west of north from Standish.

The channel is straight for 300 feet above and 250 feet below the station. The right bank is rather low and is subject to overflow at extreme high water; the left bank is high and not liable to overflow. The stream bed is sandy and liable to shift somewhat.

Discharge measurements are made from the bridge. The initial point for soundings is on the end of the bridge on the left bank.

The gage is a staff fastened vertically to the left abutment of the bridge. During 1905 the gage was read once each day by T. E. Ravenscroft

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

Description: 51, p 407; 66, p 115.
Discharge: 51, p 407.
Gage heights: 51, p 407; 66, p 115.

Discharge measurements of Willow Creek near Standish, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 24	J. Branham	57	117	0.80	6.15	94
January 29	do	57	87	.79	5.35	69
February 26	do	57	105	.79	5.75	83
April 23	do	32	21	.95	4.00	20
November 19	do	57	56	.61	4.80	34

Daily gage height, in feet, of Willow Creek near Standish, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.6	6.8	5.0	5.5	4.0	4.0	3.0	4.0	4.2	5.0	5.0	5.0
2	6.6	6.7	4.8	5.3	4.0	4.0	3.0	4.0	4.5	4.8	5.1	5.3
3	5.0	5.9	4.0	5.0	4.0	4.0	3.0	4.0	4.4	4.6	5.0	5.2
4	5.0	.....	4.0	5.0	4.0	4.0	6.0	4.0	4.4	4.3	5.0	5.0
5	4.6	5.8	4.0	4.8	4.0	4.0	5.8	4.0	4.4	4.0	5.0	5.1
6	4.6	6.0	4.4	4.5	4.0	4.0	4.8	4.0	4.4	4.0	5.1	5.0
7	4.6	6.0	4.4	4.0	4.0	4.0	4.0	4.0	4.4	4.0	5.2	5.2
8	4.6	5.8	4.4	4.0	4.0	4.2	4.0	4.0	4.4	4.2	5.0	4.1
9	4.6	5.6	4.0	4.0	4.0	4.1	4.0	4.0	4.4	4.2	5.0	4.1
10	4.6	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.1	5.2	4.4
11	4.6	5.0	4.4	4.0	4.2	4.0	4.0	4.2	4.0	4.1	5.1	4.4
12	4.7	5.0	4.0	3.8	4.2	4.0	6.0	4.0	4.0	4.0	4.6	4.4
13	4.7	5.0	4.0	4.0	4.0	4.0	6.0	4.0	4.0	4.0	4.4	4.3
14	4.7	5.0	4.0	4.0	4.0	4.0	5.8	4.0	6.0	4.0	4.4	4.5
15	5.8	4.6	4.4	4.0	4.0	4.0	5.0	4.0	5.8	4.0	4.4	4.1
16	5.8	4.7	4.4	4.0	4.0	4.0	5.8	4.0	5.0	4.1	4.6	4.1
17	6.0	4.7	4.4	4.0	4.0	4.0	5.8	4.0	5.0	4.5	4.8	4.3
18	6.0	4.7	4.4	4.0	4.0	4.0	5.8	4.2	5.0	4.5	4.8	4.3
19	6.4	5.1	5.0	4.0	4.0	4.0	6.0	4.2	5.0	4.5	5.0	4.3
20	6.35	6.0	5.0	4.0	4.0	4.0	6.0	4.6	5.0	4.5	5.0	4.3
21	6.0	7.8	5.2	4.0	4.1	4.0	6.0	4.5	4.8	4.5	4.8	4.0
22	7.6	7.8	5.2	4.0	4.1	4.0	5.0	4.6	4.8	4.5	4.6	5.0
23	7.8	7.0	5.0	4.0	4.0	4.0	5.0	4.2	4.8	5.0	4.6	5.0
24	6.0	6.2	4.8	4.0	4.0	4.0	4.8	4.0	4.6	5.1	4.5	5.2
25	6.0	6.0	4.6	4.0	4.0	4.0	4.1	4.0	4.5	5.2	4.4	5.0
26	5.8	6.3	5.3	4.0	4.0	6.2	4.0	4.2	5.0	5.2	4.8	5.2
27	5.6	5.0	5.0	4.0	4.0	5.0	4.0	4.2	6.0	5.1	4.8	5.3
28	5.6	5.0	5.0	4.0	3.8	4.0	4.0	4.2	5.8	5.5	5.0	5.3
29	5.7	.....	5.0	4.0	3.8	4.0	4.0	4.2	5.8	5.2	5.0	5.3
30	5.0	.....	5.0	4.0	3.8	3.6	4.0	4.3	5.0	5.0	5.0	5.3
31	5.6	.....	5.5	.....	.....	.....	4.0	4.2	.....	5.0	.....	5.3

Station rating table for Willow Creek near Standish, Cal., 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.*
3.60	10	4.60	31	5.60	74	6.60	141
3.70	11	4.70	34	5.70	80	6.70	149
3.80	13	4.80	37	5.80	86	6.80	157
3.90	15	4.90	41	5.90	92	6.90	165
4.00	17	5.00	45	6.00	98	7.00	173
4.10	19	5.10	49	6.10	105	7.20	189
4.20	21	5.20	54	6.20	112	7.40	205
4.30	23	5.30	59	6.30	119	7.60	221
4.40	25	5.40	64	6.40	126	7.80	238
4.50	28	5.50	69	6.50	133		

NOTE.—The above table is based on five discharge measurements made during 1905 and is not well defined.

Estimated monthly discharge of Willow Creek near Standish, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	238	31	80.4	4,944
February [a]	238	31	89.4	4,965
March	69	17	33.5	2,060
April	69	17	22.9	1,363
May [a]	21	13	17.0	1,045
June	112	10	21.1	1,256
July	98	0	46.2	2,841
August	31	17	19.6	1,205
September	98	17	41.0	2,440
October	69	17	31.8	1,955
November	54	25	39.6	2,356
December	59	17	38.7	2,380
The year	238	0	40.1	28,810

[a] Discharge interpolated February 4 and May 31.

OWENS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Owens River has its source in the Sierra Nevadas in eastern California and flows southeast parallel with this range, finally discharging its waters into Owens Lake. This basin has a length from north to south of approximately 150 miles with a width of from 20 to 25 miles. It lies between the Sierra Nevadas on the west and the White Mountains on the east. Practically the entire flow of this river is derived from the Sierra Nevadas, as it drains the entire eastern slope of this range from Mount Lyell on the north to a point some distance below Mount Whitney on the south. The White Mountains furnish no water for this stream except in times of exceptionally heavy rain storms, which seldom occur on this range. There are numerous tributaries entering Owens River from the west which have their source in the high elevations of the Sierra Nevadas, extending from the northern to the southern limits of this basin. The topography of the portion of the Sierra Nevadas which is drained by this stream is extremely rough and precipitous, the mountains rising abruptly from Owens Valley to elevations of 13,000 to 14,000 feet. The formation is of granite, with very little soil covering and sparse timber growth. Numerous lakes and marshes are found in the upper reaches of this portion of the drainage basin. Owens River, a short distance below its source, enters a flat, swampy country known as Long Valley, where a considerable quantity of its flow is used for the irrigation of meadow lands for stock raising. This water returns to the river channel at the lower end of this valley, at which point the stream enters a deep, narrow gorge with heavy grade. As the river breaks from this canyon it enters Owens Valley, through which it flows for a distance of about 80 miles, finally discharging into Owens Lake. The gaging station at Round Valley is located at the lower end of this canyon. Below this point numerous diversions are made for the irrigation of land in Owens Valley, where the soil is extensively cultivated and large areas are used for the raising of hay and grain. This country is particularly adapted to stock raising, which is carried on extensively throughout the valley. There are numerous opportunities for the construction of storage reservoirs within this basin, both on the main stream and also on the upper reaches of its tributaries, although none have been constructed as yet. The precipitation is extremely light within the area of this basin with the exception of the high elevations of the Sierra Nevadas, where there is a heavy fall of snow. The

melting of the snow in the spring and summer months feeds the numerous tributaries of this river, insuring a continued flow throughout the year.

The gaging stations on canals taking water from Owens River may be considered as temporary. The gage rods in most instances are securely fastened to footbridges and are not liable to change. No permanent bench marks were established.

OWENS RIVER NEAR ROUND VALLEY, CAL.

This station was established August 3, 1903, by J. C. Clausen. It is located at the footbridge, 700 feet above the junction of Owens River and Rock Creek.

The river at this point cuts through a lava deposit about 100 feet thick and forms a gorge, which is about 250 feet wide at the top. The channel is straight for 175 feet above and 250 feet below the station. The current is swift at all stages. Both banks are high and rocky and are not liable to overflow. The bed of the stream is composed of rock and lava bowlders and is not subject to much change.

Discharge measurements are made from the single-span footbridge to which the gage is attached. The bridge is 37 feet long and has a clear span of 35 feet. The initial point for soundings is the anchor bolt of the right abutment.

The gage is a vertical rod, fastened to the concrete bridge abutment on the left bank. During 1905 the gage was read once each day by T. E. Jones. The bench mark is a bolt set in a lava bowlder 97.4 feet north of the right abutment.

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

Description: 100, p 206; 134, p 200.
Discharge: 100, p 206; 134, p 201.
Discharge, monthly: 134, p 203.
Gage heights, 100, p 207; 134, p 202.
Rating table: 134, p 203.

Discharge measurements of Owens River near Round Valley, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 16	R. J. Taylor	34	73	2.52	1.97	184
February 9	do	34	76	2.30	1.95	175
April 4	J. S. Evans	34	72	2.49	2.00	179
May 22	do	34	91	3.36	2.39	306
June 27	do	34	102	3.74	2.58	382
July 25	do	34	76	2.73	2.15	207
August 15	do	34	72	2.12	1.90	154
September 8	do	34	76	2.33	2.00	177
September 27	do	34	72	2.15	1.90	155
November 2	F. R. S. Buttemer	34	72	2.28	1.80	164
November 24	do	34	75	2.40	1.85	180
December 10	do	34	70	2.16	1.73	151

Daily gage height, in feet, of Owens River near Round Valley, Cal., for 1905.

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

Station rating table for Owens River near Round Valley, Cal., from January 1 to October 10, 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.*
1.80	134	2.20	240	2.60	377	3.00	533
1.90	158	2.30	271	2.70	415		
2.00	184	2.40	304	2.80	453		
2.10	211	2.50	339	2.90	493		

NOTE.—The above table is based on 12 discharge measurements made during 1904–5. It is fairly well defined between gage heights 1.9 feet and 3.1 feet.

Station rating table for Owens River near Round Valley, Cal., from October 11 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.*
1.70	141	1.80	165	1.90	191	2.00	219

NOTE.—The above table is based on three discharge measurements made during the latter part of 1905 and is fairly well defined.

Estimated monthly discharge of Owens River near Round Valley, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	240	158	193	11,870
February	240	146	196	10,880
March	339	158	213	13,100
April	211	158	177	10,530
May	358	184	246	15,130
June	533	271	392	23,330
July	377	184	275	16,910
August	211	146	169	10,390
September	184	158	180	10,710
October	219	153	180	11,070
November	219	153	197	11,720
December	219	153	179	11,010
The year	533	146	216	156,600

ROCK CREEK NEAR ROUND VALLEY, CAL.

This station was established August 3, 1903, by J. C. Clausen. It is located at the wagon bridge on the road from Long Valley to Bishop 3,500 feet above the mouth of the creek.

The channel is straight for 50 feet above and 40 feet below the footbridge. The current is swift. Both banks are high and rocky and are not liable to overflow. The bed of the stream is composed of gravel and is not subject to much change.

Discharge measurements are made from a footbridge, which has a span of 18 feet. The initial point for soundings is on right bank of stream.

The gage is a vertical rod fastened to the left end of the bridge. During 1905 the gage was read once each day by T. E. Jones. The bench mark is a point marked on a lava rock 15 feet east of the left end of the footbridge.

Information in regard to this station is contained in the following water-supply papers of the United States Geological Survey:

Description: 100, p 207; 134, p 204.
Discharge: 100, p 207; 134, p 204.
Discharge, monthly: 134, p 207.
Gage heights: 100, p 208; 134, pp 205–206.
Rating table: 134, p 206.

Discharge measurements of Rock Creek near Round Valley, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 16	R. J. Taylor	13	16	1.76	1.52	28
February 9	do	13	12.8	1.56	1.30	20
April 4	J. S. Evans	13	12.8	1.55	1.40	19.9
April 25	do	12	11.6	1.60	1.15	18.6
May 24	do	14	19.3	2.02	1.80	39
June 27	do	14.5	23	2.22	2.00	51
July 25	do	13	12.6	1.90	1.30	24
August 15	do	12.5	11.6	1.69	1.20	19.6
September 8	do	12	11.2	1.57	1.18	18.6
September 27	do	12	11.6	1.57	1.20	18.2
November 2	F. R. S. Buttemer	13.5	14	1.50	1.35	21
November 24	do	13.5	15.3	1.50	1.46	23
December 10	do	13.5	16	1.69	1.60	27

Daily gage height, in feet, of Rock Creek near Round Valley, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	2.1	1.4	1.4	1.3	1.7	1.8	1.35	1.2	1.2	1.3	1.6
2	1.6	1.6	1.4	1.4	1.4	1.65	1.8	1.35	1.2	1.2	1.3	1.6
3	1.6	1.6	1.4	1.4	1.35	1.65	1.75	1.35	1.2	1.2	1.3	1.65
4	1.5	1.5	1.4	1.4	1.3	1.6	1.75	1.3	1.2	1.25	1.3	1.65
5	1.5	1.5	1.35	1.4	1.3	1.6	1.8	1.3	1.2	1.25	1.3	1.65
6	1.5	1.5	1.3	1.4	1.2	1.6	1.8	1.25	1.2	1.25	1.3	1.65
7	1.5	1.4	1.2	1.4	1.2	1.5	1.9	1.3	1.2	1.25	1.3	1.65
8	1.5	1.35	1.2	1.4	1.2	1.6	2.0	1.3	1.2	1.25	1.25	1.65
9	1.4	1.3	1.1	1.3	1.25	1.7	2.0	1.4	1.2	1.25	1.25	1.65
10	1.3	1.3	1.1	1.3	1.25	1.7	2.0	1.4	1.2	1.25	1.25	1.6
11	1.3	1.3	1.2	1.25	1.25	1.8	2.0	1.3	1.2	1.2	1.2	1.6
12	1.3	1.4	1.2	1.25	1.3	2.1	2.0	1.25	1.2	1.2	1.2	1.6
13	1.3	1.4	1.5	1.25	1.3	2.1	2.0	1.25	1.2	1.2	1.25	1.6
14	1.3	1.4	1.35	1.2	1.3	2.15	2.0	1.2	1.15	1.2	1.3	1.6
15	1.3	1.4	1.35	1.2	1.3	2.3	2.0	1.2	1.1	1.25	1.3	1.6
16	1.35	1.45	1.4	1.2	1.3	2.3	1.9	1.15	1.1	1.25	1.3	1.6
17	1.4	1.5	1.45	1.15	1.7	2.35	1.8	1.15	1.15	1.3	1.3	1.6
18	1.4	1.4	1.45	1.1	1.9	2.4	1.7	1.15	1.15	1.3	1.3	1.6
19	1.45	1.4	1.4	1.1	1.9	2.5	1.6	1.15	1.2	1.3	1.3	1.6
20	1.45	1.4	1.4	1.0	1.9	2.45	1.6	1.15	1.2	1.3	1.3	1.6
21	1.7	1.4	1.35	1.0	1.8	2.4	1.6	1.15	1.25	1.3	1.3	1.55
22	1.7	1.4	1.35	1.0	1.8	2.3	1.55	1.15	1.3	1.3	1.35	1.55
23	1.6	1.4	1.3	1.0	1.75	2.3	1.55	1.15	1.3	1.3	1.4	1.55
24	1.6	1.45	1.35	1.1	1.75	2.2	1.5	1.1	1.3	1.3	1.45	1.5
25	1.5	1.45	1.4	1.15	1.7	2.2	1.5	1.1	1.3	1.3	1.5	1.5
26	1.4	1.45	1.4	1.15	1.7	2.1	1.4	1.1	1.25	1.3	1.5	1.55
27	1.4	1.4	1.4	1.15	1.75	2.0	1.4	1.1	1.2	1.25	1.55	1.6
28	1.4	1.4	1.4	1.2	1.9	1.9	1.3	1.1	1.2	1.25	1.6	1.6
29	1.4	.....	1.4	1.2	1.8	1.85	1.25	1.1	1.2	1.25	1.6	1.6
30	1.3	.....	1.4	1.25	1.8	1.8	1.25	1.15	1.2	1.25	1.55	1.6
31	1.3	.....	1.4	.....	1.75	.....	1.4	1.15	.....	1.25	.....	1.55

Daily discharge, in second-feet, of Rock Creek near Round Valley, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	34	56	23	23	20	34	42	24	19	19	20	27
2	30	30	23	23	23	32	42	24	19	19	20	27
3	30	30	23	23	21	32	40	24	19	19	20	28
4	26	26	23	23	20	30	40	23	19	19	20	28
5	26	26	21	23	20	30	42	23	19	19	20	28
6	26	26	20	23	18	30	42	21	19	19	20	28
7	26	23	18	23	18	26	46	23	19	19	20	28
8	26	21	18	23	18	30	51	23	19	19	19	28
9	23	20	16	20	19	34	51	26	19	19	19	28
10	20	20	16	20	19	34	51	26	19	19	19	27
11	20	20	18	19	19	39	51	23	19	19	19	27
12	20	23	18	19	20	56	51	21	19	19	19	27
13	20	23	26	19	20	56	51	21	19	19	19	27
14	20	23	21	18	20	59	51	20	18	19	20	27
15	20	23	21	18	20	68	51	20	18	19	20	27
16	21	24	23	18	20	68	46	18	18	19	20	27
17	23	26	24	17	34	71	42	18	18	20	20	27
18	23	23	24	16	44	74	38	18	18	20	20	27
19	24	23	23	16	44	81	33	18	19	20	20	27
20	24	23	23	14	44	78	33	18	19	20	20	27
21	34	23	21	14	39	74	33	18	19	20	20	26
22	34	23	21	14	39	68	31	18	20	20	21	26
23	30	23	20	14	36	68	31	18	20	20	22	26
24	30	24	21	16	36	62	30	17	20	20	23	24
25	26	24	23	17	34	62	30	17	20	20	24	24
26	23	24	23	17	34	56	26	17	19	20	24	26
27	23	23	23	17	36	50	26	17	19	19	26	27
28	23	23	23	18	44	46	23	17	19	19	27	27
29	23	.....	23	18	39	44	21	17	19	19	27	27
30	20	.....	23	19	39	42	21	18	19	19	26	27
31	20	.....	23	.....	36	.....	26	18	.....	19	.....	26

NOTE.—Owing to shifting conditions, the daily discharge has been computed from several curves, each covering a short period of time.

Estimated monthly discharge of Rock Creek near Round Valley, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	34	20	24.8	1,525
February	56	20	24.9	1,383
March	26	16	21.5	1,322
April	23	14	18.7	1,113
May	44	18	28.8	1,771
June	81	26	51.1	3,041
July	51	21	38.5	2,367
August	26	17	20.1	1,236
September	20	18	19.0	1,131
October	20	19	19.3	1,187
November	27	19	21.1	1,256
December	28	24	26.9	1,654
The year	81	14	26.2	18,990

PINE CREEK NEAR ROUND VALLEY, CAL.

This station was established August 3, 1903, by J. C. Clausen. It is located 150 feet below the wagon bridge on the road from Bishop to Long Valley and 100 feet above the mouth of the creek.

The channel is straight for about 50 feet above and 100 feet below the station. The current has a velocity of about 1 foot per second at ordinary stages. Both banks are high and rocky and are not liable to overflow. The bed of the stream is rocky and permanent.

Discharge measurements are made by wading. The initial point for soundings is a stake on the right bank of the stream.

The gage is a vertical rod fastened in the rocks near the right bank. During 1905 the gage was read once each day by T. E. Jones. The bench mark is the one at the Rock Creek station. It is a point marked on the lava rock 15 feet east of the left end of the footbridge.

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

Description: 100, p 208; 134, p 207.
Discharge: 100, p 209; 134, p 208.
Discharge, monthly: 134, p 210.
Gage heights: 100, p 209; 134, pp 208-209.
Rating table: 134, p 210.

Discharge measurements of Pine Creek near Round Valley, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 16	R. J. Taylor	20	15.2	0.88	1.91	13.3
February 9	do	20	15.2	.67	1.86	10.2
April 4	J. S. Evans	8	10.4	.19	1.80	2.0
April 25	do	10	8.8	.66	1.70	5.8
June 27	do	27	2.8	2.61	2.90	73
July 25	do	19	16.1	1.43	2.05	23
August 15	do	18	10.8	.67	1.80	7.2
September 8	do	17	9.2	.73	1.75	6.7
September 27	do	17	8.1	.77	1.78	6.2
November 2	F. R. S. Buttemer	17	19.7	.44	1.83	8.7
November 24	do	18	18.2	.42	1.85	7.7
December 10	do	18	18.4	.41	1.82	7.6

Daily gage height, in feet, of Pine Creek near Round Valley, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.2	2.2	1.8	1.8	1.8	1.9	2.9	1.8	1.7	1.8	1.8	1.85
2	2.15	2.0	1.8	1.8	1.8	1.9	2.9	1.7	1.7	1.8	1.8	1.85
3	2.1	2.0	1.8	1.8	1.75	1.9	2.85	1.7	1.7	1.8	1.8	1.9
4	1.95	1.9	1.8	1.8	1.75	1.9	2.8	1.7	1.7	1.85	1.8	1.9
5	1.95	1.9	1.8	1.8	1.75	1.95	2.8	1.7	1.7	1.85	1.85	1.9
6	1.95	1.8	1.8	1.8	1.7	1.95	2.8	1.7	1.7	1.85	1.85	1.9
7	1.9	1.8	1.8	1.75	1.7	2.05	2.9	1.7	1.7	1.85	1.85	1.9
8	1.9	1.85	1.8	1.75	1.7	2.1	2.95	1.7	1.65	1.85	1.85	1.9
9	1.9	1.85	1.8	1.75	1.7	2.45	3.0	1.8	1.6	1.85	1.8	1.9
10	1.8	1.85	1.75	1.75	1.7	2.7	3.0	1.8	1.65	1.8	1.8	1.85
11	1.8	1.85	1.75	1.8	1.75	2.6	2.9	1.75	1.65	1.8	1.8	1.85
12	1.8	1.85	1.8	1.8	1.8	2.8	2.85	1.7	1.65	1.7	1.8	1.85
13	1.75	1.85	1.8	1.8	1.8	3.3	2.8	1.7	1.65	1.75	1.8	1.8
14	1.75	1.85	1.8	1.8	1.8	3.3	2.7	1.7	1.65	1.75	1.8	1.8
15	1.75	1.85	1.8	1.8	1.75	3.3	2.6	1.7	1.6	1.8	1.8	1.8
16	1.8	1.8	1.85	1.8	1.75	3.3	2.5	1.7	1.6	1.8	1.8	1.8
17	1.8	1.8	1.85	1.8	1.75	3.25	2.4	1.7	1.65	1.8	1.8	1.8
18	1.8	1.85	1.85	1.75	1.75	3.2	2.45	1.75	1.65	1.85	1.8	1.8
19	1.8	1.85	1.8	1.75	1.75	3.2	2.5	1.75	1.7	1.85	1.8	1.8
20	1.85	1.8	1.8	1.75	1.8	3.1	2.5	1.75	1.7	1.85	1.8	1.8
21	2.0	1.8	1.8	1.75	1.9	3.1	2.1	1.75	1.75	1.85	1.8	1.8
22	2.0	1.8	1.8	1.7	1.9	3.1	1.95	1.75	1.8	1.85	1.8	1.8
23	1.9	1.8	1.8	1.7	1.9	3.0	1.95	1.75	1.8	1.85	1.8	1.8
24	1.9	1.8	1.8	1.7	2.0	2.9	2.0	1.7	1.8	1.85	1.85	1.8
25	1.9	1.85	1.8	1.7	2.0	2.9	2.0	1.7	1.8	1.85	1.85	1.8
26	1.9	1.85	1.8	1.7	2.0	2.9	2.0	1.7	1.8	1.85	1.85	1.8
27	1.9	1.8	1.8	1.7	2.0	2.9	2.05	1.7	1.8	1.8	1.85	1.8
28	1.9	1.8	1.75	1.75	1.95	2.9	2.05	1.7	1.8	1.8	1.8	1.8
29	1.9	.....	1.75	1.75	1.9	2.9	2.0	1.7	1.8	1.8	1.8	1.8
30	1.85	.....	1.75	1.75	1.8	2.9	2.0	1.7	1.8	1.8	1.8	1.8
31	1.85	.....	1.8	.....	1.85	.....	1.9	1.7	.....	1.8	.....	1.8

Station rating table for Pine Creek near Round Valley, Cal., from August 4, 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.*
1.60	1	2.10	23	2.60	52	3.10	95
1.70	4	2.20	28	2.70	59	3.20	106
1.80	8	2.30	33	2.80	67	3.30	119
1.90	13	2.40	39	2.90	75		
2.00	18	2.50	45	3.00	85		

NOTE.—The above table is based on 20 discharge measurements made during 1903-1905. It is fairly well defined between gage heights 1.7 feet and 3 feet. The table has been extended beyond these limits, being based on one measurement at 3.7 feet.

Estimated monthly discharge of Pine Creek near Round Valley, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	28	6	12.7	781
February	28	8	10.6	589
March	10	6	7.9	486
April	8	4	6.5	387
May	18	4	9.0	553
June	119	13	68.1	4,052
July	85	13	47.9	2,945
August	8	4	4.8	295
September	8	1	4.6	274
October	10	4	8.7	535
November	10	8	8.5	506
December	13	8	9.5	584
The year	119	1	16.6	11,990

OWENS RIVER CANAL NEAR BISHOP, CAL.

This station was established August 5, 1903, by J. C. Clausen and R. S. Hawley. It is located at the footbridge near the quarter-section line which divides the north half of sec. 27, T 6 S., R. 32 E., of the Mount Diablo meridian.

The channel is straight for 300 feet above and 100 feet below the station. The current is sluggish. The right bank is high and rocky and will not overflow. The left bank is low and will overflow. The bed of the stream is composed of gravel and is permanent.

Discharge measurements are made from the footbridge. The initial point for soundings is on right bank of the canal.

The gage is a vertical rod nailed to the bridge. No regular observer could be obtained, but the ditch tender reads the rod when passing the station.

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

Description: 100, pp 209–210; 134, p 211.
Discharge: 100, p 210; 134, p 211.
Discharge, monthly: 134, p 213.
Gage heights: 100, p 210; 134, p 212.
Rating table: 134, p 213.

Discharge measurements of Owens River Canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 10	R. J. Taylor	11.5	4.9	0.92	1.55	4.5
February 4	do	11	4.1	.80	1.49	3.3
April 6	J. S. Evans	14.5	16.4	1.71	2.40	28
April 24	do	15.0	22	1.91	2.77	42
May 12	do	14.5	24	1.79	2.78	43
June 1	do	14.5	21	1.76	2.62	38
July 7	do	14	16.8	1.90	2.30	32
August 4	do	14.5	23	1.87	2.75	43
September 11	do	15	19.6	1.73	2.60	34
October 24	F. R. S. Buttemer	14.5	19.3	1.45	2.38	28
November 22	do	12	5.6	.95	1.50	5.3
December 13	do	13	6.6	1.17	1.63	7.7

Daily gage height, in feet, of Owens River canal near Bishop, Cal., for 1905.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	0.0	2.7	2.55	2.8	2.55	2.8
2	.....	.0	2.7	2.55	2.75	2.55	2.8
3	.....	.0	2.7	2.55	2.8	2.55	2.8
4	.....	2.4	.....	2.55	2.75	2.55	2.8
5	.....	2.7	2.65	2.55	2.8	2.55	2.8
6	.....	2.7	2.65	2.55	2.85	2.75	2.75
7	.....	2.7	2.6	2.55	2.9	2.8	2.75
8	.....	2.65	2.6	2.55	2.85	2.8	2.8
9	.....	2.7	.....	2.55	2.85	2.8	2.8
10	.....	2.5	.....	2.55	2.9	2.8	2.8
11	.....	2.7	2.65	2.55	2.9	2.75	2.7
12	.....	2.8	2.7	2.55	2.5	2.8	2.7
13	.....	2.8	2.65	2.55	2.5	2.8	2.7
14	.....	.....	2.7	2.55	2.5	2.8	2.75
15	.....	2.75	2.55	2.55	2.5	2.75	.....
16	.....	2.8	2.55	2.55	2.5	2.8	.....
17	.....	2.75	2.55	2.5	.0	2.75	.....
18	.....	2.75	2.55	2.65	.0	2.6	.....
19	.....	2.7	2.5	2.7	.0	2.6	.....
20	.....	2.75	2.5	2.7	2.6	2.6	.....
21	.....	2.75	2.5	2.65	2.6	2.6	.....
22	.....	2.7	2.55	2.65	.0	2.6	.....
23	.....	2.65	2.55	2.7	.0	2.6	.....
24	.....	2.65	2.55	2.7	2.6	2.6	.....
25	.....	2.7	2.55	2.7	2.6	2.65	.....
26	2.8	2.7	2.55	2.7	2.8	2.65	.....
27	2.8	2.75	2.55	2.7	2.85	2.7	.....
28	.....	.....	2.55	2.75	2.85	2.65	.....
29	.....	.....	2.55	2.7	2.9	2.5	.....
30	2.65	2.7	2.55	2.8	2.95	2.8	.....
31	.....	2.7	.....	2.75	2.55	.....	.....

BISHOP CREEK CANAL NEAR BISHOP, CAL.

This station was established August 5, 1903, by J. C. Clausen, assisted by R. S. Hawley. It is located at the footbridge below the waste gate near the house of A. Fitzgerald, 3½ miles northwest of Bishop, Cal.

The channel is straight for 50 feet above and 100 feet below this station. The current is swift. The right bank is high and the left bank is low. Neither bank is liable to overflow. The bed of the stream is composed of sand and gravel and is fairly permanent.

Discharge measurements are made from the footbridge. The initial point for soundings is on right bank.

The gage is a vertical rod fastened to the bridge anchor.

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

Description: 100, pp 210–211; 134, p 214.
Discharge: 100, p 211; 134, p 214.
Discharge, monthly: 134, p 216.
Gage heights: 100, p 211; 134, p 215.
Rating table: 134, p 216.

Discharge measurements of Bishop Creek canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 17	R. J. Taylor	15	10.1	0.84	1.40	8.5
April 6	J. S. Evans	16	30	2.07	2.80	62
April 24	do	16	47	2.23	3.81	105
May 12	do	16	49	2.20	3.95	108
June 1	do	16	50	2.08	4.00	105
July 7	do	16	44	1.75	3.70	77
August 4	do	16	51	2.39	4.10	122
September 11	do	16	44	2.20	3.85	97
October 24	F. R. S. Buttemer	16	26	1.12	1.92	29
November 22	do	13	4.6	.39	1.05	1.8
December 13	do	13	5.1	.31	1.06	1.6
December 21	do	14	15.6	.79	1.21	12.4

Daily gage height, in feet, of Bishop Creek canal near Bishop, Cal., for 1905.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept
1	.....	.....	9	3.9	3.5	17	3.5	2.9	25	4.0	.....
2	.....	.....	10	3.5	3.5	18	3.5	2.9	26	4.0	.....
3	.....	4.0	11	3.5	3.5	19	3.5	2.9	27	.....	.....
4	.....	4.0	12	3.5	3.5	20	3.5	2.9	28	.....	.....
5	.....	4.0	13	3.5	3.5	21	.....	2.9	29	.....	.....
6	3.9	3.5	14	3.5	3.5	22	3.5	2.9	30	.....	.....
7	3.9	3.5	15	3.5	3.5	23	.....	2.9	31	.....	.....
8	3.9	3.5	16	3.5	3.5	24	3.5	.....			

FARMERS' CANAL NEAR BISHOP, CAL.

This station was established August 6, 1903, by J. C. Clausen and R. S. Hawley. It is located at the footbridge near the house of Robert Love and 3 miles north of Bishop, Cal.

The channel is straight for 300 feet above and 50 feet below the station. The current is sluggish. Both banks are low and are liable to overflow. The bed of the stream is sandy and shifting.

Discharge measurements are made from the footbridge, to which the gage is attached. The initial point for soundings is on the footbridge, near the right bank.

The gage is a vertical rod fastened to the bridge pier.

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

Description: 100, pp 211–212; 134, p 216.
Discharge: 100, p 212; 134, p 217.
Discharge, monthly: 134, p 219.
Gage heights: 100, p 212; 134, pp 217–218.
Rating table: 134, p 219.

Discharge measurements of Farmers' canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 10	R. J. Taylor	13	9.0	0.69	2.20	6.2
February 4	do	13	9.4	.74	2.16	7.0
March 7	do	10	16.8	1.79	2.90	30
April 6	J. S. Evans	10.5	12.8	1.47	2.55	18.8
April 24	do	10	8.4	.64	2.30	5.4
May 12	do	10.5	12.8	1.16	2.60	14.9
June 1	do	10.5	14.6	1.37	2.60	20
July 7	do	9.5	15.4	1.56	2.75	24
August 4	do	10	9.0	.53	2.00	4.8
September 11	do	10.5	15.7	1.04	2.55	16.4
November 22	F. R. S. Buttemer	10.5	10.8	.70	2.35	7.6
December 13	do	10.5	10.8	.59	2.36	6.4

Daily gage height, in feet, of Farmers' canal near Bishop, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1								2.5
2					2.8	2.7		
3	2.2	2.15	3.0				2.6	
4		2.16		2.65				2.5
5			2.9		2.8			
6	2.2			2.55		2.7		
7			2.9				2.75	
8								2.6
9	2.2		2.9		2.6	2.75		
10	2.2							
11		2.15		1.8				2.6
12					2.6		2.7	
13					2.6	2.9		
14	2.2	2.15	3.0	1.7			2.65	
15								2.65
16					2.65	2.95		
17	2.15		2.9					
18				1.1			2.6	2.55
19					2.95			
20	2.15					2.8		
21							2.6	2.2
22				1.2				
23			2.75		2.95	2.7		
24				2.3				
25	2.15			2.3			2.6	2.65
26					2.9			2.65
27						2.7		
28	2.15		2.75	2.7			2.55	
29								
30					2.9	2.6		
31	2.15		2.75					

McNALLY CANAL NEAR BISHOP, CAL.

This station was established July 31, 1903, by J. C. Clausen and R. S. Hawley. It is located at the head of the canal, 3¾ miles north of Bishop, Cal.

The channel is straight for 50 feet below the gage. The current is swift. Both banks are high and will not overflow. The bed of the stream is rocky and permanent.

Discharge measurements are made from a footbridge. The initial point for soundings is marked on the footbridge, near the right bank.

The gage is a vertical board fastened to the headworks of the canal. No gage reader could be obtained for this station, but since the gage was installed there has been little variation in the amount of water flowing in the canal.

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

Description: 100, p 213; 134, pp 219–220.
Discharge: 100, p 213; 134, p 220.
Discharge, monthly: 134, p 221.
Gage heights: 134, pp 220–221.
Rating table: 134, p 221.

Discharge measurements of McNally canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 17	R. J. Taylor	20	11.2	1.06	0.50	11.9
April 6	J. S. Evans	20	14.2	1.76	.70	25
April 24	do	21	18.2	2.09	1.00	38
May 12	do	21	21	2.05	1.05	43
June 1	do	21	25	2.23	1.10	56
July 7	do	22	32	2.69	1.30	86
August 4	do	22	32	1.66	1.50	53
September 11	do	21	23	2.17	1.10	50
November 22	F. R. S. Buttemer	21	17.5	1.14	.70	20
December 13[a]	do				.10	0

[a] Headgate shut down; no water in canal.

GEORGE COLLINS CANAL NEAR BISHOP, CAL.

This station was established August 17, 1903, by R. S. Hawley. It is located at the footbridge 3 miles east and one-half mile north of Bishop, Cal.

The channel is straight for 75 feet above and for 50 feet below the station. The current is sluggish. The right bank is low and the left bank is high. Neither bank is liable to overflow. The bed of the stream is composed of sand and is fairly permanent.

Discharge measurements are made from the bridge. The initial point for soundings is marked on the footbridge near the right bank of the canal.

The gage is a vertical rod fastened to the bridge near the house of Arthur Wines.

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

Description: 100, p 213; 134, p 222.
Discharge: 100, p 214; 134, p 222.
Discharge, monthly: 134, p 225.
Gage heights: 100, p 214; 134, pp 223–224.
Rating table: 134, p 224.

Discharge measurements of George Collins canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
May 2	J. S. Evans	11	10.8	1.12	1.10	12.1
May 25	do	14	13	1.13	1.35	14
June 28	do	11.5	7.3	.71	1.00	5.2
July 26	do	11.5	9.1	.65	1.00	5.9
August 9	do	11.5	8.0	.50	.60	4.0
September 5	do	12	8.4	.57	.60	4.8
September 14	do	11.6	8.0	.65	.50	5.2
October 3	do	12	8.8	1.00	.65	8.8
October 25	F. R. S. Buttemer	11	5.8	.59	.78	3.4
November 23	do	11.5	5.2	.65	.82	3.4
December 11	do	10.7	4.7	.53	.80	2.5

Daily gage height, in feet, of George Collins canal near Bishop, Cal., for 1905.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	0.9	.....	0.8	.....	1.0	17	1.0	1.4	1.2	0.9	.....	.....
2	0.9	1.0	.....	.8	0.8	.9	18	1.0	1.5	.....	.9	1.2	.....
3	.....	1.0	0.8	.....	.8	.....	19	1.0	1.4	.....	.....	.....	.....
4	.9	.....	.....	.....	.....	.9	20	1.0	.....	1.0	.....	1.2	
5	.....	1.0	.....	.5	.8	.....	21	.....	1.0	.....	.9	1.1	.....
6	.....	1.0	.8	.....	.....	.9	22	1.0	1.0	1.0	.....	.....	.....
7	1.0	1.2	.9	.5	.9	.....	23	.....	.....	.....	.8	1.1	.....
8	.....	1.5	.....	.....	.....	.....	24	1.0	.9	.....	.8	1.1	.....
9	.8	1.5	1.4	.5	1.2	.....	25	.....	.9	.....	.....	.....	.....
10	.....	1.4	.....	.5	.....	.....	26	.....	1.0	.9	.....	1.0	.....
11	.8	.8	1.4	.....	1.2	.....	27	.6	.....	.....	.9	.....	.....
12	.....	1.5	1.4	.....	1.2	.....	28	.5	.....	.....	.....	1.0	.....
13	.....	1.6	.....	.8	.....	.....	29	.5	.8	.9	.9	.....	.....
14	.8	1.6	1.4	.9	.....	.....	30	.6	.8	.....	.9	.....	.....
15	1.0	1.4	.....	.....	1.2	.....	31	.....	.....	.....	.....	.....	.....
16	1.0	1.4	1.2	.....	.....	.....							

NOTE.—Water shut off October 6 to December 31.

BISHOP CREEK NEAR BISHOP, CAL.

This station was established August 10, 1903, by J. C. Clausen and R. S. Hawley. It is located at the wagon bridge on the Bishop road about 4¼ miles from Bishop and about 2 miles from the point where the creek leaves the canyon. North Hillside canal, South Hillside canal, and Powers canal are taken out above the station.

The channel is straight for 100 feet above and for 50 feet below the station. The current is swift. Both banks are high and rocky and are not liable to overflow. The bed of the stream is rough and rocky and is permanent.

Discharge measurements are made from the wagon bridge. The initial point for soundings is marked on the bridge near the right bank of the stream.

The gage is a vertical rod fastened in the rocks and braced to the right bank just above the wagon bridge. During 1905 the gage was read once each day by A. S. Kilpatrick. The bench mark is a large flat granite bowlder on the right bank 40 feet above the bridge.

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

Description: 100, pp 214–215; 134, p 225.
Discharge: 100, p 215; 134, p 226.
Discharge, monthly: 134, p 228.
Gage heights: 100, p 215; 134, pp 226–227.
Rating table: 134, p 228.

Discharge measurements of Bishop Creek near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 11	R. J Taylor	16	22	1.18	1.40	26
February 8	do	16	24	1.25	1.55	30
March 4	do	16	23	1.35	1.55	31
April 3	J. S. Evans	16	20	2.10	1.65	42
April 18	do	16	22	1.50	1.57	33
May 5	do	16	34	2.76	2.30	94
June 21	do	19	63	6.21	3.80	391
July 10	do	18	61	5.54	3.60	338
July 27	do	17	44	4.01	2.75	178
August 10	do	16	37	3.35	2.50	124
September 7	do	16	28	2.07	2.00	58
September 22	do	16	24	1.91	1.80	46
October 25	F. R. S. Buttemer	15	25	.84	1.35	21
November 23	do	16	19.6	1.22	1.52	24
December 11	do	16	22	1.05	1.67	23
December 21	do	14	15.6	.79	1.21	12.4

Daily gage height, in feet, of Bishop Creek near Bishop, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	1.5	1.55	1.8	2.5	2.9	3.4	2.5	2.1	1.9	1.4	1.5
2	1.4	1.5	1.55	1.8	2.5	2.9	3.3	2.3	2,1	1.9	1.4	1.4
3	1.4	1.45	1.5	1.75	2.5	2.9	3.2	2.3	2.1	1.8	1.4	1.5
4	1.4	1.5	1.6	1.75	2.3	2.9	3.3	2.3	2.0	1.9	1.4	1.4
5	1.4	1.5	1.6	1.75	2.3	3.0	3.3	2.2	2.0	1.8	1.4	1.4
6	1.4	1.5	1.6	1.8	2.1	3.1	3.3	2.2	1.9	1.8	1.4	1.5
7	1.45	1.5	1.6	1.8	2.1	3.3	3.4	2.2	1.8	1.8	1.4	1.5
8	1.45	1.5	1.6	1.8	2.1	3.4	3.4	2.3	1.9	1.8	1.5	1.5
9	1.4	1.5	1.6	1.75	2.0	3.3	3.5	2.4	1.9	1.8	1.5	1.5
10	1.4	1.55	1.6	1.75	2.0	3.4	3.6	2.5	1.9	1.8	1.4	1.4
11	1.4	1.5	1.6	1.7	2.0	3.5	3.7	2.6	1.8	1.8	1.4	1.4
12	1.4	1.5	1.65	1.7	2.1	3.6	3.7	2.5	1.7	1.7	1.5	1.5
13	1.4	1.45	1.65	1.7	2.1	3.6	3.6	2.4	1.8	1.7	1.5	1.5
14	1.4	1.45	1.7	1.75	2.1	3.6	3.2	2.35	1.8	1.7	1.4	1.5
15	1.45	1.45	1.7	1.75	2.2	3.7	3.0	2.3	1.7	1.7	1.5	1.5
16	1.45	1.4	1.7	1.75	2.2	3.8	2.8	2.2	1.7	1.6	1.4	1.5
17	1.45	1.4	1.65	1.75	2.5	3.8	2.7	2.2	1.9	1.6	1.5	1.4
18	1.5	1.4	1.65	1.7	2.5	3.8	2.6	2.2	1.8	1.6	1.5	1.4
19	1.5	1.4	1.7	1.7	2.6	3.8	2.6	2.2	1.9	1.6	1.6	1.5
20	1.45	1.4	1.7	1.7	2.7	3.8	2.5	2.2	1.8	1.5	1.6	1.5
21	1.45	1.4	1.7	1.7	2.5	3.8	2.5	2.3	1.9	1.5	1.5	1.4
22	1.4	1.4	1.7	1.7	2.5	3.8	2.5	2.2	1.8	1.5	1.5	1.5
23	1.4	1.5	1.7	1.8	2.5	3.7	2.6	2.2	1.8	1.5	1.5	1.4
24	1.4	1.5	1.7	1.8	2.6	3.6	2.6	2.2	1.9	1.4	1.5	1.5
25	1.4	1.5	1.75	2.0	2.6	3.3	2.7	2.2	1.9	1.4	1.5	1.4
26	1.4	1.5	1.75	2.4	2.6	3.3	2.7	2.2	1.9	1.4	1.5	1.4
27	1.4	1.5	1.8	2.4	2.7	3.2	2.8	2.2	1.9	1.4	1.5	1.5
28	1.4	1.5	1.8	2.5	2.8	3.2	2.8	2.1	1.8	1.4	1.5	1.5
29	1.45	.....	1.8	2.5	2.8	3.2	2.7	2.1	1.8	1.4	1.6	1.6
30	1.45	.....	1.8	2.5	2.8	3.3	2.6	2.1	1.7	1.4	1.6	1.7
31	1.45	.....	1.8	.....	2.8	.....	2.5	2.0	.....	1.4	.....	1.6

NOTE.—Gage heights interpolated February 17–19.

Station rating table for Bishop Creek near Bishop, Cal., from January 1 to December 11, 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	21	2.10	74	2.80	170	3.50	314
1.50	27	2.20	84	2.90	188	3.60	339
1.60	33	2.30	95	3.00	206	3.70	365
1.70	40	2.40	108	3.10	225	3.80	391
1.80	48	2.50	122	3.20	245		
1.90	56	2.60	137	3.30	267		
2.00	65	2.70	153	3.40	290		

NOTE.—The above table is based on 14 discharge measurements made during 1905 and some older measurements. It is not very well defined. This table does not apply later than December 11, as conditions were changed at the station.

Estimated monthly discharge of Bishop Creek near Bishop, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	27	21	22.5	1,384
February	30	21	25.2	1,400
March	48	27	38.2	2,349
April	122	40	56.6	3,368
May	170	65	113	6,948
June	391	188	299	17,790
July	365	122	215	13,220
August	137	65	92.1	5,663
September	74	40	53.6	3,189
October	56	21	36.1	2,220
November	33	21	25.6	1,523
December 1–11	27	21	24.3	530
The period				59,580

RAWSON CANAL NEAR BISHOP, CAL.

This station was established August 7, 1903, by R. S. Hawley. It is located at the county bridge 2½ miles east of Bishop, Cal.

The channel is straight for 100 feet above and below the station and the current is swift. The right bank is high and the left bank is low. Neither bank is liable to overflow. The bed of the stream is composed of gravel and is permanent.

Discharge measurements are made from the bridge. The initial point for soundings is marked on the bridge near the right bank of the canal.

The gage is a vertical rod fastened to the bridge. During 1905 the gage was read by W. P. Parker.

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

Description: 100, pp 215–216; 134, p 229.
Discharge: 100, p 216; 134, p 229.
Discharge, monthly: 134, p 231.
Gage heights: 100, p 216; 134, pp 230–231.
Rating table: 134, p 231.

Discharge measurements of Rawson canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sc.*	*Feet.*	*Sec.-ft.*
March 14	R. J. Taylor	17	13.2	1.67	1.75	22
April 1	J. S. Evans	17	13.3	1.95	1.85	26
April 17	do	17	10.6	1.59	1.60	16.9
May 2	do	17	16.3	1.72	1.90	28
May 25	do	17	17.4	1.55	1.90	27
June 28	do	17	14.8	1.22	1.70	18.1
July 26	do	14	5.4	.39	1.30	2.1
August 9	do	17	14.6	1.00	1.55	14.6
September 5	do	16	9.8	.72	1.45	7.0
September 14	do	17	10.1	1.05	1.50	10.6
October 3	do	17	15.2	1.17	1.90	17.8
October 25	F. R. S. Buttemer	7	4.2	.29	1.05	1.2
November 23	do	6	1.6	.69	1.15	1.1
December 11	do	7	4.2	.31	1.08	1.3

Daily gage height, in feet, of Rawson canal near Bishop, Cal., for 1905.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	1.8	1.7	1.8	0.8	0.9	1.3	1.8
2	.....	.....	1.7	1.8	.9	.9	.....	1.8
3	.....	1.8	1.7	1.8	.9	.8	1.3	1.8
4	.....	1.8	1.9	1.8	.9	.8	1.5	1.8
5	.....	1.8	.....	1.7	.9	.8	1.5	1.8
6	1.4	.....	1.9	1.9	.8	.8	1.5	1.8
7	1.4	1.7	1.9	1.9	.8	.8	1.7	1.6
8	1.5	1.7	1.8	1.9	.8	.8	1.7	1.4
9	1.5	.....	1.8	1.8	.8	.8	1.7	1.4
10	1.6	1.7	1.8	1.8	.8	.8	1.7	1.4
11	1.6	1.7	1.8	1.9	.7	.8	1.7	1.4
12	1.6	1.7	1.8	1.8	.7	.8	1.7	1.6
13	1.8	.....	1.8	1.8	.7	.9	1.6	1.6
14	1.8	1.7	1.8	1.7	.8	.9	1.6	.....
15	.....	1.6	1.9	1.0	.8	.0	1.6	.....
16	.....	1.6	1.9	.9	.8	.....	1.6	.....
17	.....	1.6	1.9	1.4	.8	.9	1.6	.....
18	.....	1.6	1.9	1.4	.8	.9	1.6	.....
19	.....	1.6	1.9	.....	.8	.9	1.6	.....
20	.....	1.7	1.9	.....	.8	.....	1.6	.....
21	.....	1.7	1.8	.....	.8	.7	1.7	.....
22	.....	1.7	1.9	.6	.7	.7	1.7	.....
23	.....	.....	1.9	.8	.7	.7	.....	.....
24	.....	1.7	1.8	.9	.7	.7	1.7	.....
25	.....	1.7	1.8	.9	.7	.7	1.7	.....
26	.....	1.7	1.8	.9	.....	1.3	1.7	.....
27	.....	1.7	1.8	.8	.....	1.3	1.7	.....
28	.....	1.7	1.8	.8	.....	1.3	1.7	.....
29	.....	1.7	1.7	.8	.9	.....	1.7	.....
30	1.8	1.7	1.7	.8	.9	1.3	.....	.....
31	1.8	.....	1.7	.....	.9	.....	.....	.....

NOTE.—Water shut off January 1 to March 5 and October 14 to December 31.

A. O. COLLINS CANAL NEAR BISHOP, CAL.

This station was established August 7, 1903, by R. S. Hawley. It is located at the county bridge, 3 miles east of Bishop, Cal.

The channel is straight for 100 feet above and 50 feet below the station. The current is sluggish. Both banks are high and are not liable to overflow. The bed of the stream is sandy and shifting.

Discharge measurements are made from the bridge. The initial point for soundings is marked on the foot log near the right bank of the canal.

The gage is a vertical rod fastened to the right bank just above the bridge, from which discharge measurements are made. During 1905 the gage was read by W. P. Parker.

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

Description: 100, pp 216–217; 134, p 232.
Discharge: 100, p 217; 134, p 232.
Discharge, monthly: 134, p 235.
Gage heights: 100, p 217; 134, pp 233–234
Rating table: 134, p 234.

Discharge measurements of A. O. Collins canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 14	R. J. Taylor	11	12.5	2.00	2.90	25
April 1	J. S. Evans	8	2.8	.75	2.00	2.1
May 2	do	11.5	12.8	1.95	3.00	25
June 28	do	10	10.8	1.70	2.75	18.4
July 26	do	10	12.8	1.44	2.90	18.4
August 9	do	10	8.8	1.59	2.65	14.0
September 5	do	10	6.0	1.22	2.38	7.3
September 14	do	10	5.4	1.20	2.33	6.5
October 3	do	10	10.4	1.47	2.80	15.3
October 25	F. R. S. Buttemer					0
November 23	do	10.5	7.0	.70	2.25	4.9
December 11	do	10	3.8	.45	1.92	1.7

Daily gage height, in feet, of A. O. Collins canal near Bishop, Cal., for 1905.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1				2.6	1.8	2.5	2.5	2.4	2.5
2				2.6	1.8	2.5	2.0		2.5
3				2,8	1.6	2.7		2.6	2.5
4				3.0	1.9	2.7		2.6	2.2
5					1.9	2.8		2.6	2.2
6				3.0	1.7	2.8		2.6	2.2
7				3.0	1.7	2.8		2.3	2.2
8				2.4	1.8	2.9		2.0	2.2
9				2.3	1.9	2.9		2.0	2.2
10		2.4		2.3	1.9	3.0	2.3	2.0	2.2
11		2.4		2.3	1.9	3.0	2.3	2.0	2.3
12		2.4		2.3	1.9	3.0	2.3	2.0	2.3
13		2.8		2.3	2.2	3.0	2.3	2.3	2.3
14		2.8		2.3	2.3	2.9	2.3	2.3	
15		2.8		2.3	2.3	2.9		2.3	
16		2.8			2.4	2.9		2.3	
17		2.8				2.9	2.3	2.9	
18		2.8				2.9	2.1	2.9	
19		2.8	2.6			2.8	2.1	2.9	
20		2.8	2.6			2.8		2.9	
21		2.8	2.6			2.8	2.1	2.9	
22	2.3	3.0	2.6		2.3	2.8	2.1	2.7	
23		3.0			2.3	2.7	2.0		
24		3.0	2.5		2.3	2.7	2.0	2.7	
25		2.7	2.5		2.6	2.7	2.0	2.7	
26	2.3		2.5		2.6	2.7	2.0	2.7	
27			2.5		2.6		2.0	2.5	
28			2.6		2.6		2.4	2.5	
29			2.6		2.6	2.7		2.5	
30			2.6		2.5	2.7	2.4		
31				1.7		2.5			

NOTE.—No flow on days of missing gage heights.

DELL CANAL NEAR BISHOP, CAL.

This station was established August 24, 1903, by R. S. Hawley. It is located at a flume 3 miles from the head gate at a point where the canal crosses a slough in Sanders's field.

The channel is straight for 150 feet above and for 200 feet below the station. The current is sluggish at all times.

Discharge measurements are made from a bridge across the flume. The initial point for soundings is the edge of the flume at the right side.

The gage is a vertical rod fastened to the flume.

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

Description: 100, pp 217–218; 134, p 235.
Discharge: 100, p 218; 134, pp 235–236.
Discharge, monthly: 134, p 237.
Gage heights: 100, p 218; 134, pp 236–237.

Discharge measurements of Dell canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 10	R. J. Taylor	7.5	10.1	2.38	1.40	24
April 14	J. S. Evans	7.6	7.6	2.16	1.20	16.4
April 28	do	7.6	11.8	1.95	1.35	23
May 11	do	7.6	12.5	2.08	1.48	26
June 26	do	7.6	11.4	1.93	1.60	22
July 6	do	7.6	12.2	1.97	1.70	24
August 2	do	7.6	9.1	1.89	1.30	17.2
September 6	do	7.6	9.1	1.85	1.31	16.8
September 28	do	7.6	6.8	1.70	1.12	11.6
October 30	F. R. S. Buttemer	7.5	9.0	1.52	1.22	13.7
November 18	do	7.5	9.7	1.71	1.35	16.6
December 5	do	7.3	4.4	.68	.62	3.0

Daily gage height, in feet, of Dell canal near Bishop, Cal., for 1905.

Day.	Feb.	Mar.	Apr.	Nov.	Dec.	Day.	Feb.	Mar.	Apr.	Nov.	Dec.
1			1.3			17					
2		1.4			0.9	18		1.4		1.35	
3						19					
4		1.4			.8	20		1.4		1.3	
5						21					
6		1.4			.6	22		1.4		1.3	
7						23					
8		1.4			.6	24		1.2		1.3	
9						25					
10		1.4			.6	26	1.4	1.2		1.3	
11						27					
12		1.4			.8	28	1.4	1.2		1.4	
13						29					
14		1.4			.8	30		1.2		1.35	
15						31					
16		1.4			.8						

BIG PINE AND OWENS RIVER CANAL NEAR BISHOP, CAL.

This station was established by J. C. Clausen and R. S. Hawley, August 4, 1903. It is located at a footbridge near the house of William Oliver, the observer. It is 7½ miles south and 3 miles east of Bishop, Cal.

The channel is straight for 600 feet above and 300 feet below the station. The current is sluggish. Both banks are high and are not liable to overflow. The bed of the stream is sandy and somewhat shifting.

Discharge measurements are made from the footbridge. The initial point for soundings is marked on the footbridge near the right bank of the canal.

The gage is a vertical rod securely nailed to the footbridge.

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

Description: 100, pp 218–219; 134, p 238.
Discharge: 100, p 219; 134, p 238.
Discharge, monthly: 134, p 240.
Gage heights: 100, p 219; 134, pp 238–239.
Rating table: 134, p 240.

Discharge measurements of Big Pine and Owens River canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 25	R. J. Taylor	22	11.3	0.84	1.30	9.5
February 13	do	22	9.5	.70	1.15	6.7
April 28	J. S. Evans	21	12.6	.85	1.30	10.7
May 11	do	22	16	1.11	1.50	17.7
June 26	do	22	27	1.11	1.90	30
July 6	do	22	18.8	1.05	1.75	19.6
August 2	do	22	10.8	.58	1.20	6.3
September 6	do	16	10.0	.59	1.17	5.9
September 28	do	14	7.2	.36	1.10	2.6
October 30	F. R. S. Buttemer	22	41	1.00	2.53	41
November 18	do	22	17.6	.85	1.42	15
December 5	do	22	18.2	.89	1.45	16.2

Daily gage height, in feet, of Big Pine and Owens River canal near Bishop, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.2	1.4	1.2	1.15	1.4	2.0	1.8	1.1	1.2	1.4	2.55	1.4
2	1.2	1.4	1.2	1.15	1.8	1.85	1.8	1.1	1.1	1.3	2.55	1.45
3	1.2	1.4	1.15	1.15	1.8	1.8	1.8	1.1	1.2	1.4	2.55	1.5
4	1.2	1.3	1.15	1.15	1.9	1.8	1.8	1.1	1.2	1.5	2.5	1.5
5	1.2	1.25	1.15	1.15	1.7	1.8	1.8	1.0	1.2	1.65	2.5	1.45
6	1.25	1.25	1.15	1.15	1.7	1.7	1.7	1.1	1.2	1.9	2.25	1.45
7	1.3	1.25	1.15	1.1	1.5	1.7	1.7	1.1	1.2	1.9	2.3	1 45
8	1.3	1.15	1.15	1.1	1.5	1.7	2.0	1.1	1.2	1.8	2.3	1.45
9	1.25	1.15	1.1	(a)	1.6	1.95	2.05	1.2	1.2	2.0	2.3	1.45
10	1.25	1,2	1.1	(a)	1.55	2.15	2.2	1.2	1.2	2.1	2.55	1.4
11	1.25	1.2	1.1	(a)	1.55	2.1	2.25	1.2	1.3	2.15	1.2	1.4
12	1.25	1.2	1.15	(a)	1.5	2.3	2.35	1.2	1.3	2.2	1.2	1.4
13	1.25	1.2	1.5	(a)	1.5	2.45	2.4	1.2	1.2	2.2	1.2	1.4
14	1.25	1 15	1.75	1.35	1.5	2.65	2.4	1.2	1.2	2.1	1.2	1.4
15	1.3	1.15	1.55	1.4	1.5	2.7	2.25	1.2	1.3	2.15	1.2	1.4
16	1.4	1.2	1.55	1.35	1.5	2.8	2.1	1.2	1.3	2.15	1.2	1.4
17	1.4	1.2	1.4	1.35	1.55	1.8	2.05	1.2	1.3	2.3	1.3	1.4
18	1.35	1.2	1.4	1.45	1.6	1.8	1.8	1.2	1.3	2.3	1.4	1.4
19	1.35	1.2	1.35	1.3	1.8	1.85	1.7	1.1	1.1	2.35	1.4	1.4
20	1.4	1.2	1.35	1.3	2.1	1.7	1.6	1.1	1.15	2.35	1.35	1.4
21	1.4	1.15	1.35	1.15	2.15	1.65	2.0	1.0	1.15	2.35	1.3	1.35
22	1.35	1.15	1.35	1.15	2.25	1.7	1.9	1.0	1.1	2.35	1.25	1.35
23	1.35	1.15	1.1	1.1	2.2	1.8	2.0	1.5	1.1	2.35	1.25	1.35
24	1.35	1.25	1.1	1.1	2.25	2.2	1.6	1.6	1.1	2.35	1.25	1.3
25	1.35	1.25	1.1	1.1	2.0	2.2	1.4	1.5	1.2	2.35	1.3	1.3
26	1.35	1.25	1.1	1.45	1.8	1.9	1.3	1.4	1.2	2.35	1.3	1.4
27	1.3	1.3	1.2	1.4	2.25	1.8	1.3	1.4	1.15	2.35	1.4	1.4
28	1.3	1.2	1.2	1.4	2.25	1.6	1.2	1.4	1.15	2.45	1.4	1.4
29	1.3	.....	1.2	1.4	2.45	1.5	1.1	1.2	1.15	2.45	1.4	1.3
30	1.25	.....	1.1	1.4	2.4	1.8	1.1	1.3	1.15	2.5	1.4	1.3
31	1.25	.....	1.1	.....	2.1	.....	1.1	1.3	.....	2.55	.....	1.3

a Water shut off April 9–13.

SANGER CANAL AT ALVORD, CAL.

This station was established August 4, 1903, by J. C. Clausen and R. S. Hawley. It is located at the county road bridge, one-fourth mile east of the Southern Pacific Railroad station at Alvord, Cal.

The channel is straight for 300 feet above and for 100 feet below the station. The current is sluggish. Both banks are low and liable to overflow. The bed of the stream is shifting.

Discharge measurements are made from the bridge. The initial point for soundings is marked on the bridge near the left bank of the canal.

The gage is a vertical rod fastened to the bridge.

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

Description: 100, pp 219–220; 134, pp 240–241.
Discharge: 100, p 220; 134, p 241.
Gage heights: 100, p 220; 134, pp 241–242.

Discharge measurements of Sanger canal at Alvord, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 7	R. J. Taylor	16	23	0.59	2.38	13.6
February 18	do	16	22	.63	2.32	13.9
April 14	J. S. Evans	16	26	.38	2.80	9.9
April 26	do	16	29	.30	2.88	8.8
May 19	do	16	32	.18	3.05	5.6
June 9	do	16	29	.16	2.80	4.7
August 17	do	16	18	.22	2.10	4.0
September 13	do	16	16	.18	2.10	2.8
October 30	F. R. S. Buttemer	16	30	.44	2.82	13.2
November 18	do	16	26	.39	2.60	10.2

Daily gage height, in feet, of Sanger canal at Alvord, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	2.2		1.2	2.7	2.9	17	1.9		2.2	2.8	
2		1.7	1.2	2.7	2.9	18		1.3	2.2	2.8	3.5
3	2.1					19	1.8	1.3	2.2		
4		1.6	1.2	2.8	2.9	20				2.8	3.5
5	2.1	1.6	1.2			21	1.8	1.3	2.4		
6				2.8	3.0	22	1.8			2.8	
7	2.1	1.5	1.2		3.0	23		1.3	2.4		
8	2.1			2.9		24	1.8			2.8	
9		1.5	1.8	2.9	3.1	25		1.3	2.4		
10	2.0					26	1.8	1.3	2.4	2.8	
11		1.4	2.0	2.9	3.3	27					
12	2.0	1.4	2.1			28	1.7	1.2	2.6	2.8	
13				2.9	3.4	29	1.7			2.8	
14	1.9	1.3	2.1		3.4	30			2.7	2.8	
15	1.9			2.8		31	1.7		2.7		
16		1.3	2.2	2.8	3.4						

EAST SIDE CANAL NEAR CITRUS, CAL.

This station was established August 27, 1903, by R. S. Hawley. It is located at the head gate of the canal.

At low stages the meter measurements are made by wading at a point below the head gate. High-stage measurements are made from Southern Pacific Railroad bridge, one-half mile below head gate.

The gage is a vertical rod fastened to the head gate at which discharge measurements are made. During 1905 the gage was read by J. Vaughn.

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

Description: 100, p 220; 134, pp 242–243.
Discharge: 100, p 221; 134, p 243.
Discharge, monthly: 134, p 245.
Gage heights: 100, p 221; 134, pp 243–244.
Rating table: 134, p 245.

Discharge measurements of East Side canal near Citrus, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
February 2	R. J. Taylor	20	21	1.48	2.30	31
May 29	J. S. Evans	21	28	1.14	2.60	32
August 23	do	24	35	.63	3.10	22
September 20	do	21	28	.50	3.00	14
November 8	F. R. S. Buttemer	18	27	.66	2.63	18
December 3	do	11	3.7	1.30	1.90	4.8

Daily gage height, in feet, of East Side canal near Citrus, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					2.5				3.0			2.0
2						2.4				3.1		
3		2.3	2.3	2.5			3.4				3.0	
4								3.3	3.1			2.1
5					2.5	2.6						
6	2.3	2.0	2.3							3.1	2.9	
7				2.5			3.3	3.3				
8					2.5				3.1			2.1
9	2.4					3.0				3.1		
10		2.0	2.4	2.5			3.3				2.9	
11								3.1	3.1			2.1
12					2.5	3.2						
13	2.2	2.0	2.6							3.1	2.8	
14				2.6			3.3	3.1				
15					2.6				3.1			2.1
16	2.3					3.2				3.1		
17		2.1	2.5	2.6			3.2				2.8	
18								3.1	3.1			2.1
19					2.6	3.2						
20	2.3	2.2	2.1							3.2	2.7	
21				2.6			3.1	3.1				
22					2.5				3.1			2.1
23	2.2					3.2				3.2		
24		2.2	2.2	2.6			3.2				2.6	
25								3.2	3.0			2.0
26					2.5	3.2						
27	2.3	2.2	2.5							3.2	2.6	
28				2.5			3.2	3.1				
29					2.6				3.1			1.9
30	2.3					2.3				3.0		
31			2.5				3.2					

STEVENS CANAL NEAR CITRUS, CAL.

This station was established August 27, 1903, by R. S. Hawley. It is located at the waste gate of the canal, 3½ miles north of Citrus, Cal.

The channel is straight for 300 feet above and 200 feet below the station. The current is sluggish. Both banks are high and are not liable to overflow. The bed of the stream is composed of gravel and earth and is fairly permanent.

Discharge measurements are made by wading. The initial point for soundings is on the right bank of the canal.

The gage is a vertical rod fastened to the waste gate. During 1905 the gage was read by J. Vaughn.

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

Description: 100, p 221; 134, p 245.
Discharge: 100, p 222; 134, p 246.
Discharge, monthly: 134, p 248.
Gage heights: 100, p 222; 134, pp 246-247
Rating table: 134, pp 247-248.

Discharge measurements of Stevens canal near Citrus, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
May 29	J. S. Evans	12	29	1.28	2.70	37
August 23	do	12	26	.71	2.50	18.5
September 20	do	12	25	.92	2.55	23
November 8	F. R. S. Buttemer	13	11.6	.92	1.80	10.7
December 3	do	11	9.6	.76	1.65	7.3

Daily gage height, in feet, of Stevens canal near Citrus, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.6	1.9	.....	2.1	.....	.....	.....	2.3	.....	2.8	2.5
2	1.6	.....	.....	.....	.....	2.8	.....	2.5	.....	2.6	.....	.....
3	.....	1.6	1.8	1.5	2.2	.....	2.8	.....	.....	.....	2.8	.....
4	1.6	.....	.....	.....	.....	.....	.....	2.5	2.4	2.6	.....	1.8
5	.....	.....	.....	1.5	2.3	2.8	2.9	.....	.....	.....	.....	.....
6	1.5	1.5	1.9	.....	.....	.....	.....	.....	2.4	2.6	2.8	1.8
7	.....	.....	.....	1.5	.....	2.8	2.8	2.5	.....	.....	.....	.....
8	.....	1.5	2.3	.....	2.2	.....	.....	.....	2.4	.....	2.8	1.8
9	1.5	.....	.....	.....	.....	2.8	.....	2.5	.....	2.7	.....	.....
10	.....	1.5	2.3	1.5	2.2	.....	2.9	.....	.....	.....	2.8	.....
11	1.5	.....	.....	.....	.....	.....	.....	2.5	2.5	2.7	.....	1.7
12	.....	.....	.....	1.6	2.2	2.8	2.9	.....	.....	.....	.....	.....
13	1.5	1.5	2.4	.....	.....	.....	.....	.....	2.5	2.7	2.8	1.7
14	.....	.....	.....	1.6	.....	2.8	2.9	2.7	.....	.....	.....	.....
15	.....	1.5	2.5	.....	2.2	.....	.....	.....	2.5	.....	2.8	1.7
16	1.5	.....	.....	.....	.....	2.9	.....	2.7	.....	2.8	.....	.....
17	.....	1.5	2.6	1.6	2.2	.....	2.8	.....	.....	.....	2.8	.....
18	1.6	.....	.....	.....	.....	.....	.....	2.6	2.6	2.8	.....	1.7
19	.....	.....	.....	1.6	2.2	2.9	2.7	.....	.....	.....	.....	.....
20	1.5	1.6	2.4	.....	.....	.....	.....	.....	2.6	2.8	2.6	1.7
21	.....	.....	.....	1.6	.....	2.9	2.7	2 5	.....	.....	.....	.....
22	.....	1.6	2.0	.....	2.5	.....	.....	.....	2.6	.....	2.6	1.7
23	1.5	.....	.....	.....	.....	2.9	.....	2.5	.....	2.9	.....	.....
24	.....	2.0	1.5	1.6	.....	.....	2.7	.....	.....	.....	2.5	.....
25	1.5	.....	.....	.....	.....	.....	.....	2.5	2.6	2.9	.....	1.7
26	.....	.....	.....	1.5	2.6	2.9	2.8	.....	.....	.....	.....	.....
27	1.5	1.9	1.5	.....	.....	.....	.....	.....	2.6	2.9	2.5	1.7
28	.....	.....	.....	2.1	.....	2.7	2.8	2.4	.....	.....	.....	.....
29	.....	.....	1.5	.....	2.7	.....	.....	.....	2.5	.....	2.5	1.7
30	1.5	.....	.....	.....	.....	2.8	.....	2.4	.....	2.8	.....	.....
31	.....	.....	1.5	.....	2.8	.....	2.5	.....	.....	.....	.....	.....

OWENS RIVER NEAR CITRUS, CAL.

This station was established October 30, 1903, by R. S. Hawley. It is located at the county bridge 4 miles east of Independence, Cal., and 1 mile from the Southern Pacific Railroad station at Citrus, Cal. The station at this point shows the amount of waste water which is discharged into Owens Lake.

The channel is straight for 200 feet above and for 300 feet below the station. The current has a mean velocity of about 2 feet per second at ordinary stages. Both banks are high and are not liable to overflow. The bed of the stream is sandy and is liable to shift.

Discharge measurements are made by means of a cable and car located about 1,500 feet above the bridge. The cable has a span of 120 feet.

The gage is a vertical rod nailed to a pile on the upstream side of the middle pier of the bridge. During 1905 the gage was read by Milton Levy. The bench mark is a copper tack in the floor beam directly over the gage rod; elevation, 13.50 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: 100, p 222; 134, p 248.
Discharge: 100, p 223; 134, p 249.
Discharge, monthly: 134, p 251.
Gage heights: 100, p 223; 134, pp 249–250.
Rating table: 134, p. 251.

Discharge measurements of Owens River near Citrus, Cal., in 1905.

Date	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
February 2	R. J. Taylor	73	176	2.21	6.00	389
May 29	J. S. Evans	47	40	1.52	3.60	61
July 21	do	68	68	1.84	4.30	125
August 23	do	24	15.2	.80	3.00	12.1
September 20	do	25	20	1.05	3.15	12
November 8	F. R. S. Buttemer	71	91	1.98	4.65	180
December 3	do	73	131	2.21	5.20	290
December 15	do	72	128	2.20	5.30	282

Daily gage height, in feet, of Owens River near Citrus, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			5.85				5.6			3.5	4.6	5.15
2		6.0					5.35			3.45	4.65	5.2
3		6.8					5.0			3.45	4.7	5.3
4		6.8	5.8				5.0			3.5	4.75	5.35
5							5.0			3.55	4.8	5.35
6	5.7	6.9	5.8	5.0			5.0			3.5	4.8	5.4
7	5.65	6.8					5.0			3.5	4.8	5.4
8	5.65	6.85	5.75				5.5			3.6	4.85	5.35
9		6.8	5.45				5.1			3.8	4.85	5.4
10		6.85	5.4				5.1			3.85	4.9	5.4
11		6.9	5.45				5.2			3.9	4.9	5.4
12		6.9	5.4				5.25			3.9	4.9	5.35
13			5.7				5.3			4.0	4.9	5.4
14	5.7	7.1		4.5			5.3			4.1	4.95	5.4
15	5.8	7.15	5.8				5.3			4.15	4.95	5.4
16		7.2	6.3				5.3			4.15	5.0	5.4
17		7.2	6.4				5.0		3.1	4.2	5.0	5.5
18							4.8		3.1	4.25	5.0	5.45
19	5.8						4.75		3.2	4.3	5.0	5.4
20	5.9						4.6		3.3	4.3	5.0	5.5
21	5.85	5.8					4.4		3.3	4.4	5.0	5.4
22		5.8					4.1		3.3	4.4	5.0	5.45
23	6.0	5.8				6.0	3.5		3.3	4.5	5.0	5.5
24						6.1	3.2		3.2	4.5	5.0	5.5
25						6.3	3.0		3.25	4.4	5.0	5.45
26	6.0	5.8				6.4	2.8		3.3	4.45	5.0	5.45
27	6.0					6.35	2.75		3.35	4.5	5.0	5.4
28						6.0	2.6		3.4	4.5	5.0	5.5
29						5.6	2.5		3.4	4.5	5.0	5.4
30	5.8					5.6			3.45	4.55	5.0	5.45
31										4.6		5.45

Station rating table for Owens River near Citrus, Cal., 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.*
2.50	0	3.70	63	4.90	217	6.10	440
2.60	1	3.80	73	5.00	233	6.20	462
2.70	3	3.90	83	5.10	249	6.30	485
2.80	5	4.00	94	5.20	266	6.40	508
2.90	8	4.10	105	5.30	283	6.50	532
3.00	12	4.20	117	5.40	301	6.60	556
3.10	18	4.30	130	5.50	319	6.70	581
3.20	24	4.40	144	5.60	337	6.80	607
3.30	31	4.50	158	5.70	356	6.90	634
3.40	38	4.60	172	5.80	376	7.00	662
3.50	46	4.70	187	5.90	397	7.10	690
3.60	54	4.80	202	6.00	418	7.20	720

NOTE.—The above table is based on 11 discharge measurements made during 1904–5. It is fairly well defined between gage heights 3 feet and 7 feet.

Estimated monthly discharge of Owens River near Citrus, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January [a]	418	283	369	22,690
February [a]	720	376	540	29,990
March 1–17 [a]	508	301	372	12,540
June 23–30	508	337	430	6,823
July	337	0	175	10,760
September 17–30	42	18	29.9	830
October	172	42	107	6,579
November	233	172	219	13,030
December	319	292	301	18,510
The period				121,800

[a] Missing gage heights interpolated.

POWERS CANAL NEAR BISHOP, CAL.

This station was established August 19, 1903, by R. S. Hawley. It is located one-half mile above a mill on Bishop Creek, and 4½ miles west of Bishop, Cal.

The canal is straight for 20 feet above and 50 feet below the station. The bed of the canal is composed of gravel and is not subject to change.

Discharge measurements are made by wading.

The gage is a rod on the left bank of the canal. The bench mark is on granite bowlder 60 feet north of penstock of the mill pressure pipe; elevation, 3.50 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: 134, pp 251-252.
Discharge: 134, p 252.
Discharge, monthly: 134, p 253.
Gage heights: 134, p 252.
Rating table: 134, p 252.

Discharge measurements of Powers canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
April 3	J. S. Evans	3	0.7	1.00	1.10	0.7
June 21	do	9	6.4	2.66	1.90	17.0
July 27	do	8	5.0	2.36	1.68	11.8
August 10	do	7	1.3	1.08	1.30	1.4
September 7	do	7.5	2.1	1.33	1.40	2.8
November 23	F. R. S. Buttemer	8	1.4	.79	1.25	1.1
December 11	do	8	3.6	.89	1.58	3.2
December 21	do				1.16	1.0

SOUTH HILLSIDE CANAL NEAR BISHOP, CAL.

This station was established August 26, 1903, by R. S. Hawley. It is located just below waste gate at head of canal, 5 miles west of Bishop, Cal.

Discharge measurements are made by wading.

The gage is a rod on the left bank of the canal. The bench mark is on granite bowlder marked by ring of white paint and located on left bank 2 feet from gage; elevation, 2.99 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: 134, p 253.
Discharge: 134, p 253.
Discharge, monthly: 134, p 255.
Gage heights: 134, p 254.
Rating table: 134, p 254.

Discharge measurements of South Hillside canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 21	R. J. Taylor	4.5	0.9	1.11	1.60	1.0
February 8	do	4.5	.9	1.11	1.60	1.0
March 4	do	4.5	1.3	1.46	1.66	1.9
April 18	J. S. Evans	4.8	1.6	1.88	1.70	3.0
May 5	do	4.8	3.2	2.66	2.00	8.5
July 27	do	4.5	2.4	3.29	1.98	7.9
August 10	do	5.0	3.6	2.47	2.00	8.9
September 22	do	4.5	3.2	2.75	2.00	8.8
October 25	F. R. S. Buttemer	4.0	2.0	1.75	1.75	3.5
November 23	do	5.0	1.0	.90	1.58	.9
December 11	do	3.7	.6	.50	1.50	.3

NORTH HILLSIDE CANAL NEAR BISHOP, CAL.

This station was established September 3, 1903, by R. S. Hawley. It is located at head gate of the canal, 5 miles west of Bishop, Cal.

Discharge measurements are made from crosspiece of the flume on which the distances across are marked at each foot. The initial point for soundings is the end of crosspiece of flume at right bank.

The gage is a vertical rod fastened to the right side of flume or head gate. The bench mark is on a granite bowlder marked with white paint and located near gage; elevation, 2.96 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: 134, p 255.
Discharge: 134, p 255.
Discharge, monthly: 134, p 256.
Gage heights: 134, p 256.
Rating table: 134, p 256.

Discharge measurements of North Hillside Canal near Bishop, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 4	R. J. Taylor	4.3	1.8	0.83	1.51	1.5
April 18	J. S. Evans	4	2.2	2.23	1.70	4.9
May 5	do	4	3.6	3.33	2.00	12.0
June 21	do	4	3.0	7.67	2.10	23.0
July 27	do	4	2.4	7.83	2.05	18.8
August 10	do	4	2.6	7.46	2.08	19.4
September 17	do	4	3.2	3.70	1.98	11.8
September 22	do	4.2	2.5	5.20	2.0	13.0
October 23	do	4.0	2.0	1.95	1.70	3.9
November 23	do	6	2.4	1.21	1.70	2.9
December 11	do	4.3	2.2	.32	1.52	.7
December 21	F. R. S. Buttemer	4.5	.8	.75	1.45	.6

BIG PINE CREEK NEAR BIG PINE, CAL.

This station was established December 5, 1903, by R. S. Hawley. It is located 3 miles southwest of Big Pine, Cal., at a point where the creek leaves the foothills.

The channel is straight for 30 feet above and 50 feet below the station. The current is swift at all stages. Both banks are high and rocky. The bed of the stream is rough and rocky, and is not subject to much change.

Discharge measurements are made from a footbridge. The initial point is at the right bank.

The gage is a veritical rod fastened to a tree on the left bank of the creek, 3 feet above the footbridge. During 1905 the gage was read by Mrs. J. M. Randle. Bench marks were established as follows: (1) On a granite bowlder marked by a ring of white paint, 40 feet southeast of the south end of the footbridge; elevation, 8.54 feet; (2) a point marked with a ring of white paint, 45 feet southwest of the south end of the footbridge; elevation, 10.44 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: 134, p 257.
Discharge: 134, pp 257, 260.
Discharge, monthly: 134, p 259.
Gage heights: 134, p 258.
Rating table: 134, p 258.

Discharge measurements of Big Pine Creek near Big Pine, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 18	R. J. Taylor	13	9.9	2.52	1.95	25
February 18	do	12.5	8.5	2.71	1.85	23
April 26	J. S. Evans	13	10.8	2.78	2.20	30
May 19	do	13	13.8	3.70	2.38	51
June 9	do	13	15.8	3.86	2.48	61
July 16	do	13.5	21.0	5.71	2.85	120
August 17	do	13	18.4	4.77	2.60	88
September 13	do	13	13.0	3.15	2.30	41
November 16	F. R. S. Buttermer	10	6.6	1.61	1.85	10.6
December 1	do	13.5	8.8	1.62	2.00	14.3
December 16	do	13.5	12.6	0.83	2.20	10.5
December 16	do	13.5	12.5	0.98	2.20	12.2

[a] Channel changed.

Daily gage height, in feet, of Big Pine Creek near Big Pine, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.85	1.9	1.85	1.8	2.5	2.4	2.95	2.9	2.7	2 25	1.8	.....
2	1.85	1.9	1.9	1.9	2.5	2.4	3.0	2.9	2.6	2.15	.....	1.9
3	1.85	1.9	1.9	1.85	2.5	2.4	3.0	2.9	2.5	2.15	.....	.....
4	1.85	2.0	1.9	1.9	2.5	2.4	3.0	2.9	2.4	2.15	.....	1.9
5	1.85	2.0	1.9	1.9	2.4	2.4	3.0	2.9	2.4	2.1	.....	.....
6	1.85	2.0	1.9	1.85	2.4	2.45	3.0	2.9	2.35	2.0	.....	.....
7	1.85	1.95	1.9	1.85	2.4	2.45	3.0	2.8	2.25	2.0	.....	.....
8	1.85	1.95	1.9	1.9	2.3	2.5	3.0	2.8	2.25	2.0	1.8	.....
9	1.9	1.9	1.9	1.95	2.0	2.5	3.2	2.9	2.2	2.0	.....	1.9
10	1.9	1.9	1.85	1.95	2.0	2.5	3.5	3.0	2.3	2.0	.....	.....
11	1.85	1.9	1.85	1.95	2.0	2.7	3.5	3.0	2.4	2.0	1.85	2.0
12	1.8	1.9	1.9	1.95	2.0	2.8	3.5	3.0	2.4	2.0	.....	.....
13	1.8	1.9	1.9	1.95	2.1	2.9	3.3	2.9	2.45	2.0	.....	.....
14	1.8	1.9	1.9	1.95	2.2	2.9	3.3	2.9	2.45	2.0	.....	.....
15	1.8	1.85	1.9	1.95	2.3	2.9	3.3	2.9	2.45	1.85	1.85	2.0
16	1.85	1.85	1.9	1.95	2.3	2.9	3.05	2.9	2.45	1.85	.....	.....
17	1.85	1.85	1.9	1.95	2.3	2.95	3.2	2.9	2.35	1.8	.....	.....
18	1.85	1.85	1.9	1 95	2.4	3.0	3.1	2.8	2.4	1.8	1.8	.....
19	1.85	1.85	1.9	1.95	2.4	3.0	3.0	2.8	2.45	1.8	.....	.....
20	1.85	1.85	1.9	1.95	2.4	3.0	3.0	2.9	2.45	1.8	.....	2.2
21	1.85	1.85	1.9	1.95	2.5	3.2	3.0	2.8	2.4	1.8	.....	.....
22	1.8	1.85	1.9	1.95	2.5	3.3	3.0	2.8	2.4	1.8	.....	.....
23	1.85	1.85	1.9	2.0	2.4	3.4	3.1	2.7	2.4	1.8	1.85	2.15
24	1.85	1.85	1.9	2.0	2.4	3.2	3.2	2.7	2.35	1.8	.....	.....
25	1.85	1.85	1.9	2.0	2.4	2.8	3.3	2.7	2.3	1.8	.....	.....
26	1.85	1.85	1.9	2.2	2.4	2.8	3.4	2.7	2.3	1.8	.....	2.3
27	1.85	1.85	1.9	2.3	2.4	2.8	3.3	2.7	2.3	1.8	.....	.....
28	1.85	1.85	1.8	2.3	2.4	2.9	3.2	2.7	2.3	1.8	1.85	.....
29	1.85	.....	1.8	2.4	2.4	2.9	3.1	2.7	2.3	1.8	.....	.....
30	1.85	.....	1.8	2.5	2.4	2.9	3.1	2.7	2.3	1.8	.....	.....
31	1.85	.....	1.8	.....	2.4	.....	3.0	2.7	.....	1.8	.....	.....

Station rating table for Big Pine Creek near Big Pine, Cal., from March 21 to December 15, 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.*
1.80	9	2.30	40	2.80	115	3.30	220
1.90	11	2.40	52	2.90	134	3.40	244
2.00	15	2.50	66	3.00	154	3.50	268
2.10	21	2.60	81	3.10	175		
2.20	30	2.70	97	3.20	197		

NOTE.—The above table is based on eight discharge measurements made during 1905. It is fairly well defined between gage heights 2 feet and 2.8 feet. The table has been extended beyond these limits, being based on extension of area and mean-velocity curves.

Estimated monthly discharge of Big Pine Creek near Big Pine, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	24	19	21.7	1,334
February	30	22	23.9	1,327
March	24	9	18.9	1,162
April	66	9	17.9	1,065
May	66	15	46.7	2,872
June	244	52	118	7,021
July	268	144	187	11,500
August	154	97	122	7,501
September	97	30	51.1	3,041
October	35	9	13.7	842
November	10	9	9.6	571
December 1–15	15	11	12.5	372
The period				38,610

NOTE.—Discharge January 1 to March 20 based on discharge measurements directly. Rating table used March 21 to December 15. Because of a change in channel the rating table does not apply after December 15.

Discharges for days in November and December, when gage heights are not recorded, were interpolated.

BIRCH CREEK NEAR TINEMAHA, CAL.

This station was established June 14, 1905, by J. S. Evans. It is located 6 miles southwest of Big Pine and 500 feet west of ranch of Charles Peterson.

The channel is straight for 25 feet above and below the station. The water is swift at all stages. Both banks are low, but not subject to overflow. The bed of the stream is composed of coarse gravel and is not subject to material change. The stream flows in one channel.

Discharge measurements are made from a footbridge, which consists of a cottonwood tree placed across the stream. The initial point for soundings is a nail in footbridge on the left bank.

The gage is a vertical staff nailed to a willow tree on the left bank. During 1905 the gage was read by Charles Peterson. The bench mark is a nail in the top of a willow stump on the left bank; elevation, 2.00 feet above the datum of the gage.

Discharge measurements of Birch Creek near Tinemaha, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
June 14	J. S. Evans	7	9.6	2.19	1.00	21
July 17	do	8	8.0	1.35	.71	10.8
August 24	do	8	7.6	1.00	.58	7.6
November 17	F. R. S. Buttemer	8	6.2	.35	.55	2.2
December 2	do	8	6.0	.42	.55	2.5

Daily gage height, in feet, of Birch Creek near Tinemaha, Cal., for 1905.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.8	0.65	0.6	0.5	0.35	0.8
2	.....	.75	.65	.55	.4	.35	.55
3	.....	.75	.65	.6	.4	.35	.55
4	.....	.8	.65	.55	.35	.45	.55
5	.....	.8	.6	.55	.35	.5	.5
6	.....	.8	.55	.5	.3	.5	.5
7	.....	.85	.6	.5	.3	.5	.5
8	.....	.9	.65	.45	.3	.5	.5
9	.....	.9	.75	.45	.35	.5	.5
10	.....	.85	.8	.5	.35	.5	.....
11	.....	.9	.65	.5	.35	.5	.....
12	.....	.9	.6	.5	.35	.5	.....
13	.....	.85	.6	.45	.35	.5	.....
14	1.0	.75	.6	.45	.35	.5	.....
15	.....	.7	.6	.45	.35	.5	.....
16	.....	.7	.55	.4	.35	.5	.....
17	.....	.7	.55	.4	.35	.5	.....
18	.9	.7	.55	.4	.35	.5	.....
19	.9	.65	.5	.4	.35	.5	.....
20	.9	.65	.6	.4	.35	.5	.....
21	.8	.65	.65	.4	.35	.5	.....
22	1.0	.65	.65	.4	.35	.5	.....
23	.8	.7	.55	.4	.35	.5	.....
24	.9	.7	.55	.4	.35	.5	.....
25	.75	.75	.55	.4	.35	.5	.....
26	.75	.8	.55	.4	.35	.5	.....
27	.75	.8	.6	.4	.35	.5	.....
28	.75	.75	.6	.4	.35	.65	.....
29	.8	.7	.65	.45	.35	.7	.....
30	.85	.65	.65	.45	.35	.6	.....
31	.....	.65	.65	.....	.35	.....	.....

INDEPENDENCE CREEK NEAR INDEPENDENCE, CAL.

This station was established June 15, 1905, by J. S. Evans. It is located about 1 mile west of the town of Independence near intake of the city waterworks of Independence.

The channel is straight for 25 feet above and below the gaging station. Both banks are low, but not subject to overflow. The bed of the stream is composed of gravel and rocks. The approximate depth of water is 1.2 feet. The stream discharges in one channel.

Discharge measurements are made by wading. The initial point for soundings is on the right bank.

The gage is a vertical timber nailed to a willow tree on the right bank. During 1905 the gage was read by Milton Levy. The bench mark is a cross on large rock on right bank of the stream; elevation, 1.70 feet above the datum of the gage.

Discharge measurements of Independence Creek near Independence, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
June 15	J. S. Evans	12	13.6	3.46	1.10	47
July 21	do	12	8.0	2.42	.72	19.4
August 23	do	11	5.0	1.46	.47	7.3
November 11	F. R. S. Buttemer	11	3.9	.79	.35	3.1
December 3	do	11	4.6	.80	.37	3.7

Daily gage height, in feet, of Independence Creek near Independence, Cal., for 1905.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		0.9	0.65	0.45	0.35	0.35	0.4
2		.9	.65	.45	.35	.35	.4
3		.85	.65	.45	.35	.35	.4
4		.85	.6	.45	.35	.35	.4
5		.85	.6	.45	.35	.35	.4
6		.85	.6	.45	.35	.35	.4
7		.9	.55	.45	.35	.35	.4
8		.85	.55	.45	.35	.35	.35
9		.85	.55	.45	.3	.35	.4
10		.85	.55	.35	.35	.35	.4
11		.9	.55	.35	.35	.35	.4
12		.9	.55	.35	.35	.35	.3
13		.9	.55	.4	.35	.35	.35
14		.85	.55	.4	.35	.35	.35
15	1.1	.8	.55	.35	.4	.35	.4
16	1.1	.8	.55	.35	.4	.35	.4
17	1.1	.75	.55	.4	.35	.35	.4
18	1.1	.75	.55	.4	.35	.35	.35
19	1.1	.75	.55	.4	.35	.35	.4
20	1.1	.75	.55	.35	.35	.35	.4
21	1.1	.7	.55	.35	.4	.35	.3
22	1.05	.7	.55	.35	.35	.35	.3
23	1.05	.7	.55	.4	.35	.4	.35
24	1.1	.7	.55	.4	.35	.4	.35
25	.95	.7	.55	.35	.35	.4	.3
26	.95	.7	.55	.35	.35	.4	.3
27	.95	.7	.5	.35	.35	.4	.3
28	.95	.7	.5	.35	.35	.4	.35
29	.9	.7	.5	.35	.35	.4	.35
30	.9	.7	.5	.35	.35	.4	.35
31		.65	.45		.35		.35

NOTE.—Gage heights interpolated June 16–20; October 29 to November 10; November 12 to December 2.

Station rating table for Independence Creek near Independence, Cal., from June 15 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.*
0.30	1.6	0.60	12.9	0.80	24	1.00	39
0.40	4.8	0.70	18	0.90	31	1.10	47
0.50	8.5						

NOTE.—The above table is based on five discharge measurements made during 1905. It is well defind between gage heights 0.4 foot and 1.1 feet.

Estimated monthly discharge of Independence Creek near Independence, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
June 15–30	47	31	41.5	1,317
July	31	15.4	23.5	1,445
August	15.4	6.6	10.9	670
September	6.6	3.1	4.6	274
October	4.8	1.6	3.2	198
November	4.8	3.1	3.6	214
December	4.8	1.6	3.6	223
The period				4,341

OAK CREEK NEAR INDEPENDENCE, CAL.

This station was established June 15, 1905, by J. S. Evans. It is located about 1 mile west of old Fort Independence and 3 miles northwest of the town of Independence.

The channel is straight for a short distance above and below the station. Both banks are low and subject to slight overflow in high water. The bed of the stream is composed of gravel and rocks, with high velocity at all stages. The stream flows in one channel and has an average depth of 1.2 feet.

Discharge measurements are usually made by wading, although a plank placed across the stream is used as a footbridge for higher stages of the water. The initial point for soundings is a nail in the footbridge on the left bank.

The gage is a staff nailed to a stake driven on the left bank of the stream. During 1905 the gage was read by A. M. Bell. The bench mark is a nail driven in the top of a stake set firmly in the ground on the right bank of the stream near the end of the footbridge; elevation, 1.30 feet above the datum of the gage.

Discharge measurements of Oak Creek near Independence, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
June 15	J. S. Evans	6	8.4	3.81	1.10	32
July 17	do	5	4.4	4.00	.63	17.6
August 23	do	5	2.8	4.18	.30	11.7
November 8	F. R. S. Buttemer	5	3.4	3.24	.35	11.0
December 4	do	6	3.1	1.87	.25	5.8

Daily gage height, in feet, of Oak Creek near Independence, Cal., for 1905.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.0	0.6	0.4	0.3	0.3	0.3
2	.....	1.0	.5	.4	.3	.3	.3
3	.....	1.0	.5	.4	.3	.3	.25
4	.....	.9	.5	.4	.3	.3	.25
5	.....	1.0	.5	.4	.2	.3	.3
6	.....	1.0	.5	.3	.2	.4	.3
7	.....	1.0	.5	.3	.2	.4	.25
8	.....	1.0	.5	.3	.3	.3	.25
9	.....	1.0	.5	.3	.3	.4	.25
10	.....	1.1	.5	.3	.3	.3	.25
11	.....	1.1	.5	.3	.3	.3	.25
12	.....	1.1	.5	.3	.3	.3	.25
13	.....	1.0	.5	.3	.3	.3	.3
14	.....	.9	.4	.3	.2	.3	.3
15	.....	.9	.4	.3	.3	.3	.3
16	.....	.8	.4	.2	.2	.3	.3
17	.....	.8	.4	.2	.2	.3	.25
18	1.3	.7	.4	.2	.3	.3	.25
19	1.3	.7	.4	.2	.3	.3	.25
20	1.3	.6	.4	.2	.3	.3	.25
21	1.4	.7	.4	.2	.3	.3	.25
22	1.2	.6	.4	.2	.3	.3	.25
23	1.2	.6	.4	.2	.3	.3	.25
24	1.1	.7	.4	.2	.3	.3	.25
25	1.0	.7	.4	.2	.3	.3	.25
26	1.0	.7	.4	.2	.3	.3	.25
27	1.0	.7	.4	.2	.3	.3	.25
28	.9	.7	.4	.2	.3	.3	.25
29	1.0	.6	.4	.2	.3	.3	.25
30	1.0	.6	.4	.3	.3	.3	.25
31	.....	.6	.4	.....	.3	.....	.25

MISCELLANEOUS MEASUREMENTS IN OWENS RIVER DRAINAGE BASIN.

The following is a list of the miscellaneous discharge measurements made in the Owens River drainage basin during 1905:

Ash Creek near Lone Pine, Cal.—This stream discharges into Owens Lake from the eastern slope of the Sierra Nevada. The following measurements were made during 1905 at a point where the stream leaves the foothills and enters the valley:

June 19: Width, 10 feet; area, 5.4 square feet; mean velocity, 1.96 feet per second; discharge, 10.6 second-feet.

July 19: Width, 4 feet; area, 1 square foot; mean velocity, 1.80 feet per second; discharge, 1.8 second-feet.

Birch Creek near Bishop, Cal.—This stream is tributary to Owens River above Bishop, Cal. A measurement was made August 1, 1905, by J. S. Evans at the point where the stream leaves the foothills and enters the valley.

Width, 6 feet; area, 4.4 square feet; mean velocity, 2.72 feet per second; discharge, 12 second-feet.

Clear Creek near Big Pine, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. The following measurements were made during 1905 at a point where the stream leaves the foothills and enters the valley:

June 14: Width, 7 feet; area, 5.6 square feet; mean velocity, 1.86 feet per second; discharge, 10.4 second-feet.

July 17: Width, 6 feet; area, 3.4 square feet; mean velocity, 1.61 feet per second; discharge, 5.5 second-feet.

Cottonwood Creek near Olancha, Cal.—This stream discharges into Owens Lake from the eastern slope of the Sierra Nevada. The gage rod is a 1 by 3 inch timber graduated to feet and tenths and nailed to a cottonwood tree on the right bank of the stream. The following measurements were made during 1905 at a point where the stream leaves the foothills and enters the valley:

June 16: Width, 28 feet; area, 30 square feet; mean velocity, 3.03 feet per second; gage height, 0.80 foot; discharge, 91 second-feet.

July 20: Width, 20 feet; area, 16.2 square feet; mean velocity, 1.86 feet per second; gage height, 0.33 foot; discharge, 30 second-feet.

November 10: Width, 8 feet; area, 5 square feet; mean velocity, 0.86 foot per second; discharge, 4.3 second-feet.

Division Creek near Independence, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. The following discharge measurements were made during 1905 at a point where the stream leaves the foothills and enters the valley:

June 14: Width, 4 feet; area, 1.9 square feet; mean velocity, 1.74 feet per second; discharge, 3.3 second-feet.

July 17: Width, 4 feet; area, 1.2 square feet; mean velocity, 1.75 feet per second; discharge, 2.1 second-feet.

December 2: Width, 6.5 feet; area, 2.9 square feet; mean velocity, 1.86 feet per second; discharge, 5.4 second-feet.

Eight Mile Creek near Independence, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. A measurement was made December 4, 1905, at a point where the stream leaves the foothills and enters the valley:

Width, 4.5 feet; area, 2.2 square feet; mean velocity, 1.45 feet per second; discharge, 3.2 second-feet.

Fish Springs near Big Pine, Cal.—A measurement was made of the water discharging from these springs on December 4, 1905:

Width, 7 feet; area, 20 square feet; mean velocity, 1.45 feet per second; discharge, 29 second-feet.

Goodale Creek near Tibbetts, Cal.—This stream is a tributary to Owens River from the eastern slope of the Sierra Nevada. The following measurements were made during 1905 at a point where the stream leaves the foothills and enters the valley:

June 14: Width, 4.5 feet; area, 2.6 square feet; mean velocity, 2.27 feet per second; discharge, 5.9 second-feet.

July 17: Width, 3.5 feet; area, 1.8 square feet; mean velocity, 1.94 feet per second; discharge, 3.5 second-feet.

August 22: Width, 3 feet; area, 1.5 square feet; mean velocity, 2.26 feet per second; discharge, 3.4 second-feet.

November 17: Width, 3.7 feet; area, 2.2 square feet; mean velocity, 2.09 feet per second; discharge, 4.6 second-feet.

Georges Creek near Independence, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. A measurement was made June 15, 1905, at a point where the stream leaves the foothills and enters the valley:

Width, 11 feet; area, 9.2 square feet; mean velocity, 2.61 feet per second; discharge, 24 second-feet.

Lone Pine Creek near Lone Pine, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. The following measurements were made during 1905 at a point where the stream leaves the foothills and enters the valley:

June 15: Width, 13 feet; area, 14.2 square feet; mean velocity, 2.61 feet per second; discharge, 37 second-feet.

July 19: Width, 13 feet; area, 13 square feet; mean velocity, 2.31 feet per second; discharge, 30 second-feet.

November 9: Width, 12.5 feet; area, 4.2 square feet; mean velocity, 0.83 foot per second; discharge, 3.5 second-feet.

Moffett Creek near Independence, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. A measurement was made on June 15 at a point where the stream leaves the foothills and enters the valley:

Width, 7 feet; area, 4 square feet; mean velocity, 2.25 feet per second; discharge, 9 second-feet.

McGee Creek near Bishop, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. A measurement was made on August 1, 1905, at a point where the stream leaves the foothills and enters the valley:

Width, 4 feet; area, 4 square feet; mean velocity, 2.18 feet per second; discharge, 8.7 second-feet.

Shepherds Creek near Independence, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. The following measurements were made during 1905 at a point where the stream leaves the foothills and enters the valley:

June 15: Width, 6 feet; area, 6 square feet; mean velocity, 2.53 feet per second; discharge, 15.2 second-feet.

July 18: Width, 6 feet; area, 2.7 square feet; mean velocity, 2.37 feet per second; discharge, 6.4 second-feet.

Taboose Creek near Tibbetts, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. The gage rod is a 1 by 3 inch timber graduated to feet and tenths and nailed to a willow tree on the left bank of the stream. The bench mark is a nail in willow tree on the left bank, to which gage is fastened. Its elevation is 1.60 feet above the zero of the gage. The following measurements were made during 1905 at a point where the stream leaves the foothills and enters the valley:

June 14: Width, 10 feet; area, 10.6 square feet; mean velocity, 1.68 feet per second; gage height, 0.60 foot; discharge, 17.8 second-feet.

July 17: Width, 10 feet; area, 6.6 square feet; mean velocity, 1.82 feet per second; gage height, 0.40 foot; discharge, 12 second-feet.

August 24: Width, 10 feet; area, 3 square feet; mean velocity, 1.67 feet per second; gage height, 0.10 foot; discharge, 5 second-feet.

November 17: Width, 7 feet; area, 3.8 square feet; mean velocity, 1 foot per second; gage height, 0.10 foot; discharge, 3.8 second-feet.

December 2: Width, 7 feet; area, 4.6 square feet; mean velocity, 1 foot per second; gage height, 0.15 foot; discharge, 4.6 second-foot.

Tuttle Creek near Lone Pine, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. The following measurements were made during 1905 at the point where the stream leaves the foothills and enters the valley:

June 16: Width, 12 feet; area, 6 square feet; mean velocity, 1.80 feet per second; discharge, 10.8 second-feet.

July 19: Width, 10 feet; area, 4.5 square feet; mean velocity, 2.40 feet per second; discharge, 10.8 second-feet.

Tinemaha Creek near Tinemaha, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. The following measurements were made during 1905 at the point where the stream leaves the foothills and enters the valley:

June 14: Width, 8 feet; area, 10.5 square feet; mean velocity, 1.86 feet per second; discharge, 19.5 second-feet.

July 17: Width, 6 feet; area, 4.4 square feet; mean velocity, 3.36 feet per second; discharge, 14.8 second-feet.

December 2: Width, 7 feet; area, 5.2 square feet; mean velocity, 0.60 foot per second; discharge, 3.1 second-feet.

MOHAVE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Mohave River rises on the northern slope of the San Bernardino Mountains, and, flowing in a northerly direction, finally disappears in the sands of the Mohave Desert. This stream has few tributaries, the only ones of importance being West Fork and Deep Creek, which have their source in the higher elevations of the San Bernardino Mountains. The formation is of granite, with good covering of soil. On the higher elevations there is a considerable growth of timber, which diminishes as one approaches the lower reaches, changing to a light growth of brush and grass, finally merging into the barren desert. During the greater portion of the year the stream bed is dry below the junction of West Fork and Deep Creek, where the waters disappear in the sand and gravelly bed of the stream. Water again rises at a point lower down on the river above Victorville, where the gaging station is located. Water is diverted above and below the gaging station, but is again returned to the river channel. There are several artesian wells along the river above the gaging station, the water being used for irrigation. This stream does not discharge in any large quantity except during an extremely heavy rainfall in the winter months. The precipitation throughout this basin is very light, with the possible exception of the higher elevation of the San Bernardino Mountains, where there is a considerable fall of snow during the winter months, which melts in the early spring.

MOHAVE RIVER AT VICTORVILLE, CAL.

This station was established February 27, 1899, by Bert Cole. It is located in the town of Victorville, a station on the Atchison, Topeka and Santa Fe Railroad, where the Mohave River passes through a narrow gorge locally known as the "Narrows." This place has been under investigation as a possible dam site, and soundings for the depth of bed rock were made by the United States Geological Survey during the season of 1899. The greatest depth of bed rock was found to be 54 feet. The diamond drill showed the rock to be a fine granite. A more detailed account of this exploration will be found in the Twenty-first Annual Report, part 4. Above the "Narrows" the valley broadens into a large reservoir site, but as no surveys of it have been made the capacity is unknown.

The channel is straight for 300 feet above and below the section where the rod is located. Both banks are high and rocky and not subject to overflow. The channel is composed of sand, which is constantly shifting.

During medium and low stages discharge measurements are made from a low foot bridge or by wading. During floods discharge measurements are made from the county bridge. The mean estimated monthly discharge is obtained by averaging the discharge measurements made during the year.

Gage readings were discontinued in 1902. On March 1, 1905, a new inclined rod was fastened to the rock on the left bank about 300 feet above the county bridge. This gage was established as a matter of interest in connection with the discharge of the stream at high stages. There is no relation between gage readings and the discharge, as the bed of the stream is constantly changing at different stages of the river. During 1905 discharge measurements were made twice each week, and the gage was read by P. H. Leahy. The bench mark is a bolt sulphured in solid rock on the left bank, about 15 feet from the Santa Fe Railroad track and 40 feet west of the gage rod. It is 20.45 feet above the datum of the gage. Elevation, 2,726.52 feet above sea level, as established by connection with a standard United States Geological Survey bench mark at Victorville.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 100, and 134 of the United States Geological Survey.

Discharge measurements of Mohave River at Victorville, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet*	*Sec.-ft.*
January 3	P. H. Leahy		56	June 27	P. H. Leahy		30
January 6	do		58	June 30	do		35
January 10	do		70	July 3	do		36
January 13	do		71	July 7	do		32
January 17	do		59	July 11	do		31
January 20	do		59	July 14	do		27
January 25	do		56	July 18	do		36
January 27	do		53	July 21	do		32
January 31	do		56	July 25	do		30
February 5	do		822	July 28	do		34
February 8	do		82	August 2	do		30
February 11	do		90	August 5	do		29
February 15	do		2,032	August 25	do		36
February 18	do		97	August 28	do		29
February 21	do		95	August 31	do		35
March 2	do	3.96	98	September 1	do		47
March 3	E. C. La Rue	3.92	90	September 5	do		35
March 6	P. H. Leahy	3.85	91	September 8	do		35
March 11	do	3.77	74	September 11	do		37
March 13	do	9.90	5,410	September 15	do		42
March 15	do	4.50	820	September 19	do		43
March 16	O. W. Peterson	4.95	2,350	September 22	do		43
March 18	P. H. Leahy	4.06	980	September 26	do		42
March 22	do	4.04	740	September 29	do		42
March 25	do		460	October 3	do		40
March 27	do	4.0	340	October 6	do		49
March 31	do	3.91	290	October 10	do		41
April 6	R. S. Hawley	3.75	133	October 13	do		44
April 8	P. H. Leahy	3.75	133	October 17	do		44
April 11	do	3.7	123	October 20	do		54
April 14	do	3.66	104	October 24	do		51
April 18	do	3.58	93	October 27	do		50
April 24	do	3.5	60	October 31	do	4.20	49
April 25	R. S. Hawley	3.5	38	November 3	do	4.20	46
April 29	P. H. Leahy	3.45	58	November 7	do	4.29	81
May 3	do	3.76	151	November 10	do	4.21	66
May 6	do	3.98	218	November 14	do	4.20	62
May 10	do	4.60	327	November 17	do	4.16	58
May 13	do		260	November 22	do	4.15	65
May 16	do		152	November 24	do	4.16	73
May 20	do	3.98	80	November 28	do	4.15	67
May 23	do		65	December 1	do	4.16	65
May 27	do		55	December 5	do	4.09	72
May 29	do		48	December 8	do	4.09	67
June 2	do		63	December 12	do	4.02	65
June 6	do		51	December 15	do	4.02	73
June 10	do		46	December 19	do	4.05	71
June 13	do		39	December 22	do	4.05	67
June 16	do		43	December 26	do	4.03	66
June 20	do		43	December 30	do	4.03	58

Daily gage height, in feet, of Mohave River at Victorville, Cal., for 1905.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.0	3.9	3.45	4.0	4.05	4.0	4.0	4.1	4.2	4.15
2	3.95	3.9	3.5	4.0	4.0	4.0	4.0	4.1	4.2	4.15
3	.....	3.85	3.65	4.0	4.0	4.0	4.0	4.1	4.2	4.15
4	3.95	3.9	3.85	4.0	4.0	4.0	4.0	4.1	4.2	4.15
5	3.85	3.8	3.95	4.0	4.0	4.0	4.0	4.1	4.2	4.15
6	3.85	3.75	4.0	4.0	4.0	4.0	4.0	4.15	4.2	4.1
7	3.8	3.75	4.85	4.0	4.0	4.0	4.0	4.15	4.3	4.1
8	3.8	3.4	4.85	4.0	4.0	4.0	4.0	4.15	4.3	4.1
9	3.8	3.4	.....	4.0	4.0	4.0	4.0	4.15	4.25	4.1
10	3.75	3.65	4.6	4.0	4.0	4.0	4.0	4.15	4.2	4.05
11	3.75	3.65	4.6	4.0	4.0	4.0	4.0	4.15	4.2	4.05
12	3.75	3.65	4.2	4.0	4.0	4.0	4.0	4.15	4.2	4.0
13	9.95	3.65	4.2	4.05	4.0	4.0	4.0	4.15	4.2	4.0
14	5.0	3.65	4.1	4.05	4.0	4.0	4.0	4.15	4.2	4.0
15	5.0	3.6	4.1	4.05	4.0	4.0	4.0	4.15	4.2	4.0
16	5.05	3.6	4.05	4.05	4.0	4.0	4.0	4.15	4.15	4.0
17	4.1	3.6	4.0	4.05	4.0	4.0	4.0	4.2	4.15	4.0
18	4.05	3.6	4.0	4.05	4.0	4.0	4.0	4.2	4.15	4.05
19	4.05	3.55	4.0	4.05	4.0	4.0	4.0	4.2	4.15	4.05
20	4.05	3.65	4.0	4.05	4.0	4.0	4.0	4.2	4.15	4.05
21	4.05	3.6	4.0	4.05	4.0	4.0	4.0	4.2	4.15	4.05
22	4.05	3.6	4.0	4.05	4.0	4.0	4.0	4.2	4.15	4.05
23	4.0	3.5	4.0	4.05	4.0	4.0	4.0	4.2	4.15	4.05
24	4.0	3.5	4.0	4.05	4.0	4.0	4.0	4.2	4.15	4.05
25	4.0	3.5	3.95	4.05	4.0	4.0	4.0	4.2	4.2	4.05
26	4.0	3.5	3.95	4.05	4.0	4.0	4.0	4.2	4.2	4.05
27	4.0	3.45	4.0	4.05	4.0	4.0	4.0	4.2	4.15	4.05
28	3.85	3.45	4.2	4.05	4.0	4.0	4.0	4.2	4.15	4.05
29	3.8	3.45	4.1	4.05	4.0	4.0	4.0	4.2	4.15	4.05
30	4.2	3.45	4.1	4.05	4.0	4.0	4.0	4.2	4.15	4.05
31	3.9	.....	4.0	.....	4.0	4.0	4.0	4.2	.....	4.05

Daily discharge, in feet, of Mohave River at Victorville, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	56	60	100	263	60	61	35	30	a 47	40	48	a 65
2	56	325	a 98	237	100	a 63	36	a 30	44	40	47	66
3	a 56	605	a 90	211	a 151	60	a 36	30	41	a 40	a 46	68
4	57	713	90	185	172	57	35	29	38	40	55	70
5	58	a 822	91	159	195	54	34	a 29	a 35	44	64	a 72
6	a 58	576	a 91	a 133	a 218	a 51	33	29	35	a 49	72	67
7	61	328	88	133	246	50	a 32	29	35	47	a 81	67
8	64	a 82	84	a 133	272	49	32	29	a 35	45	76	a 67
9	67	84	81	133	300	47	32	29	35	43	71	67
10	a 70	87	77	128	a 327	a 46	31	29	36	a 41	a 66	66
11	70	a 90	a 74	a 123	296	44	a 31	29	a 37	41	65	66
12	71	90	74	118	273	41	29	29	38	41	64	a 65
13	a 71	90	a5,410	110	a 260	a 39	28	29	39	a 44	63	67
14	68	90	2,295	a 104	224	40	a 27	31	40	44	a 62	70
15	65	a2,032	a 820	103	188	41	29	31	a 42	44	61	a 73
16	62	1,387	a2,250	98	a 152	a 43	31	33	42	44	59	73
17	a 59	150	1,665	95	134	43	34	33	42	a 44	a 58	72
18	59	a 97	a 980	a 93	116	43	a 36	33	42	47	60	71
19	59	96	920	86	98	43	35	33	a 43	50	61	a 71
20	a 59	95	860	79	a 80	a 43	33	33	43	a 54	62	70
21	59	a 95	800	75	75	41	a 32	36	43	53	64	68
22	59	95	a 740	70	70	39	32	36	a 43	52	a 65	a 67
23	58	95	647	65	a 65	37	32	36	42	51	69	67
24	57	95	553	a 60	63	35	31	36	42	a 51	a 73	67
25	a 56	95	a 460	a 38	60	33	a 30	a 36	42	51	71	67
26	55	95	450	43	58	31	32	33	a 42	51	70	a 66
27	a 53	95	a 340	48	a 55	a 30	33	31	42	a 50	69	64
28	54	95	327	53	52	31	a 34	a 29	42	50	a 67	62
29	54	.....	315	a 58	a 48	33	32	31	a 42	50	67	60
30	55	.....	302	60	53	a 35	32	33	42	49	66	a 58
31	a 56	.....	290	.....	57	.....	32	a 35	.....	a 49	.....	58

a Taken from discharge measurements.

NOTE.—Daily discharge obtained by interpolation between discharge measurements.

Estimated monthly discharge of Mohave River at Victorville, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	71	53	60.1	3,695
February	2,032	60	309	17,160
March	5,410	74	695	42,734
April	263	38	110	6,545
May	327	48	146	8,977
June	63	30	43.4	2,583
July	36	27	32.3	1,986
August	36	29	31.6	1,943
September	47	34	40.0	2,380
October	54	40	46.5	2,859
November	81	46	64.0	3,808
December	73	58	67.0	4,120
The year	5,410	27	137	98,790

SOUTHERN PACIFIC OCEAN DRAINAGE.

GENERAL FEATURES.

The Southern Pacific Ocean drainage includes those streams south of San Francisco Bay whose waters, in times of flood at least, reach the Pacific Ocean.

SAN LUIS REY RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The San Luis Rey River rises on the western slope of the Coast Range in the northern portion of San Diego County, and, flowing in a westerly direction, discharges its waters into the Pacific Ocean near the town of Oceanside. It has numerous small tributaries, none of which have their sources at elevations above 5,000 feet. On the upper reaches of this stream the country is rolling, with several small valleys which are under cultivation, being used principally for the raising of grain and the pasturage of stock. At a point below what is known as Warner's ranch reservoir site the river flows through a deep, narrow canyon, with a heavy grade for a distance of about 10 miles, below which point the grade is light and the discharge is over a sandy and gravelly bed, where the water soon disappears, again rising in small quantities near the town of Pala, where the gaging station is located. Below this point it flows for a distance of about 25 miles on a light grade to the Pacific Ocean. There is a good soil covering throughout this basin, with a considerable growth of brush and grass, and with small areas of timber on the extreme higher elevations. The water is diverted at several points along this stream for irrigation, a considerable quantity being diverted from the canyon above the gaging station and used in the vicinity of Escondido, which lies in an entirely separate drainage basin. This stream is torrential in its character, the discharge being very light except during the winter season, in times of heavy rainfall. The mean precipitation varies from 10 to 20 inches and falls principally in the form of rain, there being only a light fall of snow on the extreme higher elevations, which soon melts and only adds to the flood discharge.

SAN LUIS REY RIVER NEAR PALA, CAL.

This station was established October 9, 1903, by W. B. Clapp. It is located at Sickler's mill, 4 miles above Pala, Cal. It is reached by driving from Fallbrook or Temecula, stations on the Southern California Railway, 18 and 13 miles distant, respectively.

The channel is straight for about 800 feet above and 2,000 feet below the station. The grade of the stream is 0.60 foot in 100 feet. The current is swift. The right bank rises abruptly about 15 feet beyond the oak tree to which the cable is fastened and is not liable to overflow. The left bank is low, but is not liable to overflow. It was once a portion of the river channel, but is now well above high-water marks. The bed of the stream is rocky in portions of the flood channel, but the low-water channel is clear of rocks. There is a considerable growth of small timber in the channel, but this has been cleared the entire width of the cross section for a distance of 100 feet above and 50 feet below the station. This timber growth is not permanent, being washed out by floods every few years.

Discharge measurements are usually made by wading. During high water they are made from a car suspended from a cable stretched across the river at the gage. The initial point for soundings is the base of the oak tree to which the left end of the cable is fastened.

The gage is an inclined staff fastened to tree stumps and stakes at the left bank of the river. During 1905 the gage was read once each day by M. M. Sickler. The bench mark is a United States standard bronze-capped iron post set flush with the ground on the right bank of the river and the north side of the wagon road, and about 50 feet west from the line of the cable prolonged. Its elevation is 557 feet above mean sea level and 26.98 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 100 and 134 of the United States Geological Survey.

Discharge measurements of San Luis Rey River near Pala, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
February 8	E. C. La Rue	44	43	2.51	2.25	108
February 17	F. M. Sickler	51	70	2.69	2.72	188
February 18	do	100	204	3.60	4.75	735
March 17	do	188	679	7.14	7.50	5,180
March 22	R. S. Hawley	67	100	3.05	2.64	305
March 22	F. M. Sickler	68	96	3.11	2.64	299
April 11	do	44	42	2.48	1.80	104
May 15	do	41	26	1.88	1.20	49
May 17	do	40	21	1.90	1.10	40
May 20	do	43	25	2.28	1.40	57
July 6	do	3.0	1.7	2.06	.55	3.5
August 8	R. S. Hawley	3.6	1.7	1.74	(a)	3
August 19	M. M. Sickler	3.5	1.6	2.00	.....	3.2
August 26	do	3.5	1.6	2.06	.....	3.3
September 2	do	3.5	1.5	1.80	.....	2.7
September 9	do	3.5	1.5	1.80	.....	2.7
September 16	do	3.5	1.4	1.78	.....	2.5
September 21	D. W. Murphy	.....	.....	.....	.....	2.1
September 23	F. M. Sickler	3.5	1.4	2.00	.42	2.8
October 28	do	3.5	1.6	2.25	.53	3.6
December 27	do	7	4.1	3.15	.63	12.9
December 29	do	10.9	6.7	1.40	.61	9.4

(a) Channel so uncertain from July 11 to September 23 that no readings were made.

Estimated monthly discharge of San Luis Rey River near Pala, Cal., for 1903–1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
1903.				
October (23 days)	1.5	1.0	1.1	50
November	1.5	1.0	1.4	83
December	1.5	1.0	1.2	74
The period				207
1904.				
January	1.5	1.5	1.5	92
February	2.5	1.5	2.0	115
March	348	1.5	41.6	2,558
April	104	20	43.6	2,595
May	35	12	16.2	996
June	12	9	10.8	643
July	9	3	3.8	234
August	2	2	2.0	123
September	2	2	2.0	119
October	13	2	2.5	154
November	3	2	2.4	143
December	5.5	2	3.7	227
The year	348	1.5	11.0	7,999
1905.				
January	66	3	19.1	1,174
February	711	13	151	8,386
March	4,265	2	336	20,660
April	139	27	64.9	3,862
May	282	27	88.1	5,417
June	35	11	23	1,369
July	9	3	4.1	252
August	3.5	3	3	184
September	3.0	2.5	2.6	155
October	3.8	2.8	3.2	197
November	96.0	3.8	17.8	1,059
December	47.0	10	18.3	1,125
The year	4,265	2.0	60.9	43,840

NOTE.—The estimated monthly discharge is approximate only.

SANTA ANA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Santa Ana River has its source in the southern slope of the San Bernardino Mountains and, flowing in a southwesterly direction, traverses San Bernardino Valley, below which it breaks in a narrow canyon through the Santa Ana Mountains, finally discharging its waters through Santa Ana Valley into the Pacific Ocean below the town of Santa Ana. This stream has numerous tributaries which rise in the southern slope of the San Bernardino Mountains, the surface flow of most of which only reach Santa Ana River, where it traverses San Bernardino Valley in times of flood discharge. The topography on the higher elevations is rough and rugged, reaching elevations of from 10,000 to 12,000 feet, the formation being of granite with good soil covering and considerable growth of timber. On the lower elevations the topography is less rough and the soil covering is principally of brush. A gaging station is located on this stream at a point known as Warm Springs, a distance of about 8 miles above Redlands. Below this station the river leaves the mountainous country and discharges over a sandy and gravelly bed through San Bernardino Valley. During the summer months the entire flow of the stream is diverted above this gaging station and used for power development at the mouth of the canyon, below which point it is again taken out and used for irrigation on the higher elevations of San Bernardino Valley along the base of the mountains where the country is under a high state of cultivation, used principally for the raising of citrus fruits. The water rises to the surface in San Bernardino Valley near the city of San Bernardino and is diverted and used extensively for irrigation in the neighborhood of Riverside. In addition to this surface flow a large number of wells have been sunk in this territory, many of which are artesian, and from others the water is being pumped. This developed water is also used extensively for irrigation in the vicinity of San Bernardino and Riverside. The water is again forced to the surface by bed-rock obstructions at Riverside Narrows below the city of Riverside, and gradually increases in volume until it reaches Santa Ana Canyon, where it is diverted for irrigation on the lower valley lands in the vicinity of Santa Ana and Fullerton. During the summer months measurements are made of the flow at Rincon, Cal., at the head of Santa Ana Canyon. There are only occasional flood discharges of this river which flow continuously from the mountain to the sea. The mean precipitation throughout this basin is from 15 to 30 inches, which falls in the form of rain except on the higher elevations of the San Bernardino Mountains, where there is a considerable snowfall, which usually remains on the extreme high elevations until midsummer. A storage reservoir has been constructed on Bear Creek, a tributary of this stream, and is known as the Bear Valley reservoir. This stored water is held until the summer months and used for irrigation in San Bernardino Valley.

SANTA ANA RIVER NEAR MENTONE, CAL.

This station was established in June, 1896. It is located 5 miles northeast of Mentone, Cal., three-fourths of a mile below the headworks of the Mentone Power Company's canal, and opposite the warm springs in the canyon.

The Edison Electric Company diverts the greater portion of the water from Santa Ana River above the gaging station, but also returns all of it above the station. They, however, allow only limited portions of the water to pass out of their conduits during certain hours of the day, holding back the water for the purpose of obtaining additional power when the greatest demand exists.

The Mentone Power Company's canal, formerly called the Santa Ana canal, diverts water above the station, all of which is returned below the point of measurement. During the low-water season the entire flow of the river is diverted by the canals.

The channel is straight for 100 feet above and below the station, and has a width of 22 feet at low and 125 feet at high stages. The current is swift at all stages. The right bank is low and is liable to overflow at flood stages for about 100 feet. The left bank is low but is

not liable to overflow. Both banks are overgrown with alders. The bed of the stream is composed of firm sand and small bowlders. It is subject to considerable change during flood stages.

Discharge measurements are made by means of a cable and car. The initial point for soundings is the bench-mark spike set in the north side of a cottonwood tree on the left bank, 30 feet west of the tree to which the cable is fastened. At flood stages the velocity is so high that measurements can be made only by means of floats.

The gage is an inclined timber fastened to a large bowlder on the left bank 100 feet above the cable. The channel was deepened by a flood March 31, 1903, and the gage was accordingly lowered to reach low-water stages June 30, 1903. During 1905 the gage was read once each day by A. Laird. The bench mark is a spike in the north side of the cottonwood tree on the left bank, 30 feet west of the tree to which the cable is fastened; elevation, 7.29 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 100, and 134 of the United States Geological Survey.

Discharge measurements of Santa Ana River near Mentone, Cal., in 1905.

Date.	Hydrographer.	Gage height of river.	Discharge.		
			River.	Mentone Power Company's canal.	Total for River.
		Feet.	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*
February 13	Clapp and La Rue	1.15	10	40	50
February 21	E. C. La Rue	1.70	17	74	91
February 22	do	1.65	10	71	81
February 23	do	1.65	11	63	74
March 14 a. m	do	2.60	188	0	188
March 14 p. m	do	2.50	138	50	188
March 15 a. m	do	2.30	132	57	189
March 15 p. m	do	2.10	113	57	170
March 30	R. S. Hawley	1.90	81	46	127
April 14, 1 p. m	do	1.95	86	1	87
May 17	do	2.25	111	37	148
June 7	do	2.20	79	0	79
June 26	do	1.43	4	66	70
July 6	do	1.40	3	61	64

Daily gage height, in feet, of Santa Ana River near Mentone, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.85	0.8	1.3	1.7	1.3	2.3	1.4	1.3	1.3	1.3	1.3	1.5
2	.85	2.5	1.3	2.05	2.2	2.3	1.4	1.3	1.3	1.3	1.3	1.5
3	.85	2.3	1.3	2.05	2.0	2.3	1.4	1.3	1.3	1.3	1.3	1.4
4	.85	2.8	1.3	1.35	2.0	2.3	1.4	1.3	1.3	1.3	1.3	1.4
5	.85	3.0	1.3	1.35	1.9	2.3	1.4	1.3	1.3	1.3	1.3	1.4
6	.85	1.9	1.25	1.35	1.9	2.25	1.4	1.3	1.3	1.3	1.3	1.4
7	.85	1.9	1.25	1.35	2.0	2.25	1.4	1.3	1.3	1.3	1.35	1.4
8	.85	1.75	1.25	1.35	2.3	2.2	1.4	1.3	1.3	1.3	1.4	1.4
9	2.0	1.5	1.25	1.35	2.2	2.2	1.4	1.3	1.3	1.3	1.35	1.4
10	1.0	1.5	1.25	1.35	2.2	2.2	1.4	1.3	1.3	1.3	1.3	1.4
11	.85	1.35	1.25	1.35	2.2	2.15	1.4	1.3	1.3	1.3	1.3	1.4
12	.85	1.25	1.3	1.35	2.2	1.6	1.4	1.3	1.3	1.3	1.3	1.4
13	.85	1.15	3.4	1.3	2.2	1.75	1.4	1.3	1.3	1.3	1.3	1.4
14	.85	1.1	2.6	1.3	2.5	1.6	1.4	1.3	1.3	1.3	1.3	1.4
15	.85	1.1	2.35	1.3	2.5	1.45	1.4	1.3	1.3	1.3	1.3	1.4
16	.8	2.8	2.4	1.3	2.6	1.45	1.35	1.3	1.3	1.3	1.3	1.4
17	.8	2.1	2.5	2.2	2.6	1.6	1.35	1.3	1.3	1.3	1.3	1.4
18	.8	1.9	2.6	2.0	2.5	1.6	1.35	1.3	1.3	1.3	1.3	1.4
19	.8	1.9	2.5	2.1	2.6	1.55	1.35	1.3	1.3	1.3	1.35	1.6
20	.8	1.8	2.6	1.2	2.6	1.55	1.35	1.3	1.3	1.3	1.35	2.2
21	1.65	1.7	2.5	1.15	2.5	1.45	1.35	1.3	1.3	1.3	1.4	1.6
22	.85	1.7	2.4	1.2	2.2	1.45	1.35	1.3	1.3	1.3	1.35	1.5
23	.85	1.5	2.0	1.4	2.2	1.45	1.35	1.3	1.3	1.3	1.35	1.5
24	.85	1.3	1.9	1.4	2.1	1.45	1.3	1.3	1.3	1.3	1.35	1.5
25	.85	1.85	1.9	1.3	2.3	1.45	1.3	1.3	1.3	1.3	1.35	1.5
26	.85	1.25	1.9	1.3	2.2	1.45	1.3	1.3	1.3	1.3	1.8	1.5
27	.85	1.35	1.8	1.3	2.2	1.45	1.3	1.3	1.3	1.3	2.5	1.5
28	.85	1.3	1.65	1.25	2.4	1.4	1.3	1.3	1.3	1.3	2.9	1.5
29	.8	.....	1.5	1.2	2.4	1.4	1.3	1.3	1.3	1.3	1.7	2.0
30	.8	.....	2.0	1.2	2.4	1.4	1.3	1.3	1.3	1.3	1.5	1.6
31	.8	.....	1.8	.....	2.4	.....	1.3	1.3	.....	1.3	.....	1.5

Station rating table for Santa Ana River near Mentone, Cal., from January 1 to February 17, 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	1	1.40	23	2.00	80	2.60	170
0.90	2	1.50	29	2.10	93	2.70	186
1.00	5	1.60	37	2.20	106	2.80	202
1.10	8	1.70	47	2.30	122	2.90	218
1.20	12	1.80	57	2.40	138	3.00	234
1.30	17	1.90	68	2.50	154		

Station rating table for Santa Ana River near Mentone, Cal., from February 18 to March 12 and from June 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.*
1.30	1	2.00	48	2.70	164	3.40	290
1.40	3	2.10	62	2.80	182	3.50	308
1.50	6	2.20	78	2.90	200	3.60	326
1.60	11	2.30	94	3.00	218	3.70	344
1.70	17	2.40	110	3.10	236	3.80	362
1.80	25	2.50	128	3.20	254	3.90	380
1.90	35	2.60	146	3.30	272		

Station rating table for Santa Ana River near Mentone, Cal., from March 13 to May 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	1	1.60	46	2.40	151	3.20	287
0.90	2	1.70	56	2.50	168	3.30	304
1.00	4	1.80	68	2.60	185	3.40	321
1.10	8	1.90	80	2.70	202	3.50	338
1.20	13	2.00	92	2.80	219	3.60	355
1.30	20	2.10	106	2.90	236	3.70	362
1.40	28	2.20	120	3.00	253	3.80	379
1.50	36	2.30	135	3.10	270		

Daily discharge, in second-feet, of Santa Ana canal near Mentone, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	22	25	60	57	71	0	63	53	66	51	46	34
2	22	64	57	0	66	0	61	53	63	51	32	32
3	21	64	60	0	66	0	61	51	63	56	32	34
4	21	0	60	54	56	0	61	61	63	56	32	32
5	21	0	60	63	58	0	61	61	66	51	32	32
6	22	22	57	63	73	0	61	61	66	46	36	32
7	21	42	57	63	51	0	58	63	66	46	41	32
8	20	37	54	72	56	0	58	63	61	41	46	32
9	0	37	51	78	66	0	56	63	61	56	41	32
10	61	35	48	78	76	0	56	63	63	46	29	30
11	54	43	48	72	76	0	58	63	73	46	29	32
12	41	26	51	66	76	66	61	63	76	61	30	32
13	41	28	0	66	76	43	63	66	76	66	32	29
14	31	29	0	63	0	71	66	68	78	56	30	29
15	31	35	0	57	0	71	66	68	78	61	30	32
16	27	29	97	43	71	71	63	71	78	56	29	30
17	29	32	78	0	71	68	63	71	78	51	29	30
18	33	42	0	0	71	68	63	81	78	46	29	29
19	25	70	0	0	36	68	61	81	73	43	29	29
20	27	70	0	71	36	68	61	56	68	41	29	29
21	66	70	0	66	32	68	61	56	68	41	34	32
22	61	74	78	66	29	68	61	56	61	46	32	25
23	49	74	66	66	29	68	61	56	68	41	30	25
24	40	66	78	66	29	68	61	73	68	41	29	25
25	31	66	78	71	0	68	61	73	51	46	30	25
26	29	58	60	71	0	68	61	73	56	46	30	25
27	27	51	85	66	0	68	61	76	56	41	41	29
28	25	58	85	66	0	63	61	76	66	41	50	28
29	25	.....	78	71	0	63	61	76	66	41	41	30
30	25	.....	42	76	0	63	56	73	66	41	32	29
31	25	.....	57	.....	0	.....	56	73	.....	41	.....	27

Estimated monthly discharge of Santa Ana [a] River near Mentone, Cal., for 1905.

[Drainage area, 182 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	108	22	36.6	2,251	0.201	0.232
February	234	26	97.6	5,420	.536	.558
March	321	48	130	7,993	.714	.823
April	120	63	90.5	5,385	.497	.554
May	256	91	172	10,580	.945	1.09
June	94	64	77.7	4,624	.427	.476
July	69	57	62.9	3,867	.346	.399
August	82	52	66.8	4,107	.367	.423
September	79	52	68.3	4,064	.375	.418
October	67	42	49.2	3,025	.270	.311
November	250	30	47.5	2,827	.261	.291
December	107	31	38.4	2,362	.211	.243
The year	321	22	78.1	56,500	.429	5.82

[a] Including Mentone Power Company's canal.

SEEPAGE MEASUREMENTS.

In the vicinity of Colton and San Bernardino large quantities of water are developed in addition to the natural surface flow. This water is used for the irrigation of land in the vicinity of San Bernardino, Colton, and Riverside, and also for domestic supply for these towns. Much of this water returns to Santa Ana River below Riverside, above a point known as Slover Mountain and is again diverted and used for irrigation on the lower lands below Riverside, and above what is known as Riverside Narrows. Below this point there are still further diversions which irrigate the lower lands along the river bottom, much of this water again returning to the river above Rincon. Measurements were made during the summer of 1905 to determine the amount of water, including the natural flow and developed water, above Colton, Cal. Also measurements were made of natural flow and developed water below Slover Mountain and above Riverside Narrows, this all being return water from irrigated lands on the higher elevations. Measurements were also made of diversion ditches and Santa Ana River below Riverside Narrows and above what is known as the Auburndale Bridge. The following tabulations show the result of these measurements which were made by K. Sanborn, of Riverside, Cal.

Natural flow of return water to Santa Ana River in second-feet; compared with developed water in San Bernardino Valley above Colton, Cal., 1905.

[Measurements by K. Sanborn, engineer Riverside Water Company.]

Date.	Location.	Developed.	Natural.	Total.
		Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*
June 9	Barnhill pumping plant	1.10	.....	1.10
September 27	do	.80	.....	.80
June 10	Beam ditch	.....	0.00	.00
September 2	do	.....	.00	.00
June 16	Bloomington pumping plants	6.62	.....	6.62
September 27	do	7.20	.....	7 20
June 10	City of San Bernardino, Sixth street pumping plant.	1.99	.....	1.99
September 27	do	4.80	.....	4.80
June 19	Cty of San Bernardino, Lytle Creek	.....	2.04	2.04
September 27	do	.....	1.90	1.90
June 9	City of Colton pumping plant (total)	3.81	.....	3.81
September 27	City of Colton (water used for irrigation)	1.20	.....	1.20
September 27	City of Colton pumping plant (total)	2.70	.....	2.70
May 31	Camp Carlton ditch	2.60	.....	2.60
August 14	do	1.20	.....	1.20
June 10	Carr pumping plant	.72	.....	.72
August 14	do	.60	.....	.60
June 10	Daley ditch	.....	.00	.00
September 4	do	.....	.00	.00
May 30	Excelsior Land and Water Co	.65	.....	.65
September 28	do	.40	.....	.40
May 31	Grand Terrace Pumping Co. pumping plant	.54	.....	.54
August 14	do	.00	.....	.00
May 31	Gage canal, Palm avenue weir	28.83	.....	28.83
September 2	do	32.70	.....	32.70
May 26	Gage canal intake, Santa Ana River	.....	.00	.00
September 4	do	.....	.00	.00
June 2	Haws & Talmadge ditch	.....	.00	.00
September 5	do	.....	.00	.00
June 6	Hunter pumping plant	1.09	.....	1.09
September 4	do	1.60	.....	1.60
June 9	Johnson & Hubbard pumping plant	.59	.....	.59

Natural flow of return water to Santa Ana River in second-feet, compared with developed water in San Bernardino Valley above Colton, Cal., 1905—Continued.

Date.	Location.	Developed.	Natural.	Total.
		Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*
September 4	Johnson & Hubbard pumping plant	0.30		0.30
June 9	Lamb pumping plant	.30		.30
September 27	do	.00		.00
June 9	Lawson Well Co. pumping plant	.62		.62
September 27	do	.60		.60
June 10	Logsdon & Farrell ditch		0.00	.00
September 2	do		.00	.00
June 10	Lytle Creek Water and Improvement Co	.00		.00
September 27	do	.00		.00
May 30	Merryfield pumping plant	.67		.67
September 28	do	.40		.40
June 2	McKenzie ditch		.00	.00
September 5	do		.00	.00
June 9	Meeks & Daley ditch		15.70	15.70
September 2	do		15.50	15.50
June 16	McIntyre ditch		.00	.00
September 28	do		.00	.00
June 9	Orange Land and Water Co. pumping plant	.00		.00
September 27	do	1.60		1.60
June 16	Riverside Highland Water Co., Lytle Creek	7.05		7.05
September 28	do	8.00		8.00
May 31	Riverside Highland Water Co., Santa Ana River	6.36		6.36
September 4	do	7.60	.40	8.00
June 16	Rancheria pumping plant	1.24		1.24
September 27	do	1.10		1.10
June 2	Rabel ditch		.00	.00
September 5	do		.00	.00
May 31	Riverside Water Co., upper canal	25.33	24.85	50.18
August 31	do	21.20	12.90	34.10
May 31	Riverside Water Co., mill pumping plant	.92		.92
August 31	do	1.30		1.30
May 31	Riverside Water Co., mill flume		2.24	2.24
August 31	do		.00	.00
May 26	Riverside Water Co., flume pump No. 1	3.95		3.95
August 31	do	3.60		3.60
May 26	Riverside Water Co., flume pump No. 2	3.18		3.18
August 31	do	3.00		3.00
June 6	Rosedale Water Co. pumping plant	.30		.30
September 28	do	.00		.00
June 6	Rogers pumping plant		.00	.00
August 31	do	.00		.00
June 2	Shay or Stout Dam ditch		.00	.00
September 5	do		.00	.00
May 31	Swamp ditch		.47	.47
August 14	do		.40	.40
June 6	West Riverside 350-inch Water Co. pumping plant	2.00		2.00
September 28	do	5.60		5.60
June 19	Whitlock ditch		.00	.00
September 2	do		.00	.00
June 6	Whiting ditch		.00	.00
September 4	do		.00	.00
May 31	Ward and Warren ditch	.00		.00
September 4	do		.00	.00

Return waters in San Bernardino Valley below Slover Mountain and above Riverside Narrows, 1905.

[Measurements by K. Sanborn, engineer Riverside Water Company.]

Date.	Location.	Developed.	Natural.	Total.
		Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*
May 27	Alvitrez ditch at headgate, east end of West Riverside Bridge.		3.00	3.00
August 11	do		1.30	1.30
June 6	Cuttle's pumping plant	2.50		2.50
October 4	do	2.25		2.25
May 27	Evans Island or Jansen ditch, under west end of West Riverside Bridge.		.00	.00
August 11	do		.00	.00
May 29	Evans ditch, near Riverside County line		.00	.00
August 11	do		.50	.50
May 29	Evans Well ditch, Santa Ana street	.00		.00
August 9	do	1.70		1.70
May 30	Evans pipe line to China garden at headworks		.00	.00
August 11	do		.00	.00
May 27	Evans pumping plant, 1,000 feet south of west end of West Riverside Bridge.	2.87		2.87
September 5	do	4.20		4.20
June 19	Evans Jurupa pumping plant at wier end of main	2.00		2.00
October 4	Evans Jurupa pumping plant	.00		.00
May 30	Ferris Gallagher ditch, near headworks		2.20	2.20
August 14	do		2.00	2.00
May 30	Gallagher ditch, near headworks		.00	.00
August 14	do		1.20	1.20
May 29	Jurupa pumping plant, to supply Rubidoux ditch	2.10		2.10
August 15	do	4.80		4.80
May 30	Lower Canal Riverside Water Co. at flume at headworks.		2.20	2.20
September 5	do		.00	.00
June 6	Pond's pumping plant	2.50		2.50
October 4	do	2.25		2.25
May 29	Rubidoux ditch at measuring box		4.92	4.92
August 15	do		7.20	7.20
June 15	Riverside Power Co. canal at Pedley crossing		30.60	30.60
September 22	do		27.00	27.00
June 19	Rivero Land Co. pumping plant	.80		.80
October 4	do	.60		.60
May 29	Smith or Evans ditch, 1 mile below Riverside County line.		2.30	2.30
August 14	do		.00	.00
May 27	Soquel ditch at intake		3.20	3.20
August 11	do		2.70	2.70
May 27	Spring Brook pumping plant at wier end of main		5.58	5.58
August 11	do		3.60	3.60
May 29	Spanishtown pumping plant at wier end of main	4.17		4.17
August 11	do	2.60		2.60
May 30	Zimmerman pipe line at dam		1.40	1.40
August 14	do		1.20	1.20

Discharge measurements of canals between the Riverside Narrows and the Auburndale bridge having their source in the Santa Ana River, 1905.

Date.	Location.	Discharge.
		Sec.-ft.
June 15	Castele ditch near intake	0.00
September 22	do	.00
June 15	Durkee ditch at Auburndale road crossing	4.10
September 22	do	.00
June 15	Fuller ditch at waste gate	5.60
September 22	do	5.40
June 15	Gilliland ditch at Auburndale road crossing	1.40
September 22	do	.30
June 15	Newton ditch near intake	2.30
September 22	do	1.70
June 15	Newberry ditch at Auburndale road crossing	.00
September 22	do	.00
June 15	Roberts or Le Gay ditch near intake Santa Ana River	1.00
September 22	do	1.70
June 15	Wilbur ditch at Rogers pipe trestle crossing Santa Ana River	6.10
September 22	do	6.40
June 15	Santa Ana River, Auburndale Bridge	63.60
Do	Santa Ana River, Auburndale Bridge, including ditches	71.13
September 22	Santa Ana River, Auburndale Bridge	57.00
Do	Santa Ana River, Auburndale Bridge, including ditches	57.80

MISCELLANEOUS MEASUREMENTS IN SANTA ANA RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in the Santa Ana River drainage basin during 1905:

City Creek near Highlands, Cal.—This stream is a tributary of Santa Ana River. A measurement was made September 23 by W. B. Clapp in diversion canal at mouth of canyon. Measurement made over weir.

Discharge, 1.16 second-feet.

Chino Creek near Rincon, Cal.—This stream is a tributary of Santa Ana River. The following measurements were made during 1905 at the wagon bridge at Rincon road crossing, one-fourth mile above junction of Chino Creek with the Santa Ana river.

February 24: Width, 16 feet; area, 22 square feet; mean velocity, 2.09 feet per second; discharge, 46 second-feet.

April 17: Width, 7 feet; area, 5.6 square feet; mean velocity, 4.64 feet per second; discharge, 26 second-feet.

May 16: Width, 5 feet; area, 4 square feet; mean velocity, 4.25 feet per second; discharge, 17 second-feet.

June 6: Width, 4 feet; area, 1.7 square feet; mean velocity, 3.53 feet per second; discharge, 6.0 second-feet.

July 29: Width, 2 feet; area, 0.4 square foot; mean velocity, 2.75 feet per second; discharge, 1.1 second-feet.

September 21: Width, 3 feet; area, 2 square feet; mean velocity, 0.95 foot per second; discharge, 1.9 second-feet.

Cable Canyon Creek near Glen Helen, Cal.—This stream is a tributary of the Santa Ana River. A measurement was made July 13 by K. Sanborn. Measurement made over weir.

Discharge, 1.66 second-feet.

Devil Canyon near Irvington Station, Cal.—This stream is a tributary of the Santa Ana River. A measurement was made July 13 by K. Sanborn at the mouth of the canyon, 100 feet below head of M. L. & W. Co.'s ditch.

Discharge, 1.26 second-feet.

East Twin Creek near Arrowhead Springs, Cal.—This stream is a tributary of the Santa Ana River. A measurement was made September 23 by W. B. Clapp at the mouth of the canyon. Measurement made over weir.

Discharge, 0.54 second-foot.

Lytle Creek near Rialto, Cal.—This stream is one of the principal tributaries of the Santa Ana River. A measurement was made June 16 by K. Sanborn at the head of Fontella Development Company's canal at the mouth of the canyon. Measurement made over weir.

Discharge, 23 second-feet.

Mill Creek near Mentone, Cal.—This stream is one of the principal tributaries of the Santa Ana River. The following measurements were made during 1905:

At road crossing between Mentone and Santa Ana Canyon, April 14: Width, 16 feet; area, 11.2 square feet; mean velocity, 4.11 feet per second; discharge, 46 second-feet. This is waste water and does not include water diverted by Crafton Zanja.

At head of Crafton Zanja, September 23: Width, 7.7 feet; area, 4.7 square feet; mean velocity, 4.33 feet per second; discharge, 20 second-feet.

Morton Canyon Creek near Mentone, Cal.—This stream is a small tributary of Santa Ana River. A measurement was made September 22 by W. B. Clapp at the mouth of the canyon, 500 feet above its junction with Santa Ana River.

Width, 0.8 foot; area, 0.096 square foot; mean velocity, 1.67 feet per second; discharge, 0.16 second-foot.

Plunge Creek near East Highlands, Cal.—This stream is a tributary of the Santa Ana River. The following measurements were made during 1905:

At road crossing Orange avenue between Redlands and Highlands, April 15: Width, 16 feet; area, 5.1 square feet; mean velocity, 1.94 feet per second; discharge, 9.9 second-feet.

At cement ditch at the mouth of the canyon, September 22: Width, 2 feet; area, 0.6 square foot; mean velocity, 1.67 foot per second; discharge, 1.0 second-foot.

Redlands tunnel near Mentone, Cal.—This is developed water from tunnel in the bed of the Santa Ana River at the mouth of the canyon. A measurement was made September 22 over weir at the mouth of the tunnel.

Discharge, 1.1 second-feet.

Santa Ana River near Redlands, Cal.—A measurement of this stream was made at the road crossing at Orange avenue between Redlands and Highlands April 14.

Width, 55 feet; area, 34 square feet; mean velocity, 2.35 feet per second; discharge, 76 second-feet.

Santa Ana River near Rincon, Cal.—The following measurements were made during 1905 at the Rincon wagon bridge, at the lower end of San Bernardino Valley, and the head of the lower Santa Ana Canyon. These measurements, with the addition of those of Chino Creek, show the total discharge of the Santa Ana River below all diversions in San Bernardino Valley, and show the amount of water which is used for irrigation in the vicinity of Orange, Santa Ana, Anaheim, and Fullerton, Cal., diversions being made below this point of measurement.

The gage is a 1 by 4 inch timber, graduated to feet and tenths and bolted to the first caisson from the south end of the Rincon wagon bridge. There is no bench mark.

February 24: Width, 40 feet; area, 68 square feet; mean velocity, 3.01 feet per second; gage height, 3.63 feet; discharge, 205 second-feet.

April 17: Width, 48 feet; area, 68 square feet; mean velocity, 2.53 feet per second; gage height, 3.60 feet; discharge, 172 second-feet.

May 16: Width, 45 feet; area, 50 square feet; mean velocity, 2.30 feet per second; gage height, 3.35 feet; discharge, 115 second-feet.

June 6: Width, 45 feet; area, 44 square feet; mean velocity, 1.98 feet per second; gage height, 3.32 feet; discharge, 87 second-feet.

July 29: Width, 48 feet; area, 34 square feet; mean velocity, 2.06 feet per second; gage height, 3.25 feet; discharge, 70 second-feet.

September 21: Width, 46 feet; area, 39 square feet; mean velocity, 1.95 feet per second; gage height, 3.33 feet; discharge, 76 second-feet.

Waterman Canyon Creek or West Twin Creek, near Arrowhead Springs, Cal.—This stream is a tributary of Santa Ana River. A measurement was made July 13 by K. Sanborn at the bridge on the road to Waterman's ranch at the mouth of the canyon.

Discharge, 1.02 second-feet.

SAN GABRIEL RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The San Gabriel River rises in the Sierra Madre Mountains and, flowing in a southwesterly direction through the San Gabriel and Los Angeles valleys, discharges its waters into the Pacific Ocean near Long Beach, Cal. In the upper reaches of this basin there are numerous tributaries, which have their source in the higher elevations of the Sierra Madre Range. The topography in the upper reaches of this basin is rough and rugged, with deep and narrow canyons, while on the lower elevations the country is rolling, with large areas of valley land. The formation on the higher mountain elevation is of granite, with a light soil covering, with sparse timber growth. As one approaches the middle elevations the covering is brush, with scattering timber, while in the foothill country there is nothing but a growth of grass. The gaging station on this stream is located at a point where the stream leaves the higher mountains in the vicinity of Azusa. Below this point the river enters San Gabriel Valley, where the stream has a comparatively light grade, the bed being composed of bowlders, gravel, and sand, in which the water quickly disappears, except in times of flood discharge. The waters of this stream again appear on the surface at the lower end of San Gabriel Valley, at the discharge from the foothills, where an obstruction to the underground passage forces the water to the surface, on which it flows for a short distance and again disappears in the sands of the flat country below the foothills. The entire flow of this stream during the summer months is diverted at a point about 5 miles above the gaging station and is used for power purposes at the mouth of the canyon. From this point it is carried in ditches and used for irrigation in San Gabriel Valley. The water is again diverted where it appears on the surface at the lower end of this valley and is used for irrigation on the lower levels below this point. The mean precipitation in this basin varies from 15 to 30 inches and is principally in the form of rain. On small areas in the higher mountain elevations the precipitation is in the form of snow, which melts in the early spring months.

SAN GABRIEL RIVER AND CANALS NEAR AZUSA, CAL.

Owing to the numerous diversions, it has been difficult to obtain accurate discharge measurements at Azusa, but during 1898 the San Gabriel Electric Company completed its system, and measurements are now obtained with greater ease and hence with greater accuracy. The headworks of this company are located about 6 miles above the mouth of the canyon. The water is carried around the left side by a series of tunnels and conduits, and a head of 400 feet is obtained where the electric power is generated. Weirs are placed on the conduit of the electric company and the water is measured at this point. The capacity of the conduit is 80 second-feet.

The cable and gage are located about 1 mile from Azusa. During the season of low water for a period of from six to eight months the canals above the station divert the entire flow and there is no running water at the station. The total flow of the river is obtained by adding the daily discharge for the river to the figures for the corresponding dates for the canals.

The channel is straight for 100 feet above and 500 feet below the cable and has a width of 280 feet at high water. At low stages there are two channels having different elevations, and accurate measurements are difficult to obtain. The bed of the stream is composed of cobblestones and bowlders, and the current is swift.

Discharge measurements are made by means of a cable and car. The gage is a vertical staff. During 1905 the gage was read by Don. D. Morgan.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 100, and 134 of the United States Geological Survey.

Discharge measurements of San Gabriel River and canals near Azusa, Cal., in 1905.

Date.	Hydrographer.	Gage height.	Discharge.		
			River.	Canal.	Total.
		Feet.	*Sec.-feet.*	*Sec.-feet.*	*Sec.-feet.*
February 10	E. C. La Rue	2.20	190	66	256
February 17	do	3.50	560	66	626
March 12	R. S. Hawley	9.30	11,055	72	11,127
March 14	W. B. Clapp	5.30	2,030	70	2,100
March 16	R. S. Hawley	5.80	3,225	80	3,305
March 24	do	4.20	611	54	665
March 31	do	3.80	400	80	480
April 13	do	3.45	262	80	342
April 19	do	3.30	190	80	270
May 2	do	4.12	553	80	633
May 9	do	3.50	288	80	368
June 5	do	2.91	97	80	177
June 23	W. B. Clapp	2.60	41	84	125
July 5	Hawley and Clapp	2.28	17	85	102
November 4	W. B. Clapp	.....	00	30	30

Daily gage height, in feet, of San Gabriel River near Azusa, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	0	0	2.1	a 3.8	3.1	2.95	2.4
2	0	2.6	2.1	a 3.75	3.7	2.95	2.35
3	0	5.5	2.1	a 3.75	3.4	2.95	2.35
4	0	a 4.75	2.1	a 3.7	3.3	2.9	2.35
5	0	4.0	2.3	a 3.7	3.2	2.9	2.25
6	0	3.0	2.3	a 3.65	3.2	2.9	2.25
7	0	2.7	1.7	a 3.65	3.2	2.85	2.2
8	0	2.5	1.7	a 3.6	4.0	2.85	2.15
9	0	2.3	1.65	a 3.6	3.6	2.85	2.15
10	0	2.2	1.65	a 3.55	3.5	2.8	2.15
11	0	2.0	1.7	a 3.55	3.4	2.8	2.55
12	0	1.9	9.3	a 3.5	3.4	2.8	2.15
13	0	1.8	a 7.3	3.5	3.3	2.8	2.15
14	0	1.8	5.3	3.45	3.3	2.8	2.1
15	0	a 3.0	4.7	a 3.4	3.3	2.75	2.1
16	0	a 3.5	5.8	a 3.4	3.3	2.7	2.05
17	0	a 3.5	5.1	a 3.4	3.3	2.7	2.0
18	0	3.1	4.8	a 3.35	3.3	2.7	1.9
19	0	3.0	4.7	3.3	3.3	2.65	1.8
20	0	2.8	4.4	3.3	3.2	2.6	1.5
21	0	2.7	4.3	3.3	3.2	2.6	(b)
22	1.55	2.5	4.2	3.3	3.2	2.6	.....
23	0	2.4	4.2	3.2	3.2	2.6	.....
24	0	2.3	4.2	3.2	3.15	2.6	.....
25	0	2.2	4.2	3.2	3.1	2.55	.....
26	0	2.2	a 4.2	3.2	3.1	2.55	.....
27	0	2.2	a 4.1	3.1	3.1	2.55	.....
28	0	2.2	a 4.0	3.1	3.1	2.5	.....
29	0	.....	4.0	3.1	3.1	2.45	.....
30	0	.....	a 3.9	3.05	3.05	2.45	.....
31	0	.....	3.8	.....	3.0	.....	.....

a Estimated. b Dry from July 21 to December 31.

NOTE.—Gage washed out on March 12; replaced April 19. Gage heights taken with a level between March 12 and April 19.

Station rating table for San Gabriel River near Azusa, Cal., from February 2 to March 11, 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.*
1.10	0	2.50	207	3.60	610	4.70	1,620
1.50	55	2.60	231	3.70	670	4.80	1,750
1.60	65	2.70	259	3.80	730	4.90	1,900
1.70	76	2.80	289	3.90	800	5.00	2,050
1.80	88	2.90	320	4.00	870	5.10	2,220
1.90	101	3.00	351	4.10	950	5.20	2,390
2.00	115	3.10	390	4.20	1,040	5.30	2,570
2.10	130	3.20	430	4.30	1,140	5.40	2,750
2.20	147	3.30	470	4.40	1,250	5.50	2,940
2.30	165	3.40	513	4.50	1,370		
2.40	185	3.50	560	4.60	1,490		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during first part of 1905; 1904 table applies from January 1 to February 1, inclusive.

Station rating table for San Gabriel River near Azusa, Cal., from March 12 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.*
1.70	1	3.20	170	4.70	1,040	6.40	4,499
1.80	2.5	3.30	202	4.80	1,160	6.60	4,951
1.90	4.5	3.40	237	4.90	1,300	6.80	5,403
2.00	7	3.50	273	5.00	1,460	7.00	5,855
2.10	10	3.60	311	5.10	1,640	7.20	6,307
2.20	14	3.70	351	5.20	1,830	7.40	6,759
2.30	18	3.80	394	5.30	2,030	7.60	7,211
2.40	24	3.90	441	5.40	2,245	7.80	7,663
2.50	32	4.00	492	5.50	2,470	8.00	8,115
2.60	42	4.10	550	5.60	2,695	8.20	8,567
2.70	55	4.20	616	5.70	2,920	8.40	9,019
2.80	71	4.30	687	5.80	3,145	8.60	9,471
2.90	90	4.40	762	5.90	3,370	8.80	9,923
3.00	113	4.50	841	6.00	3,595	9.00	10,375
3.10	140	4.60	935	6.20	4,047	9.20	10,828

NOTE.—The above table is applicable only for open-channel conditions. It is based on 11 discharge measurements made during 1905.

Daily discharge, in second-feet, of San Gabriel canals near Azusa, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	30	34	67	80	80	80	85	55	34	30	29	50
2	23	67	67	80	80	80	85	54	33	29	29	47
3	21	70	67	80	80	80	86	54	32	28	29	45
4	20	78	67	80	80	80	85	53	33	28	29	44
5	19.5	68	0	80	80	80	85	52	34	28	29	44
6	19	78	67	80	80	80	86	50	35	28	32	42
7	18.5	69	72	80	80	80	86	47	34	28	44	42
8	18.5	86	72	80	48	80	85	46	33	28	95	41
9	41	74	72	80	80	80	85	45	32	27	53	39
10	59	66	72	80	80	80	85	45	32	27	42	37
11	40	66	72	80	80	73	71	46	32	27	38	37
12	35	66	72	80	80	73	74	44	32	27	36	37
13	31	66	0	80	80	76	75	44	32	28	36	38
14	29	66	70	80	80	76	74	43	31	29	34	39
15	27	66	79	80	80	0	74	43	31	29	34	39
16	30	67	80	80	80	78	74	42	30	29	45	39
17	30	66	80	80	80	78	74	41	31	30	53	39
18	28	68	80	80	80	78	74	40	31	30	43	39
19	28	69	79	80	80	78	73	41	30	30	40	38
20	27	68	80	80	80	78	73	41	29	29	42	46
21	55	68	80	80	80	78	70	40	29	29	41	42
22	67	68	78	80	80	88	69	40	28	31	39	39
23	67	68	57	80	80	84	68	39	30	32	38	38
24	57	67	54	80	80	84	67	38	30	31	37	37
25	46	68	69	80	80	84	64	38	30	30	37	38
26	41	67	80	80	80	84	62	36	29	29	37	38
27	40	67	80	80	80	84	64	36	30	29	97	38
28	38	67	80	80	80	84	62	35	31	28	87	38
29	37	.....	80	80	80	84	60	34	32	28	62	37
30	36	.....	80	80	80	84	68	33	31	29	53	37
31	34	.....	80	.....	80	.....	56	33	.....	28	.....	38

Estimated monthly discharge of San Gabriel River [a] near Azusa, Cal., for 1905.

[Drainage area, 222 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	108	18.5	36.6	2,251	0.165	0.190
February	3,010	34	466	25,880	2.10	2.19
March	11,130	142	1,222	75,140	5.50	6.34
April	474	206	329	19,580	1.48	1.65
May	540	193	278	17,090	1.25	1.44
June	182	63	139	8,271	.626	.698
July	109	56	83.0	5,103	.374	.431
August	55	33	42.8	2,631	.193	.222
September	35	28	31.4	1,869	.141	.157
October	32	27	28.8	1,771	.130	.150
November	97	29	44.7	2,660	.201	.224
December	50	37	40.1	2,466	.181	.209
The year	11,130	18.5	2,284	164,700	1.03	13.90

[a] Includes water in canal.

MISCELLANEOUS MEASUREMENTS IN SAN GABRIEL RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in the San Gabriel River drainage basin during 1905:

Baldwin ditch near El Monte, Cal.—This ditch diverts water from the Rio Hondo River and is used for irrigation of land in the vicinity of the Old Mission. A measurement was made October 6 by W. B. Clapp at Old Mission Bridge, 4 miles below El Monte, Cal.

Width, 1.2 feet; area, 1.4 square feet; mean velocity, 2.14 feet per second; discharge, 3.0 second-feet.

Cate ditch near El Monte, Cal.—This ditch diverts water from the San Gabriel River and is used for the irrigation of land in the vicinity of Rivera, Cal. A measurement was made October 6 by W. B. Clapp in flume at road crossing near county road between El Monte and Whittier and about 5 miles below El Monte.

Width, 4 feet; area, 7.7 square feet; mean velocity, 1.45 feet per second; discharge, 11.2 second-feet.

Ranchito or Standerford ditch near El Monte, Cal.—This ditch diverts water from the San Gabriel River and is used for the irrigation of land in the vicinity of Rivera and Downey, Cal. A measurement was made October 6 by W. B. Clapp 25 feet below head-gate and about 5 miles below El Monte, Cal.

Width, 11.8 feet; area, 11 square feet; mean velocity, 1.42 feet per second; discharge, 15.6 second-feet.

Los Nietos or Banta ditch.—This ditch diverts water from the San Gabriel River and is used for the irrigation of land in the vicinity of Los Nietos, Cal. A measurement was made October 6 by W. B. Clapp 100 feet below head-gate of Ranchito ditch.

Width, 18 feet; area, 14.8 square feet; mean velocity, 1.14 feet per second; discharge, 16.8 second-feet.

Rio Hondo near El Monte, Cal.—This stream constitutes one branch of the San Gabriel River. A measurement was made October 6 by W. B. Clapp at Old Mission Bridge, 4 miles below El Monte and below the diversion of the Baldwin ditch.

Width, 13 feet; area, 12 square feet; mean velocity, 1.75 feet per second; discharge, 21 second-feet.

Rincon ditch near El Monte, Cal.—This ditch diverts water from the San Gabriel River 2 miles below Southern Pacific Railroad bridge and is used for irrigation of land in the vicinity of Rincon, Cal. A measurement was made October 6 by W. B. Clapp at road crossing, one-half mile east of the Durfee ranch.

Width, 6 feet; area, 3.2 square feet; mean velocity, 1.06 feet per second; discharge, 3.4 second-feet.

Sheep Creek ditch near El Monte, Cal.—This ditch diverts water from Sheep Creek, a tributary of San Gabriel River. A measurement was made October 6 by W. B. Clapp in flume at road crossing, 1 mile east of Durfee ranch.

Width, 3 feet; area, 2.1 square feet; mean velocity, 2.19 feet per second; discharge, 4.6 second-feet.

Santa Anita Creek near Sierra Madre, Cal.—This stream is a tributary of the San Gabriel River. A measurement was made October 23 by W. B. Clapp at the mouth of the canyon above Baldwin diversion.

Width, 3 feet; area, 1.0 square foot; mean velocity, 1.50 feet per second; discharge, 1.5 second-feet.

San Gabriel River near El Monte, Cal.—A measurement was made of this stream on April 13 by R. S. Hawley at wagon bridge, 2 miles east of El Monte, Cal.

Width, 56 feet; area, 20 square feet; mean velocity, 2.35 feet per second; discharge, 47 second-feet.

LOS ANGELES RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Los Angeles River is formed by the Tujunga, Pacoima, and other small creeks which have their source in the Sierra Madre Range of mountains to the northeast of the city of Los Angeles. These streams leave the mountains at a point about 25 miles above the city and enter the comparatively flat country of San Fernando Valley, where, except in times of excessive flood, the waters disappear in the sand and gravel washes of the valley. These waters again make their appearance at the lower end of this valley, where a secondary range of hills, extending from east to west, forces the waters to the surface in what is known as Los Angeles River. Below this point the river discharges through the flat country of Los Angeles Valley, finally entering the Pacific Ocean near the town of Long Beach, Cal. During the summer months the entire flow of Los Angeles River is diverted at a point about 5 miles above Los Angeles for the supply of the city, and only a small amount of water passes this point except during flood discharge of the river. The topography is rough in the upper reaches of this drainage basin, the streams discharging in deep, narrow canyons. In this portion of the drainage basin the formation is of granite, with good soil covering and light timber and heavy brush growth. There is a considerable area of foothill country within this basin, lying between the base of the Sierra Madre Range and Los Angeles Valley, which has a light covering of brush and grass. The soil of San Fernando Valley consists principally of river wash, coarse sand, and gravel, except along the base of the mountains and foothills, where the soil is of good depth and is under a high state of cultivation. The soil of Los Angeles Valley, below the city of Los Angeles, consists of a light sandy loam and is under a high state of cultivation. The mean precipitation throughout this basin is from 15 to 30 inches and falls in the form of rain, except on small areas on the higher mountain elevations.

MISCELLANEOUS MEASUREMENTS IN LOS ANGELES RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in Los Angeles River drainage basin during 1905:

Arroyo Seco near Pasadena, Cal.—This stream is a tributary of Los Angeles River. The following measurements were made on this stream during 1905 by W. B. Clapp:

At mouth of canyon, 5 miles above Pasadena, Cal., April 11: Width, 13.5 feet; area, 8.1 square feet; mean velocity, 2.11 feet per second; discharge, 17.1 second-feet.

At Devils Gate, 3 miles above Pasadena, Cal., April 11: Width, 8 feet; area, 8.7 square feet; mean velocity, 1.44 feet per second; discharge, 12.5 second-feet.

At point 1,000 feet above submerged dam of Pasadena Land and Water Company, at Pasadena, Cal., April 11: Width, 8 feet; area, 2 square feet; mean velocity, 1.30 feet per second; discharge, 2.6 second-feet.

At sycamore grove, near Morgan's south line, Los Angeles, Cal., by J. B. Lippincott, October 27: Width, 1.1 feet; area, 0.16 square foot; mean velocity, 0.64 foot per second; discharge, 0.10 second-foot.

At sycamore grove, 600 feet above Morgan's south line, October 27: Width, 1.2 feet; area, 0.20 square foot; mean velocity, 1.14 feet per second; discharge, 0.23 second-foot.

Big Tejunga Creek near Sunland, Cal.—This stream is a tributary of the Los Angeles River. The following measurements were made during 1905 by R. S. Hawley:

At mouth of canyon, 1 mile above Sunland, Cal., April 12: Width, 25 feet; area, 13.7 square feet; mean velocity, 4.45 feet per second; discharge, 61 second-feet.

At Southern Pacific Company's railroad crossing near Pacoima, Cal., April 12: Width, 25 feet; area, 10.3 square feet; mean velocity, 2.82 feet per second; discharge, 29 second-feet.

Two miles below Southern Pacific Railroad bridge at Pacoima, Cal., April 12: No discharge.

Little Tejunga Creek near Sunland, Cal.—This stream is a tributary of Los Angeles River and discharges into Big Tejunga Creek below Sunland. A measurement was made April 11 by R. S. Hawley at mouth of canyon two-thirds of a mile above the junction with Big Tejunga Creek.

Width, 6 feet; area, 1.6 square feet; mean velocity, 2.06 feet per second; discharge, 3.3 second-feet.

Pacoima Creek near Fernando, Cal.—This stream is a tributary of Los Angeles River. The following measurements were made during 1905 by R. S. Hawley:

At mouth of canyon, 5 miles above Fernando, Cal., April 12: Width, 20 feet; area, 7.3 square feet; mean velocity, 4.11 feet per second; discharge, 30 second-feet.

At Southern Pacific Railroad bridge, 1 mile east of Fernando, Cal., April 12: Width, 10 feet; area, 6.2 square feet; mean velocity, 2.84 feet per second; discharge, 17.6 second-feet.

Three miles below Southern Pacific Railroad bridge, near Fernando, Cal., April 12: No discharge.

MISCELLANEOUS MEASUREMENTS ON LOS ANGELES RIVER.

The following measurements were made on Los Angeles River at Los Angeles, Cal., during 1905:

At Fourth Street Bridge.—March 13: Width, 120 feet; area, 446 square feet; mean velocity, 10.15 feet per second; discharge, 4,525 second-feet.

At Huron street.—April 12: Width, 38 feet; area, 20 square feet; mean velocity, 2.15 feet per second; discharge, 43 second-feet.

At Ninth Street Bridge.—April 12: Width, 13 feet; area, 5.8 square feet; mean velocity, 2.19 feet per second; discharge, 12.7 second-feet.

During the summer of 1905 measurements were made to determine the amount of water diverted by the city of Los Angeles for domestic supply and also to determine the amount of water which passes the city's diversion point. The amount of water diverted for the city's supply is shown in measurements made in the 44-inch conduit and the main supply conduit. The amount of water discharging in the river below these points of diversion is shown by measurements made at Huron street. The following measurements were made during 1905 at these points:

Measurements on Los Angeles River in Los Angeles.

Date.	44-inch conduit discharge.	Main supply conduit discharge.	Huron street.			
			Width.	Area.	Mean velocity.	Discharge.
	Sec.-ft.	*Sec.-ft.*	*Feet.*	*Sq. ft.*	*Ft. per sec.*	*Sec.-ft.*
May 15	42	11	24	7.2	1.47	10.6
June 22	38	9.9	16	3.2	1.03	3.3
July 28	37	8.4	6	2.2	1.77	4.6
September 19	35.3	8.7	6	2.2	1.55	3.4

MALIBU CREEK DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Malibu Creek rises in the Santa Monica Mountains and enters the Pacific Ocean about 15 miles above the town of Santa Monica. This stream is formed by Triunfo and Las Virgenes creeks, which drain the northern portion of the Santa Monica Range and the lower foothill country to the north. The formation throughout this basin is shale, sandstone, and conglomerate, with good soil covering. There is a sparse growth of timber on the higher elevations, but a greater portion of this area has a covering of brush and grass used extensively for pasturage, with limited areas of cultivated land for the raising of grain. A reservoir has been constructed on the upper reaches of the Triunfo Creek and the waters are used for irrigation within the basin during the summer months. This reservoir covers an area of about 300 acres when filled.

The mean precipitation in this basin amounts to about 25 inches and falls wholly in the form of rain.

MALIBU CREEK NEAR CALABASAS, CAL.

This station was established November 29, 1901, by S. G. Bennett. It is located at Chapman's ranch, 40 miles from Los Angeles, by wagon road, and 8 miles southwest of Calabasas, about one-fourth mile below the mouth of Las Virgenes Creek.

The channel section is poor and subject to change during high water, but is at the only point where an observer could be secured. The excessive cost of visiting the station has made it impossible to obtain as many meter measurements as desired, but the observer is instructed to take float velocities at various gage heights, and these data, with cross sections and slope, are used in addition to meter measurements for computing discharges for use in constructing rating curves and tables. The estimated discharge is a rough approximation only.

The channel is straight for about 600 feet above the station and curved for about 300 feet below. The current is swift. Both banks are high. The right bank is rocky, and the bed of the stream is composed of rock and gravel.

The initial point for soundings is on the right bank. The gage rod is a vertical staff fastened to an alder tree on the right bank. During 1905 the gage was read by J. G. Chapman. The bench mark is a cross on a small projection on a rock bluff about 10 feet southwest of the gage rod; elevation, 5.43 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 100 and 134 of the United States Geological Survey.

Discharge measurements of Malibu Creek near Calabasas, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
April 20	R. S. Hawley	9	6.2	1.5	0.9	9.3
May 12	do	9	6.3	1.35	.82	8.5

Daily gage height, in feet, of Malibu Creek near Calabasas, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.2	1.2	1.1	1.5	0.8	0.6	0.5	0.5	0.5	0.4	0.45	0.5
2	1.2	1.3	1.1	1.25	.8	.6	.5	.5	.5	.4	.45	.5
3	1.2	1.6	1.1	1.2	.8	.6	.5	.5	.5	.4	.45	.5
4	1.2	2.85	1.1	1.2	.8	.6	.5	.5	.5	.4	.45	.5
5	1.2	1.85	1.1	1.2	.8	.6	.5	.5	.5	.4	.55	.5
6	1.2	2.1	1.1	1.25	.8	.6	.5	.5	.5	.4	.55	.5
7	1.2	1.3	1.1	1.25	1.3	.6	.5	.5	.5	.4	.55	.5
8	1.2	1.2	1.1	1.25	.9	.6	.5	.5	.5	.4	.55	.5
9	1.2	1.15	1.1	1.2	.9	.6	.6	.5	.5	.4	.55	.5
10	1.2	1.15	1.1	1.2	.9	.6	.6	.5	.5	.4	.55	.6
11	1.2	1.15	1.0	1.2	.9	.6	.6	.5	.45	.4	.55	.6
12	1.2	1.15	7.6	1.1	.9	.6	.6	.5	.45	.4	.6	.6
13	1.2	1.15	4.2	1.25	.9	.6	.6	.5	.45	.4	.6	.6
14	1.2	1.1	3.25	1.0	.7	.6	.6	.5	.45	.4	.6	.6
15	1.2	1.1	3.25	1.0	.7	.6	.6	.5	.45	.4	.6	.6
16	1.2	1.8	4.75	1.0	.7	.6	.6	.5	.45	.4	.6	.6
17	1.2	1.65	3.55	1.0	.7	.6	.6	.5	.45	.4	.6	.6
18	1.2	1.55	2.8	.9	.7	.6	.6	.5	.4	.4	.6	.6
19	1.22	1.4	2.5	.9	.7	.6	.6	.5	.4	.4	.6	.6
20	1.25	1.3	2.4	.9	.7	.6	.6	.5	.4	.4	.6	.6
21	1.3	1.2	2.4	.9	.7	.6	.6	.5	.4	.4	.6	.6
22	1.24	1.2	2.3	.9	.7	.6	.6	.5	.4	.4	.6	.6
23	1.2	1.15	2.2	.9	.7	.6	.5	.5	.45	.4	.6	.6
24	1.2	1.1	2.2	.9	.7	.6	.5	.5	.45	.4	.6	.6
25	1.2	1.1	1.0	.9	.7	.5	.5	.5	.45	.4	.6	.6
26	1.2	1.1	1.6	.9	.7	.5	.5	.5	.45	.4	.5	.6
27	1.2	1.1	1.45	.9	.7	.5	.5	.5	.45	.4	.5	.6
28	1.2	1.1	1.55	.8	.6	.5	.5	.5	.45	.4	.5	.6
29	1.2	.....	1.7	.8	.6	.5	.5	.5	.45	.45	.5	.6
30	1.2	.....	1.7	.8	.6	.5	.5	.5	.45	.45	.5	.6
31	1.2	.....	1.55	.....	.6	.....	.5	.5	.....	.45	.....	.6

Estimated monthly discharge of Malibu Creek near Calabasas, Cal., for 1905.

[Drainage area, 97 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	10	5	5.4	332	0.056	0.065
February	560	2	36.1	2,005	.372	.387
March	6,800	1	484.	29,760	4.99	5.75
April	41	8	14.4	857	.148	.165
May	24	4	7.3	449	.075	.086
June	4	3	3.8	226	.039	.044
July	3	3	3.0	184	.031	.036
August	3	3	3.0	184	.031	.036
September	3	1	2.1	125	.022	.024
October	2	1	1.1	68	.011	.013
November	4	2	3.6	214	.037	.041
December	4	3	3.7	228	.038	.044
The year	6,800	1	47.3	34,630	.488	6.69

NOTE.—The estimated monthly discharge is only an approximation.

TRIUNFO CREEK NEAR CALABASAS, CAL.

This station is located 8 miles southwest of Calabasas, Cal., about one-half mile above the mouth of Las Virgenes Creek.

The channel section is poor and subject to change during high water, but is at the only point where an observer could be secured. The excessive cost of visiting the station has made it impossible to obtain as many meter measurements as desired, but the observer is instructed to take float velocities during floods at various gage heights, and these data, with cross sections and grade of stream, are used in addition to meter measurements for computing discharges for use in constructing rating curves and tables. The estimated discharge from this stream is a rough approximation only.

The channel is straight for about 400 feet above and 800 feet below the station, and the water is swift. Both banks are high and rocky. The bed of the stream is composed of gravel and sand and is shifting.

The initial point for soundings is on the right bank. The gage rod is a vertical staff bolted to rock cliff on right bank. During 1905 the gage was read by J. G. Chapman. The bench mark is a cross on a point of rock 3.5 feet above the bed of the creek on the right bank; elevation, 4.53 feet above the datum of the gage.

Information in regard to this section is contained in Water-Supply Papers Nos. 100 and 134 of the United States Geological Survey.

Discharge measurements of Triunfo Creek near Calabasas, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
April 20	R. S. Hawley	15	7.1	1.13	1.60	8.0
May 12	do	17	6.3	1.13	1.44	7.1

Daily gage height, in feet, of Triunfo Creek near Calabasas, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	.....	0.00	0.5	1.3	.....	1.3	1.0
2	.....	.75	.5	1.5	.....	1.3	1.1
3	.....	.9	.5	1.5	.....	1.3	1.1
4	.....	2.15	.5	1.5	.....	1.3	1.1
5	.....	1.65	.5	1.5	.....	1.3	1.1
6	.....	2.2	.5	1.5	.....	1.3	1.1
7	.....	1.65	.5	1.6	1.4	1.3	1.1
8	.....	1.0	.5	1.6	.8	1.3	1.1
9	.....	.9	.5	1.6	.4	1.3	1.2
10	.....	.7	.45	1.5	.....	1.3	1.2
11	.....	.55	.45	1.55	.....	1.25	1.2
12	.....	.5	6.0	1.5	.....	1.25	1.2
13	.....	.5	2.55	1.5	.....	1.25	1.2
14	.....	.3	2.15	1.5	1.2	1.25	1.2
15	.....	.3	2.05	1.5	1.2	1.25	1.2
16	.....	1.65	3.3	1.5	1.2	1.25	1.2
17	.....	1.45	3.1	1.5	1.2	1.25	1.2
18	.....	1.3	2.6	1.5	1.2	1.2	1.2
19	.....	1.2	2.25	1.4	1.2	1.2	1.2
20	.....	1.1	1.2	1.4	1.2	1.2	1.2
21	.....	.9	1.2	1.4	1.2	1.2	1.2
22	.....	.85	1.2	1.4	1.2	1.2	1.2
23	.....	.8	1.1	.....	1.2	1.2	1.1
24	.....	.8	2.2	.....	1.2	1.2	1.1
25	.....	.7	1.6	.....	1.2	1.0	1.1
26	.....	.7	1.4	.....	1.3	1.0	1.1
27	.....	.7	1.4	.....	1.3	1.0	1.1
28	.....	.6	1.3	.....	1.3	1.0	1.1
29	.....	.....	1.4	.....	1.3	1.0	1.1
30	.....	.....	1.4	.....	1.3	1.0	1.0
31	.....	.....	1.4	.....	1.3	.....	0.0

NOTE.—Creek dry Jan 2 to Feb. 1, Apr. 23 to May 6, May 10–13, Aug. 1 to Dec. 31.

Estimated monthly discharge of Triunfo Creek near Calabasas, Cal., for 1905.

[Drainage area, 72 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	0	0	0.0	0	0.0	0.0
February	410	0	26.2	1,455	.364	.379
March	5,000	1	353.0	21,700	4.90	5.65
April	40	0	11.2	666	.156	.174
May	6	0	1.0	61	.014	.016
June	2	1	1.3	77	.018	.020
July	1	0	.97	60	.013	.015
August	0	0	.0	0	.0	.0
September	0	0	.0	0	.0	.0
October	0	0	.0	0	.0	.0
November	0	0	.0	0	.0	.0
December	0	0	.0	0	.0	.0
The year	5,000	0	32.8	24,020	.455	6.25

'NOTE.—The estimated monthly discharge is only an approximation.

SANTA CLARA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Santa Clara River rises in the Coast Range in the northwestern part of Los Angeles County and flows in a westerly direction, discharging its waters into the Pacific Ocean near Ventura, Cal. It has numerous tributaries from the north, all of which are torrential in their character, having a heavy discharge during the winter months. This stream has a comparatively flat grade, flowing over a sandy and gravelly bed, into which it sinks during a greater portion of the year. At numerous points along its course the water rises to the surface during the summer and flows for a short distance, again disappearing in the sand. At points where the waters make their appearance on the surface numerous diversions are made for irrigation along the valley, where the soil is deep and is under the highest state of cultivation, this being especially the case on the lower reaches of the river below the town of Santa Paula. The principal tributaries of this stream are Piru Creek, Sespe Creek, and Santa Paula Creek, all of which produce a very heavy flood discharge of short duration during the rainy season, but during the summer months have a light discharge. On the upper reaches of the principal tributaries of this stream the topography is rough and broken, the streams discharging through deep canyons. This is especially noticeable on the Sespe Creek. On the upper reaches of the main stream the country is rolling and has a sparse covering of timber with a considerable growth of brush and grass, and is used extensively for pasturage. The formation is of shale, sandstone, and conglomerate throughout the entire basin. The precipitation is extremely light in the upper reaches of this basin, but increases on the lower reaches nearer the Pacific Ocean and falls in the form of rain.

MISCELLANEOUS MEASUREMENTS IN SANTA CLARA RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in the Santa Clara River drainage basin during 1905:

Camulos ditch near Camulos, Cal.—This ditch diverts water from the Santa Clara River 1 mile above Camulos, Cal. The water is used for the irrigation of land at Camulos. A measurement was made October 19 by W. B. Clapp in a flume about 1,000 feet below the head of the canal.

Width, 3.5 feet; area, 3.5 square feet; mean velocity, 2.17 feet per second; discharge, 7.6 second-feet.

Farmers' canal near Santa Paula, Cal.—This canal diverts water from the Santa Clara River at a point 1 mile above Santa Paula, Cal. The water is used for irrigation of land between Santa Paula and Saticoy, Cal. A measurement was made October 21 by W. B. Clapp in flume 200 feet below where canal crosses Santa Clara River, about 1 mile above the town of Santa Paula, Cal.

Width, 4 feet; area, 4.8 square feet; mean velocity, 1.50 feet per second; discharge, 7.2 second-feet.

Grees ditch near Santa Paula, Cal.—This ditch diverts water from the Santa Clara River about 1 mile above the town of Santa Paula, Cal. The water is used for the irrigation of land between Santa Paula and Saticoy. A measurement was made on October 21 by W. B. Clapp at a point 200 feet below head of ditch and about 1 mile above the town of Santa Paula, Cal.

Width, 8 feet; area, 6.6 square feet; mean velocity, 1.39 feet per second; discharge, 9.2 second-feet.

Piru Land and Water Company's upper diversion near Esperanza, Cal.—This water is diverted from Piru Creek for domestic and irrigation purposes in the town of Piru, Cal. A measurement was made October 20 by W. B. Clapp at point of diversion at head of pipe line, 1 mile above the town of Esperanza, Cal.

Width, 5 feet; area, 1.5 square feet; mean velocity, 0.93 foot per second; discharge, 1.4 second-feet.

Piru Creek near Esperanza, Cal.—This stream is a tributary of the Santa Clara River. A measurement was made October 20 by W. B. Clapp at point 1 mile above Esperanza, Cal., and below the upper diversion of the Piru Land and Water Company.

Width, 8 feet; area, 2.4 square feet; mean velocity, 1.42 feet per second; discharge, 3.4 second-feet. For total flow of Piru Creek at this point add upper diversion of Piru Land and Water Company.

Piru Creek near Piru City, Cal.—A measurement was made October 20 by W. B. Clapp 1 mile above Piru City and above lower diversion of Piru Land and Water Company.

Width, 8 feet; area, 2.8 square feet; mean velocity, 1.90 feet per second; discharge, 5.3 second-feet. This measurement shows total flow of Piru Creek at this point and includes the discharge of Piru Creek 1 mile above Esperanza, Cal. The increase is caused by seepage water along the creek.

Sespe Land and Water Company's canal near Sespe, Cal.—This canal diverts water from Sespe Creek and is used for irrigation of land in the vicinity of Sespe. A measurement was made October 20 by W. B. Clapp one-half mile below head of canal.

Width, 5.2 feet; area, 4.5 square feet; mean velocity, 1.47 feet per second; discharge, 6.6 second-feet.

Sespe Creek near Sespe, Cal.—This creek is a tributary of the Santa Clara River. A measurement was made October 20 by W. B. Clapp one-half mile below heading of Sespe Land and Water Company's canal.

Width, 4 feet; area, 2.9 square feet; mean velocity, 1.66 feet per second; discharge, 4.8 second-feet. For total flow of Sespe Creek add discharge of Sespe Land and Water Company's canal as shown by measurement made on this date.

San Francisquito Creek near Saugus, Cal.—This creek is a tributary of the Santa Clara River. A measurement was made October 19 by W. B. Clapp at road crossing near Newhall ranch, 3½ miles below Saugus, Cal., and 500 feet above junction with Santa Clara River

Width, 5 feet; area, 2.8 square feet; mean velocity, 0.46 foot per second; discharge, 1.3 second-feet.

Santa Paula Creek near Santa Paula, Cal.—This stream is a tributary of the Santa Clara River. A measurement was made October 21 by W. B. Clapp 3 miles above Santa Paula and above diversion of the Santa Paula Land and Water Company.

Width, 11 feet; area, 5.6 square feet; mean velocity, 0.88 foot per second; discharge, 4.9 second-feet. This measurement shows total discharge of Santa Paula Creek on this date.

Santa Clara River near Saugus, Cal.—A measurement was made October 19 by W. B. Clapp at road crossing near Newhall ranch, 3½ miles below Saugus, Cal.

Width, 6 feet; area, 3.8 square feet; mean velocity, 1.39 feet per second; discharge, 5.3 second-feet.

Santa Clara River near Camulos, Cal.—A measurement was made October 19 by W. B. Clapp at a point 1 mile above Camulos and 1,000 feet below diversion of Camulos ditch.

Width, 11 feet; area, 4.9 square feet; mean velocity, 2.06 feet per second; discharge, 10.1 second-feet. For total discharge of Santa Clara River at this point add discharge of Camulos ditch.

Santa Clara River near Santa Paula, Cal.—A measurement was made October 21 by W. B. Clapp 1 mile above Santa Paula and about 500 feet below diversion of Farmers and Grees canals.

Width, 33 feet; area, 17.4 square feet; mean velocity, 1.55 feet per second; discharge, 27 second-feet. For total diversion of Santa Clara River at this point add discharge of Farmers and Grees canals.

Santa Clara River near Saticoy, Cal.—A measurement was made October 21 by W. B. Clapp at a point opposite Saticoy and 200 feet below head of Santa Clara Water and Irrigation Company's canal.

Width, 14 feet; area, 14.7 square feet; mean velocity, 1.63 feet per second; discharge, 24 second-feet. For total discharge of Santa Clara River at this point add discharge of Santa Clara Water and Irrigation Company's canal.

Santa Clara Water and Irrigation Company's canal near Saticoy, Cal.—This canal diverts water from the Santa Clara River and is used for the irrigation of Santa Clara ranch near Oxnard, Cal.

Measurement made over weir. Discharge equals 16.7 second-feet.

SANTA YNEZ RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Santa Ynez River rises in the mountains of Santa Barbara and Ventura counties and flows westerly with a flat grade to the Pacific Ocean, having a length of approximately 75 miles. The Santa Ynez Range of mountains, varying in elevation from 3,000 to 4,000 feet, forms the southern boundary of this drainage basin. The northern divide ranges from 4,500 to 5,500 feet in elevation, culminating in Mount Pinos, the elevation of which is 8,826 feet. The northern part of the watershed is drained by streams running in a southerly direction and uniting with the Santa Ynez River proper, which runs close to the northerly base of the Santa Ynez Mountains, flowing westerly and paralleling the Coast Range. The principal tributary, Mono Creek, enters from the north.

The formation throughout the entire drainage basin consists chiefly of shale and sandstone, the strike being parallel to the coast and the dip nearly vertical, inclining somewhat to the south.

The greater portion of the drainage is sparsely covered with brush and small trees, only a small area on the higher elevations having any considerable growth of timber.

The mean annual precipitation is estimated at 25 inches for the entire area and falls almost entirely in the form of rain.

There are several reservoir sites on Santa Ynez and its tributaries which have been surveyed.

SANTA YNEZ RIVER NEAR SANTA BARBARA, CAL.

The original station, at which measurements were made during the greater part of 1903, was located about 1 mile above the mouth of Mono Creek. On November 1, 1903, the old station was abandoned and a new station established by L. M. Hyde. It is located at the Gibraltar dam site, 5 miles below the original station, and is below the mouth of Mono Creek. It is 9 miles above the San Marcus ranch and halfway between the old quicksilver mines.

The channel is straight for 700 feet above and 600 feet below the station. The right bank is low, but is not liable to overflow. The left bank rises abruptly about 20 feet beyond the tree to which the cable is attached. It is not liable to overflow. The bed of the stream is composed of sand and gravel, free from vegetation and bowlders. The cross section is regular and is permanent. The current is swift.

Discharge measurements are made at high water by means of a cable. Measurements can can usually be made by wading. The initial point for soundings is a blaze at the base of the cottonwood tree on the right bank, to which the cable is attached.

The gage is an inclined timber spiked to a cottonwood tree on the right bank. The tree is blazed and graduated above the gage rod for recording stages above the gage. The bench mark is a cross on a bench of a ledge of rock on the left bank, about 100 feet below the cable. Elevation, 13.54 feet above the datum of the gage. The approximate elevation above sea level, as estimated from topographic maps, is 1,200 feet.

Information in regard to this station is contained in Water Supply Papers Nos. 81, 100, and 134 of the United States Geological Survey.

Daily gage height, in feet, of Santa Ynez River near Santa Barbara, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.3	2.5	3.1	3.25	2.65	2.4	2.05	2.0	1.9	1.8	1.8	2.05
2	2.3	3.6	3.05	3.25	2.7	2.4	2.05	2.0	1.9	1.8	1.8	2.05
3	2.25	8.4	3.0	3.2	2.65	2.4	2.05	2.0	1.85	1.8	1.8	2.05
4	2.25	6.8	3.0	3.15	2.6	2.4	2.05	2.0	1.85	1.8	1.8	2.05
5	2.25	4.0	3.05	3.15	2.6	2.4	2.05	2.0	1.85	1.8	1.8	2.05
6	2.25	3.9	3.1	3.1	2.6	2.4	2.05	2.0	1.85	1.8	1.85	2.05
7	2.2	3.75	3.0	3.1	2.6	2.4	2.05	2.0	1.85	1.8	1.85	2.05
8	3.8	3.7	2.9	3.05	2.6	2.4	2.05	2.0	1.85	1.8	1.85	2.05
9	3.7	3.65	2.9	3.05	2.6	2.35	2.05	2.0	1.85	1.8	1.85	2.05
10	2.6	3.65	2.85	3.05	2.6	2.35	2.05	2.0	1.85	1.8	1.85	2.05
11	2.55	3.6	2.9	3.0	2.6	2.35	2.05	2.0	1.85	1.8	1.85	2.05
12	2.5	3.6	4.7	3.05	2.6	2.3	2.05	2.0	1.85	1.8	1.9	2.05
13	2.45	3.6	8.9	3.0	2.55	2.3	2.05	2.0	1.85	1.8	1.9	2.05
14	2.4	3.55	5.65	2.95	2.55	2.25	2.05	2.0	1.85	1.8	1.9	2.05
15	2.45	3.4	4.65	2.95	2.55	2.25	2.05	2.0	1.85	1.8	1.9	2.05
16	2.5	4.45	5.3	2.9	2.55	2.2	2.05	1.95	1.85	1.8	1.9	2.05
17	2.45	6.55	4.65	2.9	2.55	2.2	2.05	1.95	1.85	1.8	1.9	2.05
18	2.4	4.0	4.4	2.9	2.5	2.2	2.05	1.95	1.85	1.8	1.9	2.05
19	2.4	3.75	4.15	2.85	2.5	2.15	2.05	1.95	1.85	1.8	1.9	2.05
20	2.4	3.7	4.0	2.85	2.5	2.15	2.05	1.95	1.85	1.8	1.9	2.05
21	4.25	3.65	3.8	2.85	2.5	2.15	2.05	1.95	1.85	1.8	1.9	2.05
22	3.15	3.5	3.75	2.8	2.5	2.1	2.05	1.95	1.85	1.8	1.9	2.05
23	2.9	3.4	3.65	2.8	2.5	2.1	2.05	1.95	1.8	1.8	1.9	2.05
24	2.8	3.3	3.6	2.8	2.5	2.1	2.05	1.9	1.8	1.8	1.9	2.05
25	2.75	3.2	3.55	2.75	2.45	2.1	2.05	1.9	1.8	1.8	1.9	2.05
26	2.65	3.15	3.5	2.75	2.45	2.1	2.0	1.9	1.8	1.8	2.0	2.05
27	2.65	3.1	3.4	2.85	2.45	2.1	2.0	1.9	1.8	1.8	2.1	2.05
28	2.6	3.1	3.4	2.75	2.45	2.1	2.0	1.9	1.8	1.8	2.1	2.05
29	2.6	.....	3.6	2.7	2.45	2.1	2.0	1.9	1.8	1.8	2.1	2.05
30	2.5	.....	3.4	2.7	2.45	2.1	2.0	1.9	1.8	1.8	2.05	2.05
31	2.5	.....	3.3	.....	2.45	.....	2.0	1.9	.....	1.8	.....	2.05

Station rating table for Santa Ynez River near Santa Barbara, Cal., from January 1 to February 2, 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	0.4	2.60	38	3.20	154	3.80	401
2.10	2.8	2.70	50	3.30	186	3.90	451
2.20	6.4	2.80	65	3.40	222	4.00	502
2.30	11.6	2.90	82	3.50	263		
2.40	18.5	3.00	103	3.60	306		
2.50	28	3.10	126	3.70	353		

Station rating table for Santa Ynez River near Santa Barbara, Cal., from February 3 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.*
1.80	1	3.00	153	4.20	875	5.80	2,790
1.90	2	3.10	184	4.30	965	6.00	3,070
2.00	3	3.20	220	4.40	1,065	6.20	3,360
2.10	5	3.30	265	4.50	1,175	6.40	3,650
2.20	10	3.40	315	4.60	1,285	6.60	3,940
2.30	19	3.50	370	4.70	1,395	6.80	4.230
2.40	30	3.60	430	4.80	1,510	7.00	4,520
2.50	44	3.70	495	4.90	1,630	7.50	5,245
2.60	60	3.80	565	5.00	1,750	8.00	5,970
2.70	79	3.90	635	5.20	1,990	8.50	6,695
2.80	100	4.00	710	5.40	2,250	9.00	7,420
2.90	125	4.10	790	5.60	2,510		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during January, February, and March, 1906.

Estimated monthly discharge of Santa Ynez River near Santa Barbara, Cal., for 1905.

[Drainage area, 207 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	635	6.4	73.8	4,538	0.357	0.412
February	6,550	28.0	905	50,260	4.37	4.55
March	7,275	112	797	49,010	3.85	4.44
April	242	79	143	8,509	.691	.771
May	100	37	52.5	3,228	.254	.293
June	30	5	15.9	946	.077	.086
July	4	3	3.8	234	.018	.021
August	3	2	2.6	160	.013	.015
September	2	1	1.4	83	.0068	.0076
October	1	1	1.0	61	.0048	.0055
November	5	1	2.1	125	.010	.011
December	4	4	4.0	246	.019	.022
The year	7,275	1.0	167	117,400	.806	10.63

SANTA MARIA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Santa Maria River drains the northern slope of the San Rafael Mountains and a limited area of foothill country to the north of this range. It flows in a westerly direction, finally discharging its waters into the Pacific Ocean at Guadalupe about 25 miles south of San Luis Obispo. Its flow is torrential in character, subject to floods of short duration during the rainy period, but being practically dry during the summer months. It has numerous tributaries, the most important of which is the Sisquoc, which enters it about 12 miles above the town of Santa Maria. The gaging station is located about 25 miles above the town of Santa Maria and above most of its important tributaries. The country throughout this basin consists of rolling foothills, with the exception of the higher elevations of the San Rafael Mountains, which reach an elevation of 6,000 to 8,000 feet. The river breaks from the foothills at the point where it is joined by the Sisquoc and flows through the flat country of the Santa Maria Valley for a distance of about 25 miles until it joins the Pacific Ocean at Guadalupe. The formation throughout this basin is of shale, sandstone, and conglomerate, with a good covering of heavy clay soil. There is considerable growth of timber on the higher elevations of the San Rafael Mountains, but over most of the area the growth of timber is light, with large areas of brush and grass. The pasturage of stock is carried on extensively throughout the basin. There are no diversions along this stream for irrigation although tunnel work has been attempted above Santa Maria for the development of underground water, with poor results. There are numerous wells in the vicinity of Santa Maria which produce considerable water for the irrigation of land in that locality, the soil being very deep and of exceptional quality, susceptible to the highest state of cultivation. The mean precipitation in this drainage basin is probably about 25 inches. The greatest rainfall occurs on the lower elevations near the coast. The higher elevations receive some snowfall, which melts early in the spring and does not tend to keep up the flow of the stream through the summer.

SANTA MARIA RIVER NEAR SANTA MARIA, CAL.

This station was established October 22, 1903, by W. B. Clapp. It is located near the ranch house on Dutard's ranch, 21 miles above Santa Maria, Cal., a station on the Pacific Coast Railway. It is reached by driving from Santa Maria.

The channel is slightly curved for 300 feet above and curved for 1,000 feet below the station. The water is swift at medium and flood stages.

The right bank is high and rocky, and not liable to overflow. The left bank is low, covered with scattering poplar trees, but not liable to overflow. The bed of the stream is composed of sand and gravel. A portion of the bed is covered with a light growth of low brush. The channel is not liable to much change.

At low and medium water discharge measurements are made with meter by wading. During high water velocities are measured by means of floats. For this purpose two wires are stretched across the stream 254 feet apart. The rise in the channel above the upper wire is 0.40 foot in 100 feet, and below the upper wire it is 0.57 foot in 100 feet. The initial points for soundings are blazes on the poplar trees on the left bank, to which the wires are attached.

The gage is an inclined staff, fastened to a rock ledge at the right bank. During 1905 the gage was read once each day by James A. Thompson. The bench mark is a spike driven near the ground into the south side of the poplar tree to which the upper wire is fastened on the left bank of the stream; elevation, 9.65 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 100 and 134 of the United States Geological Survey.

Discharge measurements of Santa Maria River near Santa Maria, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
February 2	E. C. La Rue	34	30	2.67	3.30	80
March 6	O. W. Peterson	24	22	2.14	2.70	47
March 21	do	40	28	2.39	1.20	67

Daily gage height, in feet, of Santa Maria River near Santa Maria, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.5	2.6	2.05	0.9	0.8	0.65	0.7	0.6	0.5	0.6	0.75	0.85
2	3.0	3.8	2.05	.9	1.1	.65	.7	.6	.5	.6	.75	.85
3	2.9	6.0	2.05	.9	1.0	.7	.7	.6	.5	.6	.75	.85
4	2.7	5.95	2.05	.9	.85	.7	.7	.6	.5	.65	.75	.8
5	2.7	5.0	2.05	.9	.8	.7	.7	.6	.5	.65	.75	.8
6	2.7	5.0	2.7	.9	.8	.7	.7	.6	.5	.65	.75	.8
7	2.7	3.5	2.65	.85	.8	.7	.7	.6	.5	.65	.75	.8
8	2.7	3.2	2.5	.85	1.2	.7	.7	.6	.5	.65	.75	.8
9	2.7	3.0	2.35	.85	1.25	.7	.7	.6	.5	.65	.75	.8
10	2.7	2.9	2.2	.85	1.0	.7	.7	.6	.5	.65	.75	.8
11	2.7	2.85	2.2	.85	.9	.7	.7	.6	.5	.65	.75	.8
12	2.65	2.8	2.2	.85	.9	.7	.7	.6	.5	.65	.75	.8
13	2.65	2.75	10.0	.85	.85	.7	.7	.6	.5	.65	.75	.8
14	2.65	2.75	[a] 5.0	.85	.85	.7	.7	.6	.5	.65	.75	.8
15	2.65	2.65	[a] 4.5	.85	.8	.7	.7	.6	.5	.65	.75	.8
16	2.7	3.0	[a] 4.0	.85	.8	.7	.7	.6	.5	.7	.75	.8
17	2.65	4.1	[a] 4.0	.85	.8	.7	.65	.6	.5	.7	.75	.8
18	2.65	5.95	[a] 3.5	.85	.8	.7	.65	.6	.5	.7	.75	.8
19	2.65	4.0	[a] 3.5	.85	.8	.7	.65	.6	.5	.7	.75	.85
20	2.65	2.6	[a] 2.0	.85	.8	.7	.65	.6	.5	.7	.75	.85
21	3.0	2.4	1.2	.85	.8	.7	.65	.6	.5	.7	.75	.85
22	2.8	2.35	1.1	.85	.75	.7	.65	.6	.5	.7	.75	.85
23	2.7	2.25	1.05	.85	.75	.7	.65	.6	.5	.7	.75	.85
24	2.7	2.15	1.05	.85	.7	.7	.65	.6	.5	.7	.75	.85
25	2.65	2.15	1.0	.85	.65	.7	.65	.55	.7	.75	.75	.85
26	2.65	2.15	1.0	.85	.6	.7	.65	.55	.7	.75	.75	.8
27	2.65	2.1	1.0	.85	.6	.7	.65	.55	.65	.75	.75	.8
28	2.65	2.05	1.2	.85	.6	.7	.65	.55	.6	.75	.85	.8
29	2.65	.....	1.2	.8	.6	.7	.65	.5	.6	.75	.85	.85
30	2.6	.....	1.1	.8	.65	.7	.6	.5	.6	.75	.85	.85
31	2.6	.....	1.0	.....	.65	.....	.6	.5	.....	.75	.....	.85

[a] Estimated.

Station rating table for Santa Maria River near Santa Maria, Cal., from January 1 to February 2, 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	1	2.60	13	3.20	67	3.70	178
2.10	2	2.70	18	3.30	82	3.80	213
2.20	3	2.80	25	3.40	100	3.90	250
2.30	5	2.90	33	3.50	122	4.00	290
2.40	7	3.00	43	3.60	148	4.10	330
2.50	10	3.10	54				

Station rating table for Santa Maria River near Santa Maria, Cal., from February 3 to March 12, 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.*
1.70	1	2.70	48	3.70	285	4.70	915
1.80	2	2.80	59	3.80	335	4.80	990
1.90	3	2.90	72	3.90	385	4.90	1,065
2.00	5	3.00	87	4.00	440	5.00	1,140
2.10	8	3.10	105	4.10	500	5.20	1,290
2.20	12	3.20	125	4.20	565	5.40	1,440
2.30	17	3.30	147	4.30	630	5.60	1,595
2.40	23	3.40	173	4.40	700	5.80	1,755
2.50	30	3.50	205	4.50	770	6.00	1,915
2.60	38	3.60	242	4.60	840		

Stationrating table for Santa Maria River near Santa Maria, Cal., from March 13 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.*
0.50	1	2.00	250	4.00	1,070	7.00	3,260
0.60	3	2.10	280	4.20	1,185	7.20	3,450
0.70	6	2.20	310	4.40	1,305	7.40	3,650
0.80	10	2.30	340	4.60	1,435	7.60	3,870
0.90	18	2.40	375	4.80	1,565	7.80	4,100
1.00	31	2.50	410	5.00	1,700	8.00	4,350
1.10	47	2.60	445	5.20	1,840	8.20	4,640
1.20	65	2.70	480	5.40	1,980	8.40	4,970
1.30	84	2.80	520	5.60	2,130	8.60	5,340
1.40	105	2.90	560	5.80	2,280	8.80	5,750
1.50	127	3.00	600	6.00	2,430	9.00	6,200
1.60	150	3.20	690	6.20	2,585	10.00	10,000
1.70	175	3.40	780	6.40	2,745		
1.80	200	3.60	875	6.60	2,910		
1.90	225	3.80	975	6.80	3,080		

NOTE.—The upper part of the rating curve is based on slope measurements.

Estimated monthly discharge of Santa Maria River near Santa Maria, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	122	13	22.5	1,384
February	1,915	6	361	20,050
March	10,000	6	574	35,290
April	18	10	14.5	863
May	74	3	15.5	953
June	6	4	5.9	352
July	6	3	5.0	307
August	3	1	2.7	166
September	6	1	1.6	96
October	8	3	5.4	332
November	14	8	8.6	512
December	14	10	11.7	719
The year	10,000	1	85.7	61,020

NOTE.—Estimates during high-water periods are approximate only.

SALINAS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Arroyo Seco is the most northern tributary of any size of the Salinas River, and rises on the slopes of the highest portion of the Santa Lucia Range, one of the ranges that go to make up the Coast Range of California extending in a general southeast direction from San Francisco Bay. The upper valleys of this stream are far back in the range, surrounded by high mountains.

The drainage area of the Arroyo Seco is almost entirely made up of sharp ridges and V-shaped canyons. The western portion is well covered with brush and trees of medium size. Toward the east this growth decreases until at the Salinas Valley the country is bare. The stream beds of this area fall rapidly, the Arroyo Seco rising at an elevation of nearly 6,000 feet and discharging into the Salinas at an elevation of 170 feet.

Below the gaging station several canals divert water from this stream before it reaches the broad wash of sand and gravel on the flat floor of the Salinas Valley, into which it sinks during the dry season and from which it receives its name "Arroyo Seco."

There are five reservoir sites on the stream and its tributaries, of more or less value as possible storage reservoirs, that have already been surveyed.

This portion of the range undoubtedly receives as great rainfall as any other locality in this region, and it is estimated that the average annual precipitation is from 30 to 50 inches and falls almost entirely in the form of rain.

ARROYO SECO NEAR SOLEDAD, CAL.

The original gaging station on this stream was established by W. W. Cockins, jr., in December, 1900, at Foster's ranch, near Piney, Cal. High water of January, 1901, enlarged an old side channel, dividing the stream into two channels. The gaging station was then removed to Pettitt's ranch, 4 miles below the old station.

The channel is straight for 400 feet above and below the station. The right bank is low, wooded, and subject to overflow. The left bank is high, rocky, and not subject to overflow. The bed of the stream is composed of gravel and is not subject to much change.

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

The gage rod is in two sections. The low-water section is placed 400 feet above the cable on the right bank; the high-water section is fastened to a sycamore tree above the cable and about 250 feet from the right bank of the low-water channel. During 1905 the gage was read by Mrs. Charles Pettitt. The bench mark is a spike in the tree to which the high-water section of the gage is fastened; elevation, 15.00 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 100, and 134 of the United States Geological Survey.

Discharge measurements of Arroyo Seco River near Soledad, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 31	La Rue and Pettitt	122	123	1.04	5.91	128
February 2	Charles Pettitt	130	410	3.84	8.80	1,574
February 3	do	124	281	3.05	7.50	856
February 5	do	125	254	3.06	7.35	778
February 16	do	125	212	2.29	6.82	486
February 17	do	133	423	4.32	8.95	1,829
March 11	do	120	135	1.05	5.90	142
March 13	do	133	484	4.65	10.05	2,253
March 16	do	128	327	4.02	8.00	1,315
March 17	do	128	288	2.91	7.50	838
March 19	do	133	455	4.90	9.30	2,233
March 29	do	125	248	2.36	7.05	585
April 9	do	123	158	1.57	6.10	248
April 16	do	123	150	1.40	6.09	210
April 19	do	123	151	1.59	6.16	240
April 29	do	122	117	1.07	5.95	125
May 7	do	130	351	3.75	8.30	1,317
May 8	do	125	241	2.86	7.12	689
May 28	do	123	107	1.15	5.93	123
June 4	do	123	113	1.03	5.83	116
June 12	do	122	95	.82	5.75	78
June 18	do	122	89	.76	5.70	68
Do	do	48	63	1.24	5.70	78
June 24	do	43	54	1.00	5.62	54
July 3	do	41	49	.80	5.55	39
July 9	do	40	46	.61	5.48	28
July 15	do	38	42	.57	5.45	24
July 23	do	35	39	.54	5.42	21
July 29	do	36	37	.43	5.40	16
August 6	do	34	35	.37	5.38	13
August 10	do	27	24	.33	5.33	8

Daily gage height, in feet, of Arroyo Seco River near Soledad, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.1	8.4	6.15	6.5	5.9	5.85	5.6	5.4	5.2	5.25	5.35	5.65
2	5.9	8.6	6.1	6.45	6.55	5.85	5.55	5.4	5.2	5.25	5.35	5.6
3	5.8	7.45	6.05	6.4	6.2	5.8	5.5	5.4	5.2	5.25	5.35	5.55
4	5.75	7.4	6.0	6.35	6.05	5.85	5.5	5.4	5.2	5.25	5.35	5.5
5	5.7	7.35	6.0	6.3	6.0	5.8	5.5	5.4	5.2	5.25	5.35	5.5
6	5.7	7.2	6.0	6.25	6.0	5.8	5.5	5.4	5.2	5.25	5.35	5.5
7	5.65	7.0	5.95	6.25	7.9	5.8	5.5	5.35	5.2	5.25	5.35	5.5
8	5.6	6.8	5.9	6.2	7.2	5.8	5.5	5.35	5.2	5.25	5.35	5.5
9	5.8	6.65	5.9	6.1	6.8	5.8	5.5	5.35	5.2	5.25	5.35	5.5
10	6.0	6.55	5.9	6.15	6.6	5.8	5.5	5.35	5.2	5.25	5.35	5.5
11	5.9	6.45	5.9	6.1	6.45	5.75	5.45	5.35	5.2	5.25	5.35	5.5
12	5.8	6.35	6.55	6.1	6.4	5.75	5.45	5.35	5.2	5.25	5.35	5.5
13	5.8	6.3	10.1	6.1	6.3	5.7	5.45	5.35	5.2	5.25	5.35	5.5
14	5.9	6.25	7.85	6.1	6.2	5.7	5.45	5.35	5.2	5.25	5.35	5.5
15	5.9	6.2	7.5	6.05	6.2	5.7	5.45	5.35	5.2	5.25	5.35	5.5
16	6.95	6.8	8.0	6.1	6.15	5.7	5.45	5.3	5.25	5.25	5.35	5.5
17	6.3	8.5	7.6	6.05	6.1	5.7	5.45	5.3	5.25	5.3	5.4	5.5
18	6.1	7.45	7.3	6.0	6.1	5.7	5.45	5.3	5.25	5.3	5.4	5.55
19	6.2	7.05	9.1	6.2	6.05	5.7	5.45	5.3	5.25	5.3	5.4	5.6
20	6.1	6.9	7.6	6.1	6.05	5.7	5.4	5.3	5.2	5.3	5.4	5.6
21	6.5	6.6	7.35	6.05	6.0	5.7	5.4	5.3	5.2	5.3	5.4	5.6
22	6.2	6.5	7.1	6.05	6.0	5.65	5.4	5.3	5.2	5.3	5.4	5.6
23	6.1	6.4	6.9	6.0	5.95	5.65	5.4	5.3	5.2	5.35	5.4	5.6
24	6.05	6.35	6.75	6.0	5.9	5.65	5.4	5.3	5.2	5.35	5.5	5.55
25	6.1	6.3	6.7	6.0	5.9	5.6	5.4	5.3	5.2	5.35	5.65	5.55
26	6.0	6.25	6.65	6.0	5.95	5.6	5.4	5.3	5.2	5.35	5.5	5.5
27	6.0	6.2	6.55	6.0	5.95	5.6	5.4	5.25	5.2	5.35	5.5	5.5
28	6.0	6.2	6.5	6.0	5.95	5.6	5.4	5.25	5.2	5.35	5.75	5.5
29	5.95	.....	7.5	5.95	5.9	5.6	5.4	5.25	5.2	5.35	5.6	5.55
30	5.9	.....	6.65	5.95	5.9	5.6	5.4	5.25	5.2	5.35	5.9	5.5
31	5.9	.....	6.6	.....	5.85	.....	5.4	5.25	.....	5.3	.....	5.5

Station rating table for Arroyo Seco River near Soledad, Cal., 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.*
5.20	2	6.30	265	7.40	800	9.00	1,900
5.30	6	6.40	305	7.50	860	9.20	2,060
5.40	15	6.50	345	7.60	920	9.40	2,225
5.50	30	6.60	390	7.70	980	9.60	2,400
5.60	50	6.70	435	7.80	1,045	9.80	2,580
5.70	70	6.80	480	7.90	1,110	10.00	2,760
5.80	95	6.90	530	8.00	1,175	10.20	2,945
5.90	125	7.00	580	8.20	1,310	10.40	3,135
6.00	155	7.10	635	8.40	1,450		
6.10	190	7.20	690	8.60	1,595		
6.20	225	7.30	745	8.80	1,745		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 31 discharge measurements made during 1905. It is well defined between gage heights 5.3 feet and 9.5 feet.

Estimated monthly discharge of Arroyo Seco River near Soledad, Cal., for 1905

[Drainage area, 215 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	555	50	160	9,838	0.744	0.858
February	1,595	225	556	30,880	2.59	2.70
March	2,850	125	586	36,030	2.73	3.15
April	345	140	202	12,020	.940	1.05
May	1,110	110	246	15,130	1.14	1.31
June	110	50	75.6	4,499	.352	.393
July	50	15	22.8	1,402	.106	.122
August	15	4	8.6	529	.040	.046
September	4	2	2.3	137	.011	.012
October	10	4	6.1	375	.028	.032
November	125	10	22.4	1,333	.104	.116
December	60	30	36.5	2,245	.170	.196
The year	2,850	2	160	114,400	.746	9.98

MISCELLANEOUS MEASUREMENTS IN SOUTHERN CALIFORNIA.

The following is a list of miscellaneous discharge measurements made in Riverside and San Diego counties during 1905:

Cottonwood Creek near Jamul, Cal.—This stream rises in the Coast Range in the southeastern part of San Diego County, and flowing in a southwesterly direction discharges into Tiajuana River below the California-Mexico boundary line. The following discharge measurements were made at the Barrett Dam. The gage is a 2-by-4 inch vertical timber painted white and graduated to feet and hundredths. It is nailed to the timber wall on the left bank of the stream at the concrete dam. No bench mark was established, as the zero of the rod is set level with the top of the concrete dam.

November 18: Width, 2.7 feet; area, 0.5 square foot; mean velocity, 1.00 foot per second; discharge, 0.5 second-foot.

December 14: Width, 5 feet; area, 1.6 square feet; mean velocity, 0.69 foot per second; gage height, 0.05 foot; discharge, 1.1 second-feet.

Temecula Creek near Temecula, Cal.—This creek rises in the Coast Range in the southeastern part of Riverside County, and flowing in a southwesterly direction discharges into the Pacific Ocean near Oceanside, Cal. The following discharge measurements were made on this stream during 1905:

At Pauba dam site, 12 miles above Temecula, Cal., November 14: Width, 7.5 feet; area, 2 square feet; mean velocity, 1.25 feet per second; discharge, 2.5 second-feet.

At Temecula Bridge, 1 mile below Temecula, Cal., November 14: Width, 11 feet; area, 5.4 square feet; mean velocity, 1.07 feet per second; gage height, 3.10 feet; discharge, 5.8 second-feet.

December 30: Width, 9 feet; area, 3.5 square feet; mean velocity, 1.32 feet per second; gage height, 2.98 feet; discharge, 4.6 second-feet.

A gage was placed on the Temecula Bridge consisting of a 2-by-6 inch vertical timber, graduated to feet and hundredths. It is fastened to the downstream pier near the right bank of the stream. No bench mark was established.

San Diego River near Lakeside, Cal.—This stream rises in the Coast Range in the eastern part of San Diego County, and flowing in a southwesterly direction discharges in the Pacific Ocean near San Diego, Cal. A measurement was made at the concrete dam of the San Diego Flume Company, at the head of that company's flume.

November 23: Width, 6 feet; area, 1.0 square foot; mean velocity, 1.90 feet per second; discharge, 1.9 second-feet.

Santa Ysabel River near San Pasqual, Cal.—This stream rises in the eastern part of San Diego County, and flowing in a southwesterly direction discharges into the Pacific Ocean near Del Mar, Cal. The lower portion of this river is known as the San Dieguito River. The following measurements were made during 1905 at the upper end of the San Pasqual Valley. The gage consists of a 2-by-4 inch inclined timber, graduated to feet and hundredths, and bolted to a large granite bowlder on the left bank of the stream. The bench mark is on top of the bowlder to which the gage is bolted. It is marked with a circle of white paint. Its elevation is 11.66 feet above the zero of the gage.

November 21: Width, 5 feet; area, 2.2 square feet; mean velocity, 2.05 feet per second; discharge, 4.5 second-feet.

November 28: Width, 83 feet; area, 24 square feet; mean velocity, 1.70 feet per second; gage height, 3.72 feet; discharge, 41 second-feet.

December 21: Width, 24 feet; area, 7.2 square feet; mean velocity, 1.44 feet per second; gage height, 3.55 feet; discharge, 10.4 second-feet.

Sweetwater River near Descanso, Cal.—This stream rises in the southeastern part of San Diego County, and flowing in a southwesterly direction discharges into San Diego Bay near National City. The following measurements were made during 1905, 1 mile below Descanso. The gage is a 2-by-6 inch vertical timber, graduated to feet and hundredths. It is bolted to a granite bowlder on the left bank of the stream. The bench mark is the highest point on the large bowlder to which the gage is fastened. It is marked with a circle of white paint, and its elevation is 5 feet above the zero of the gage.

September 11: Measured by Weir; discharge, 0.37 second-foot.

November 21: Width, 3 feet; area, 0.9 square foot; mean velocity, 1.22 feet per second; gage height, 3.54 feet; discharge, 1.1 second-feet.

December 10: Width, 6 feet; area, 1.9 square feet; mean velocity, 1.35 feet per second; gage height, 3.62 feet; discharge, 2.5 second-feet.

SAN FRANCISCO BAY DRAINAGE BASIN.

GENERAL FEATURES.

Sacramento River, rising in northern California and flowing south, and San Joaquin River, rising in the southern Sierras and flowing north, drain the western slope of the Sierra Nevada and the eastern slope of the Coast Range north of San Francisco. They meet near Suisun Bay, finally discharging their waters into the Pacific Ocean through San Francisco Bay.

SACRAMENTO RIVER.

DESCRIPTION OF RIVER.

Sacramento River is the principal river of California, and drains all of the territory south of Mount Shasta and between the Coast Range and Trinity Range on the west and the Sierra Nevadas on the east. The portion of the drainage basin above the gaging station which is located near Red Bluff, Cal., extends from the Trinity Mountains on the west to Warner Mountains near the California-Nevada State line on the east. The watershed on the west from the Trinity Mountains is comparatively narrow, being only from 10 to 35 miles in width, and furnishes a very small proportion of the discharge of this river, but from the east Pit River, which is the most important tributary, drains a large area extending about 120 miles east from the Sacramento River and between Mount Shasta on the north and Lassen Peak on the south. The greater portion of this basin is composed of lava, and shows other evidences of volcanic activity, such as volcanic cones and craters. Nearly all the streams tributary to Pit River have their origin in large springs, many of which discharge several hundred second-feet. The most important tributary of the Pit is the McCloud

River, draining the southeastern slope of Mount Shasta. It derives its waters principally from the melting of the snow on the high elevations of this mountain. The western portion of the watershed extending along the Trinity Range is well timbered, as is also that portion of the drainage area in the Sierra Nevadas lying between Mount Shasta and Lassen Peak. Farther east, however, there is little or no forest covering, and the country is used extensively for pasturage. The rainfall is very unequally distributed, varying from less than 10 inches in the eastern portion of the basin to 50 inches along the northern and western portion. Below the gaging station the river enters the Sacramento Valley, through which it flows on a comparatively light grade until it reaches Suisun Bay. During the winter months, when the Sacramento and its tributaries are in flood, large areas of the Sacramento Valley are overflowed. The floods which occur in the latter part of the rainy season, and after these large overflow areas or basins are filled, cause great damage in the lower portion of the valley.

SACRAMENTO RIVER NEAR RED BLUFF, CAL.

The gaging station at Jellys Ferry, which is located about 12 miles above the town of Red Bluff, was established April 30, 1895. The right bank of the river is high, but the left bank is liable to overflow when the river rises above the 25-foot mark. The river has been known to reach the 35-foot mark. Because of the liability to overflow it was deemed advisable to select a new gaging station, where the water at flood stage could be more confined. A point in Iron Canyon, where the river had been gaged by the State engineering department in 1879 and by commissioner of public works in 1893–94, was chosen as a new gaging station.

The river at this point in lower portion of Iron Canyon, 4 miles above Red Bluff, has a direct course for 2 or 3 miles. The width between banks at low water is about 500 feet. The depth of water at low stages averages 6 feet, with a maximum depth of 9 feet. The banks are steep and firm. The river flows in a bed of coarse gravel and cobbles, with here and there a small bowlder. The bed rock is lava.

Discharge measurements are made from a cable 600 feet in span, which is anchored in the lava rock which forms the wall of the canyon.

The river stage rod used by commissioner of public works was still in place, and has been used in making river height observations since January 28, 1902, the date upon which the observations were begun. A second set of gage rods were placed on the right bank 3,200 feet below the gaging station January 1, 1904, as no observer could be obtained to continue readings of the station gage. By synchronous readings of the lower gages and the station gage the actual readings for this lower gage have been converted into equivalent readings for the station gage. On September 28, 1904, it was necessary to move the lower gage rods to the left bank about 4,000 feet below the gaging station. The actual readings of this set of gage rods have also been converted into equivalent readings for the station gage. During 1905 the gage was read twice each day by Fred Weeks. All reported gage heights are those determined for the station gage. Bench marks were established as follows: (1) A nail in the crotch of sycamore tree to which the third section of the gage is fastened; elevation, 8.355 feet. (2) Point of rock marked with heavy ring of white paint 7.1 feet south of eye-bolt on left bank; elevation, 47.75 feet. (3) A point marked with ring of white paint 45 feet north of 10-foot mark on cable; elevation 38.01 feet. (4) Eye-bolt on left bank; elevation 44.80 feet. (5) Point on rock under left cable support marked with circle of white paint; elevation, 27.59 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 100, and 134 of the United States Geological Survey.

Discharge measurements of Sacramento River near Red Bluff, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
August 5	Peterson and Lee	448	3,520	1.48	1.49	5,208
August 30	C. H. Lee	497	3,404	1.48	1.34	5,043

Daily gage height, in feet, of Sacramento River near Red Bluff, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.2	8.9	4.85	8.05	4.05	3.0	1.95	1.45	1.25	1.3	1.3	1.75
2	6.15	15.85	4.75	7.8	4.3	3.0	1.95	1.45	1.25	1.3	1.3	1.55
3	4.8	13.3	4.6	7.55	4.1	3.0	1.9	1.45	1.25	1.3	1.3	1.55
4	4.7	11.35	4.55	7.1	3.9	3.0	1.9	1.45	1.25	1.25	1.3	1.55
5	4.3	10.15	4.5	6.8	3.7	3.0	1.9	1.45	1.25	1.25	1.3	1.55
6	4.0	8.95	4.4	6.45	3.7	3.0	1.8	1.45	1.25	1.25	1.4	1.55
7	3.75	8.15	4.3	6.25	4.1	2.85	1.75	1.4	1.25	1.3	1.4	1.55
8	3.55	7.4	4.2	5.95	5.5	2.9	1.7	1.4	1.25	1.3	1.4	1.55
9	3.45	6.8	4.15	5.75	4.95	2.85	1.75	1.4	1.25	1.3	1.4	1.55
10	3.35	6.4	4.05	5.45	4.6	2.85	1.75	1.4	1.25	1.3	1.4	1.55
11	3.2	6.0	4.05	5.25	3.85	2.7	1.7	1.4	1.25	1.3	1.4	1.55
12	3.1	5.55	4.9	5.0	4.15	2.7	1.7	1.3	1.25	1.3	1.45	1.55
13	3.85	5.2	10.25	4.85	4.15	2.65	1.7	1.3	1.25	1.25	1.45	1.7
14	14.35	4.9	13.55	4.75	3.9	2.6	1.7	1.3	1.25	1.3	1.45	1.55
15	9.8	4.75	11.15	4.7	3.85	2.55	1.7	1.3	1.25	1.3	1.45	1.55
16	9.5	4.55	10.7	5.45	3.85	2.5	1.7	1.3	1.25	1.3	1.45	1.55
17	7.95	4.55	9.7	4.95	4.0	2.4	1.7	1.3	1.25	1.3	1.45	1.7
18	6.85	4.5	8.25	4.75	3.85	2.35	1.6	1.3	1.25	1.3	1.45	1.8
19	7.3	5.25	11.4	5.2	3.75	2.35	1.6	1.3	1.25	1.3	1.45	2.1
20	7.05	8.2	10.3	5.0	3.6	2.3	1.55	1.3	1.25	1.3	1.55	2.1
21	9.2	7.95	11.1	4.85	3.5	2.3	1.55	1.3	1.25	1.3	1.55	1.9
22	14.3	7.2	11.2	4.7	3.4	2.25	1.55	1.3	1.25	1.3	1.55	1.7
23	20.3	6.6	9.0	4.55	3.35	2.25	1.55	1.3	1.25	1.3	1.55	1.55
24	15.55	6.0	9.8	4.4	3.3	2.2	1.5	1.3	1.25	1.3	1.55	1.55
25	15.45	5.7	8.45	4.4	3.2	2.25	1.5	1.25	1.25	1.3	1.55	1.55
26	12.75	5.45	9.0	4.4	3.2	2.2	1.45	1.25	1.25	1.3	1.55	1.55
27	9.8	5.3	8.9	4.3	3.2	2.1	1.45	1.25	1.25	1.3	1.6	1.7
28	8.95	5.0	8.2	4.15	3.2	2.0	1.45	1.25	1.3	1.3	1.7	1.7
29	7.5	.....	15.5	4.05	3.2	2.0	1.45	1.25	1.3	1.3	1.8	1.9
30	6.85	.....	9.85	4.0	3.15	1.95	1.45	1.25	1.3	1.3	1.95	1.8
31	6.55	.....	8.7	.....	3.05	.....	1.45	1.25	.....	1.3	.....	1.9

Station rating table for Sacramento River near Red Bluff, Cal., 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.*
1.00	4,450	3.10	10,380	5.40	18,700	9.60	37,180
1.10	4,690	3.20	10,710	5.60	19,500	9.80	38,140
1.20	4,930	3.30	11,040	5.80	20,300	10.00	39,100
1.30	5,170	3.40	11,370	6.00	21,100	10.50	41,600
1.40	5,410	3.50	11,700	6.20	21,940	11.00	44,200
1.50	5,650	3.60	12,040	6.40	22,780	11.50	46,900
1.60	5,920	3.70	12,380	6.60	23,620	12.00	49,700
1.70	6,190	3.80	12,720	6.80	24,460	12.50	52,600
1.80	6,460	3.90	13,060	7.00	25,300	13.00	55,600
1.90	6,730	4.00	13,400	7.20	26,180	13.50	58,600
2.00	7,000	4.10	13,760	7.40	27,060	14.00	61,700
2.10	7,300	4.20	14,120	7.60	27,940	14.50	64,900
2.20	7,600	4.30	14,480	7.80	28,820	15.00	68,200
2.30	7,900	4.40	14,840	8.00	29,700	16.00	75,100
2.40	8,200	4.50	15,200	8.20	30,620	17.00	82,200
2.50	8,500	4.60	15,580	8.40	31,540	18.00	89,700
2.60	8,810	4.70	15,960	8.60	32,460	19.00	97,600
2.70	9,120	4.80	16,340	8.80	33,380	20.00	105,900
2.80	9,430	4.90	16,720	9.00	34,300		
2.90	9,740	5.00	17,100	9.20	35,260		
3.00	10,050	5.20	17,900	9.40	36,220		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1902–1905. It is fairly well defined.

Estimated monthly discharge of Sacramento River near Red Bluff, Cal., for 1905.

[Drainage area, 9,295 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	108,500	10,380	31,830	1,957,000	3.42	3.94
February	74,050	15,200	26,800	1,488,000	2.88	3.00
March	71,600	13,580	30,920	1,901,000	3.33	3.84
April	29,930	13,400	18,680	1,112,000	2.01	2.24
May	19,100	10,220	12,750	784,000	1.37	1.58
June	10,050	6,865	8,623	513,100	.928	1.04
July	6,865	5,530	6,075	373,500	.654	.754
August	5,530	5,050	5,251	322,900	.565	.651
September	5,170	5,050	5,062	301,200	.545	.608
October	5,170	5,050	5,155	317,000	.555	.640
November	6,865	5,170	5,616	334,200	.604	.674
December	7,300	5,785	6,100	375,100	.656	.756
The year	108,500	5,050	13,570	9,779,000	1.46	19.72

SACRAMENTO RIVER AT SACRAMENTO, CAL.

The following gage heights were observed at this station during 1905:

Daily gage height, in feet, of Sacramento River at Sacramento, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	18.5	20.9	19.7	21.8	19.6	17.4	11.4
2	18.0	21.6	19.7	21.8	19.8	17.3	11.2
3	17.7	21.8	19.6	21.7	19.6	17.2	11.0
4	18.1	21.8	19.5	21.7	19.6	17.0	10.9
5	18.4	21.9	19.5	21.6	19.0	16.9	10.8
6	18.4	22.0	19.4	21.5	18.9	16.4	10.7
7	18.2	21.9	19.3	21.5	19.0	16.3	10.6
8	18.1	21.9	19.0	21.5	19.0	16.2	10.5
9	18.0	21.8	18.8	21.6	19.0	16.1	10.4
10	17.8	21.8	18.7	21.6	19.3	16.0	10.3
11	17.5	21.6	18.2	21.2	18.9	16.0	10.0
12	17.1	21.4	18.1	21.0	18.8	16.0	9.9
13	16.7	21.2	18.0	20.9	18.5	15.9	9.8
14	16.7	20.9	18.9	20.8	18.5	15.8	9.7
15	17.4	20.8	18.9	20.7	18.6	15.4	9.7
16	18.0	20.5	19.0	20.6	18.8	15.1	9.6
17	18.2	20.4	19.2	20.6	19.3	15.0	9.5
18	18.5	20.4	19.4	20.2	18.9	14.7	9.4
19	18.8	20.4	20.1	20.4	18.9	14.5	9.3
20	19.0	20.4	21.0	20.3	18.9	14.0	9.2
21	19.0	20.4	20.8	20.2	18.8	13.8	9.1
22	20.0	20.2	21.1	20.0	18.8	13.6	9.0
23	20.5	20.1	21.0	19.9	18.6	13.3	8.9
24	20.2	20.0	21.2	19.8	18.5	13.0	8.8
25	20.4	20.0	21.2	19.7	18.0	12.7	8.7
26	20.5	20.0	21.3	19.8	17.9	12.4	8.6
27	20.7	20.0	21.7	20.1	18.0	12.0	8.4
28	20.8	19.9	21.6	20.0	17.9	11.9	8.2
29	20.8	.....	21.8	19.9	17.8	11.8	8.2
30	20.9	.....	21.8	19.8	17.7	11.6	.....
31	20.9	.....	21.9	.....	17.5	.....	.....

MISCELLANEOUS MEASUREMENTS IN SACRAMENTO RIVER DRAINAGE BASIN.

Sacramento River at Baird Station, on Southern Pacific Railway, Gregory post-office, Cal.—A measurement of this stream was made August 28, 1905, from wagon bridge by W. B. Clapp.

Width, 116 feet; area, 308 square feet; mean velocity, 1.14 feet per second; discharge, 352 second-feet.

Clear Creek near Stella post-office, Cal.—A measurement was made of this stream August 26, 1905, 500 feet above mouth of Brandy Creek by W. B. Clapp.

Width, 28 feet; area, 31 square feet; mean velocity, 1.26 feet per second; discharge, 39 second-feet.

North Fork Cottonwood Creek near Gas Point, Cal.—A measurement of this stream was made August 28, 1905, 40 feet below the highway bridge above the junction of the North and Middle forks by C. H. Lee. Several diversions are made above the point of measurement; their total discharge is reported to be about 8 second-feet.

Width, 15.5 feet; area, 9.0 square feet; mean velocity, 0.66 foot per second; discharge, 5.9 second-feet.

Middle Fork Cottonwood Creek near Gas Point, Cal.—A measurement of this stream was made August 28, 1905, 300 feet above its junction with the North Fork by C. H. Lee. Three small diversions are made above the point of measurement.

Width, 35 feet; area, 11.3 square feet; mean velocity, 0.81 foot per second; discharge, 9.1 second-feet.

Pit River near Copper City, Cal.—This stream is the largest tributary of the Sacramento River, joining it about 11 miles north of Redding, Cal. It has a well-sustained summer flow. A measurement of this stream was made August 25, 1905, by C. H. Lee from the downstream side of the Delamar Mining Company's toll bridge above the mouth of Squaw Creek.

Width, 135 feet; area, 465 square feet; mean velocity, 6.68 feet per second; discharge, 3,107 second-feet.

Squaw Creek near Copper City, Cal.—A measurement of this stream was made 500 feet below bridge near Copper City by C. H. Lee on August 26, 1905.

Width, 39 feet; area, 95 square feet; mean velocity, 0.21 foot per second; discharge, 20 second-feet.

Cow Creek (above Clover Creek) at Millville, Cal.—A measurement of this stream was made August 26, 1905, at the highway bridge south of Millville by C. H. Lee.

Width, 39.2 feet; area, 35 square feet; mean velocity, 1.75 feet per second; discharge, 61 second-feet.

Clover Creek at Millville, Cal.—A measurement of this stream was made August 26, 1905, about 500 feet below the highway bridge above its junction with Cow Creek by C. H. Lee.

Width, 15 feet; area, 7.8 square feet; mean velocity, 0.40 foot per second; discharge, 3.1 second-feet.

Clover Creek ditch.—A measurement of this ditch was made on August 27, 1905, in flume at its heading, 3 miles above Millville by C. H. Lee.

Width, 2.15 feet; area, 1.8 square feet; mean velocity, 1.33 feet per second; discharge, 2.4 second-feet. This water is diverted from Clover Creek.

Little Cow Creek near Palocedro, Cal.—A measurement of this stream was made on August 27, 1905, 800 feet downstream from the highway bridge east of Palocedro by C. H. Lee. There are several small diversions from this stream above this point.

Width, 11.2 feet; area, 9.0 square feet; mean velocity, 0.50 foot per second; discharge, 4.5 second-feet.

Cow Creek near Palocedro, Cal.—A measurement of this stream was made August 27, 1905, 150 feet below its junction with Little Cow Creek by C. H. Lee.

Width, 41.5 feet; area, 58 square feet; mean velocity, 1.05 feet per second; discharge, 61 second-feet.

Battle Creek near Balls Ferry, Cal.—This stream is an important tributary of the Sacramento River. A measurement was made August 29, 1905, at a point about 2 miles above the wagon bridge on main road from Red Bluff to Balls Ferry by C. H. Lee.

Width, 88 feet; area, 171 square feet; mean velocity, 1.92 feet per second; discharge, 329 second-feet.

Mill ditch near Balls Ferry, Cal.—This ditch heads in Battle Creek 1½ miles above the wagon bridge on the main road from Red Bluff to Balls Ferry. A measurement was made August 29, 1905, 1½ miles below head of ditch, by C. H. Lee.

Width, 22 feet; area, 19.3 square feet; mean velocity, 1.33 feet per second; discharge, 26 second-feet.

Antelope Creek near Red Bluff, Cal.—A measurement of this stream was made August 31, 1905, 600 feet above the Antelope Creek and Red Bluff Water Company's dam, about 8 miles east of Red Bluff, by C. H. Lee.

Width, 36 feet; area, 83 square feet; mean velocity, 0.54 foot per second; discharge, 45 second-feet.

Mill Creek near Tehama, Cal.—A measurement of this stream was made September 1, 1905, 300 feet above the head-gate of the Los Molinas ditch and about 6 miles east of Tehama, by C. H. Lee.

Width, 40.2 feet; area, 91 square feet; mean velocity, 1.34 feet per second; discharge, 122 second-feet.

Millrace canal near Tehama, Cal.—This canal diverts water from Mill Creek about 1½ miles above its junction with Sacramento River. A measurement was made in flume at head of canal September 1, 1905, by C. H. Lee.

Width, 11.8 feet; area, 40 square feet; mean velocity, 2.25 feet per second; discharge, 90 second-feet.

Deer Creek near Vina, Cal.—A measurement of this stream was made September 1, 1905, from the downstream side of the bridge at upper main road crossing, about 4 miles from Vina, by C. H. Lee. Two or three small ditches divert water from creek above this point of measurement.

Width, 57.7 feet; area, 77 square feet; mean velocity, 1.08 feet per second; discharge, 83 second-feet.

Valley Counties Power Company's canal near Centerville, Cal.—This canal diverts water from Butte Creek. A measurement was made May 19 in flume at town of Centerville.

Width, 6 feet; area, 13.2 square feet; mean velocity, 1.74 feet per second; discharge, 23 second-feet.

PIT RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Pit River has its source in the Warner Mountains in the extreme northeast part of California. It flows in a southwesterly direction, discharging its waters into Sacramento River a few miles above Redding, Cal. It has numerous tributaries, the larger of which have their source in large springs, which discharge from crevices in the lava formation. About 50 per cent of the area of this drainage basin is barren of timber and composed, principally, of lava with a light soil covering, being used extensively for pasturage and the raising of stock. There are numerous small valleys with light grades, which hold the water throughout the summer months principally in the state of swamps. These areas are used, mainly, as meadow land and for the raising of stock feed. Pit River does not discharge in any great volume until it reaches a point near Fall River Mills, which lies about midway between the point where the Pit River enters the Sacramento and its source. Fall River, which is the principal tributary of the Pit from the north, receives its water supply from large perennial springs which discharge 1,500 second-feet. Hat Creek and Burney Creek are also large tributaries from the south and drain the northern slope of Lassen Peak. Their principal sources are also from large perennial springs in the lava formation.

West Valley Creek is a tributary of South Fork of Pit River. Ash Creek flows into Clear Creek, through which it enters Pit River from the south. There is considerable timber scattered throughout this drainage basin, the principal growth lying in the southern portion of the basin and also in that section lying north of Pit River and between Fall River and the upper Sacramento. There are numerous reservoir sites on the upper reaches of this stream, all of which have been or are being surveyed. Several gaging stations are maintained on Pit River and tributaries at points where surveys have been made for the construction of storage reservoirs. The rainfall throughout this basin is very unevenly distributed, ranging from 10 inches in the eastern portion to 50 to 75 inches in the western and northwestern portion. About 50 per cent of the precipitation falls in the form of snow, but does not remain any length of time except on the higher elevation of Mount Shasta and Lassen Peak.

McCloud River drains the southeastern slope of Mount Shasta. Its drainage area is comparatively small, covering 676 square miles. It is long and narrow, extending from north to south. There are few tributaries. Its main water supply comes from Mount Shasta, on which the snow remains during the entire year. It is also fed by numerous large springs scattered throughout the drainage basin. The precipitation is very heavy and is principally in the form of rain, except on the higher elevations of Mount Shasta. The discharge of this stream seldom falls below 1,200 second-feet. It discharges into the Pit River a few miles above the junction of the Pit with the Sacramento. The entire basin is well timbered.

PIT RIVER NEAR CANBY, CAL.

This station was established December 26, 1903, by H. E. Green and J. S. Evans. It is located at the wagon bridge, 3½ miles southwest of Canby, Cal.

The channel is straight for 150 feet above and 200 feet below the station. The current is moderate at all stages. The banks are high and are subject to overflow. The channel is rocky and is not subject to much change.

Discharge measurements are made from the bridge. The initial point for soundings is a nail in the railing post at the end of the bridge on the left bank.

The gage is a vertical plank securely fastened to the first bridge pier from the left bank of the stream. During 1905 the gage was read twice each day by Ernest M. Hess. The bench mark is a painted point on a large bowlder at the bend of the wagon road near the south end of the bridge. Elevation, 24.90 feet above the datum of the gage.

A description of this station, with gage height and discharge data, is contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Pit River near Canby, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 5	J. Y. Toler	99	187	2.55	4.20	476
January 9	do	87	127	1.70	3.70	216
January 20	do	99	186	2.53	4.18	470
January 26	do	117	228	2.96	4.50	675
February 7	do	116	220	2.91	4.40	641
February 13	do	87	131	1.91	3.70	250
February 22	do	119	235	3.03	4.60	712
February 27	do	93	147	2.11	3.90	309
March 7	do	87	128	1.86	3.65	238
March 9	do	87	127	1.83	3.65	233
March 14	do	87	135	1.80	3.70	243
March 22	do	109	227	2.90	4.60	659
March 26	do	109	230	2.93	4.65	674
April 4	do	138	292	3.33	5.00	971
April 5	do	138	289	3.30	5.00	955
April 10	do	114	206	2.81	4.40	579
April 16	do	93	146	2.27	4.00	331
April 19	do	93	136	2.07	3.90	282
May 1	do	63	83	1.08	3.30	90
May 2	do	63	83	1.10	3.30	91
May 5	do	61	54	.57	2.90	31
May 16	do	90	120	1.85	3.70	222
May 20	do	90	115	1.84	3.70	212
June 9	do	87	123	1.64	3.60	201
July 17	do	52	40	.60	2.90	24
July 22	do	50	37	.62	2.85	23
August 8	do	60	39	.37	2.80	14.5
August 10	do	60	37	.38	2.75	14.1
August 21	do	9	2.9	1.27	2.50	3.7
August 28	do	7	1.8	1.17	2.45	2.1
August 31	do	7	2.0	1.15	2.45	2.3
September 9	do	8	2.6	1.19	2.50	3.1
September 19	do	9	3.4	1.68	2.60	5.7
October 6	do	35	21	1.00	2.80	21
October 19	do	55	57	.91	3.10	52
October 25	do	58	58	.86	3.20	50
October 28	do	58	61	.90	3.20	55
November 7	do	60	67	1.19	3.30	80
November 11	do	60	70	1.19	3.30	83

Daily gage height, in feet, of Pit River near Canby, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.55	4.6	3.8	5.5	3.4	3.6	3.3	2.9	2.5	2.8	3.2	3.5
2	4.4	5.05	3.8	5.6	3.4	3.7	3.25	2.9	2.5	2.8	3.25	3.5
3	4.1	5.25	3.75	5.5	3.3	3.7	3.25	2.9	2.5	2.8	3.25	3.5
4	4.0	5.65	3.7	5.4	3.0	3.7	3.25	2.9	2.5	2.8	3.3	3.5
5	3.9	4.85	3.7	5.5	3.0	3.7	3.25	2.9	2.5	2.8	3.3	3.5
6	3.8	4.65	3.7	4.8	3.0	3.5	3.25	2.5	2.5	2.8	3.3	3.5
7	3.8	4.25	3.65	4.8	3.6	3.6	3.2	2.5	2.5	2.8	3.3	3.5
8	3.8	4.1	3.65	4.7	3.6	3.7	3.2	2.5	2.5	2.8	3.3	3.5
9	3.7	4.05	3.65	4.5	3.3	3.65	3.2	2.5	2.5	3.05	3.3	3.5
10	3.6	4.0	3.65	4.3	3.15	3.65	3.2	2.5	2.5	3.05	3.3	3.4
11	3.55	3.9	3.65	4.2	3.2	3.6	3.2	2.5	2.5	3.05	3.3	3.4
12	3.45	3.7	3.7	4.1	3.2	3.6	3.2	2.5	2.5	3.05	3.3	3.35
13	3.5	3.7	3.7	4.1	3.2	3.6	3.2	2.5	2.5	3.05	3.3	3.3
14	3.7	3.75	3.7	4.0	3.6	3.5	3.2	2.5	2.5	3.05	3.3	3.3
15	3.95	3.7	3.7	4.0	3.8	3.5	3.2	2.5	2.5	3.1	3.3	3.3
16	4.25	3.65	3.8	4.0	3.8	3.4	3.2	2.5	2.5	3.1	3.25	3.3
17	4.3	3.75	4.1	4.0	3.8	3.4	3.2	2.5	2.5	3.15	3.25	3.3
18	4.3	3.8	4.35	4.0	3.8	3.4	3.2	2.5	2.5	3.15	3.25	3.3
19	4.3	4.2	4.4	4.0	3.8	3.4	3.2	2.5	2.6	3.2	3.25	3.35
20	4.2	4.95	4.5	3.95	3.8	3.4	3.2	2.4	2.6	3.2	3.3	3.4
21	4.1	4.8	4.95	3.85	3.75	3.4	3.2	2.4	2.6	3.2	3.3	3.4
22	4.35	4.6	4.8	3.8	3.7	3.4	3.2	2.4	2.6	3.2	3.3	3.4
23	4.5	4.3	4.45	3.3	3.65	3.4	3.1	2.4	2.6	3.2	3.35	3.4
24	5.0	4.2	4.5	3.3	3.8	3.4	3.1	2.4	2.6	3.2	3.35	3.4
25	5.35	4.1	4.6	3.3	3.7	3.4	3.1	2.4	2.6	3.2	3.4	3.4
26	4.6	4.0	4.7	3.3	3.6	3.4	3.1	2.4	2.6	3.2	3.4	3.4
27	4.2	4.0	4.8	3.4	3.5	3.3	3.1	2.5	2.7	3.2	3.4	3.4
28	4.05	3.9	4.85	3.4	3.5	3.3	3.1	2.5	2.8	3.2	3.4	3.4
29	4.0	.....	4.85	3.5	3.5	3.3	3.1	2.5	2.8	3.2	3.45	3.4
30	4.0	.....	4.8	3.4	3.6	3.3	3.1	2.5	2.8	3.2	3.5	3.4
31	4.15	.....	5.0	.....	3.6	.....	3.1	2.5	.....	3.2	.....	3.4

Station rating table for Pit River near Canby, Cal., 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.*
2.40	1.5	3.30	87	4.20	475	5.10	1,028
2.50	3.5	3.40	115	4.30	533	5.20	1,091
2.60	6	3.50	148	4.40	593	5.30	1,154
2.70	10	3.60	186	4.50	655	5.40	1,217
2.80	16	3.70	226	4.60	717	5.50	1,280
2.90	24	3.80	269	4.70	779	5.60	1,343
3.00	34	3.90	316	4.80	841		
3.10	47	4.00	366	4.90	903		
3.20	64	4.10	419	5.00	965		

NOTE.—The above table is applicable only for open-channel conditions. It is based on thirty-nine discharge measurements made during 1905. It is well defined between gage heights 2.4 feet and 5 feet.

Estimated monthly discharge of Pit River near Canby, Cal., for 1905.

[Drainage area, 1,500 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	1,186	132	443	27,240	0.295	0.340
February	1,374	206	533	29,600	.355	.370
March	965	206	479	29,450	.319	.368
April	1,343	87	510	30,350	.340	.379
May	269	34	165	10,140	.110	.127
June	226	87	151	8,985	.101	.113
July	87	47	61.7	3,794	.041	.047
August	24	1.5	6.4	394	.0043	.0050
September	16	3.5	5.6	333	.0037	.0041
October	64	16	45.4	2,792	.030	.035
November	148	64	92.2	5,486	.061	.068
December	148	87	118	7,256	.079	.091
The year	1,374	1.5	218	155,800	.145	1.95

PIT RIVER NEAR BIEBER, CAL.

This station was established January 22, 1904, by J. S. Evans and William Busch. It is located 12 miles below Bieber, Cal., near Muck Valley.

The channel is straight for 200 feet above and 300 feet below the station. The current is very sluggish at low-water stage. The banks are high and not subject to overflow. The channel is very rocky and rough, but is not subject to change.

Discharge measurements are made from a cable and car. The initial point for soundings is the foot of the platform at end of the cable on the right bank of the stream.

The gage is a heavy wooden rod fastened to a large bowlder on the right bank of the stream. During 1905 the gage was read once each day by F. H. Holabird. The bench mark is on a large bowlder on the right bank 50 feet east of the pine tree to which the cable is fastened; elevation 12.00 feet above the datum of the gage.

A description of this station and gage height and discharge data are contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Pit River near Bieber, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 8	J. Y. Toler	104	343	0.99	3.70	340
January 22	do	210	729	1.96	5.25	1,430
January 23	do	218	915	2.46	6.00	2,254
Do	do	217	889	2.50	5.94	2,220
February 9	do	204	630	1.68	4.80	1,060
February 24	do	208	673	1.93	5.08	1,296
March 11	do	144	389	.97	3.70	378
March 24	do	212	743	2.22	5.40	1,650
March 23	do	213	767	2.11	5.51	1,620
April 7	do	210	739	2.02	5.30	1,492
April 6	do	212	757	2.18	5.40	1,648
April 17	do	199	504	1.32	4.30	665
May 3	do	126	232	.61	2.88	141
May 18	do	134	309	.79	3.50	244
June 12	do	126	215	.51	2.80	110
July 7	do	75	143	.24	2.30	34
July 19	do	79	144	.29	2.40	42
August 9	do	58	105	.22	1.85	23
August 18	do	34	18.8	1.02	1.80	19.1
August 29	do	30	12.6	.78	1.70	9.9
September 10	do	6	2.4	.46	1.40	1.1
September 20	do	7	2.0	.60	1.40	1.2
October 7	do	6	2.8	.61	1.50	1.7
October 17	do	31	12.7	.83	1.70	10.5
October 26	do	45	22.5	1.80	2.20	41
November 8	do	80	168	.42	2.60	71

Daily gage height, in feet, of Pit River near Bieber, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.8	5.4	4.6	6.2	3.0	3.2	2.5	2.1	1.5	a1.5	a2.3	a2.4
2	5.0	5.5	4.5	6.3	3.0	3.2	2.45	2.1	1.5	a1.5	a2.4	a2.4
3	4.9	5.3	4.3	6.15	2.9	3.1	2.4	1.9	1.5	a1.5	a2.4	a2.4
4	4.5	5.0	4.0	5.9	2.9	3.1	2.4	1.8	1.4	a1.5	a2.5	a2.4
5	4.2	4.8	4.0	5.7	2.9	3.1	2.4	1.8	1.4	a1.5	a2.5	a2.4
6	3.9	4.6	4.0	5.4	3.0	3.0	2.3	1.8	1.4	a1.5	a2.5	a2.4
7	3.7	6.0	3.9	5.2	3.0	3.0	2.3	1.75	1.4	1.5	a2.5	a2.4
8	3.7	5.5	3.9	5.1	3.0	2.9	2.3	1.75	1.35	a1.5	2.6	a2.4
9	3.5	4.8	3.8	5.0	2.9	2.9	2.4	1.85	1.35	a1.5	a2.6	a2.4
10	3.4	4.6	3.7	4.9	2.9	2.8	2.35	1.8	1.4	a1.5	a2.6	a2.4
11	3.4	4.3	3.7	4.7	2.8	2.8	2.45	1.8	1.4	a1.5	a2.6	a2.4
12	3.3	3.9	3.7	4.6	2.8	2.8	2.45	1.5	1.4	a1.6	a2.6	a2.3
13	3.4	3.7	3.7	4.4	2.8	2.8	2.4	1.5	1.4	a1.6	a2.6	a2.3
14	3.4	3.7	3.8	4.3	2.8	2.7	2.4	1.5	a1.4	a1.6	a2.6	a2.3
15	3.6	3.9	3.8	4.2	2.8	2.7	2.7	1.5	a1.4	a1.6	a2.7	a2.3
16	3.9	4.0	4.0	4.3	3.0	2.7	2.7	1.7	a1.4	a1.6	a2.7	a2.3
17	4.95	4.1	4.0	4.3	3.4	2.7	2.7	1.7	a1.4	1.7	a2.7	a2.3
18	5.1	4.3	5.0	4.3	3.5	2.7	2.3	1.8	a1.4	2.0	a2.7	a2.3
19	5.0	4.6	5.4	4.2	3.5	2.5	2.4	1.8	a1.4	2.0	a2.7	a2.3
20	5.0	4.8	5.5	4.0	3.4	2.5	2.4	1.7	a1.4	2.0	a2.7	a2.3
21	5.0	5.0	5.5	4.0	3.4	2.5	2.3	1.7	a1.4	2.0	a2.7	3.3
22	5.25	5.8	5.8	3.9	3.2	2.4	2.2	1.5	a1.4	2.0	a2.7	3.3
23	5.95	5.2	5.55	3.9	3.2	2.4	2.2	1.5	a1.4	2.0	a2.6	2.2
24	6.5	5.05	5.45	3.7	3.2	2.4	2.6	1.5	a1.4	a2.0	a2.6	2.2
25	6.0	5.0	5.4	3.6	3.1	2.3	2.4	1.5	a1.4	a2.0	a2.6	2.2
26	5.8	5.0	5.7	3.4	3.1	2.3	2.1	1.5	a1.4	2.2	a2.6	2.2
27	5.5	4.8	5.9	3.1	3.0	2.3	2.1	1.7	a1.4	a2.2	a2.6	2.2
28	5.0	4.8	5.8	3.1	3.1	2.7	2.1	1.7	1.5	a2.2	a2.6	2.2
29	4.8	.....	5.8	3.1	3.2	2.7	2.2	1.7	1.5	a2.2	a2.6	2.2
30	5.1	.....	5.8	3.0	3.3	2.7	2.2	1.5	a1.5	a2.3	a2.5	2.2
31	5.4	.....	6.0	.....	3.3	.....	2.25	1.5	.....	a2.3	.....	2.2

a Estimated.

NOTE.—River frozen over December 23–31.

Station rating table for Pit River near Bieber, Cal., 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.*
1.30	0.5	2.50	64	3.70	349	4.90	1,130
1.40	1.0	2.60	77	3.80	396	5.00	1,215
1.50	2.2	2.70	92	3.90	448	5.20	1,400
1.60	5.8	2.80	109	4.00	505	5.40	1,595
1.70	9.6	2.90	127	4.10	565	5.60	1,810
1.80	13.6	3.00	147	4.20	630	5.80	2,035
1.90	18	3.10	168	4.30	695	6.00	2,270
2.00	23	3.20	190	4.40	760	6.20	2,525
2.10	29	3.30	213	4.50	830	6.40	2,810
2.20	36	3.40	239	4.60	900		
2.30	44	3.50	270	4.70	975		
2.40	53	3.60	307	4.80	1,050		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 26 discharge measurements made during 1905. It is well defined between gage heights 3.5 feet and 6 feet. Below 3.5 feet the table is not so well defined.

Estimated monthly discharge of Pit River near Bieber, Cal., for 1905.

[Drainage area, 2,948 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	2,960	213	1,036	63,700	0.351	0.405
February	2,270	349	1,083	60,150	.367	.382
March	2,270	349	1,101	67,700	.373	.430
April	2,665	147	950	56,530	.322	.359
May	270	109	166	10,210	.056	.065
June	190	44	103	6,129	.035	.039
July	92	29	51.8	3,185	.018	.021
August	29	2.2	9.73	598	.0033	.0038
September	2.2	.8	1.23	73.2	.00042	.00047
October	44	2.2	15.4	947	.0052	.0060
November	92	44	76.1	4,528	.026	.029
December 1–22	213	44	63.9	2,788	.022	.025
The period				276,500		

NOTE.—Discharge interpolated for missing gage heights in September, October, November, and December.

SOUTH FORK OF PIT RIVER NEAR IVY, CAL.

This station was established January 11, 1904, by H. E. Green and J. S. Evans. It is located 3 miles west of Ivy post-office, at the outlet of Jess Valley.

The channel is straight for 200 feet above and 80 feet below the station. The current is sluggish at low-water stage. The right bank is low and subject to overflow in high water. The bed of the stream is composed of earth and is filled with vegetation at low-water stage.

Discharge measurements are made from a cable and car. The initial point for soundings is the foot of the post used for fastening the car on the left bank of the stream.

The gage is a vertical plank fastened to a tree on the left bank 50 feet above the station. It is read only at times discharge measurements are made, as it is impossible to get an observer on account of its isolated location. The bench mark is on a large bowlder 150 feet east of cabin on the right bank and below the station; elevation, 12.00 feet above the datum of the gage.

A description of this station, with gage height and discharge data, is contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of South Fork of Pit River near Ivy, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
January 1	J. Y. Toler	32	63	0.92	4.90	58
January 13	do	28	37	.62	3.80	23
February 1	do	30	47	1.04	4.18	49
February 17	do	28	42	1.00	4.00	42
March 4	do	28	42	1.05	4.05	44
March 17	do	31	63	1.46	4.72	93
March 30	do	30	51	1.18	4.30	60
April 13	do	33	61	1.41	4.60	86
April 22	do	33	62	1.37	4.60	85
May 12	do	66	104	1.52	5.33	158
May 13	do	66	101	1.53	5.33	155
May 25	do	85	112	1.41	5.40	158
May 26	do	98	118	1.40	5.44	165
June 5	do	107	145	1.34	5.68	195
June 6	do	97	126	1.31	5.50	165
June 17	do	39	80	1.32	5.05	106
June 19	do	38	78	1.28	5.00	100
July 1	do	24	22	1.86	4.15	41
July 13	do	23	19.5	1.79	4.05	35
July 14	do	23	18.3	1.75	4.00	32
July 26	do	15	20	1.60	4.00	32
July 27	do	15	20	1.60	4.00	32
August 15	do	16	19.5	1.44	4.10	28
August 16	do	16	19.8	1.41	4.10	28
August 24	do	16	17.2	1.16	3.70	19.9
September 5	do	6	8.6	1.42	3.20	12.2
September 14	do	14	8.6	1.95	3.30	16.8
October 3	do	15	7.2	1.97	3.20	14.2
October 12	do	15	7.2	1.97	3.20	14.2
October 13	do	15	7.2	2.00	3.20	14.4
October 21	do	16	6.8	2.03	3.20	13.8
November 1	do	15	7.2	2.03	3.20	14.6
November 2	do	16	8.0	2.09	3.20	16.7
November 14	do	16	8.4	2.13	3.20	17.9
November 15	do	16	7.6	2.12	3.20	16.1

WEST VALLEY CREEK NEAR LIKELY, CAL.

This station was established January 7, 1904, by H. E. Green and J. S. Evans. It is located 7 miles east of Likely, Cal., at the outlet of West Valley.

The channel is straight for 200 feet above and 100 feet below the station. The banks are high and not subject to overflow. The bed of the stream is rocky and not subject to change. The current is swift.

Discharge measurements are made from a cable and car, or by wading at low-water stage. The initial point for soundings is a juniper stump on the left bank, which is used for a tieing post for the car. After July 1, 1905, gagings were made at the ranch house near the upper rod. These gagings give a much less discharge than at the regular station. The gage is a vertical plank nailed to a juniper tree on the right bank of the creek. As no one could be obtained to read the station gage, a gage was placed 2 miles above the station near the ranch house, where an observer could be obtained. The gage as read at this point is not considered satisfactory for use in constructing a discharge curve for the gaging station, but only gives a general idea of the fluctuations in the flow of the stream.

Numerous springs and swamps appear in the valley between the gaging station and the ranch house, giving a greater discharge at the gaging station than at this point. During 1905 the gage was read by Jasper L. Fountain. The bench mark is a point marked with paint on a large bowlder 30 feet from the creek on the left bank; elevation, 10.00 feet above the datum of the gage.

A description of this station, with gage height and discharge data, is contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of West Valley Creek near Likely, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 12	J. Y. Toler	15	22	1.28	3.30	28
January 31	do	15	23	.96	3.20	22
February 2	do	15	22	.93	3.20	20
February 16	do	15	24	1.09	3.22	26
March 4	do	15	24	1.00	3.20	24
March 5	do	15	24	1.00	3.20	24
March 16	do	15	24	1.02	3.22	25
March 17	do	15	32	2.16	3.70	69
March 29	do	15	21	1.43	3.30	30
March 31	do	15	21	1.42	3.30	30
April 13	do	15	22	1.18	3.25	26
April 22	do	15	19	1.19	3.20	23
May 12	do	15	25	1.40	3.32	35
May 13	do	15	26	1.46	3.35	38
May 25	do	15	21	1.05	3.22	22
May 26	do	15	22	.95	3.19	21
June 4	do	15	28	1.68	3.50	47
June 5	do	15	26	1.50	3.40	39
June 6	do	15	25	1.28	3.30	32
June 17	do	15	22	1.18	3.20	26
June 19	do	15	22	1.09	3.15	24
July 1	do	3	4.4	3.84	3.10	16.9
July 13	do	8	10.0	1.74	3.20	17.4
July 14	do	8	10.0	1.74	3.20	17.4
July 26	do	8	9.6	1.72	3.15	16.5
August 15	do	8	10.0	1.70	3.15	17
August 24	do	16	7.2	1.43	3.00	10.3
September 5	do	21	13	1.02	3.10	13.2
September 6	do	21	13.7	1.04	3.10	14.2
September 14	do	17	7.4	1.53	3.10	11.3
September 15	do	17	7.8	1.49	3.10	11.6
October 3	do	18	8.4	1.65	3.10	13.9
October 12	do	19	10.1	1.59	3.20	17.1
October 13	do	19	10.4	1.68	3.20	17.5
October 21	do	18	7.6	1.72	3.10	13.1
October 22	do	18	7.8	1.73	3.10	13.5
November 1	do	13	11.4	1.24	3.20	14.0
November 14	do	13	11.0	1.32	3.20	14.5
November 15	do	13	11.0	1.30	3.20	14.3

NOTE.—After July 1 gagings were made near upper gage.

Daily gage height, in feet, of West Valley Creek near Likely, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.3	3.2	3.2	4.5	3.15	3.2	3.2	3.2	3.0	a3.1	3.15	3.1
2	3.3	3.2	3.2	3.4	3.15	3.2	3.2	3.2	3.0	a3.1	3.15	3.1
3	3.25	3.2	3.2	3.3	3.15	3.2	3.2	3.2	3.0	a3.1	3.15	3.15
4	3.25	3.2	3.15	3.3	3.15	3.2	3.2	3.2	3.1	a3.1	3.2	3.15
5	3.25	3.2	3.15	3.3	3.15	3.6	3.2	3.2	3.1	a3.1	3.2	3.15
6	3.2	3.2	a3.15	3.3	3.15	3.5	3.2	3.2	3.1	a3.1	3.2	3.15
7	3.2	3.2	a3.15	3.25	3.15	3.45	3.2	3.2	3.1	a3.1	3.2	3.15
8	3.2	3.2	a3.15	3.25	3.3	3.55	3.2	3.2	3.1	a3.2	3.2	3.1
9	3.2	3.2	a3.1	3.25	3.2	3.55	3.15	3.2	3.1	a3.2	3.2	3.15
10	3.2	3.2	a3.1	3.25	3.4	3.3	3.15	3.2	3.1	a3.2	3.2	3.15
11	3.2	3.2	3.1	3.25	3.3	3.3	3.15	3.2	3.1	a3.2	3.2	3.1
12	3.2	3.2	3.1	3.25	3.25	3.25	3.15	3.2	3.2	a3.2	3.2	3.15
13	3.2	3.2	3.15	3.25	3.2	3.25	3.15	3.2	3.2	a3.2	3.2	3.1
14	3.2	3.2	3.2	3.25	3.2	3.2	3.15	3.0	3.2	a3.2	3.2	3.25
15	3.2	3.2	3.2	3.3	3.2	3.2	3.15	3.0	3.2	a3.2	3.2	3.15
16	3.2	3.2	3.2	3.3	3.2	3.2	3.15	3.0	3.2	a3.2	3.2	3.1
17	3.25	3.2	3.65	3.3	3.2	3.2	3.15	3.0	a3.2	a3.2	3.2	3.15
18	3.25	3.2	3.4	3.25	3.2	3.2	3.15	3.0	a3.2	a3.1	3.2	3.1
19	3.3	3.2	3.5	3.2	3.2	3.2	3.15	3.0	a3.2	a3.1	3.2	3.1
20	3.3	3.2	3.35	3.2	3.2	3.2	3.15	3.0	a3.2	a3.1	3.6	3.15
21	3.3	3.2	3.5	3.2	3.2	3.2	3.15	3.0	a3.2	a3.1	3.4	3.1
22	3.25	3.2	3.5	3.2	3.2	3.2	3.15	3.0	a3.2	3.1	3.8	3.1
23	3.2	3.2	3.35	3.2	3.2	3.2	3.15	3.0	a3.2	3.1	3.25	3.15
24	3.2	3.2	3.3	3.2	3.2	3.2	3.15	3.0	a3.2	3.1	3.1	3.1
25	3.2	3.2	3.3	3.2	3.2	3.2	3.15	3.0	a3.2	3.1	3.1	3.15
26	3.2	3.2	3.4	3.15	3.2	3.2	3.15	3.0	a3.2	3.1	3.1	3.1
27	3.2	3.2	3.7	3.15	3.2	3.2	3.15	3.0	a3.2	3.1	3.15	3.1
28	3.2	3.2	3.4	3.15	3.2	3.2	3.15	3.0	a3.2	3.1	3.2	3.1
29	3.2	.....	3.35	3.15	3.2	3.2	3.15	3.0	a3.2	3.1	3.1	3.15
30	3.2	.....	3.4	3.15	3.2	3.2	3.15	3.0	a3.2	3.1	3.1	3.1
31	3.2	.....	3.5	.....	3.2	.....	3.2	3.0	.....	3.1	.....	3.6

a Estimated.

Daily discharge, in second-feet, of West Valley Creek near Likely, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	28	21	24	188	22	23	20	20	10	16	12
2	28	20	24	38	22	23	20	20	9	15	12
3	25	20	24	30	22	24	20	20	9	14	12
4	25	20	24	30	22	24	19	20	13	14	14
5	25	21	24	30	23	57	19	20	13	14	14
6	22	21	21	30	23	47	19	20	14	15	14
7	22	21	21	26	23	43	18	20	14	15	14
8	22	22	21	26	32	52	18	20	13	16	14
9	22	22	19	26	26	52	16	20	13	16	15
10	22	22	19	26	42	32	16	20	12	16	15
11	22	23	19	26	33	32	15	20	12	17	15
12	22	23	19	26	30	29	15	20	26	17	15
13	22	24	21	26	27	29	15	20	26	18	14
14	22	24	24	26	27	26	15	11	26	18	14
15	22	25	25	30	27	26	15	11	26	17	14
16	22	26	25	30	26	26	15	11	26	16	14
17	25	26	63	30	26	26	15	10	26	16	14
18	25	26	38	26	26	26	15	10	25	15	14
19	28	26	48	23	24	26	16	10	24	14	14
20	28	26	34	23	24	26	16	10	24	14	.....
21	28	26	48	23	24	25	16	10	23	13	.....
22	25	26	48	23	23	25	16	10	22	14	.....
23	22	25	34	23	23	24	16	10	21	14	.....
24	22	25	30	23	21	24	16	10	21	13	.....
25	22	25	30	23	21	23	16	10	20	13	.....
26	22	25	38	21	21	23	17	10	20	12	.....
27	22	25	69	21	21	22	17	10	19	12	.....
28	22	25	38	21	21	22	17	10	18	11	.....
29	22	.....	34	21	22	21	17	10	18	11	.....
30	22	.....	38	21	22	21	17	10	17	10	.....
31	22	.....	48	.....	23	.....	20	10	.....	10	.....

NOTE.—Daily discharge obtained by indirect method for shifting channel, as no measurements were made later than November 19. No estimate has been made for the remainder of the year.

Estimated monthly discharge of West Valley Creek near Likely, Cal., for 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
January	28	22	23.5	1,445
February	26	20	23.6	1,311
March	69	19	32.0	1,968
April	188	21	31.2	1,856
May	42	21	24.8	1,525
June	57	21	29.3	1,744
July	20	15	16.8	1,033
August	20	10	14.3	879
September	26	9	18.7	1,113
October	18	10	14.4	885
November 1–19	15	12	13.9	527
The period				14,290

ASH CREEK AT ADIN, CAL.

This station was established March 13, 1904, by J. S. Evans and William Busch. It was originally located one-fourth of a mile above the town of Adin. During the summer the closing of the waste gates in the dam at Adin interfered with the discharge at this point to such an extent that on August 15, 1904, the station was reestablished at a point 100 feet below the wagon bridge in the town of Adin, Cal., which is about 500 feet below the dam.

The channel is straight for 200 feet above and 200 feet below the station. The left bank is high, but the right bank is subject to overflow from the side channel which, in flood diverts water from above the station. The bed of the stream is gravelly and not subject to change.

Discharge measurements are made from a suspension footbridge constructed with one-half inch cables.

The gage is a vertical plank fastened to a tree on the left bank of the stream. During 1905 the gage was read once each day by H. Williams.

A description of this station, with gage heights and discharged data, is contained in Water Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Ash Creek River at Adin, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 7	J. Y. Toler	32	50	0.90	1.96	45
January 21	do	34	69	1.23	2.40	85
January 25	do	35	92	1.35	2.89	124
Do	do	35	95	1.33	3.00	126
February 8	do	34	70	.99	2.30	69
February 11	do	36	78	1.47	2.80	115
February 12	do	36	76	1.30	2.50	99
February 23	do	36	108	1.57	3.30	170
February 26	do	36	93	1.44	2.90	134
March 10	do	35	67	1.07	2.30	72
March 12	do	35	67	1.10	2.30	74
March 13	do	35	68	1.16	2.35	79
March 25	do	36	114	1.27	3.60	145
April 5	do	36	125	1.85	3.95	231
April 8	do	36	107	1.72	3.55	183
Do	do	36	103	1.65	3.40	171
April 16	do	35	82	1.45	2.80	119
April 18	do	35	79	1.34	2.70	106
May 2	do	35	80	1.33	2.70	106
May 3	do	34	60	.98	2.20	59
May 4	do	34	63	1.08	2.10	68
May 17	do	33	56	.86	1.90	48
May 18	do	33	54	.85	1.90	46
May 19	do	33	53	.79	1.85	42
May 20	do	33	53	.76	1.80	40
June 10	do	45	28	1.08	1.80	30
June 11	do	45	27	1.05	1.75	28
June 13	do	44	26	.96	1.70	25
July 6	do	28	22	.93	1.65	20
July 18	do	28	23	.91	1.65	21
July 21	do	26	18.9	1.22	1.70	23
August 8	do	25	15.4	1.28	1.60	19.7
August 10	do	25	15.4	1.29	1.60	19.9
August 17	do	28	19.2	1.10	1.65	20
August 20	do	28	18.4	.98	1.60	18.1
August 29	do	27	16.7	.89	1.50	14.9
August 30	do	27	16.7	.83	1.50	13.8
September 10	do	28	19.2	.98	1.60	18.9
September 11	do	29	21	1.05	1.70	22
September 20[a]	do	7	2.5	.92	1.00	2.3
September 21	do	32	49	.49	1.70	24
October 8	do	30	19.2	1.67	1.70	32
October 9	do	32	50	.59	1.70	29
October 17	do	30	19.2	1.41	1.70	27
October 18	do	34	51	.63	1.80	32
October 26	do	26	50	.63	1.80	31
October 28	do	36	57	.87	2.00	50
November 8	do	34	50	.64	1.80	32
November 9	do	35	53	.84	1.90	44

[a] Water held back by dam above station.

Daily gage height, in feet, of Ash Creek at Adin, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	3.4	2.5	4.1	2.3	1.9	1.7	1.5	1.6	1.7	1.9	1.8
2	2.4	5.9	2.5	6.0	2.2	1.9	1.7	1.6	1.7	1.7	1.9	1.8
3	2.2	3.5	2.5	6.0	2.1	1.9	1.7	1.6	1.7	1.7	1.9	1.8
4	1.9	3.4	2.5	4.6	2.1	1.9	1.6	1.6	1.7	1.7	1.9	1.8
5	1.9	3.4	2.5	4.6	2.1	1.9	1.5	1.6	1.7	1.7	1.9	1.8
6	1.9	3.4	2.5	4.0	2.1	1.8	1.5	1.6	1.8	1.7	1.9	1.8
7	1.9	3.4	2.5	3.7	2.1	1.8	1.5	1.6	1.8	1.7	1.9	1.8
8	1.9	3.2	2.5	3.7	2.1	1.8	1.5	1.6	1.8	1.7	1.9	1.8
9	1.9	2.5	2.4	3.2	2.1	1.8	1.5	1.6	1.8	1.7	1.9	1.8
10	1.9	2.4	2.4	3.2	2.2	1.8	1.5	1.6	1.9	1.8	1.9	1.8
11	1.9	2.3	2.4	3.1	2.2	1.8	1.5	1.6	1.9	1.8	1.9	1.8
12	1.9	2.3	2.4	3.1	2.2	1.8	1.5	1.6	1.8	1.9	1.9	1.8
13	2.0	2.2	2.4	3.0	2.2	1.8	1.5	1.6	1.8	1.9	1.9	1.8
14	2.0	2.1	2.4	3.0	2.2	1.8	1.5	1.6	1.8	1.9	1.9	1.8
15	2.0	2.1	2.4	3.0	2.1	1.8	1.5	1.6	1.8	1.9	1.9	1.8
16	4.0	2.1	2.4	3.0	2.1	1.8	1.5	1.6	1.8	1.9	1.8	1.8
17	2.5	2.2	3.1	2.8	2.1	1.8	1.5	1.6	1.7	1.7	1.8	1.8
18	2.0	3.1	5.1	2.8	2.2	1.8	1.5	1.6	1.7	1.7	1.8	1.8
19	2.8	5.9	6.2	2.8	2.2	1.8	1.5	1.6	1.7	1.7	1.8	1.8
20	2.4	6.0	4.3	2.8	2.3	1.8	1.5	1.6	1.6	1.7	1.8	1.8
21	2.4	3.4	4.6	2.8	2.3	1.7	1.5	1.6	1.6	1.7	1.8	1.8
22	4.1	3.3	4.6	2.8	2.3	1.7	1.5	1.6	1.6	1.7	1.8	1.8
23	4.6	3.3	3.8	2.7	2.1	1.7	1.5	1.6	1.6	1.7	1.8	1.8
24	4.6	2.6	5.4	2.7	2.1	1.7	1.5	1.6	1.6	1.7	1.8	1.8
25	3.0	2.6	3.6	2.7	1.9	1.7	1.5	1.7	1.6	1.7	1.8	1.8
26	2.4	2.3	9.0	2.7	1.9	1.7	1.5	1.7	1.6	1.7	1.8	1.8
27	2.3	2.3	4.6	2.7	1.9	1.7	1.5	1.7	1.6	1.8	1.8	1.8
28	2.3	2.5	4.1	2.8	1.9	1.7	1.5	1.6	1.6	1.8	1.8	1.8
29	2.3	.....	4.2	2.8	1.9	1.7	1.5	1.6	1.6	1.8	1.8	1.8
30	4.5	.....	4.2	2.8	1.9	1.7	1.5	1.6	1.6	1.8	1.8	1.8
31	4.5	.....	4.1	.....	1.9	.....	1.5	1.6	.....	1.9	.....	1.8

Station rating table for Ash Creek at Adin, Cal., 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.*
1.50	14	2.60	97	3.70	205	4.80	342
1.60	20	2.70	106	3.80	216	4.90	356
1.70	27	2.80	115	3.90	227	5.00	370
1.80	34	2.90	124	4.00	238	5.20	400
1.90	41	3.00	134	4.10	250	5.40	430
2.00	48	3.10	144	4.20	262	5.60	462
2.10	56	3.20	154	4.30	274	5.80	494
2.20	64	3.30	164	4.40	287	6.00	526
2.30	72	3.40	174	4.50	300	6.20	560
2.40	80	3.50	184	4.60	314		
2.50	88	3.60	194	4.70	328		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 49 discharge measurements made during 1905. It is well defined between gage heights 1.5 feet and 4 feet. Above 4 feet the table is a rough approximation.

Estimated monthly discharge of Ash Creek at Adin, Cal., for 1905.

[Drainage area, 260 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	314	41	107	6,579	0.412	0.475
February	526	56	158	8,775	.608	.633
March	1,120	80	214	13,160	.823	.949
April	526	106	176	10,470	.677	.755
May	72	41	56.7	3,486	.218	.251
June	41	27	32.8	1,952	.126	.141
July	27	14	15.5	953	.060	.069
August	27	14	20.5	1,260	.079	.091
September	41	20	27.2	1,618	.105	.117
October	41	27	31.1	1,912	.120	.138
November	41	34	37.5	2,231	.144	.161
December	34	34	34	2,091	.131	.151
The year	1,120	14	75.9	54,490	.292	3.93

McCLOUD RIVER NEAR GREGORY, CAL.

This station was established March 23, 1902, in cooperation with the McCloud River Electric Company. It is located at John's Camp, near Hirze Mountain, 14 miles east of Gregory Post-office, Cal. Baird Station, on the Southern Pacific Railroad, is just across Sacramento River from Gregory.

The channel is straight for 300 feet above and 600 feet below the gaging station. The current is swift at all stages. The banks are high and wooded and not liable to overflow. The bed is composed of limestone on the sides, with some large river gravel and bowlders in the center of the channel.

Measurements are made from a car suspended from a cable. The initial point for soundings is at the gage rod on the right bank of the stream. A line is placed 150 feet below the cable, marking a course for float measurements during floods.

The gage rod is a timber nailed and wired to a tree on the right bank. The bench mark is a point marked with a ring of white paint on the top of a bowlder 10 feet upstream from the 10-foot mark on the cable; elevation, 21.19 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 100 and 134 of the United States Geological Survey.

Discharge measurements of McCloud River near Gregory, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
February 21	O. W. Peterson	114	830	6.43	4.58	5,337
February 22	do	114	759	5.47	3.95	4,155
February 22	do	114	766	5.38	3.98	4,120
August 6	Peterson & Lee	103	543	2.55	1.63	1,386

Daily gage height, in feet, of McCloud River near Gregory, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.9	3.85	2.9	3.4	2.8	2.1	1.8	1.65	1.55	1.55	1.5	1.55
2	2.6	4.5	2.8	3.3	2.7	2.2	1.8	1.65	1.55	1.55	1.5	1.55
3	2.45	3.85	2.8	3.25	2.65	2.1	1.8	1.65	1.55	1.55	1.5	1.55
4	2.3	3.7	2.75	3.2	2.6	2.1	1.8	1.65	1.55	1.55	1.5	1.55
5	2.2	3.6	2.7	3.1	2.5	2.1	1.8	1.6	1.55	1.55	1.5	1.55
6	2.2	3.6	2.7	3.0	2.6	2.05	1.8	1.65	1.55	1.55	1.5	1.55
7	2.15	3.5	2.65	2.9	2.7	2.05	1.8	1.6	1.55	1.6	1.5	1.55
8	2.1	3.3	2.65	2.85	2.8	2.0	1.8	1.6	1.55	1.55	1.5	1.55
9	2.0	3.2	2.6	2.8	2.7	2.0	1.8	1.6	1.55	1.55	1.5	1.55
10	2.0	3.1	2.6	2.7	2.7	2.0	1.8	1.6	1.55	1.55	1.5	1.55
11	2.0	3.0	2.7	2.7	2.7	2.0	1.8	1.6	1.55	1.55	1.5	1.55
12	1.95	2.95	3.05	2.6	2.6	2.0	1.75	1.6	1.55	1.55	1.5	1.55
13	2.05	2.7	4.6	2.6	2.6	1.95	1.75	1.6	1.55	1.55	1.5	1.55
14	3.1	2.6	6.8	2.55	2.55	1.95	1.75	1.6	1.55	1.55	1.5	1.55
15	3.25	2.5	5.25	2.6	2.5	1.9	1.75	1.6	1.55	1.55	1.5	1.55
16	3.3	2.5	4.6	2.8	2.5	1.9	1.7	1.6	1.55	1.55	1.5	1.55
17	3.1	2.4	4.15	2.6	2.5	1.9	1.7	1.6	1.55	1.55	1.5	1.55
18	3.0	2.5	4.0	2.75	2.5	1.9	1.7	1.6	1.55	1.55	1.55	1.55
19	3.0	3.4	4.4	2.9	2.4	1.9	1.7	1.6	1.55	1.55	1.55	1.6
20	2.95	5.3	4.7	2.85	2.4	1.9	1.7	1.6	1.55	1.55	1.55	1.55
21	4.1	4.7	5.2	2.8	2.3	1.85	1.7	1.6	1.55	1.55	1.55	1.55
22	8.05	3.9	4.7	2.8	2.25	1.85	1.7	1.6	1.55	1.55	1.55	1.55
23	7.4	3.6	4.35	2.7	2.3	1.85	1.7	1.6	1.55	1.55	1.55	1.55
24	6.2	3.35	4.0	2.7	2.2	1.85	1.7	1.6	1.55	1.55	1.5	1.55
25	6.6	3.1	3.8	2.7	2.2	1.85	1.7	1.6	1.55	1.55	1.55	1.55
26	5.15	3.1	4.3	2.7	2.2	1.85	1.65	1.6	1.55	1.55	1.55	1.55
27	4.25	3.0	4.0	2.7	2.2	1.8	1.65	1.55	1.55	1.55	1.55	1.55
28	3.8	2.9	3.9	2.6	2.2	1.8	1.65	1.55	1.55	1.55	1.55	1.55
29	3.45	.....	3.9	2.6	2.2	1.8	1.65	1.55	1.55	1.55	1.55	1.55
30	3.25	.....	3.6	2.7	2.2	1.8	1.65	1.55	1.55	1.55	1.55	1.55
31	3.25	.....	3.6	.....	2.1	.....	1.65	1.55	.....	1.5	.....	1.55

Station rating table for McCloud River near Gregory, Cal., from September 23, 1902, 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.*
1.00	1,090	2.40	2,042	3.80	3,860	5.40	7,170
1.10	1,132	2.50	2,140	3.90	4,030	5.60	7,630
1.20	1,178	2.60	2,242	4.00	4,210	5.80	8,110
1.30	1,228	2.70	2,349	4.10	4,395	6.00	8,600
1.40	1,282	2.80	2,461	4.20	4,585	6.20	9,120
1.50	1,340	2.90	2,578	4.30	4,785	6.40	9,650
1.60	1,402	3.00	2,700	4.40	4,990	6.60	10,190
1.70	1,468	3.10	2,825	4.50	5,200	6.80	10,740
1.80	1,538	3.20	2,955	4.60	5,410	7.00	11,300
1.90	1,612	3.30	3,090	4.70	5,625	7.20	11,870
2.00	1,690	3.40	3,230	4.80	5,840	7.40	12,450
2.10	1,772	3.50	3,380	4.90	6,060	7.60	13,040
2.20	1,858	3.60	3,535	5.00	6,280	7.80	13,640
2.30	1,948	3.70	3,695	5.20	6,720	8.00	14,250

NOTE.—The above table is applicable only for open-channel conditions. It is based on 10 discharge measurements made during 1902–1905. It is fairly well defined between gage heights 1.5 feet and 4.6 feet. The table has been extended beyond these limits. Above 8 feet the discharge is a rough approximation.

Estimated monthly discharge of McCloud River near Gregory, Cal., for 1902–1905.

[Drainage, 608 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
1902						
September 23 to 30	1,340	1,282	1,333	21,150	2.19	0.651
October	2,140	1,228	1,372	84,360	2.26	2.61
November	12,740	1,282	2,799	166,600	4.60	5.13
December	6,060	1,538	2,576	158,400	4.24	4.89
1903						
January	13,340	1,538	2,847	175,100	4.68	5.40
February	2,578	1,772	2,046	113,600	3.37	3.51
March	11,870	2,042	3,723	228,900	6.12	7.06
April	6,060	2,242	2,819	167,700	4.64	5.18
May	2,242	1,612	1,913	117,600	3.15	3.63
June	1,690	1,468	1,545	91,930	2.54	2.83
July	1,468	1,340	1,373	84,420	2.26	2.61
August	1,352	1,311	1,323	81,350	2.18	2.51
September	1,311	1,282	1,305	77,650	2.15	2.40
October	1,435	1,282	1,317	80,980	2.17	2.50
November	14,560	1,282	3,475	206,800	5.72	6.38
December	2,263	1,455	1,829	112,500	3.01	3.47
The year	14,560	1,282	2,126	1,539,000	3.50	47.48
1904						
January	2,042	1,503	1,652	101,600	2.72	3.14
February	39,500	1,468	6,153	353,900	10.12	10.92
March	41,000	3,380	9,310	572,400	15.31	17.65
April	7,285	4,120	5,468	325,400	8.99	10.03
May	4,490	3,090	3,756	230,900	6.18	7.12
June	2,890	1,858	2,218	132,000	3.65	4.07
July	1,858	1,612	1,746	107,400	2.87	3.31
August	1,612	1,503	1,572	96,660	2.59	2.99
September	1,815	1,468	1,512	89,970	2.49	2.78
October	9,785	1,503	2,697	165,800	4.44	5.12
November	2,140	1,503	1,640	97,590	2.70	3.01
December	4,585	1,575	1,844	113,400	3.03	3.49
The year	41,000	1,468	3,297	2,387,000	5.42	73.63
1905						
January	14,400	1,651	3,854	237,000	6.34	7.31
February	6,945	2,042	3,284	182,400	5.40	5.62
March	10,740	2,242	4,062	249,800	6.68	7.70
April	3,230	2,191	2,490	148,200	4.10	4.57
May	2,461	1,772	2,112	129,900	3.47	4.00
June	1,858	1,538	1,648	98,060	2.71	3.02
July	1,538	1,435	1,491	91,680	2.45	2.82
August	1,435	1,371	1,402	86,210	2.31	2.66
September	1,371	1,371	1,371	81,580	2.25	2.51
October	1,402	1,340	1,371	84,300	2.25	2.59
November	1,371	1,340	1,352	80,450	2.22	2.48
December	1,402	1,371	1,372	84,360	2.26	2.61
The year	14,400	1,340	2,151	1,554,000	3.54	47.89

MISCELLANEOUS MEASUREMENTS IN PIT RIVER DRAINAGE BASIN.

The following miscellaneous measurements were made in the Pit River drainage basin during 1905:

Cottonwood Creek, near Lakeview, Oreg.—This stream is tributary to Goose Lake. A measurement was made June 28, 1905, by S. G. Bennett and J. Y. Toler, one-half mile below Wilshire's sawmill and 10 miles above Lakeview, Oreg.

Width, 12.7 feet; area, 4.7 square feet; mean velocity, 1.55 feet per second; discharge, 7.3 second-feet.

Corporation ditch, near Likely, Cal.—This ditch diverts water from the South Fork of Pit River above Likely, Cal. The following measurements were made below head-gate, 2 miles east of Likely, Cal.:

June 7: Width, 5.7 feet; area, 16.3 square feet; mean velocity, 1.42 feet per second; discharge, 23 second-feet.

June 20: Width, 5.6 feet; area, 16.6 square feet; mean velocity, 1.41 feet per second; discharge, 24 second-feet.

September 6: Width, 7.0 feet; area, 19.9 square feet; mean velocity, 1.46 feet per second; discharge, 29 second-feet.

Duke's ditch, near Likely, Cal.—This ditch diverts water from the South Fork of Pit River. The following measurements were made in flume, 400 yards below head-gate, by John Y. Toler:

June 7: Width, 3 feet; area, 2.88 square feet; mean velocity, 4.83 feet per second; discharge, 13.9 second-feet.

June 20: Width, 3 feet; area, 2.3 square feet; mean velocity, 4.25 feet per second; discharge, 9.8 second-feet.

Fitz Hugh Creek, near Alturas, Cal.—This creek is tributary to Pit River. The following measurements were made at Doten's ranch, 10 miles south of Alturas, by John Y. Toler:

July 2: Width, 8.5 feet; area, 2.8 square feet; mean velocity, 0.64 foot per second; discharge, 1.8 second-feet.

July 25: Width, 8.4 feet; area, 2.7 square feet; mean velocity, 0.52 foot per second; discharge, 1.4 second-feet.

September 7: Width, 7.0 feet; area, 2.8 square feet; mean velocity, 0.64 foot per second; discharge, 1.8 second-feet.

September 16: Width, 8 feet; area, 3.6 square feet; mean velocity, 0.78 foot per second; discharge, 2.8 second-feet.

Ganstad's ditch, near Likely, Cal.—This ditch diverts water from the South Fork of the Pit River. The following measurements were made at head-gate, 2 miles east of Likely, Cal., by John Y. Toler:

June 8: Width, 6.6 feet; area, 10.5 square feet; mean velocity, 0.66 foot per second; discharge, 6.9 second-feet.

July 2: Width, 6.6 feet; area, 10.5 square feet; mean velocity, 0.83 foot per second; discharge, 8.7 second-feet.

Gooch's ditch, near Lookout, Cal.—This ditch diverts water from Pit River. A measurement was made 250 yards above bridge at Lookout on June 13 by John Y. Toler.

Width, 14.5 feet; area, 25 square feet; mean velocity, 0.48 foot per second; discharge, 12 second-feet.

E. Lauer and Son's ditch near Alturas, Cal.—This ditch diverts water from Pit River above the town of Alturas, Cal. A measurement was made in flume at XL ranch, 9 miles north of the town of Alturas, Cal., on May 23, by Jno. Y. Toler.

Width, 4.1 feet; area, 0.89 square foot; mean velocity, 1.60 feet per second; discharge, 1.42 second-feet.

Pine Creek near Alturas, Cal.—This stream is a tributary of South Fork of Pit River. The following measurements were made in flume 100 feet below Gibbins & Mulkey's power house, 7 miles east of the town of Alturas, Cal.

August 11: Width, 2.2 feet; area, 2.8 square feet; mean velocity, 4.43 feet per second; discharge, 12.4 second-feet.

August 22: Width, 2.15 feet; area, 2.6 square feet; mean velocity, 4.35 feet per second; discharge, 11.3 second-feet.

October 1: Width, 2.3 feet; area, 3.1 square feet; mean velocity, 3.94 feet per second; discharge, 12.2 second-feet.

Pit River at Lookout, Cal.—The following measurements were made during 1905 at bridge on county road east of town of Lookout, Cal.

June 13: Width, 87 feet; area, 217 square feet; mean velocity, 0.71 foot per second; discharge, 155 second-feet.

July 7: Width, 67 feet; area, 112 square feet; mean velocity, 0.51 foot per second; discharge, 57 second-feet.

July 20: Width, 40 feet; area, 71 square feet; mean velocity, 0.41 foot per second; discharge, 29 second-feet.

August 19: Width, 8 feet; area, 4.8 square feet; mean velocity, 2.06 feet per second; discharge, 9.9 second-feet.

Rush Creek near Adin, Cal.—This stream is a tributary to Ash Creek. The following measurements were made in canyon above upper end of Round Valley north of the town of Alturas, Cal.

July 18: Width, 13 feet; area, 9.7 square feet; mean velocity, 0.56 foot per second; discharge, 5.6 second-feet.

September 22: Width, 9 feet; area, 5.0 square feet; mean velocity, 1.16 feet per second; discharge, 5.8 second-feet.

Von Loam's ditch near Likely, Cal.—This ditch diverts water from the South Fork of Pit River. The following measurements were made below head-gate, 2 miles east of the town of Likely, Cal.

June 8: Width, 7.8 feet; area, 16.9 square feet; mean velocity, 2.09 feet per second; discharge, 35 second-feet.

June 20: Width, 8.5 feet; area, 14.9 square feet; mean velocity, 1.68 feet per second; discharge, 25 second-feet.

Willow Creek near Adin, Cal.—This stream is tributary to Ash Creek. The following measurements were made at bridge on county road, 5 miles south of the town of Adin, Cal.

July 19: Width, 8 feet; area, 5.2 square feet; mean velocity, 1.09 feet per second; discharge, 5.7 second-feet.

September 21: Width, 8 feet; area, 4.4 square feet; mean velocity, 1.00 foot per second; discharge, 4.4 second-feet.

STONY CREEK DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Stony Creek drains a portion of the Coast Range and flowing in a northerly direction discharges its waters into the Sacramento River near Orland, Cal. It has numerous tributaries, all of which are torrential in their character. The formation on the higher elevations is of granite with good soil covering and is heavily timbered. In the lower portion of the drainage basin the formation is shale, sandstone, and conglomerate, with heavy growth of brush and grass. This portion of the basin is used extensively for pasturage, the soil being heavy, it packs readily, producing a large per cent of run-off. The mean average rainfall on the higher elevation is about 40 inches; while on the lower reaches it is 20 inches. The precipitation is almost wholly in the form of rain, with some snow on the upper reaches which soon melts and only adds to the flood discharge.

The gaging station on this stream is located near the point where it emerges from the foothills and enters the Sacramento Valley.

STONY CREEK NEAR FRUTO, CAL.

This station was established on January 30, 1901, by Burt Cole. It is located at Julian's ranch, 7 miles northwest of Fruto, and 1¾ miles above the proposed mill-site dam.

The channel is straight for 200 feet above and below the cable. The current is very swift at high water and sluggish at low water. Neither bank is subject to overflow, but at high stages of the creek the water spreads to the right for several hundred feet. The bed of the stream is of gravel and is subject to some change.

Discharge measurements are made from a car and cable. The initial point for soundings is the eyebolt on the left bank to which the cable is attached.

The gage is in two sections. During 1905 the gage was read twice each day by W. H. Julian. The bench mark is the head of an iron bolt set in the rock near the upper gage; elevation, 14.00 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, and 134 of the United States Geological Survey.

Discharge measurements of Stony Creek near Fruto, Cal., in 1905.

Date	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
February 16	O. W. Peterson	130	204	3.35	5.13	684
June 23	do	110	84	1.52	3.90	128
August 4	Peterson and Lee	32	23	1.22	3.30	28
September 8	C. H. Lee	33	32	.51	3.22	16.3
September 14	W. B. Clapp	33	17	.83	3.20	14.1
October 4	Lee and Hawley	24	23	.76	3.24	17.6

Daily gage height, in feet, of Stony Creek near Fruto, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.0	10.0	5.2	6.1	4.7	4.6	3.7	3.2	3.1	3.2	3.3	3.6
2	6.8	8.75	5.2	6.0	5.0	4.5	3.6	3.2	3.1	3.2	3.3	3.6
3	6.6	7.35	5.1	6.0	5.0	4.5	3.6	3.2	3.2	3.2	3.3	3.6
4	6.3	6.7	5.1	5.9	5.0	4.6	3.6	3.2	3.2	3.2	3.3	3.6
5	6.2	6.2	5.0	5.9	4.9	4.5	3.6	3.2	3.2	3.2	3.3	3.6
6	6.1	6.0	5.0	5.8	4.8	4.5	3.5	3.2	3.2	3.2	3.3	3.6
7	5.0	5.8	5.0	5.8	6.3	4.4	3.5	3.2	3.2	3.2	3.3	3.6
8	4.9	5.6	4.9	5.7	5.75	4.4	3.5	3.2	3.2	3.2	3.3	3.6
9	4.9	5.5	4.9	5.6	5.5	4.3	3.5	3.2	3.2	3.2	3.3	3.6
10	4.8	5.4	4.9	5.5	5.5	4.3	3.5	3.2	3.2	3.2	3.3	3.6
11	4.8	5.4	4.8	5.4	5.4	4.2	3.5	3.2	3.2	3.2	3.3	3.6
12	4.8	5.3	6.4	5.3	5.4	4.2	3.4	3.2	3.2	3.2	3.3	3.6
13	4.7	5.3	8.25	5.3	5.3	4.2	3.4	3.2	3.2	3.2	3.3	3.6
14	9.5	5.2	7.75	5.2	5.3	4.1	3.4	3.2	3.2	3.2	3.3	3.6
15	7.75	5.2	8.5	5.2	5.2	4.1	3.4	3.2	3.2	3.2	3.3	3.6
16	8.5	5.1	8.5	5.3	5.2	4.1	3.3	3.2	3.2	3.2	3.3	3.6
17	7.8	5.5	7.7	5.3	5.1	4.1	3.3	3.2	3.2	3.2	3.3	3.6
18	7.7	5.8	7.15	5.3	5.0	4.1	3.3	3.2	3.2	3.2	3.3	3.6
19	7.4	5.7	9.25	5.2	4.9	4.0	3.3	3.2	3.2	3.2	3.3	3.6
20	6.8	6.0	8.25	5.2	4.9	4.0	3.3	3.1	3.2	3.2	3.3	3.6
21	6.8	5.8	7.3	5.0	4.8	4.0	3.3	3.1	3.2	3.2	3.3	3.6
22	9.75	5.6	6.75	5.0	4.8	3.9	3.3	3.1	3.2	3.2	3.3	3.6
23	9.25	5.5	6.55	5.0	4.7	3.9	3.3	3.1	3.2	3.2	3.3	3.6
24	9.5	5.4	7.25	4.9	4.7	3.9	3.3	3.1	3.2	3.3	3.3	3.6
25	7.7	5.4	6.6	4.9	4.6	3.8	3.3	3.1	3.2	3.3	3.4	3.6
26	6.9	5.3	6.55	4.9	4.6	3.8	3.3	3.1	3.2	3.3	3.4	3.6
27	6.45	5.3	6.3	4.8	5.25	3.8	3.3	3.1	3.2	3.3	3.4	3.8
28	6.3	5.2	6.1	4.8	4.8	3.7	3.3	3.1	3.2	3.3	3.4	3.8
29	6.1	.....	7.35	4.8	4.8	3.7	3.3	3.1	3.2	3.3	3.6	3.8
30	6.0	.....	6.5	4.7	4.7	3.7	3.2	3.1	3.2	3.3	3.6	3.8
31	6.0	.....	6.15	.....	4.6	.....	3.2	3.1	.....	3.3	.....	3.8

Station rating table for Stony Creek near Fruto, Cal., 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.*
3.10	10	4.50	350	5.90	1,310	7.60	3,150
3.20	14	4.60	400	6.00	1,400	7.80	3,410
3.30	23	4.70	450	6.10	1,490	8.00	3,690
3.40	34	4.80	500	6.20	1,580	8.20	3,980
3.50	47	4.90	560	6.30	1,680	8.40	4,280
3.60	62	5.00	620	6.40	1,780	8.60	4,600
3.70	80	5.10	685	6.50	1,880	8.80	4,930
3.80	100	5.20	755	6.60	1,980	9.00	5,270
3.90	120	5.30	830	6.70	2,090	9.20	5,630
4.00	150	5.40	905	6.80	2,200	9.40	6,000
4.10	180	5.50	980	6.90	2,310	9.60	6,400
4.20	210	5.60	1,060	7.00	2,420	9.80	6,800
4.30	250	5.70	1,140	7.20	2,660	10.00	7,280
4.40	300	5.80	1,220	7.40	2,900		

NOTE.—The above table is based on 22 discharge measurements made during 1903–1905 and is fairly well defined throughout. Above 3.7 feet the table is the same as for 1904.

Estimated monthly discharge of Stony Creek near Fruto, Cal., for 1905.

[Drainage area, 760 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	6,700	450	2,420	148,800	3.18	3.67
February	7,280	685	1,471	81,700	1.94	2.02
March	5,720	500	2,050	126,000	2.70	3.11
April	1,490	450	870	51,770	1.14	1.27
May	1,680	400	675	41,500	.888	1.02
June	400	80	206	12,260	.271	.302
July	80	14	36.5	2,244	.048	.055
August	14	10	12.4	762	.016	.018
September	14	10	13.7	815	.018	.020
October	23	14	16.3	1,002	.021	.024
November	62	23	27.1	1,613	.036	.040
December	100	62	68.1	4,187	.090	.104
The year	7,280	10	656	472,700	.862	11.62

FEATHER RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Feather River drains a portion of the western slope of the Sierra Nevada extending east nearly to the Nevada State line, a distance of about 75 miles and north and south for a distance of from 30 to 40 miles.

The greater portion of the watershed is rough and mountainous and has numerous tributaries which drain the slopes of the higher mountains. The formation in the southern and eastern part of the basin is of granite, with a comparatively deep soil covering. There is also a considerable area composed of lava and other volcanic matter in the northern part of the basin. Numerous meadows and valleys also exist, which tend to maintain a steady flow during the dry season. The soil is generally porous and absorbs the moisture readily. The entire watershed is well covered with a growth of brush and timber, much of which is large enough to make lumbering a profitable industry, with the exception of the meadow lands and valleys, which are used for stock ranges and grazing lands. There are numerous large springs, especially in the lava districts, which supply a more or less steady flow throughout the year. These are especially noticeable on North Fork, where there are perennial springs discharging from 50 to 100 second-feet. There is little artificial storage in the drainage area, and the water used for irrigation in the valleys is taken from the natural flow of the streams.

The mean annual precipitation is probably from 40 to 60 inches and is well distributed over the area. It falls largely in the form of snow, but disappears in the early part of the summer.

FEATHER RIVER AT OROVILLE, CAL.

This station was established January 1, 1902, by S. G. Bennett. It is located at the northeast edge of the town of Oroville, Cal., where Feather River breaks from the foothills on the western slope of the Sierra Nevada into Sacramento Valley. The drainage area is 3,640 square miles.

The current at the station is sluggish at low water and swift at high water. The channel is rough, rocky, and not subject to much change.

Discharge measurements at low and ordinary stages were made by means of a cable and boat 500 feet above the wagon bridge. High-water measurements were made by means of floats. In February, 1905, a cable with car was placed about 1,000 feet above the bridge. The cable has a span of about 400 feet. The initial point of soundings is the eyebolt on the left bank.

The original gage was previously placed by the United States Weather Bureau and used by them for a number of years. Readings were taken on this rod and reported by the Weather Bureau when there was danger of an overflow on the lower Feather and Sacramento rivers. On August 11, 1904, a new gage rod was put in. The zero of this rod was placed 2 feet lower than that of the old Weather Bureau rod to avoid negative readings at low stages of the river. This rod is placed at the wagon bridge on the left bank of the stream and is in four sections. Three of the lower sections are bolted to rock, and the fourth section, for registering the flood stages, is nailed to the bridge pier. In December, 1905, a staff gage was placed at the station 50 feet below the cable on the left bank. During 1905 the gage was read by D. G. Page, readings being taken from the gage at the bridge. The bench marks are as follows: (1) A point on rock marked with white paint, one-half the distance from the low-water gage to the high-water gage on the bridge pier; elevation, 12.25 feet. (2) A point on rock marked with white paint, 35 feet southwest of low-water gage; elevation, 14.86 feet. (3) A circle of white paint on the point of a rock 15 feet upstream from the 70-foot mark on the cable; elevation, 5.05 feet. (4) A point on rock marked with white paint, 4 feet downstream from 15-foot mark on cable; elevation, 27.16 feet. The elevations of bench marks Nos. 1 and 2 refer to the datum of the gage at the bridge; elevations of bench marks Nos. 3 and 4 refer to the datum of the gage established in December, 1905.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, and 134 of the United States Geological Survey.

Discharge measurements of Feather River at Oroville, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
February 11	O. W. Peterson	281	3,424	2.22	6.45	7,618
February 18	do	279	3,320	2.08	6.10	6,911
May 16	W. B. Clapp	281	3,728	2.28	6.65	8,509
June 26	O .W. Peterson	273	2,419	1.13	2.75	2,744
August 1	Peterson and Lee	270	2,078	.72	1.28	1,495
September 2	C. H. Lee	268	2,005	.62	.86	1,242
October 7	Hawley and Lee	272	2,013	.60	.90	1,210
November 17	R. S. Hawley	270	1,969	.62	.92	1,212

Daily gage height, in feet, of Feather River at Oroville, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10.0	9.5	6.9	8.3	7.15	5.4	2.1	1.3	0.95	1.0	1.0	1.4
2	8.3	11.3	6.9	8.05	7.05	5.25	2.1	1.25	.9	1.0	1.0	1.35
3	7.4	10.25	6.95	8.15	6.95	5.2	2.1	1.25	.9	.95	1.0	1.2
4	6.65	9.05	7.5	8.1	6.85	5.2	2.05	1.2	.9	.95	1.0	1.15
5	5.8	8.9	7.75	8.05	6.75	5.15	2.0	1.15	.9	.95	.95	1.1
6	5.5	8.95	7.4	8.0	6.55	5.0	2.0	1.15	.95	1.0	.95	1.0
7	5.5	7.85	7.0	8.0	6.45	4.95	1.95	1.15	.95	1.0	.95	1.0
8	5.1	7.4	6.8	8.05	6.35	4.95	1.9	1.1	1.0	1.0	.95	.95
9	4.5	6.95	6.75	8.0	6.25	4.9	1.9	1.1	1.0	1.1	.9	.95
10	4.2	6.7	6.6	7.9	6.15	4.8	1.85	1.05	1.0	1.05	.9	.95
11	3.4	6.5	6.7	7.8	6.1	4.7	1.8	1.05	1.0	1.05	.85	.95
12	3.3	6.25	7.85	7.7	6.0	4.6	1.8	1.05	.95	1.0	.85	1.0
13	3.2	5.9	10.25	7.5	5.85	4.45	1.75	1.05	.95	1.0	.85	1.0
14	10.15	5.6	9.95	7.5	5.9	4.2	1.75	1.0	.9	.95	.85	1.1
15	10.25	5.4	9.45	7.5	6.15	4.1	1.7	1.0	.9	.95	.9	1.2
16	7.65	5.4	8.8	7.4	6.45	3.9	1.7	1.0	.9	.95	.9	1.15
17	5.6	6.35	8.4	7.4	6.6	3.8	1.65	1.05	.85	.95	.9	[a]1.15
18	5.5	6.35	8.9	7.45	6.5	3.7	1.65	1.05	.85	.95	.9	[a]1.15
19	7.4	6.1	12.5	7.55	6.45	3.6	1.6	1.05	.85	1.0	.9	[a]1.15
20	6.65	7.8	11.35	7.35	6.4	3.45	1.6	1.1	.9	1.0	1.0	[a]1.15
21	7.35	8.25	11.35	6.95	6.4	3.2	1.6	1.1	.9	1.0	1.4	[a]1.1
22	11.8	7.75	10.95	6.7	6.3	3.15	1.55	1.1	.9	1.0	1.3	[a]1.1
23	11.95	7.4	10.8	6.8	6.3	3.05	1.5	1.2	.95	1.0	1.3	[a]1.1
24	10.5	7.3	10.7	6.95	6.3	3.0	1.5	1.2	.95	1.0	1.25	1.1
25	9.8	7.2	9.95	7.15	6.25	2.9	1.5	1.1	.9	.95	1.2	1.15
26	8.65	7.1	9.3	7.3	6.2	2.8	1.45	1.0	.9	.95	1.2	1.15
27	7.9	7.1	9.05	7.45	.....	2.6	1.45	1.0	.9	.95	1.1	1.2
28	7.45	7.0	9.5	7.5	6.0	2.5	1.4	1.0	1.7	.95	1.1	1.2
29	7.1	.....	10.65	7.4	5.95	2.4	1.4	.95	1.3	1.0	1.3	1.3
30	6.85	.....	10.05	7.3	5.85	2.3	1.35	1.0	1.0	1.0	1.4	1.35
31	6.75	.....	8.95	.....	5.65	.....	1.35	1.0	.....	1.0	.....	[a]1.35

[a] Estimated.

Station rating table for Feather River at Oroville, Cal., 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.*
0.90	1,230	2.70	2,590	4.40	4,570	7.20	8,640
1.00	1,295	2.80	2,690	4.50	4,700	7.40	9,000
1.10	1,360	2.90	2,790	4.60	4,830	7.60	9,400
1.20	1,430	3.00	2,900	4.70	4,960	7.80	9,800
1.30	1,500	3.10	3,010	4.80	5,090	8.00	10,260
1.40	1,570	3.20	3,120	4.90	5,220	8.20	10,740
1.50	1,640	3.30	3,230	5.00	5,350	8.40	11,260
1.60	1,710	3.40	3,340	5.20	5,630	8.60	11,780
1.70	1,780	3.50	3,450	5.40	5,910	8.80	12,340
1.80	1,850	3.60	3,570	5.60	6,190	9.00	12,900
1.90	1,925	3.70	3,690	5.80	6,470	9.50	14,400
2.00	2,000	3.80	3,810	6.00	6,750	10.00	16,150
2.10	2,075	3.90	3,930	6.20	7,050	10.50	18,100
2.20	2,155	4.00	4,050	6.40	7,350	11.00	20,100
2.30	2,235	4.10	4,180	6.60	7,660	11.50	22,500
2.40	2,315	4.20	4,310	6.80	7,980	12.00	25,100
2.50	2,400	4.30	4,440	7.00	8,300	12.50	28,100
2.60	2,490						

NOTE.—The above table is based on 21 discharge measurements made during 1904–5. It is well defined between gage heights 0.85 foot and 8 feet. Above gage height 3.5 feet the table is the same as for 1904.

Estimated monthly discharge of Feather River at Oroville, Cal., for 1905.

[Drainage area, 3,640 [a] 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	24,800	3,120	9,860	606,300	2.71	3.12
February	21,500	5,910	9,612	533,800	2.64	2.75
March	28,100	7,660	13,560	833,800	3.72	4.29
April	11,000	7,820	9,403	559,500	2.58	2.88
May	8,550	6,260	7,254	446,000	1.99	2.29
June	5,910	2,235	4,098	243,800	1.13	1.26
July	2,075	1,535	1,790	110,100	.492	.567
August	1,500	1,262	1,354	83,250	.372	.429
September	1,780	1,200	1,273	75,750	.350	.390
October	1,360	1,262	1,286	79,070	.353	.407
November	1,570	1,200	1,321	78,610	.363	.405
December	1,570	1,262	1,385	85,160	.380	.438
The year	28,100	1,200	5,183	3,735,000	1.42	19.23

[a] Revised since previous reports.

MISCELLANEOUS MEASUREMENTS IN FEATHER RIVER DRAINAGE BASIN.

The following miscellaneous measurements were made in the Feather River drainage basin during 1905:

Mohawk Creek near New Mohawk, Cal.—A measurement was made on this stream on September 10, 1905, just above its junction with Middle Fork of Feather River by H. A. Campbell.

Width, 12.9 feet; area, 16.9 square feet; mean velocity, 1.18 feet per second; discharge, 20 second-feet.

Middle Fork of Feather River at Mohawk Valley, Cal.—A measurement was made just above mouth of Mohawk Creek on September 10, 1905, by H. A. Campbell.

Width, 10.0 feet; area, 8.8 square feet; mean velocity, 0.17 foot per second; discharge, 1.5 second-feet.

Feather River at Prattville, Cal.—A measurement of this stream was made November 25 at lower end of Big Meadows, 4 miles southeast of Prattville, Cal.

Width, 61 feet; area, 320 square feet; mean velocity, 1.88 feet per second; discharge, 601 second-feet.

Grizzly Creek near Beckwith, Cal.—This stream is tributary to Middle Fork of Feather River. A measurement was made December 17 one-half mile above its junction with Middle Fork and about 2½ miles west of the town of Beckwith, Cal.

Width, 4 feet; area, 1.8 square feet; mean velocity, 1.72 feet per second; discharge, 3.1 second-feet.

Indian Creek near Crescent Mills, Cal.—This stream is tributary to North Fork of Feather River. A measurement was made December 14 at lower end of Indian Valley, one-half mile below highway bridge on Crescent Mill and Taylorsville road, about 1½ miles below the town of Crescent Mills.

Width, 45 feet; area, 66 square feet; mean velocity 1.15 feet per second; discharge, 76 second-feet.

YUBA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Yuba River is a tributary of Feather River, which it enters at Marysville, 30 miles above the junction of Feather and Sacramento rivers. The entire drainage area of this river is about 1,327 square miles, of which about 1,220 square miles are above the gaging station at Smartsville. Its extreme length is about 60 miles, and extreme width 56 miles. In the lower stretches of the river, at the location of the present gaging station and in the valley below, the channel has been filled to a considerable depth with débris from hydraulic mining.

The drainage basin is subdivided into 5 small basins, namely: North Fork, with a drainage area of 491.6 square miles; Middle Fork, with a drainage area of 218 square miles; South Fork, with a drainage area of 360 square miles; Deer Creek, with a drainage area of 89.6 square miles, and Dry Creek, with a drainage area of 105.5 square miles. The latter tributary discharges into the main river about 5 miles below the gaging station. The watershed rises gently in rounded and broken mountains, to the crest of the Sierra Nevada, which at the headwaters of the Yuba has a mean elevation of about 8,200 feet, with peaks rising to a height of 9,100 feet. From Mount Lincoln—a peak common to the watersheds of the Yuba, American, and Truckee rivers—to a point about 2½ miles northeast of Mount Weber, the summit of the Sierra Nevada divides the watershed of Yuba River from that of Truckee River, which discharges into Humboldt Basin. Farther north from Mount Weber there is a secondary crest which divides the watersheds of Yuba and Feather rivers, the watershed of the latter stream reaching farther east to a less elevated divide in which the passes are lower than those of the easterly crest.

The western and lower portions of the Yuba drainage basin are composed of slate and kindred rock, very much eroded and merging into the gravel and alluvial deposits of the Sacramento Valley. The upper portions of the basin are composed principally of lavas and granites, all deeply eroded, particularly the lavas. A stratum of serpentine traverses the watershed of the Yuba River in a direction generally parallel with the crest of the Sierras. The North Fork rises in lavas which vary much in composition and hardness, but which generally have a deep soil covering, with timber and brush growth. The Middle Fork rises in similar lavas and granite. The main and tributary streams fall rapidly, and their canyons head well up in the mountains. The sides of these canyons are covered with timber and brush, which, with the deep soil, retain the moisture and feed numerous perennial springs. In the case of the North Fork this is particularly noticeable. The forests of its watersheds make a reliable and constant stream. The mean annual precipitation for the basins of North and Middle forks is about 54 inches. Warm rains on soft snow sometimes give high flood discharge, but snow remains on the higher peaks until midsummer. The headwaters of South Fork lie upon a broad granite surface into which the streams have not cut deeply until the main stream reaches a point 16 miles from the summit, where it drops rapidly into a deeply eroded canyon. This part of the basin has a precipitation annually of about 60 inches. The entire drainage area of the Yuba contains nearly 100 small glacial lakes.

YUBA RIVER NEAR SMARTSVILLE, CAL.

This station was established June 2, 1903, by W. H. Stearns. It is located at what is called "The Narrows," 1 mile from Smartsville, Cal., 18 miles from the Southern Pacific Railroad station at Wheatland, Cal., and 20 miles from Marysville, Cal.

The channel is straight for 200 feet above and 300 feet below the station, and the current is swift at all stages. In the 150 feet above the cable the stream has a fall of 0.2 foot and of 0.9 foot in the 200 feet below. Both banks are high and rocky and are not subject to overflow. The banks widen out considerably just below the station. The bed of the stream is composed of gravel and sand—tailings from hydraulic mining—and is constantly shifting. After the rains of 1904 it was found that the bed of the stream had been lowered for an average depth of 2 feet.

Discharge measurements are made from a car and cable. One auxiliary cable is stretched parallel to and 100 feet upstream from the main cable, and a second one is located 150 feet below the station cable for float measurements. The initial point for soundings is on the left bank at the eyebolt to which the cable is fastened. Frequent discharge measurements are made on account of continual changes of the river bed. These changes, however, do not materially affect discharge measurements for the same gage height.

The gage is in two sections. The lower one is bolted to the rock wall on the left bank of the river and the upper one to the right bank. During 1905 the gage was read once each day by J. R. McKeel. Bench marks were established as follows: (1) A point on a rock marked with white paint, 12 feet upstream and about 15 feet to the left of the right eyebolt; elevation, 39.34 feet. (2) A bolt in shelf of rock marked with white paint, 12 feet from high-water gage on right bank; elevation, 13.75 feet. (3) A bolt in the face of rock 20 feet upstream from the cable on right bank; elevation, 16.60 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 100, and 134, United States Geological Survey.

Discharge measurements of Yuba River near Smartsville, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 20	J. R. McKeel	180	688	5.09	6.70	3,500
February 12	do	175	671	4.69	6.30	3,147
February 13	O. W. Peterson	178	665	4.39	6.25	2,920
February 26	J. R. McKeel	180	936	5.76	7.00	5,397
March 5	do	179	836	5.40	6.60	4,512
March 15	do	180	982	6.02	6.90	5,914
April 8	do	170	1,060	6.56	7.00	6,959
April 24	do	170	968	6.64	6.30	6,423
May 4	do	180	868	6.01	5.80	5,221
May 13	do	180	864	5.94	5.50	5,132
May 28	do	183	883	6.31	5.75	5,570
June 4	do	180	732	5.40	5.00	3,955
June 16	do	180	652	5.09	4.50	3,318
July 7	do	155	286	3.58	2.40	1,025
July 20	do	74	165	4.22	2.00	697
July 29	do	73	158	4.01	1.60	634
July 31	O. W. Peterson, C. H. Lee	76	137	3.38	1.64	463
August 7	J. R. McKeel	68	137	3.83	1.50	525
August 15	do	62	126	3.78	1.40	476
August 21	do	68	140	3.80	1.50	532
August 28	do	62	120	3.68	1.30	442
September 5	do	62	120	3.66	1.30	439
September 25	do	57	113	3.56	1.20	402
October 8	Hawley and Lee	74	115	3.43	1.45	395
October 20	J. R. McKeel	66	126	3.62	1.40	456
October 30	do	66	125	3.55	1.35	444
November 9	do	63	121	3.48	1.30	420
November 16	do	63	117	3.44	1.20	403
November 23	do	63	123	3.56	1.35	438
November 30	do	150	224	3.70	2.20	830
December 6	do	70	140	3.80	1.60	533
December 13	do	68	133	3.65	1.50	486
December 29	do	84	167	3.96	1.90	661

Daily gage height, in feet, of Yuba River near Smartsville, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	9.0	7.5	6.7	7.0	6.5	5.5	2.7	1.6	1.3	1.4	1.4	2.0
2	8.4	9.4	6.7	7.0	6.3	5.2	2.7	1.6	1.3	1.4	1.4	1.7
3	7.6	8.5	6.6	7.1	6.1	5.1	2.6	1.6	a1.3	1.4	1.4	1.7
4	7.2	7.9	6.7	7.1	5.8	5.0	a2.5	1.6	1.3	1.4	1.4	1.7
5	6.9	8.5	6.6	7.0	5.7	4.8	2.5	1.6	1.3	1.4	a1.4	1.6
6	6.8	7.6	6.6	7.1	5.7	4.9	2.4	a1.6	1.3	1.3	1.4	1.6
7	6.4	7.2	6.5	7.3	5.6	5.0	2.4	1.5	1.3	1.3	1.4	1.6
8	6.4	7.0	6.5	7.0	6.0	4.9	2.3	1.5	1.3	1.4	1.3	1.6
9	6.3	6.8	6.4	6.9	6.2	4.9	2.3	1.5	1.3	a1.4	1.3	1.5
10	6.2	6.6	6.4	6.9	5.7	4.9	2.2	1.5	a1.3	1.4	1.3	a1.5
11	6.1	6.6	6.3	6.5	5.7	5.2	2.2	1.5	1.3	1.4	1.3	1.5
12	6.1	6.3	6.4	6.3	5.5	5.0	2.2	1.5	1.2	1.4	a1.3	1.5
13	6.1	6.2	7.3	6.3	5.5	5.0	2.1	a1.5	1.2	1.4	1.3	1.5
14	8.2	6.1	7.7	6.2	a5.8	4.7	2.1	1.5	1.2	1.4	1.3	1.5
15	7.7	6.1	6.9	6.2	6.1	4.7	2.1	1.4	1.2	a1.3	1.3	1.5
16	7.3	6.0	6.8	6.4	6.9	4.5	2.1	1.4	1.2	1.3	1.2	1.6
17	6.9	7.0	6.6	6.0	7.0	4.5	2.0	1.4	a1.2	1.3	1.2	1.6
18	6.3	7.0	7.3	7.2	6.9	4.3	2.0	1.4	1.2	1.4	1.2	2.0
19	a6.5	6.9	11.3	6.3	6.9	4.2	2.0	1.4	a1.2	1.4	a1.4	2.0
20	6.7	8.5	8.8	6.0	6.8	4.0	2.0	a1.4	1.2	1.4	1.5	2.4
21	7.5	7.4	9.4	6.0	7.0	3.8	1.9	1.4	1.2	1.4	1.6	2.0
22	10.4	7.1	8.5	6.0	6.3	3.6	1.9	1.5	1.2	a1.4	1.4	1.8
23	10.0	6.9	7.9	6.1	6.2	3.4	1.8	1.4	1.2	1.4	1.4	1.6
24	8.9	6.8	8.4	6.3	6.0	3.3	1.8	1.4	a1.2	1.4	1.3	1.6
25	8.2	6.9	8.0	6.6	6.2	3.2	1.8	1.4	1.2	1.4	1.4	1.6
26	7.8	7.0	8.1	7.0	6.5	3.1	1.7	1.4	1.2	1.5	a1.6	1.6
27	7.4	6.9	8.0	7.4	5.8	3.0	1.7	a1.4	1.5	1.4	1.8	1.6
28	7.1	6.8	7.5	7.1	5.7	2.9	1.7	1.3	1.5	a1.4	1.6	1.8
29	6.9	.....	8.4	7.0	5.6	2.8	1.6	1.3	1.4	a1.4	1.8	1.9
30	6.8	.....	8.0	7.1	5.5	2.8	1.6	1.3	1.4	1.4	2.2	1.8
31	6.7	.....	7.3	.....	5.5	.....	1.6	1.3	.....	1.4	.....	1.8

a Gage heights estimated.

Daily discharge, in second-feet, of Yuba River near Smartsville, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8,500	5,200	4,750	6,730	6,845	4,920	1,235	515	435	455	455	710
2	7,000	10,050	4,750	6,730	6,440	4,395	1,235	515	435	455	455	555
3	5,120	7,650	4,550	7,060	6,045	4,225	1,145	515	435	455	455	555
4	4,300	6,150	4,750	7,060	5,470	4,060	1,060	515	435	455	455	555
5	3,750	7,680	4,512	6,850	5,285	3,745	1,060	515	435	455	455	515
6	3,570	5,500	4,512	7,160	5,285	3,900	980	515	435	435	455	515
7	2,920	4,670	4,460	7,600	5,100	4,060	980	480	435	435	455	515
8	2,920	4,310	4,460	6,960	5,850	3,900	905	480	435	455	435	515
9	2,770	3,950	4,400	6,750	6,240	3,900	905	480	435	455	435	480
10	2,630	3,600	4,650	6,900	5,285	3,900	835	480	435	455	435	480
11	2,510	3,650	4,400	6,160	5,285	4,395	835	480	435	455	435	480
12	2,510	3,147	4,700	5,770	4,920	4,060	835	480	415	455	435	480
13	2,510	2,920	6,700	5,900	4,920	4,060	770	480	415	455	435	480
14	6,500	2,780	7,850	5,700	5,470	3,595	770	480	415	455	435	480
15	5,350	2,780	5,914	5,800	6,045	3,595	770	455	415	435	435	480
16	4,500	2,750	5,710	6,190	7,700	3,300	770	455	415	435	415	515
17	3,850	4,550	5,420	5,520	7,920	3,300	710	455	415	435	415	515
18	2,850	4,650	6,800	8,000	7,700	3,015	710	455	415	455	415	710
19	3,160	4,500	17,400	6,200	7,700	2,880	710	455	415	455	435	710
20	3,500	8,400	10,320	5,620	7,480	2,620	710	455	415	455	480	980
21	5,040	5,800	11,800	5,720	7,920	2,375	650	455	415	455	515	710
22	12,850	5,250	9,700	5,720	6,440	2,145	650	480	415	455	455	600
23	11,550	4,920	8,350	6,030	6,240	1,930	600	455	415	455	455	515
24	8,520	4,800	9,500	6,420	5,850	1,825	600	455	415	455	435	515
25	6,750	5,060	8,700	7,055	6,240	1,720	600	455	415	455	455	515
26	5,800	5,397	8,900	7,920	6,845	1,620	555	455	415	480	515	515
27	4,950	5,150	8,700	8,800	5,470	1,520	555	455	480	455	600	515
28	4,350	4,950	7,800	8,140	5,285	1,420	555	435	480	455	515	600
29	4,000	.....	9,720	7,920	5,100	1,325	515	435	455	455	600	650
30	3,820	.....	8,800	8,140	4,920	1,325	515	435	455	455	835	600
31	3,650	.....	7,350	.....	4,920	.....	515	435	.....	455	.....	600

NOTE.—January 1 to April 24 the daily discharge was obtained indirectly. From April 25 to December 31 the daily discharge was obtained from a rating table based on measurements subsequent to April 24.

Estimated monthly discharge of Yuba River near Smartsville, Cal., for 1905.

[Drainage area, 1,220 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	12,850	2,510	4,903	301,500	4.02	4.64
February	10,050	2,750	5,008	278,100	4.10	4.27
March	17,400	4,400	7,107	437,000	5.83	6.72
April	8,800	5,520	6,751	401,700	5.53	6.17
May	7,920	4,920	6,071	373,300	4.98	5.74
June	4,920	1,325	3,101	184,500	2.54	2.83
July	1,235	515	782	48,080	.641	.739
August	515	435	471	28,960	.386	.445
September	480	415	429	25,530	.352	.393
October	480	435	453	27,850	.371	.428
November	835	415	474	28,200	.389	.434
December	980	480	566	34,800	.464	.535
The year	12,850	415	3,010	2,170,000	2.47	33.34

MISCELLANEOUS MEASUREMENTS, YUBA RIVER DRAINAGE BASIN.

Bay Counties Power Company flume near Nevada City, Cal.—A measurement was made in the flume opposite Purdon bridge over the South Fork of Yuba River on September 3, 1905, by H. A. Campbell.

Width, 6 feet; area, 13.5 square feet; mean velocity, 5.11 feet per second; discharge, 69 second-feet.

Middle Fork of Yuba River near Nevada City, Cal.—A measurement was made one-half mile upstream from Freeman's bridge and about 3 miles north of Nevada City on September 4, 1905, by H. A. Campbell.

Width, 22 feet; area, 31 square feet; mean velocity, 2.06 feet per second; discharge, 64 second-feet.

North Fork of Yuba River near Goodyears bar, Cal.—A measurement was made on this stream September 5, 1905, from the downstream side of the wagon bridge at Goodyears bar by H. A. Campbell.

Width, 44 feet; area, 96 square feet; mean velocity, 1.54 feet per second; discharge, 149 second-feet.

North Fork of North Fork of Yuba River near Downieville, Cal.—This stream enters the North Fork of Yuba River at Downieville, Cal. A measurement was made 1½ miles north of Downieville and 100 yards above its junction with Middle Fork of North Fork on September 6, 1905, by H. A. Campbell.

Width, 10 feet; area, 18.5 square feet; mean velocity, 0.36 foot per second; discharge, 6.7 second-feet.

A measurement was made 30 yards below junction of Middle Fork of North Fork of Yuba River, about 1½ miles north of Downieville, Cal., on September 6, 1905, by H. A. Campbell.

Width, 26 feet; area, 37 square feet; mean velocity, 0.73 foot per second; discharge, 27 second-feet.

Wheeler flume near Downieville, Cal.—This flume takes water from the East Fork of the North Fork of Yuba River. A measurement was made on September 6, 1905, at the headgate three-fourths mile north of Downieville by H. A. Campbell.

Width, 3.1 feet; area, 2.3 square feet; mean velocity, 1.91 feet per second; discharge, 4.4 second-feet.

Davis ditch near Downieville, Cal.—This ditch is taken out of East Fork of North Fork of Yuba River about a mile above Downieville. A measurement was made one-half mile below the head-gate on September 6, 1905, by H. A. Campbell.

Width, 3.0 feet; area, 1.9 square feet; mean velocity, 1.47 feet per second; discharge, 2.8 second-feet.

East Fork of North Fork of Yuba River at Downieville, Cal.—A measurement was made on September 6, 1905, 10 yards above its junction with North Fork of North Fork of Yuba River at Downieville by H A. Campbell.

Width, 22 feet; area, 29 square feet; mean velocity, 0.59 foot per second; discharge, 17 second-feet.

North Fork of North Fork of Yuba River at Downieville, Cal.—A measurement was made on September 6, 1905, on this stream 10 yards above its junction with North Fork of Yuba River by H. A. Campbell.

Width, 28 feet; area, 52 square feet; mean velocity, 0.77 foot per second; discharge, 40 second-feet.

North Fork of Yuba River at Downieville, Cal.—A measurement was made from the upstream side of the wagon bridge at Downieville on September 6, 1905, by H. A. Campbell.

Width, 40 feet; area, 184 square feet; mean velocity, 0.76 foot per second; discharge, 139 second-feet.

South Fork of North Fork of Yuba River near Sierra City, Cal.—A measurement was made on September 7, 1905, by H. A. Campbell, about one-third of a mile above its junction with the North Fork of the North Fork and about 1¼ miles east of Sierra City.

Width, 2.7 feet; area, 2.5 square feet; mean velocity, 0.68 foot per second; discharge, 1.7 second-feet.

Mining company's flume near Sierra City, Cal.—A measurement was made on September 7, 1905, by H. A. Campbell, about 1 mile below heading.

Width, 2.5 feet; area, 2.2 square feet; mean velocity, 4.50 feet per second; discharge, 9.9 second-feet.

North Fork of North Fork of Yuba River near Sierra City, Cal.—A measurement was made on September 7, 1905, by H. A. Campbell, about one-half mile above its junction with the South Fork of the North Fork and about 1 mile east of Sierra City.

Width, 25 feet; area, 41 square feet; mean velocity, 0.56 foot per second; discharge, 23 second-feet.

BEAR RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Bear River drains an area of 287 square miles between the Yuba and American rivers. Its headwaters do not reach back to the crest of the range so that it seldom receives precipitation in the form of lasting snow. It is torrential in character, having no forested areas except in its upper portion. The rainfall records kept by the Central Pacific from Auburn to Emigrant Gap are indicative of the precipitiation in the southern part of its basin. A 28-year record at Grass Valley in the northern portion of its watershed gives a mean of 49.41 inches.

BEAR RIVER ABOVE WHEATLAND, CAL.

This station was established by O. W. Peterson on October 8, 1904. It is located about 800 feet below McCourtney Crossing and 8 miles above Wheatland.

The channel is straight for 350 feet both above and below the station. At ordinary stages the velocity is moderate. Neither bank is subject to overflow. The bed of the stream is composed of gravel and is not subject to any material change.

Discharge measurements are made from a car and cable. An auxiliary cable is located 150 feet downstream and parallel to the large one, so that float measurements can be made at very high water. The white-oak tree to which the right end of the cable is fastened is the initial point for soundings.

The gage rods are 300 feet above the station, on the left bank of the river. Two of the sections are bolted to the rock and the upper section is nailed to a tree. During 1905 the

gage was read once each day by Hermann Ernestus. A standard United States Geological Survey bench mark is sulphured in a hole drilled in the rock between the two upper sections of the gage; elevation, 12.26 feet above the datum of the gage.

A description of this station with gage height and discharge data is contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Bear River above Wheatland, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
February 8	F. R. S. Buttemer	142	225	4.21	5.10	948
February 13	do	140	165	3.62	4.57	598
February 19	do	139	172	3.66	4.66	629
February 24	do	139	151	3.50	4.50	528
June 27	O. W. Peterson	42	47	1.89	3.42	89
July 30	Peterson and Lee	27	39	.95	3.10	37
September 3	C. H. Lee	31	44	1.43	3.24	63
October 10	Hawley and Lee	26	20	2.15	3.00	43

Daily gage height, in feet, of Bear River above Wheatland, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.0	5.6	4.3	a 5.45	a 4.1	a 4.1	3.2	3.1	3.2	3.1	3.1	3.4
2	4.8	7.0	4.2	5.3	a 4.2	a 4.1	3.2	3.1	3.2	3.1	3.0	3.3
3	4.3	4.9	4.2	5.0	4.5	a 4.1	3.2	3.1	3.2	3.1	3.0	3.2
4	4.2	6.7	4.2	4.9	4.2	a 4.1	3.2	3.1	3.2	3.1	3.0	3.2
5	4.2	7.0	4.2	4.8	a 4.4	a 4.1	3.2	3.1	3.4	3.1	3.0	3.2
6	4.1	5.5	4.2	4.7	a 4.5	a 4.0	3.2	3.1	3.2	3.1	3.0	3.1
7	4.0	5.1	4.2	4.6	4.6	a 4.0	3.1	3.1	3.2	3.1	3.0	3.1
8	3.9	5.2	4.1	4.5	a 4.7	a 3.8	3.1	3.1	3.2	3.1	3.0	3.1
9	4.4	5.0	4.0	4.4	4.8	a 3.8	3.1	3.1	3.2	3.1	3.0	3.1
10	4.2	4.8	4.0	4.4	a 4.7	a 3.8	3.1	3.1	3.1	3.1	3.0	3.0
11	4.0	4.9	4.0	4.4	a 4.7	a 3.8	3.1	3.1	3.1	3.1	3.0	3.0
12	3.9	4.6	4.2	4.4	a 4.7	a 3.8	3.1	3.1	3.1	3.1	3.0	3.0
13	3.8	4.5	4.7	4.3	a 4.7	a 3.8	3.1	3.35	3.1	3.1	2.9	3.0
14	5.0	4.4	4.6	4.3	a 4.7	a 3.8	3.1	3.1	3.1	3.1	2.9	3.0
15	4.5	4.3	4.4	4.3	a 5.1	a 3.8	3.2	3.4	3.1	3.1	2.9	3.0
16	4.8	4.7	4.4	4.5	a 5.5	a 3.6	3.1	3.1	3.1	3.1	2.9	3.1
17	4.4	5.0	4.4	4.4	a 5.5	a 3.6	3.1	3.1	3.1	3.1	2.9	3.0
18	4.3	4.8	4.9	4.9	a 5.2	a 3.6	3.2	3.1	3.0	3.1	2.9	3.0
19	4.9	4.7	10.5	4.9	a 5.0	a 3.6	3.1	3.1	3.0	3.1	2.9	3.2
20	4.6	5.1	6.8	4.6	a 5.0	a 3.6	3.1	3.1	3.0	3.1	3.0	3.4
21	6.5	4.9	6.8	4.7	a 4.8	a 3.6	3.1	3.1	3.0	3.1	3.1	3.3
22	8.5	4.7	5.9	4.7	a 4.6	a 3.6	3.1	3.1	3.0	3.1	3.0	3.2
23	7.5	4.6	5.4	4.5	a 4.5	a 3.5	3.1	3.1	3.0	3.0	3.0	3.1
24	5.7	4.5	5.9	4.4	a 4.4	a 3.5	3.1	3.1	3.0	3.1	3.0	3.0
25	5.2	4.5	5.3	4.3	a 4.3	a 3.5	3.1	3.1	3.2	3.1	3.0	3.0
26	5.0	4.4	5.5	4.2	a 4.3	a 3.5	3.1	3.1	3.1	3.1	3.0	3.0
27	5.8	4.4	5.7	a 4.2	a 4.2	3.5	3.1	3.1	3.1	3.0	3.35	3.0
28	5.6	4.3	5.4	a 4.2	a 4.2	3.5	3.1	3.1	3.1	3.1	3.2	3.0
29	5.5	.....	7.0	a 4.1	a 4.2	3.4	3.1	3.1	3.2	3.1	3.2	3.4
30	5.5	.....	6.2	4.1	a 4.2	3.3	3.1	3.3	3.1	3.1	3.5	3.2
31	5.8	.....	5.6	.....	a 4.2	.....	3.1	3.2	.....	3.1	.....	3.3

a Estimated.

Station rating table for Bear River above Wheatland, Cal., from October 9, 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.*
2.90	10	4.10	328	5.30	1,105	7.00	3,250
3.00	20	4.20	375	5.40	1,200	7.20	3,575
3.10	33	4.30	425	5.50	1,300	7.40	3,910
3.20	49	4.40	475	5.60	1,405	7.60	4,265
3.30	69	4.50	530	5.70	1,515	7.80	4,635
3.40	92	4.60	585	5.80	1,625	8.00	5,020
3.50	118	4.70	645	5.90	1,740	8.20	5,410
3.60	146	4.80	710	6.00	1,860	8.40	5,810
3.70	177	4.90	780	6.20	2,105	8.60	6,220
3.80	210	5.00	855	6.40	2,365	8.80	6,640
3.90	246	5.10	930	6.60	2,640	9.00	7,060
4.00	285	5.20	1,015	6.80	2,935		

NOTE.—The above table is based on 11 discharge measurements made during 1904–5. It is well defined between gage heights 3.1 feet and 5.1 feet. Above 6 feet the table is a rough approximation.

Estimated monthly discharge of Bear River above Wheatland, Cal., for 1904 and 1905.

[Drainage area, 263 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 9–31	7,060	92	559	25,500	2.13	1.82
November	1,300	92	223	13,270	.848	.946
December	6,640	118	504	30,990	1.92	2.21
1905.						
January	6,015	210	1,058	65,060	4.02	4.64
February	3,250	425	975	54,150	3.71	3.86
March	10,210	285	1,300	79,930	4.94	5.70
April	1,250	328	576	34,270	2.19	2.44
May	1,300	328	615	37,820	2.34	2.70
June	328	69	193	11,480	.734	.819
July	49	33	37.1	2,281	.141	.163
August	92	33	38.1	2,343	.145	.167
September	92	20	37.3	2,220	.142	.158
October	33	20	32.2	1,980	.122	.141
November	118	10	23.8	1,416	.090	.100
December	92	20	39.8	2,447	.151	.174
The year	10,210	10	410	295,400	1.56	21.06

NOTE.—Discharge estimated for missing gage heights.

MISCELLANEOUS MEASUREMENTS IN BEAR RIVER DRAINAGE BASIN.

South Yuba Mining Company's ditch near Colfax, Cal.—This ditch is taken out of Bear River 2½ miles east of Colfax. A measurement was made September 1, 1905, one-eighth of a mile below this heading in flume, by H. A. Campbell.

Width, 6.0 feet; area, 11.8 square feet; mean velocity, 2 54 feet per second; discharge, 30 second-feet.

Bear River near Colfax, Cal.—A measurement was made September 1, 1905, one-eighth of a mile below intake of the South Yuba Mining Company's canal and 2½ miles northeast of Colfax, by H. A. Campbell.

Width, 29 feet; area, 17.8 square feet; mean velocity, 1.45 feet per second; discharge, 26 second-feet.

Green Horn River near Colfax, Cal.—A measurement was made 75 yards above the junction of Big Horn and Bear rivers and about 3½ miles north of Colfax on September 1, 1905, by H. A. Campbell.

Width, 10 feet; area, 6.0 square feet; mean velocity, 1.13 feet per second; discharge, 6.8 second-feet.

Bear River near Colfax, Cal.—A measurement was made on this stream on September 1, 1905, about 100 yards above mouth of Green Horn River and 3½ miles north of Colfax.

Width, 24 feet; area, 21 square feet; mean velocity, 2.05 feet per second; discharge, 43 second-feet.

CACHE CREEK DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Cache Creek drains that portion of the eastern slope of the Coast Range directly north from the Puta Creek basin. This basin is long and narrow, extending from northwest to southeast; it has numerous tributaries, of which North Fork is the largest. Most of these tributaries are torrential in their character, but the flow of the main stream is regulated largely by its discharge from Clear Lake, which is fed by numerous creeks having their source in the higher portion of the drainage basin. The lake covers an area of 65 square miles, and has a drainage area of 417 square miles. The streams which enter Cache Creek below Clear Lake are practically dry during the summer months. There are large cultivated areas on the west side of Clear Lake, a greater portion of which is meadow land used for stock raising. There are two gaging stations located on this stream—one at Lower Lake directly at the point where the stream discharges from the lake and one at Yolo a short distance below where it emerges from the foothills. There are numerous diversions above the gaging station at Yolo which take practically the entire flow during the summer months. This water is used for irrigation in the vicinity of Woodland and Yolo, where the soil is rich and deep and susceptible of the highest state of cultivation.

CLEAR LAKE AT LAKEPORT, CAL.

This station was established in January, 1901. It embraces evaporation for both lake and land. The lake pan is held in place by a triangular raft placed in a protected arm of the lake and anchored in such a manner that it has a clear swing, adjusting itself to the wind so one of its angles will cut the water. The pan is submerged to within an inch or so of the water surface. The land pan is located in a clear open space and set in the ground so that its top is flush with the ground surface, it being protected by a small wire fence that it may not be disturbed. These pans are the regulation type, as referred to in Circular No. 4 of instructions for observing evaporation. The record of this station from January, 1901, to December, 1904, was published in Water-Supply Paper No. 134. The observer is Mr. D. C. Rumsey, at Lakeport, Cal.

Evaporation record of Clear Lake at Lakeport, Cal., 1905.

Month.	Evaporation in inches.		Month.	Evaporation in inches.	
	Lake.	Land.		Lake.	Land.
January	0.60	0.60	August	7.25	8.45
February	.90	1.10	September	5.95	6.65
March	1.05	1.15	October	3.10	3.55
April	2.45	2.85	November	1.30	1.55
May	3.45	3.70	December	.95	1.05
June	6.50	7.00			
July	7.70	8.90	Annual	41.20	46.55

CACHE CREEK AT LOWER LAKE, CAL.

This station was established January 1, 1900, by S. G. Bennett. It is located three-fourths mile from Lower Lake, Cal.

The channel is straight for 150 feet above and 300 feet below the station. The current has a moderate velocity at ordinary stages. The right bank is low, and will overflow at a gage height of about 10 feet. It is covered with a thick growth of willow and oak trees for 100 feet back from the water's edge. The left bank is high and rocky, and is not liable to overflow. The bed of the stream is composed of firm gravel, and changes only slightly. Gravel is sometimes washed in from Siegler Creek 300 feet below the cable.

Discharge measurements are made from a cable 300 feet above the wagon bridge. The initial point for soundings is a small tree in line with the cable on the left bank, 28 feet from the tree to which the cable is attached.

The present gage is a vertical plank nailed to a timber driven into the bed of the river and fastened to a large willow tree on the left bank 100 feet above the cable. On March 25, 1903, when the new gage was put in place, the reading was 5.7 feet. The old gage read 4.4 feet on the same date. During 1905 the gage was read once each day by Mr. J. R. Anderson. The bench mark is a nail in the root of the oak tree, to which cable is fastened on the left bank; elevation, 8.43 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, and 134 of the United States Geological Survey.

Discharge measurements of Cache Creek at Lower Lake, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 1	J. R. Anderson	51	138	1.86	4.10	257
January 7	do	51	146	2.05	4.20	300
January 14[a]	do	52	159	2.08	4.50	331
January 15	do	52	159	2.35	4.50	373
January 22	do	52	178	2.61	4.90	467
January 23[a]	do	56	222	1.35	5.60	299
January 24	do	52	206	2.86	5.40	589
January 26	do	53	218	3.09	5.60	673
January 31	do	53	229	3.27	5.80	748
February 1[a]	do	60	273	2.06	6.48	562
February 2[a]	do	56	254	3.11	6.20	790
February 9	do	56	266	3.63	6.40	965
February 15	do	56	254	3.34	6.20	848
February 21	do	56	258	3.44	6.30	888
February 27	do	56	256	3.38	6.20	864
March 5	do	56	249	3.33	6.10	828
March 11	do	56	234	3.24	5.80	757
March 13[a]	do	60	286	2.18	6.68	625
March 14	do	56	248	3.28	6.08	814
March 20	do	59	271	3.52	6.52	955
March 25	do	60	296	3.69	6.90	1,092
March 31	do	60	308	3.76	7.10	1,159
April 7	do	60	305	3.63	7.00	1,108
April 15	do	56	277	3.55	6.60	984
April 22	do	56	259	3.42	6.35	886
April 29	do	56	248	3.34	6.10	829
May 6	do	56	233	3.24	5.80	755
July 11	O. W. Peterson	54	153	2.53	4.30	387
September 29	C. H. Lee	53	86	.93	2.83	80
October 8	J. R. Anderson	48	73	.86	2.70	63
October 14	do	48	73	.82	2.70	60
October 21	do	48	68	.70	2.60	48
November 5	do	48	62	.50	2.50	31
November 11	do	48	61	.46	2.45	28
November 22	do	48	58	.41	2.40	24
November 27	do	48	54	.37	2.30	20

[a] Backwater from Siegler Creek.

Daily gage height, in feet, of Cache Creek at Lower Lake, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.1	6.5	6.2	7.3	5.9	5.3	4.5	3.8	3.25	2.8	2.5	2.5
2	4.1	6.2	6.15	7.1	6.0	5.3	4.5	3.8	3.2	2.8	2.5	2.5
3	4.15	6.25	6.15	7.05	6.0	5.25	4.45	3.75	3.2	2.8	2.5	2.45
4	4.2	6.25	6.1	7.0	5.95	5.25	4.4	3.75	3.2	2.8	2.5	2.45
5	4.2	6.35	6.1	7.0	5.90	5.2	4.4	3.7	3.2	2.8	2.5	2.45
6	4.2	6.4	6.1	7.0	5.8	5.2	4.4	3.7	3.15	2.8	2.5	2.4
7	4.2	6.4	6.05	7.0	6.05	5.15	4.4	3.7	3.15	2.75	2.45	2.4
8	4.2	6.4	6.0	7.0	6.0	5.15	4.4	3.7	3.15	2.75	2.45	2.4
9	4.2	6.4	6.0	6.9	5.9	5.1	4.35	3.7	3.1	2.75	2.45	2.4
10	4.2	6.4	5.9	6.8	5.85	5.1	4.35	3.7	3.1	2.7	2.45	2.35
11	4.2	6.3	5.8	6.8	5.8	5.05	4.3	3.65	3.1	2.7	2.45	2.35
12	4.2	6.3	6.2	6.85	5.8	5.0	4.3	3.65	3.05	2.7	2.45	2.35
13	4.3	6.3	6.45	6.75	5.8	4.95	4.25	3.65	3.05	2.7	2.4	2.35
14	4.5	6.3	6.2	6.6	5.75	4.95	4.25	3.6	3.05	2.7	2.4	2.35
15	4.5	6.2	6.2	6.65	5.75	4.9	4.2	3.6	3.05	2.7	2.4	2.45
16	4.7	6.2	6.3	6.55	5.8	4.9	4.15	3.6	3.0	2.7	2.4	2.45
17	4.75	6.3	6.4	6.45	5.7	4.85	4.15	3.55	3.0	2.65	2.4	2.35
18	4.75	6.3	6.3	6.4	5.7	4.85	4.1	3.55	3.0	2.65	2.4	2.45
19	4.8	7.0	6.6	6.5	5.7	4.8	4.1	3.5	2.95	2.6	2.4	2.5
20	4.8	6.3	6.55	6.3	5.6	4.8	4.1	3.5	2.95	2.6	2.5	2.5
21	4.9	6.3	6.7	6.35	5.6	4.75	4.05	3.5	2.9	2.6	2.35	2.45
22	5.85	6.35	6.8	6.35	5.5	4.75	4.05	3.45	2.9	2.6	2.4	2.4
23	5.55	6.35	6.8	6.3	5.5	4.75	4.0	3.45	2.9	2.6	2.25	2.5
24	5.7	6.3	6.95	6.25	5.5	4.7	4.0	3.45	2.9	2.6	2.3	2.5
25	5.65	6.25	6.95	6.25	5.45	4.7	4.0	3.4	2.9	2.6	2.3	2.5
26	5.65	6.25	7.1	6.2	5.4	4.65	4.0	3.4	2.9	2.6	2.35	2.5
27	5.75	6.2	6.95	6.2	5.4	4.6	4.0	3.35	2.9	2.6	2.3	2.45
28	5.8	6.2	6.75	6.15	5.4	4.6	3.95	3.35	2.85	2.55	2.65	2.4
29	5.8	.....	7.2	6.1	5.4	4.55	3.9	3.35	2.85	2.55	2.5	2.4
30	5.8	.....	7.2	6.05	5.45	4.5	3.9	3.3	2.8	2.55	2.5	2.5
31	5.8	.....	7.1	.....	5.4	.....	3.85	3.3	.....	2.5	.....	2.55

Station rating table for Cache Creek at Lower Lake, Cal., 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.*
2.30	17	3.40	149	4.50	365	5.60	670
2.40	27	3.50	163	4.60	390	5.70	701
2.50	37	3.60	178	4.70	416	5.80	732
2.60	48	3.70	194	4.80	442	5.90	763
2.70	59	3.80	212	4.90	469	6.00	795
2.80	71	3.90	232	5.00	496	6.20	859
2.90	83	4.00	252	5.10	524	6.40	923
3.00	95	4.10	274	5.20	552	6.60	988
3.10	108	4.20	296	5.30	581	6.80	1,054
3.20	121	4.30	318	5.40	610	7.00	1,120
3.30	135	4.40	341	5.50	640	7.20	1,188

NOTE.—The above table is based on 28 discharge measurements made during 1905 and during the latter part of 1904. It is well defined throughout.

Estimated monthly discharge of Cache Creek near Lower Lake, Cal., for 1905.

[Drainage area, 500 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	748	274	448	27,550	0.896	1.03
February	1,120	562	884	49,100	1.77	1.84
March	1,188	610	933	57,370	1.87	2.16
April	1,222	811	991	58,970	1.98	2.21
May	811	610	702	43,160	1.40	1.61
June	581	365	476	28,320	.952	1.06
July	365	222	294	18,080	.588	.678
August	212	135	173	10,640	.346	.399
September	128	71	98.5	5,861	.197	.220
October	71	37	56.0	3,443	.112	.129
November	54	12	30.1	1,791	.060	.067
December	42	22	30.7	1,888	.061	.070
The year	1,222	12	426	306,200	.853	11.47

CACHE CREEK NEAR YOLO, CAL.

This station was established January 1, 1903, by S. G. Bennett. It is located at the wagon bridge on the road from Woodland to Yolo, about 1,000 feet above the Southern Pacific Railroad bridge. A new wagon bridge, which greatly improves the channel conditions, was erected during 1904. The station was reestablished on the new bridge December 4, 1904.

Numerous diversions are made from Cache Creek above this station which take practically all of the summer flow. The channel is straight for 1,000 feet above and below the station. The current is swift at ordinary and high stages. The banks are steep and wooded and their height has been increased by levees. They are said to overflow at extreme high water. The bed of the stream is composed of earth and gravel, with a little sand, and is not subject to any material change.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is the end of the bridge on the right bank.

The gage is a staff in four sections, three of which are above the bridge and the fourth is bolted to the face of the concrete abutment on the right bank. During 1905 the gage was read by John Woodard. The bench mark is corner of top of concrete abutment to which the high-water section of gage is fastened and directly over gage; elevation, 31.68 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 100 and 134 of the United States Geological Survey.

Discharge measurements of Cache Creek near Yolo, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
February 2	O W. Peterson	114	1,255	6.07	11.75	7,624
February 3	do	107	833	5.83	8.30	4,860
Do	do	108	890	5.87	8.80	5,227
February 4	do	102	630	6.03	7.05	3,802
February 15	do	94	345	4.39	4.85	1,516
May 16	W. B. Clapp	91	275	3.73	4.05	1,027
June 5	Peterson and Rodman	89	215	3.25	3.40	699
June 24	O. W. Peterson	89	151	2.37	2.60	358
August 3	do	87	88	1.47	1.79	129
September 7	C. H. Lee	32	19	.67	1.26	13.0
September 13	W. B. Clapp	17	7.3	.64	1.15	4.7
October 3	Lee and Hawley	2	.5	.80	1.09	.4

Daily gage height, in feet, of Cache Creek near Yolo, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	5.0	6.0	4.7	5.9	4.2	3.6	2.55	1.8	1.4	1.0
2	4.05	12.4	4.6	5.8	4.2	3.6	2.5	1.8	1.4	1.0
3	3.65	9.05	4.6	5.7	4.2	3.5	2.5	1.75	1.4	1.0
4	3.45	7.35	4.5	5.6	4.15	3.5	2.5	1.75	1.35	1.1
5	3.25	6.4	4.5	5.5	4.15	3.45	2.45	1.7	1.3	1.1
6	3.1	6.0	4.45	5.4	4.15	3.4	2.45	1.7	1.3	1.1
7	3.1	5.6	4.4	5.3	4.1	3.35	2.4	1.7	1.25	1.1
8	3.05	5.35	4.4	5.2	4.75	3.3	2.4	1.75	1.25	1.1
9	3.0	5.2	4.35	5.2	4.5	3.25	2.4	1.8	1.2	1.1
10	3.0	5.1	4.35	5.1	4.4	3.2	2.35	1.8	1.15	1.05
11	3.0	5.0	4.3	5.1	4.3	3.15	2.3	1.75	1.15	1.05
12	2.95	4.95	4.3	5.05	4.25	3.1	2.25	1.75	1.1	1.05
13	3.2	4.9	5.65	5.0	4.2	3.1	2.2	1.7	1.1	1.1
14	9.95	4.8	6.05	5.0	4.2	3.05	2.2	1.7	1.1	1.1
15	6.4	4.8	5.85	4.9	4.15	3.05	2.15	1.65	1.15	1.1
16	5.3	4.75	6.4	4.9	4.15	3.0	2.15	1.65	1.1	1.1
17	7.4	5.3	6.2	4.85	4.1	3.0	2.1	1.65	1.1	.....
18	7.0	5.25	5.7	4.8	4.1	3.0	2.1	1.6	1.1	.....
19	6.55	5.2	6.0	4.75	4.1	2.95	2.0	1.6	1.15	.....
20	5.3	5.1	6.0	4.7	4.05	2.9	2.0	1.6	1.15	.....
21	5.05	5.0	5.95	4.65	4.05	2.9	1.95	1.6	1.1	.....
22	8.25	5.0	5.9	4.6	4.0	2.85	1.9	1.65	1.1	.....
23	15.55	4.95	6.3	4.55	4.0	2.8	1.9	1.55	1.05	.....
24	8.8	4.9	6.2	4.5	3.95	2.8	1.85	1.55	1.05	.....
25	9.25	4.85	6.1	4.45	3.95	2.75	1.8	1.55	1.05	.....
26	7.0	4.8	6.05	4.4	3.9	2.7	1.8	1.5	1.05	.....
27	6.2	4.8	6.0	4.35	3.9	2.7	1.75	1.5	1.05	.....
28	5.8	4.7	5.9	4.3	3.8	2.65	1.75	1.5	1.05	.....
29	5.4	.....	7.1	4.25	3.8	2.6	1.6	1.45	1.0	.....
30	5.15	.....	6.85	4.2	3.7	2.6	1.6	1.45	1.0	.....
31	5.0	.....	6.1	.....	3.7	.....	1.6	1.4	.....	.....

NOTE.—Creek dry October 17 to December 31.

Station rating table for Cache Creek near Yolo, Cal., 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.*
1.00	0	2.60	361	4.40	1,230	7.60	3,635
1.10	1	2.70	395	4.60	1,350	7.80	3,815
1.20	7	2.80	430	4.80	1,480	8.00	4,000
1.30	17	2.90	467	5.00	1,610	8.50	4,475
1.40	32	3.00	505	5.20	1,745	9.00	4,970
1.50	53	3.10	550	5.40	1,885	9.50	5,470
1.60	76	3.20	595	5.60	2,025	10.00	5,980
1.70	100	3.30	640	5.80	2,170	10.50	6,505
1.80	125	3.40	690	6.00	2,320	11.00	7,050
1.90	151	3.50	740	6.20	2,470	11.50	7,600
2.00	178	3.60	790	6.40	2,625	12.00	8,150
2.10	206	3.70	840	6.60	2,785	13.00	9,300
2.20	235	3.80	890	6.80	2,945	14.00	10,500
2.30	265	3.90	945	7.00	3,110	15.00	11,700
2.40	296	4.00	1,000	7.20	3,280	16.00	12,950
2.50	328	4.20	1,110	7.40	3,455		

NOTE.—The above table is based on 12 discharge measurements made during 1905. It is well defined between gage heights 0 and 5 feet.

Estimated monthly discharge of Cache Creek near Yolo, Cal., for 1905.

[Drainage area, 1,280 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	12,390	486	2,313	142,200	1.81	2.09
February	8,610	1,415	2,142	119,000	1.67	1.74
March	3,195	1,170	1,969	121,100	1.54	1.78
April	2,245	1,110	1,576	93,780	1.23	1.37
May	1,448	840	1,058	65,050	.827	.953
June	790	361	542	32,250	.423	.472
July	344	76	214	13,160	.167	.192
August	125	32	86.5	5,319	.068	.078
September	32	0	7.1	423	.0055	.0061
October	1	0	.32	20	.00025	.00029
November	0	0	0	0	0	0
December	0	0	0	0	0	0
The year	12,390	0	826	592,300	.645	8.68

NOTE.—Estimates January 1 to February 10 are subject to considerable error owing to the scouring and filling at this section during high water.

MISCELLANEOUS MEASUREMENTS IN CACHE CREEK DRAINAGE BASIN.

Clover Creek near Upper Lake, Cal.—This stream discharges into Clear Lake. A measurement was made July 12 by O. W. Peterson, one-third of a mile above town of Upper Lake.

Width, 9.2 feet; area, 5.5 square feet; mean velocity, 0.49 foot per second; discharge, 2.7 second-feet.

Cole Creek at Kelseyville, Cal.—This stream discharges into Clear Lake. A measurement was made July 11, 1905, by O. W. Peterson, near Kelseyville and Lower Lake road, three-fourths of a mile below Kelseyville.

Width, 11.5 feet; area, 4.3 square feet; mean velocity, 1.00 foot per second; discharge, 4.3 second-feet.

Capay ditch at Capay, Cal.—This ditch diverts water from Cache Creek. The following measurements were made at head of ditch at Capay by O. W. Peterson.

June 19: Width, 18.8 feet; area, 34 square feet; mean velocity, 1.80 feet per second; discharge, 61 second-feet.

August 2: Width, 18.8 feet; area, 21 square feet; mean velocity, 1.57 feet per second; gage-height, 1.10 feet; discharge, 33 second-feet.

Kelsey Creek near Kelseyville, Cal.—This stream discharges into Clear Lake. A measurement was made July 11 by O. W. Peterson, 1¼ miles above Kelsey Creek Mill, about 3½ miles above the town of Kelseyville.

Width, 16.5 feet; area, 9 square feet; mean velocity, 1.29 feet per second; discharge, 11.6 second-feet.

Middle Creek near Upper Lake, Cal.—This stream discharges into Clear Lake. A measurement was made July 12 by O. W. Peterson, 1½ miles above the town of Upper Lake in sec. 31, T. 15 N, R. 9 W, M. D. M.

Width, 9.9 feet; area, 8.3 square feet; mean velocity, 0.48 foot per second; discharge, 4.0 second-feet.

Moore's ditch near Woodland, Cal.—The following measurements were made at Walker Bridge, one-half mile below canal heading:

June 3: Width, 21.6 feet; area, 89 square feet; mean velocity, 0.90 foot per second; discharge, 80 second-feet.

June 3: Width, 20 feet; area, 102 square feet; mean velocity, 1.69 feet per second; discharge, 172 second-feet.

June 17: Width, 24.5 feet; area, 72 square feet; mean velocity, 0.83 foot per second; gage height, 4.20 feet; discharge, 60 second-feet.

June 17: Width, 26 feet; area, 89 square feet; mean velocity, 1.13 feet per second; gage height, 4.80 feet; discharge, 101 second-feet.

June 17: Width, 35 feet; area, 119 square feet; mean velocity, 1.36 feet per second; gage height, 5.55 feet; discharge, 162 second-feet.

June 21: Width, 25.2 feet; area, 74 square feet; mean velocity, 1.65 feet per second; gage height, 5.45 feet; discharge, 122 second-feet.

August 2: Width, 19.8 feet; area, 87 square feet; mean velocity, 1.14 feet per second; gage height, 4.40 feet; discharge, 99 second-feet.

AMERICAN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

American River drains an area of about 2,000 square miles of the western slope of the Sierra Nevada. This drainage basin lies between those of the Bear and Yuba rivers on the north and that of Consumnes River on the south. It has three main forks, heading in the summit of the range, which reaches an elevation of about 9,000 feet. The country lying between these main forks is drained by numerous small tributaries. The formation in the higher and greater portions of this basin is of granite, with a considerable timber

growth. The flow is rather torrential during the winter months, due to the large area of barren and sparsely timbered country in the lower portion of the watershed. The precipitation on the higher elevations is in the form of snow, which usually melts late in the spring. Rainfall records have been kept along the line of the Central Pacific Railroad, which follows the ridge to the north of North Fork.

The mean annual rainfall at Auburn is 33.40 inches, that at Colfax 47.4 inches, and at Cisco and Emigrant Gap about 50 inches. At Georgetown, between North and Middle forks, a 30-year record has an average of 56.72 inches, and at Placerville, above South Fork, another of about the same length shows 43.58 inches.

There are several small lakes in the upper reaches of this basin, the storage capacity of a few having been increased by the construction of low dams at their outlets. This stored water is used for mining purposes during the low-water flow and is used entirely within the drainage basin.

AMERICAN RIVER NEAR FAIROAKS, CAL.

This station was established November 3, 1904, by O. W. Peterson. It is located at Fairoaks Bridge, near Fairoaks.

The channel is straight for 400 feet above and below the station. At ordinary stages the velocity is sluggish. The right bank is not subject to overflow. At times of very high water the left bank is subject to overflow and a second channel is formed. The bed of the stream is composed of gravel, and is subject to slight changes at times of high water. At ordinary stages the river is about 210 feet in width and averages over 4 feet in depth.

Discharge measurements are made from the downstream side of the bridge. The vertical face of the right abutment is 4 feet from the initial point for soundings.

The gage is a staff nailed to one of the piles at the upper side at the right end of Fairoaks Bridge. During 1905 the gage was read twice each day by W. F. Bailey, jr. The bench mark is a nail driven in the guard rail over the upstream center pier; elevation, 31.00 feet above the datum of the gage.

A description of this station, with gage height and discharge data, is contained in Water-Supply Paper No. 134 of the United States Geological Survey.

Discharge measurements of American River near Fairoaks, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 26	F. R. S. Buttemer	356	1,648	2.41	4.52	3,971
January 26	do	356	1,648	2.42	4.49	3,994
February 2	do	373	2,891	4.35	7.55	12,580
February 11	do	353	1,505	2.09	4.08	3,151
February 17	do	354	1,544	2.19	4.22	3,378
February 22	do	355	1,776	2.67	4.90	4,742
May 17	W. B. Clapp	370	2,864	4.34	7.35	12,340
June 28	O. W. Peterson	260	993	1.53	2.88	1,520
July 29	Peterson and Lee	167	694	.56	1.46	392
September 4	C. H. Lee	165	599	.20	.88	119

Daily gage height, in feet, of American River near Fairoaks, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.1	4.25	4.6	5.95	6.0	4.6	2.85	1.4	0.9	0.95	0.95	1.35
2	5.25	7.6	4.6	6.15	6.1	4.55	2.75	1.4	.9	.9	.95	1.25
3	3.95	5.85	4.6	5.95	5.9	4.45	2.7	1.4	.9	.95	.95	1.2
4	3.65	5.05	4.55	6.0	5.6	4.55	2.7	1.4	.9	.95	.95	1.25
5	3.5	6.65	4.6	6.15	5.55	4.45	2.65	1.35	.85	.95	.95	1.1
6	3.35	5.5	4.6	6.0	5.5	5.1	2.6	1.35	.9	.95	.95	1.15
7	3.6	4.9	4.6	6.15	5.6	5.15	2.5	1.35	.9	.95	.95	1.2
8	3.6	4.45	4.6	5.75	5.55	5.2	2.5	1.35	.9	.9	.95	1.15
9	3.9	4.25	4.5	5.65	5.8	5.35	2.4	1.3	.85	.95	.95	1.15
10	3.1	4.2	4.3	5.8	5.5	4.6	2.3	1.3	.9	.9	1.0	1.15
11	3.0	4.1	4.45	5.5	5.2	4.7	2.2	1.3	.9	.95	1.0	1.0
12	3.0	4.05	4.6	5.65	5.2	4.6	2.15	1.3	.85	.95	1.0	1.0
13	2.95	3.85	4.8	4.85	5.0	4.35	2.05	1.3	.9	.95	1.0	.9
14	3.5	3.7	5.1	5.25	5.55	4.1	2.0	1.25	.9	.95	.95	.95
15	4.65	3.6	5.15	5.1	6.15	4.2	1.9	1.25	.9	1.0	.95	1.0
16	4.55	3.4	4.55	4.85	6.7	4.0	1.8	1.25	1.0	.95	1.0	1.1
17	3.9	4.35	4.75	4.7	6.95	3.85	1.8	1.25	.95	.95	1.05	1.1
18	3.85	4.25	4.9	4.55	6.65	3.8	1.7	1.25	1.0	.95	.9	1.15
19	3.95	4.15	10.5	4.65	6.5	3.8	1.65	1.2	.9	.95	1.0	1.2
20	3.9	6.15	7.45	4.9	6.4	3.8	1.6	1.2	.95	.95	1.05	1.1
21	4.1	5.2	7.1	5.4	5.95	3.85	1.55	1.2	.95	.95	1.0	1.05
22	4.8	4.85	6.7	6.5	5.3	3.55	1.5	1.2	.9	.95	1.15	1.05
23	6.85	4.6	6.1	7.4	5.5	3.7	1.5	1.2	.95	.95	1.0	1.2
24	6.4	4.5	6.55	8.85	5.7	3.3	1.5	1.1	.95	.95	1.15	1.3
25	5.4	4.55	6.3	7.65	6.1	3.15	1.45	1.1	.9	1.0	1.0	1.2
26	4.45	4.9	6.5	7.1	5.9	3.1	1.45	1.1	.9	.95	1.1	1.3
27	4.25	4.7	6.8	6.6	5.5	2.9	1.45	1.1	.95	.95	1.0	1.4
28	3.9	4.75	6.4	6.7	5.35	2.8	1.45	1.0	.95	1.0	1.4	1.4
29	3.8	.....	6.85	6.8	4.75	2.75	1.45	1.0	.95	.95	1.75	1.55
30	3.75	.....	6.35	6.75	4.5	2.7	1.4	1.0	.95	.95	1.5	1.7
31	3.85	.....	5.95	.....	4.15	.....	1.4	1.0	.....	.....	.....	1.45

NOTE.—Gage heights estimated July 2–28; July 30 to September 2; November 1–9.

Station rating table for American River near Fairoaks, Cal., from November 4 to December 31, 1904.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.40	700	2.70	990	3.00	1,300	3.30	1,680
2.50	790	2.80	1,090	3.10	1,410		
2.60	890	2.90	1,190	3.20	1,540		

NOTE.—The above table is based on 2 discharge measurements made during 1904, and on the 1905 curve.

Station rating table for American River near Fairoaks, Cal., 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	90	2.20	840	3.60	2,410	6.00	7,450
0.90	120	2.30	920	3.70	2,555	6.20	8,040
1.00	155	2.40	1,005	3.80	2,705	6.40	8,670
1.10	195	2.50	1,095	3.90	2,860	6.60	9,340
1.20	240	2.60	1,195	4.00	3,020	6.80	10.040
1.30	285	2.70	1,300	4.20	3,365	7.00	10,770
1.40	335	2.80	1,410	4.40	3,730	7.20	11,530
1.50	390	2.90	1,525	4.60	4,115	7.40	12,310
1.60	445	3.00	1,640	4.80	4,520	7.60	13,090
1.70	505	3.10	1,760	5.00	4,950	7.80	13,890
1.80	565	3.20	1,880	5.20	5,405	8.00	14,700
1.90	630	3.30	2,005	5.40	5,880		
2.00	695	3.40	2,135	5.60	6,375		
2.10	765	3.50	2,270	5.80	6,900		

NOTE.—The above table is based on 10 discharge measurements made during 1905. It is fairly well defined between gage heights 0.8 foot and 5 feet.

Estimated monthly discharge of American River near Fairoaks, Cal., for 1904 and 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
1904.				
November 4–30	1,355	700	896	47,980
December	13,600	700	1,404	86,330
1905.				
January	10,220	1,582	3,549	218,200
February	13,090	2,135	4,630	257,100
March	25,900	3,545	6,924	425,700
April	18,300	4,018	7,736	460,300
May	10,580	3,278	6,717	413,000
June	5,760	1,300	3,231	192,300
July	1,468	335	719	44,210
August	335	155	255	15,680
September	155	105	126	7,498
October	155	120	138	8,485
November	535	120	181	10,770
December	505	120	242	14,880
The year	25,900	105	2,874	2,068,000

MISCELLANEOUS MEASUREMENTS IN AMERICAN RIVER DRAINAGE BASIN.

South Fork of American River near Placerville, Cal.—A measurement was made August 20, 1905, at Chillie Bar, 3 miles north of Placerville and 400 yards upstream from wagon bridge, by H. A. Campbell. The distance to water surface from top of outer bar, of lower chord in the middle panel, on the upstream side of bridge was 23.5 feet.

Width, 28 feet; area, 42 square feet; mean velocity, 1.80 feet per second; discharge, 76 second-feet.

North Fork of the American River near Auburn, Cal.—A measurement was made about 400 yards above junction of North and Middle forks and about 2 miles northeast of Auburn on August 21, 1905, by H. A. Campbell.

Width, 28 feet; area, 44 square feet; mean velocity, 1.48 feet per second; discharge, 65 second-feet.

Middle Fork of the American River near Auburn, Cal.—A measurement was made on this stream about 400 yards above junction of the North and Middle forks and about 2 miles northeast of Auburn, Cal., on August 21, 1905, by H. A. Campbell.

Width, 55 feet; area, 101 square feet; mean velocity, 0.97 foot per second; discharge, 98 second-feet.

El Dorado ditch.—This ditch is taken out of South Fork of the American River about 1 mile below Slippery Ford. A measurement was made at the heading on August 24, 1905, by H. A. Campbell.

Width, 13.9 feet; area, 45 square feet; mean velocity, 1.24 feet per second; discharge, 56 second-feet.

Silver Fork of American River.—This stream enters South Fork of American River about 1 mile below Slippery Ford. A measurement was made on August 24, 1905, just above mouth, by H. A. Campbell.

Width, 11 feet; area, 18.3 square feet; mean velocity, 1.07 feet per second; discharge, 19.6 second-feet.

South Fork of American River.—A measurement was made one-fourth of a mile above Silver Fork and three-fourths mile below Slippery Ford on August 25, 1905, by H. A. Campbell.

Width, 26 feet; area, 63 square feet; mean velocity, 0.54 foot per second; discharge, 34 second-feet.

South Fork of Silver Creek.—A measurement was made on this stream August 26, 1905, about 200 feet above the mouth by H. A. Campbell.

Width, 16.5 feet; area, 21 square feet; mean velocity, 0.30 foot per second; discharge, 6.3 second-feet.

Silver Creek.—A measurement was made August 26, 1905, 100 feet above the mouth of South Fork of Silver Creek by H. A. Campbell.

Width, 11 feet; area, 16.2 square feet; mean velocity, 0.92 foot per second; discharge, 14.9 second-feet.

PUTA CREEK DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Puta Creek drains a portion of the eastern slope of the Coast Range, its waters discharging into Sacramento River through what is known as the Yolo basin in the vicinity of Davis, Cal. This basin is rather long and narrow, extending from west to east; it has numerous tributaries which have a heavy flood discharge during the winter months, but are practically dry during the summer. This stream is torrential in its flow. It has a comparatively small drainage basin with an exceptionally heavy rainfall, especially on the higher elevations in the vicinity of Mount St. Helena. A five-year rainfall record at Helen Mine on the northern slope of Mount St. Helena gives an average of 99.52 inches. The precipitation decreases as we approach the lower elevations. The upper reaches of this basin are well timbered, but the lower portion is comparatively barren of timber, though it has a considerable growth of brush extending to a point where the stream leaves the foothills. The areas in the lower portion of the basin are used principally for pasturage. The topography of the country is rough and precipitous. The underlying rock is an impervious slate and serpentine with a thin soil covering. There is comparatively little tilled land in this drainage basin above the point where the stream emerges from the foothills at Winters. Below this point the soil is deep and susceptible to high cultivation, and at present is used for the raising of grain and fruit.

PUTA CREEK NEAR GUENOC, CAL.

This station was established February 12, 1904. It is located about 2 miles below the old town of Guenoc, near the Asbill ranch house and at the Guenoc dam site. The nearest post-office is at Middletown, Cal.

The bed of the stream is gravelly, with a few bowlders above and below the section. Bed rock is laid bare on the right side of the channel. The left bank is high and rocky, while the right bank is rather low and flat and subject to overflow in very high water. The velocity is moderate for ordinary stages of flow, but high in flood periods. The range is about 12 feet, representing discharges of from 7 to 17,000 second-feet. The channel is straight for several hundred feet upstream, but has several large bowlders in it. Downstream it is straight for about 100 feet. The section is located in a narrow gorge at the lower end of a long, flat valley, which is flooded during high water. The channel will not allow the water to run off through the gorge fast enough to prevent backwater forming during flood periods.

Meter measurements during high water are made from a car and cable. At first the cable was located directly opposite the ranch house, but as the location proved very unfavorable it was moved November 15, 1904, to a point about 1,000 feet below. It now has a clear span of about 200 feet. The initial point for soundings is the eyebolt to which the cable is fastened on the left bank. An auxiliary cable has been placed parallel to the large one, so that float measurements can be made in time of very high water. During low water measurements are made by wading.

The gage, which was established near the old section, is still read, although a new one was placed near the cable in its present position. The old gage is a staff in two sections, both being fastened to trees. The section which is read in low water is about 600 feet upstream from the ranch stable, and the high-water section is directly opposite the stable. The new rod is made similarly to the other one. Both sections are located a few feet above the cable. One is bolted to a large bowlder on the left bank and the other nailed to a tree on the right bank. During 1905 the gage was read once each day during ordinary stages and twice a day during high water by Miss Agnes Asbill. The bench mark is the top of the rock to which the low-water section of the new gage is fastened; elevation, 7.62 feet above the datum of the new gage.

A description of this station and gage height and discharge data are contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Puta Creek near Guenoc, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 1	F. R. S. Buttemer	81	433	1.37	5.58	592
January 1	do	76	390	1.36	5.42	530
January 2	do	66	342	1.13	5.14	386
January 2[a]	do	66	321	1.12	5.12	359
January 3	do	66	322	0.90	4.94	289
January 4	do	64	316	0.78	4.82	247
January 14	do	110	624	2.94	7.04	1,834
January 15	do	95	478	1.83	5.96	876
January 16	do	94	429	2.04	5.86	875
January 16	do	95	467	2.08	5.98	972
July 8	O. W. Peterson	16	12	1.58	3.72	19
September 29	C. H. Lee	8	4.1	1.66	3.56	6.8

[a] Float measurement.

Daily gage height, in feet, of Puta Creek near Guenoc, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.8	7.0	4.5	5.2	4.3	a4.0	3.6	3.6	3.6	3.7	3.6	3.6
2	a6.0	6.5	4.4	5.2	4.3	4.0	3.7	3.6	3.6	3.7	3.6	3.6
3	a5.4	6.2	4.3	5.2	4.3	3.9	3.7	3.6	3.6	3.7	3.6	3.6
4	4.8	6.0	4.2	5.1	4.4	5.4	3.7	3.6	3.6	3.7	3.6	3.6
5	4.7	6.3	4.4	5.1	4.3	5.6	3.7	3.6	3.6	3.7	3.6	3.6
6	4.4	6.0	4.4	5.1	4.3	5.0	3.7	3.6	3.6	3.7	3.6	3.6
7	4.4	5.8	4.3	5.0	5.0	4.2	3.7	3.6	3.6	3.7	3.6	3.6
8	4.5	5.5	4.3	5.0	5.2	4.2	3.7	3.6	a3.6	3.7	3.6	3.6
9	4.7	5.4	4.2	5.1	4.8	4.1	3.7	3.6	3.6	3.7	3.6	3.6
10	4.6	5.1	4.2	5.1	4.6	4.1	3.7	a3.6	3.6	3.7	3.6	3.6
11	4.5	5.0	4.2	5.0	4.4	4.0	3.7	3.6	3.6	3.7	3.6	3.6
12	4.5	4.9	4.5	5.0	4.4	4.0	3.7	3.6	a3.6	3.7	3.6	3.6
13	6.1	4.8	5.5	5.0	4.4	3.9	3.7	3.6	3.6	3.7	3.6	3.6
14	7.45	4.7	6.5	5.0	4.4	3.9	3.7	3.5	3.6	3.7	3.6	3.6
15	5.9	4.6	6.0	5.1	4.3	3.9	3.6	3.5	3.6	a3.7	3.6	3.7
16	5.9	4.9	6.2	5.2	4.3	3.9	3.6	3.5	3.6	3.7	3.6	3.8
17	4.4	5.1	6.0	5.2	4.3	3.9	3.6	3.5	3.6	3.7	3.6	3.8
18	4.5	5.4	6.5	5.1	4.2	3.8	3.6	3.5	a3.6	3.7	3.6	3.8
19	6.45	6.3	6.85	5.0	4.2	3.8	3.5	3.5	3.6	3.7	3.6	3.8
20	5.4	6.0	6.1	4.9	4.2	3.8	3.5	3.6	3.6	3.7	3.6	3.8
21	6.8	5.9	5.9	4.9	4.2	3.8	3.5	a3.6	3.6	3.6	3.6	3.7
22	13.5	5.7	5.8	4.8	4.1	3.8	3.5	3.6	3.6	3.6	3.6	3.7
23	8.9	5.4	5.8	4.8	4.1	3.8	3.5	3.6	3.6	3.6	3.6	3.7
24	7.2	5.2	5.7	4.7	4.1	3.8	3.6	3.6	3.6	3.6	3.6	4.0
25	6.7	5.0	5.4	4.6	4.1	3.7	3.6	3.6	3.6	3.6	3.6	4.1
26	6.0	4.8	5.0	4.5	4.0	3.7	3.6	3.6	3.6	3.6	3.6	3.9
27	5.9	4.7	5.8	4.4	4.0	3.7	a3.6	3.6	3.6	3.6	3.6	3.9
28	5.7	4.6	5.8	4.3	4.0	3.7	3.6	3.6	3.6	3.6	3.6	a3.9
29	5.6	.....	7.5	4.3	4.0	3.7	3.6	3.6	3.6	3.6	3.6	3.8
30	5.4	.....	5.8	a4.3	4.0	3.6	3.6	3.6	3.6	3.6	a3.6	3.8
31	5.8	.....	5.5	.....	4.0	.....	3.6	3.6	.....	3.6	.....	3.7

a Interpolated

Station rating table for Puta Creek near Guenoc, Cal., 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.*
3.50	4	5.00	310	6.50	1,360	9.00	5,000
3.60	10	5.10	350	6.60	1,450	9.20	5,400
3.70	18	5.20	395	6.70	1,545	9.40	5,800
3.80	28	5.30	445	6.80	1,640	9.60	6,230
3.90	42	5.40	500	6.90	1,740	9.80	6,690
4.00	58	5.50	560	7.00	1,840	10.00	7,150
4.10	75	5.60	625	7.20	2,060	10.50	8,300
4.20	93	5.70	695	7.40	2,290	11.00	9,450
4.30	112	5.80	770	7.60	2,540	11.50	10,600
4.40	133	5.90	850	7.80	2,820	12.00	11,800
4.50	156	6.00	930	8.00	3,130	12.50	13,000
4.60	181	6.10	1,010	8.20	3,460	13.00	14,200
4.70	208	6.20	1,095	8.40	3,810	14.00	16,700
4.80	238	6.30	1,180	8.60	4,200		
4.90	272	6.40	1,270	8.80	4,600		

NOTE.—The above table is based on 17 discharge measurements made during 1904–5. It is well defined between gage heights 3.5 feet and 7 feet. Above 7 feet the table depends on 2 measurements at 12 feet and 13.7 feet. Above 9 feet the table is the same as for 1904.

Estimated monthly discharge of Puta Creek near Guenoc, Cal., for 1905.

[Drainage area, 91 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	15,450	133	1,344	82,640	14.77	17.03
February	1,840	181	619	34,380	6.80	7.08
March	1,690	93	630	38,740	6.92	7.98
April	395	112	288	17,140	3.16	3.53
May	395	58	120	7,379	1.32	1.52
June	625	10	85.0	5,058	.934	1.04
July	18	4	12.4	762	.136	.157
August	10	4	8.8	541	.097	.112
September	10	10	10.0	595	.110	.123
October	18	10	15.2	935	.167	.192
November	10	10	10.0	595	.110	.123
December	75	10	22.1	1,359	.243	.280
The year	15,450	4	264	190,100	2.90	39.17

PUTA CREEK AT WINTERS, CAL.

This station was established September 26, 1905, by R. S. Hawley. It is located about 450 feet below the Southern Pacific Railroad bridge and about 800 feet southeast of the depot at Winters, Cal.

The channel is straight for about 500 feet above and 700 feet below the cable section. The bed of the stream is composed of coarse gravel and is liable to some change at very high stages, but at ordinary stages it is not subject to much change. The current is sluggish at low water, but is swift during flood stages. There is a growth of willows and cottonwoods with wild grapevines along the banks, but the main portion of the channel is clear.

At very high flood stages the water spreads out over the left bank for about 150 feet, reaching nearly to the foot of the left cable support. At ordinary stages, however, the water remains within the high banks.

Measurements are made during low water by wading at a point about 400 feet above the bridge, but for higher stages a cable and car are used. The cable has a span of 280 feet. For float measurements, a course 250 feet long has been marked off by setting posts painted white, 250 feet above and parallel with the cable. Floats can be dropped from the railroad bridge above and timed from these posts to the cable. The initial point of soundings is a bolt in the trunk of the oak tree to which the cable is fastened on the right bank.

The gage consists of a series of timbers painted white and located under the cable. The first or low-water section is on the right bank, and is nailed vertically to the trunk of a cottonwood tree. It has a range of about 6 feet. The second section is on the left bank and is nailed vertically to the stump of a cottonwood tree. The third section is an inclined rod anchored on the left bank with posts. The fourth section is on an eucalyptus tree on top of left bank. During 1905 the gage was read once each day by Roy Wyatt. Bench marks were established as follows: (1) A standard United States Geological Survey bench mark, located 150 feet south of the depot. Its elevation as marked on the copper plate is 131 feet, 39.23 feet above the datum of the gage. (2) A square-headed bolt in concrete, 3 feet south of the left cable support; elevation, 37.27 feet above the datum of the gage.

Discharge measurements of Puta Creek at Winters, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
September 12	W. B. Clapp	16	8.0	1.09	.....	8.7
September 26	Hawley and Lee	16	8.8	.97	4.39	8.5
November 15	R. S. Hawley	16	8.8	1.33	4.42	11.7

Daily gage height, in feet, of Puta Creek at Winters, Cal., for 1905.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	4.4	4.4	4.6	17	.....	4.4	4.45	4.55
2	.....	4.4	4.4	4.65	18	.....	4.4	4.45	4.6
3	.....	4.4	4.4	4.6	19	.....	4.4	4.45	4.6
4	.....	4.4	4.4	4.6	20	.....	4.4	4.45	4.6
5	.....	4.4	4.4	4.6	21	.....	4.4	4.45	4.6
6	.....	4.4	4.4	4.6	22	.....	4.4	4.45	4.6
7	.....	4.4	4.4	4.55	23	.....	4.4	4.5	4.6
8	.....	4.4	4.4	4.55	24	.....	4.4	4.5	4.6
9	.....	4.4	4.4	4.55	25	.....	4.4	4.5	4.6
10	.....	4.4	4.4	4.5	26	4.4	4.4	4.5	4.6
11	.....	4.4	4.4	4.5	27	4.4	4.4	4.5	4.6
12	.....	4.4	4.45	4.5	28	4.4	4.4	4.5	4.6
13	.....	4.4	4.45	4.55	29	4.45	4.4	4.6	4.6
14	.....	4.4	4.45	4.55	30	4.4	4.4	4.6	4.6
15	.....	4.4	4.45	4.55	31	.....	4.4	.....	4.6
16	.....	4.4	4.45	4.55					

SAN JOAQUIN RIVER.

DESCRIPTION OF RIVER.

San Joaquin River is divided into two distinct parts. The valley portion forms the central drainage line of San Joaquin Valley, and during the spring is navigable for 100 miles or more. Stanislaus, Tuolumne, Merced, and Kings rivers are the largest streams in this portion of the drainage basin. The waters of Kings, Kaweah, Tule, and Kern rivers, which are located in the portion of San Joaquin Valley lying to the south and east of Fresno, although forming a portion of the drainage of San Joaquin River, seldom reach this stream. Their entire flow, except in extreme flood, is diverted and used for irrigation at points where they emerge from the foothills. The valley is fertile and almost destitute of timber. The mountainous portion of the stream drains the western slope of the Sierra Nevada between the Merced River on the north and Kings River on the south, the crest of its divide reaching an elevation of 13,000 feet in Mount Lyell and an elevation of 14,000 feet in Mount Goddard. There are numerous tributaries in this portion of the drainage basin, many of which have their source in the high elevations. The formation is of granite, which in the upper reaches is bare and sharply marked by glacial action. The middle reaches of the basin are well timbered, the timber diminishing on the lower foothills, which have a covering of brush and grass. The precipitation takes the form of snow on the higher elevations. The fall of the river is rapid, with many favorable locations for power development. There are numerous lakes in the upper reaches of the basin. A storage reservoir has been constructed on North Fork, which will tend to further regulate the flow of the river.

SAN JOAQUIN RIVER AT HERNDON, CAL.

The gage rod at this station was established by the engineering department of the Southern Pacific Railroad Company in 1879. The old trestle bridge was torn down by the railroad company during 1899 and a new iron structure was erected in its place. A new gage rod, set to the datum of the old gage, was bolted to the western side of the central concrete pier. The bench mark is a nail in a post at the south end of the bridge on the west side, 0.2 foot above the ground, and marked "B. M." It is at an elevation of 24.12 feet above gage datum.

The channel for some distance above and below the bridge is straight, and the water has a uniform velocity. The right bank is high, rocky, and steep. The bed of the stream is composed of small gravel and shifting sand. Because of the continual changes in the cross section, which were increased by a side channel breaking through the gravel pits on the left bank of the river just above the gaging station, meter measurements were discontinued at this station at the end of 1901.

The river stage record for 1905 has been furnished by William Hood, chief engineer of the Southern Pacific Railroad Company. G. G. Nelson was the observer.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, and 134 of the United States Geological Survey.

Daily gage height, in feet, of San Joaquin River at Herndon, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.5	3.0	3.9	4.5	7.0	6.75	6.1	3.5	3.15	2.5	2.4	2.6
2	3.5	3.15	4.1	4.5	6.75	6.6	6.0	3.5	3.1	2.5	2.4	2.65
3	3.3	4.6	4.25	4.5	6.6	6.6	5.75	3.5	3.0	2.5	2.4	2.65
4	3.25	4.4	4.25	4.5	6.0	6.75	6.0	3.5	3.0	2.5	2.4	2.6
5	3.15	4.3	4.25	5.0	5.5	6.75	6.0	3.5	2.9	2.5	2.4	2.6
6	3.15	4.75	4.15	5.25	5.5	6.4	5.75	3.5	2.75	2.5	2.4	2.6
7	3.15	4.5	4.15	5.3	5.65	6.3	5.5	3.4	2.75	2.5	2.4	2.6
8	3.15	4.0	4.25	5.5	5.65	7.15	5.3	3.4	2.75	2.5	2.4	2.6
9	3.1	3.75	4.3	6.65	6.0	7.4	5.3	3.4	2.75	2.5	2.4	2.5
10	3.1	3.5	4.3	5.75	5.5	7.4	5.2	3.4	2.75	2.5	2.4	2.5
11	3.1	3.5	4.5	5.5	5.5	7.5	5.15	3.4	2.75	2.5	2.4	2.5
12	3.1	3.5	4.5	5.5	5.5	8.3	5.1	3.3	2.75	2.5	2.4	2.5
13	3.1	3.4	4.5	5.3	5.5	8.75	5.0	3.3	2.75	2.5	2.4	2.5
14	3.1	3.3	7.15	4.75	5.5	8.0	4.75	3.3	2.65	2.5	2.4	2.5
15	3.1	3.3	5.5	4.7	6.0	8.0	4.75	3.3	2.65	2.5	2.4	2.5
16	3.3	3.25	5.0	5.1	7.0	7.75	4.65	3.25	2.65	2.5	2.4	2.5
17	3.15	3.15	5.0	5.25	8.5	8.0	4.65	3.25	2.65	2.5	2.4	2.5
18	3.1	3.15	5.0	5.0	8.75	8.25	4.65	3.25	2.65	2.5	2.4	2.5
19	3.0	3.15	5.0	5.0	9.65	8.75	4.65	3.25	2.65	2.5	2.4	2.5
20	3.0	3.15	6.5	5.0	8.25	8.3	4.5	3.25	2.65	2.5	2.4	2.6
21	3.0	3.15	5.0	4.75	8.6	7.75	4.5	3.25	2.65	2.5	2.4	2.75
22	3.0	3.15	5.0	5.0	8.25	8.0	4.5	3.25	2.65	2.5	2.4	2.75
23	3.0	3.15	5.0	5.0	8.3	7.5	4.5	3.15	2.65	2.5	2.4	2.75
24	3.0	3.15	5.0	5.0	8.1	7.15	4.3	3.15	2.6	2.4	2.4	2.75
25	3.0	3.15	5.0	5.0	8.25	6.5	4.3	3.15	2.6	2.4	2.4	2.75
26	3.0	3.15	5.0	5.5	8.5	6.65	4.3	3.15	2.6	2.4	2.4	2.75
27	3.0	3.15	5.25	5.5	8.3	6.5	4.25	3.15	2.6	2.4	2.4	2.75
28	3.0	3.15	5.0	6.0	7.65	6.5	4.0	3.15	2.6	2.4	2.4	2.75
29	3.0	.....	5.0	6.0	7.65	6.5	3.75	3.15	2.6	2.4	2.4	2.75
30	3.0	.....	4.75	6.15	6.6	6.6	3.6	3.15	2.6	2.4	2.4	2.75
31	3.0	.....	4.7	.....	6.75	.....	3.6	3.15	.....	2.4	2.6	2.65

NOTE.—Gage heights reduced to feet and tenths from feet and inches as furnished by Southern Pacific Railroad Company.

MISCELLANEOUS MEASUREMENTS IN SAN JOAQUIN RIVER DRAINAGE BASIN.

Pitman Creek.—This stream is tributary to the San Joaquin River through Big Creek. An estimate was made of the discharge below the mouth of Tamarack Creek on September 2, 1905, by R. S. Hawley.

Discharge, 1.5 second-feet.

Home Camp Creek.—This stream is tributary to the San Joaquin River through Big Creek, which it enters at Home Camp meadow. A measurement was made on this creek on September 2, 1905, 100 feet above its mouth, by R. S. Hawley.

Width, 3.0 feet; area, 0.8 square foot; mean velocity, 1.12 feet per second; discharge, 0.90 second-foot.

Big Creek.—This stream is tributary to San Joaquin River from the east. A measurement was made 100 feet above the mouth of Home Camp Creek on September 2, 1905, by R. S. Hawley.

Width, 4.5 feet; area, 1.9 square feet; mean velocity, 2.53 feet per second; discharge, 4.8 second-feet.

Discharge below the mouth of Home Camp Creek was 5.7 second-feet.

Small Creek.—This is a small creek which enters the South Fork of the San Joaquin from the south at Mono crossing. A measurement was made at the Mono trail crossing about 1,000 feet above its mouth on September 4, 1905, by R. S. Hawley.

Width, 2.8 feet; area, 1.1 square feet; mean velocity, 1.18 feet per second; discharge, 1.3 second-feet.

South Fork of San Joaquin River.—This is the principal tributary of the San Joaquin River from the south. A measurement was made September 4, 1905, at the Mono crossing by R. S. Hawley.

Width, 60 feet; area, 94 square feet; mean velocity, 1.11 feet per second; discharge, 104 second-feet.

Mono Creek.—This stream is tributary to South Fork of San Joaquin River from the east. A measurement was made at the Mono Trail crossing, about 2 miles above its mouth, on September 4, 1905, by R. S. Hawley.

Width, 44.5 feet; area, 37 square feet; mean velocity, 1.17 feet per second; discharge, 43 second-feet.

Fish Creek.—This stream is the principal tributary of the Middle Fork of the San Joaquin from the south about 10 miles above the junction of the Middle and South forks. A measurement was made on September 6, 1905, at the trail crossing, about 3 miles above its mouth, by R. S. Hawley.

Width, 29 feet; area, 36 square feet; mean velocity, 1.42 feet per second; discharge, 51 second-feet.

Middle Fork of San Joaquin River.—This stream drains the northeastern portion of the San Joaquin watershed. A measurement was made on September 6, 1905, at the Devils Post Pile at the trail crossing by R. S. Hawley.

Width, 42 feet; area, 41 square feet; mean velocity, 0.90 foot per second; discharge, 37 second-feet.

Reds Creek.—This stream enters Middle Fork of San Joaquin River one-half mile below the Devils Post Pile. A measurement was made September 6, 1905, at the Mammoth trail crossing, one-fourth mile above its mouth, by R. S. Hawley.

Width, 9 feet; area, 4.2 square feet; mean velocity, 0.93 foot per second; discharge, 3.9 second-feet.

King Creek.—This stream enters Middle Fork of San Joaquin River near Rainbow Falls. An estimate was made of the discharge one mile above its mouth, at Mammoth trail crossing, on September 7, 1905, by R. S. Hawley.

Discharge, 3.5 second-feet.

Mugler Creek.—This stream enters the San Joaquin River from the north. On September 7, 1905, an estimate of the discharge was made at the trail crossing, one-half mile below Mugler Meadow, by R. S. Hawley.

Discharge, 3.0 second-feet.

Stevenson Creek.—This stream enters the San Joaquin River 4 miles northwest of Shaver post-office. A measurement was made one-fourth mile above the head of Shaver Lake on September 2, 1905, by R. S. Hawley.

Width, 8 feet; area, 3.2 square feet; mean velocity, 1.22 feet per second; discharge, 3.9 second-feet.

North Fork of the San Joaquin River.—This stream enters the San Joaquin River 4 miles below the junction of the Middle and South forks. A measurement was made on September 7, 1905, 150 feet below the bridge, at the trail crossing, 3 miles above its mouth.

Width, 31 feet; area, 27 square feet; mean velocity, 1.33 feet per second; discharge, 36 second-feet.

North Fork of Willow Creek.—This stream enters the San Joaquin from the north. A measurement was made on September 9, 1905, at "The Pines," 1½ miles above reservoir dam, by R. S. Hawley.

Width, 7 feet; area, 3.6 square feet; mean velocity, 1.19 feet per second; discharge, 4.3 second-feet.

San Joaquin River at the San Joaquin power house.—A measurement was made on this stream on September 9, 1905, one-half mile below the power house, by R. S. Hawley. This measurement includes practically the total flow from the whole drainage area of the San Joaquin River about this point.

Width, 148.5 feet; area, 226 square feet; mean velocity, 1.37 feet per second; discharge, 310 second-feet.

KERN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Kern River drains 2,345 square miles of the western slope of the Sierra Nevada at its extreme southern limits. This drainage basin is the largest of any stream discharging into the San Joaquin Valley, it having an area 600 square miles greater than that of the Kings River. It has its source in the highest elevations of the Sierra Nevada, draining the western and southern slopes of Mount Whitney and numerous other high granite peaks grouped about it, which reach elevations of over 14,000 feet. Its general direction is south for about 65 miles when it turns and flows in a southwesterly direction, discharging into the San Joaquin Valley east of Bakersfield, Cal. Extending, as it does in its upper reaches, for some distance parallel with the Sierra Nevada, it receives waters not only from the main crest on the east, but also from a somewhat lower divide on the west behind the basins of the Kaweah and Tule rivers. It has numerous tributaries, the principal ones entering from the east, which drain the higher elevations of the main crest of the Sierra Nevada. The topography is extremely rough and broken in the upper reaches of this basin, becoming less rugged in the middle portion in the vicinity of Kernville, where there is quite an extensive valley with considerable cultivated land; below this point the stream enters a rough canyon, finally discharging into the flat country of the San Joaquin Valley. The entire flow, except during extreme flood stages, is diverted and used for irrigation at points where streams emerge from the foothills.

The formation is of granite, which, above the 10,000-foot contour, is practically bare of timber growth. Between elevations of 3,000 and 10,000 feet there is a good depth of soil, with timber and brush covering; the lower reaches have a light covering of brush and grass.

There are several lakes and marshes scattered throughout this basin, but they are less numerous than in the basins farther to the north. Several power plants are located on this stream, none of which, however, receive water from storage reservoirs, the diversions being made from the natural flow of the river and again returned to the river channel. The precipitation is very light throughout this basin, with the possible exception of the high elevations surrounding Mount Whitney, where the snow remains through the summer months.

KERN RIVER NEAR BAKERSFIELD, CAL.

This station, established in 1893 by Walter James, chief engineer of the Kern County Land Company, is located at what is known as "first point of measurement," 5 miles above Bakersfield and at the mouth of the canyon of the river.

Regular meter measurements are taken, and an automatic gage records daily fluctuations of the river heights. A. K. Warren, the engineer in charge of this work for the Kern County Land Company, attends to the discharge measurements with accuracy and precision and furnishes the Geological Survey with the final results.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, and 134 of the United States Geological Survey.

Daily discharge, in second-feet, of Kern River near Bakersfield, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	280	305	435	799	1,700	1,953	1,520	427	233	205	230	262
2	285	326	458	848	1,713	1,979	1,422	413	229	226	227	281
3	272	435	480	934	1,743	1,932	1,313	403	224	227	221	276
4	278	486	500	997	1,633	1,931	1,226	394	213	208	218	285
5	290	517	512	1,047	1,542	1,919	1,215	376	216	196	215	277
6	281	503	530	1,070	1,517	1,879	1,218	362	215	190	216	271
7	269	452	545	1,103	1,453	1,997	1,171	345	217	181	231	267
8	272	391	593	1,138	1,531	2,154	1,157	356	220	175	217	275
9	270	364	616	1,185	1,461	2,150	1,115	358	218	176	225	278
10	276	365	609	1,119	1,418	2,066	1,130	351	207	186	227	284
11	280	351	613	1,186	1,367	2,200	1,125	349	202	192	230	264
12	272	338	631	1,180	1,300	2,567	1,092	349	208	199	232	278
13	266	334	785	1,052	1,298	2,923	1,038	352	218	206	233	265
14	246	317	1,154	971	1,317	2,978	958	352	225	206	228	241
15	255	317	974	952	1,425	3,039	886	345	221	202	223	244
16	255	361	996	991	1,649	2,933	799	338	218	199	234	240
17	260	398	1,143	995	1,949	2,948	748	327	215	203	240	238
18	269	434	1,140	1,052	2,312	2,747	717	319	215	194	257	246
19	277	417	1,009	1,121	2,359	2,569	665	318	208	198	263	259
20	273	413	1,309	1,058	2,528	2,555	628	308	203	215	262	266
21	305	401	1,073	992	2,549	2,547	634	286	197	218	247	285
22	329	386	957	964	2,625	2,539	597	279	194	217	243	272
23	343	390	888	920	2,558	2,408	578	267	195	221	239	255
24	311	397	871	895	2,412	2,154	558	269	196	230	227	233
25	301	410	900	936	2,456	1,835	557	286	201	226	237	221
26	298	420	929	1,033	2,560	1,690	548	285	204	218	239	239
27	281	432	999	1,070	2,598	1,685	536	282	214	217	253	255
28	276	434	978	1,067	2,378	1,617	532	271	200	221	259	262
29	271	.....	919	1,157	2,120	1,584	520	270	205	222	263	271
30	276	.....	1,051	1,451	1,962	1,563	488	265	205	224	245	255
31	284	.....	913	.....	1,930	.....	451	250	.....	226	.....	257

Estimated monthly discharge of Kern River near Bakersfield, Cal., for 1905.

[Drainage area, 2,345 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	343	246	281	17,280	0.120	0.138
February	517	305	396	21,990	.169	.176
March	1,309	435	823	50,600	.351	.405
April	1,451	799	1,043	62,060	.445	.496
May	2,625	1,298	1,915	117,800	.817	.942
June	3,039	1,563	2,235	133,000	.953	1.06
July	1,520	451	876	53,860	.374	.431
August	427	250	327	20,110	.139	.160
September	233	194	211	12,560	.090	.100
October	230	175	207	12,730	.088	.101
November	263	215	236	14,040	.101	.113
December	285	221	261	16,050	.111	.128
The year	3,039	175	734	532,100	.313	4.25

TULE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Tule River rises in the Sierra Nevada, and drains the country between the Kaweah River on the north and the Kern River on the south and east. Its drainage area is much less than that of the Kaweah River, although of the same general character. It has numerous small tributaries, few of which have their source at elevations above 8,000 feet. Its drainage basin does not extend back to the main divide, being cut off by the Kern River, which reaches to the north and drains the higher portion of Sierra Nevada to the east of Tule River. There is good timber and brush covering on the higher and middle elevations, with grass and scattering timber on the lower elevations, where the soil is extensively cultivated. Below the gaging station the water is diverted by several canals and used for the irrigation of land in the vicinity of Portersville, which is especially adapted for the raising of citrus fruits, such as oranges and lemons. During the flood period the water discharges through an old channel, and either sinks in the sand or finds its way to the old bed of Tulare Lake.

The mean precipitation in this watershed is probably not more than 20 inches, and falls principally in the form of rain.

TULE RIVER NEAR PORTERSVILLE, CAL.

This station was established April 8, 1901. It is located about 8 miles east of Portersville near the McFarland ranch, 100 feet below wagon bridge and about 1 mile above the mouth of the South Fork of Tule River.

The channel is straight for 200 feet above and below the cable section. The right bank is high and not subject to overflow. The left bank is subject to overflow at flood stages. The bed of the stream is composed of gravel, with some large rocks, but is not subject to much change.

Discharge measurements during medium and high water are made from a car and cable; at low water measurements are made by wading.

The gage is a staff in two sections on the right bank under the cable The lower section is inclined and fastened to posts set in the ground. The higher section is vertical and nailed to the tree through which the cable passes. During 1905 the gage was read by Adah

McFarland. Bench marks were established as follows: (1) A cross on the top of a bowlder on the right bank of the river between the cable and the bridge; elevation, 13.10 feet. (2) A point marked with white paint on a dark granite bowlder 55 feet south of the rock pier of the bridge; elevation, 10.05 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, and 134 of the United States Geological Survey.

Discharge measurements of Tule River near Portersville, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 22	F. R. S. Buttemer	71	107	2.05	2.50	219
May 19	R. S. Hawley	77	152	2.34	3.00	355
June 13	do	69	97	1.68	2.27	163
July 26	do	33	26	.96	1.16	25
September 18	C. H. Lee	26	17	.58	.92	10
September 26	Clapp and Holley	24	16	.50	.91	8.0
October 25	Hawley and Lee	30	22	.70	1.10	15.5

Daily gage height, in feet, of Tule River near Portersville, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	1.45	1.7	2.3	2.5	2.55	1.7	1.05	0.9	1.1	1.05	1.9
2	1.7	2.30	1.7	2.4	3.0	2.55	1.7	1.05	.9	1.05	1.1	1.85
3	1.65	2.0	1.75	2.5	2.9	2.5	1.65	1.05	.9	1.05	1.1	1.85
4	1.6	2.0	1.75	2.6	2.8	2.45	1.6	1.05	.9	1.0	1.1	1.8
5	1.6	1.9	1.75	2.55	2.5	2.45	1.55	1.05	.9	1.0	1.1	1.8
6	1.6	1.8	1.8	2.55	2.5	2.45	1.5	1.0	.9	1.0	1.1	1.8
7	1.55	1.75	1.8	2.55	3.05	2.4	1.45	1.0	.9	1.0	1.1	1.8
8	1.55	1.7.	1.8	2.5	3.2	2.35	1.4	1.0	.9	1.0	1.15	1.8
9	1.5	1.65	1.75	2.5	2.95	2.35	1.4	1.0	.9	1.05	1.15	1.8
10	1.5	1.6	1.75	2.4	2.85	2.3	1.4	1.0	.95	1.05	1.15	1.8
11	1.5	1.6	1.7	2.35	2.8	2.3	1.4	1.0	.95	1.0	1.15	1.8
12	1.45	1.6	1.75	2.3	2.75	2.4	1.35	.95	.95	1.0	1.15	1.8
13	1.45	1.6	3.1	2.35	2.7	2.35	1.35	.95	.95	.95	1.15	1.8
14	1.4	1.6	2.8	2.35	2.9	2.3	1.3	.95	1.0	1.0	1.15	1.8
15	1.4	1.7	2.6	2.4	3.0	2.25	1.3	.95	.95	1.0	1.2	1.8
16	1.4	1.75	3.0	2.35	3.2	2.25	1.3	.95	.95	1.0	1.2	1.8
17	1.4	1.75	3.0	2.3	3.3	2.1	1.25	.95	.95	1.0	1.3	1.8
18	1.4	1.8	2.9	2.3	3.1	2.0	1.25	.95	.95	1.0	1.3	1.9
19	1.4	1.8	4.1	2.5	3.0	1.95	1.2	.95	.95	1.0	1.3	1.9
20	1.4	1.75	3.7	2.45	3.0	1.9	1.2	.95	.95	1.0	1.7	1.9
21	1.6	1.75	3.5	2.45	2.95	1.85	1.2	.95	.95	1.0	1.7	1.9
22	1.6	1.75	3.1	2.4	2.8	1.8	1.15	.95	.95	1.0	1.65	1.9
23	1.5	1.7	2.8	2.4	2.7	1.8	1.15	.95	.95	1.0	1.65	1.9
24	1.5	1.7	2.5	2.35	2.75	1.8	1.1	.95	.95	1.0	1.65	1.85
25	1.5	1.7	2.3	2.4	2.8	1.9	1.1	.95	.95	1.0	1.6	1.85
26	1.5	1.7	2.3	2.4	2.8	1.85	1.15	.95	.95	1.0	1.6	1.9
27	1.5	1.7	2.3	2.45	2.8	1.85	1.1	.95	.95	1.0	2.1	2.0
28	1.5	1.7	2.25	2.5	2.75	1.8	1.1	.9	1.0	1.0	1.95	2.0
29	1.5	.....	2.9	2.6	2.7	1.8	1.15	.9	1.0	1.0	1.85	2.1
30	1.45	.....	2.4	2.7	2.65	1.75	1.05	.9	1.0	1.05	1.9	2.1
31	1.4	.....	2.3	.....	2.6	.....	1.05	.9	.....	1.05	.....	2.1

Station rating table for Tule River near Portersville, Cal., 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.*
0.90	7	1.80	82	2.70	270	3.60	581
1.00	12	1.90	98	2.80	297	3.70	626
1.10	18	2.00	115	2.90	325	3.80	672
1.20	24	2.10	133	3.00	355	3.90	720
1.30	31	2.20	152	3.10	386	4.00	770
1.40	38	2.30	173	3.20	419	4.10	822
1.50	46	2.40	195	3.30	455		
1.60	56	2.50	219	3.40	494		
1.70	68	2.60	244	3.50	537		

NOTE.—The above table is based on seven discharge measurements made during 1905. It is well defined between gage heights 0.9 foot and 3 feet.

Estimated monthly discharge of Tule River near Portersville, Cal., for 1905.

[Drainage area, 437 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	68	38	47.4	2,914	0.108	0.124
February	173	42	75.9	4,215	.174	.181
March	822	68	230	14,140	.526	.606
April	270	173	205	12,200	.469	.523
May	455	219	313	19,250	.716	.826
June	232	75	146	8,688	.334	.373
July	68	15	32.9	2,023	.075	.086
August	15	7	9.8	603	.022	.025
September	12	7	8.2	488	.019	.021
October	18	8	12.6	775	.029	.033
November	133	15	42.4	2,523	.097	.108
December	133	82	94.2	5,792	.216	.249
The year	822	7	101	73,610	.232	3.16

MISCELLANEOUS MEASUREMENTS IN TULE RIVER DRAINAGE BASIN.

South Fork of Tule River near Success, Cal.—The following measurements were made at a point one-half mile above junction of South Fork with Main Tule River.

May 19: Width, 28 feet; area, 32 feet; mean velocity, 2.86 feet per second; discharge, 90 second-feet.

September 26, stream dry.

North Fork of Tule River near Springville, Cal.—A measurement was made September 26 at road crossing one-half mile above junction with Middle Fork of Kings River.

Water standing in pools; discharge, 00 second-feet.

Middle Fork of Tule River near Springville, Cal.—This stream is the principal tributary of Kaweah River and furnishes practically all the water of this river during low-water flow. A measurement was made September 27 one-fourth mile above clubhouse and 2 miles above the town of Springville.

Width, 33.5 feet; area, 36 square feet; mean velocity, 0.64 foot per second; discharge, 23 second-feet.

South Fork of Middle Fork of Tule River near Springville, Cal.—This stream is a tributary to Middle Fork of Kaweah River. A measurement was made September 27 at a point 100 feet above its junction with Middle Fork.

Width, 8.4 feet; area, 4.0 square feet; mean velocity, 2.20 feet per second; discharge, 8.8 second-feet.

North Fork of Middle Fork of Tule River near Springville, Cal.—This stream is tributary to Middle Fork of Kaweah River. A measurement was made September 27 100 feet above its junction with Middle Fork.

Width, 7.9 feet; area, 5.9 square feet; mean velocity, 2.19 feet per second; discharge, 12.9 second-feet.

KAWEAH RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Kaweah River drains the western slope of the Sierra Nevada between the basins of Kings River on the north and Kern and Tule rivers on the south. This is an important stream, but its watershed is only about one-third that of Kings River and is much less elevated and snow covered than those of the Kings and Kern rivers. It has a number of tributaries which have their source in numerous lakes and meadows on the higher elevations. The formation is of granite and similar in every way to that in the Kings River basin. The greater part of the area of 619 square miles above the gaging station is well covered with brush and timber. In this basin is situated the Sequoia National Park, where the largest grove of big trees (*Sequoia gigantea*) of the Sierra Nevada is found. This grove is known as the "Giant Forest," and is one of the many points of interest of the Sierra Nevadas. There are two power plants on this stream owned by the Mount Whitney Power Company, which divert water from the Middle and East forks. This company has constructed several small storage reservoirs on the upper reaches of this basin. This has been done by building low dams at the outlet of some of the larger lakes. The stored water is held back for use during the low-water flow of the stream, and is of great benefit to the irrigators in the valley during the late summer months. About 6 miles below the gaging station the river leaves the foothills and flows across San Joaquin Valley in a general southwesterly direction to the old bed of Tulare Lake. After it leaves the foothills many canals divert water for the purpose of irrigating land in Tulare County, which is especially adapted to the raising of fruits.

The mean annual precipitation in the basin above the gaging station is from 20 to 40 inches, which falls in the form of snow over probably one-half the area.

KAWEAH RIVER BELOW THREE RIVERS, CAL.

This station was established April 29, 1903, by W. H. Stearns. It is located at a point three-fourths of a mile below the confluence of the North, Middle, and South forks. It is 10 miles from the Southern Pacific Railroad station at Lemon Cove, Tulare County, Cal., and one-fourth of a mile west of the wagon road from Exeter to Three Rivers.

The channel is straight for 400 feet above and below the station. The current is swift at high stages, but sluggish at low water. There are rapids about 400 feet above and 500 feet below the cable. The right bank is low and subject to overflow at high stages. The left bank is high enough to be above overflow. There are willow trees along the water's edge on both banks, and a line of willows, sycamores, and cottonwoods back from the water's edge on the left bank. The bed of the stream is composed of sand, gravel, and large bowlders. The section is probably permanent.

Discharge measurements are made from a cable and car. The initial point for soundings is a sycamore tree on the left bank of the stream, to which the cable is fastened.

The low-water gage is an inclined timber on the left bank. The high-water gage is a timber securely nailed to a willow tree on the left bank. During 1905 the gage was read by J. O. Carter. Bench marks were established as follows: (1) A point marked "B. M." with black paint on a large rock 10 feet upstream from the tree to which the cable is attached;

elevation, 13.95 feet. (2) A point on rock marked with white paint 7 feet upstream from the 75-foot mark on the cable; elevation, 15.89 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 100 and 134 of the United States Geological Survey.

Discharge measurements of Kaweah River below Three Rivers, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 18	F. R. S. Buttemer	157	464	1.24	5.94	577
March 20	do	160	526	1.55	6.26	815
May 20	R. S. Hawley	175	647	2.70	7.25	1,746
June 14	do	170	653	2.27	7.00	1,480
July 25	do	140	306	0.44	4.83	136
September 17	C. H. Lee	29	44	0.73	4.25	32
October 24 [a]	Hawley and Lee	56	61	0.80	4.30	49

[a] Section 400 feet below cable.

Daily gage height, in feet, of Kaweah River below Three Rivers, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.9	4.9	5.4	5.8	6.8	7.05	6.05	4.65	4.3	4.3	4.2	4.6
2	4.85	5.95	5.45	5.9	6.7	7.0	6.0	4.65	4.3	4.35	4.2	4.6
3	4.8	5.4	5.5	6.0	6.55	7.0	5.9	4.65	4.2	4.3	4.25	4.55
4	4.75	5.2	5.5	6.1	6.4	7.3	5.9	4.65	4.3	4.25	4.25	4.5
5	4.7	5.65	5.5	6.2	6.3	6.8	5.8	4.6	4.3	4.3	4.25	4.6
6	4.7	5.2	5.4	6.2	6.4	7.45	5.75	4.6	4.3	4.2	4.3	4.5
7	4.7	5.15	5.45	6.3	6.55	7.05	5.75	4.6	4.3	4.25	4.3	4.6
8	4.7	5.15	5.5	6.25	6.6	6.95	5.7	4.55	4.3	4.2	4.3	4.55
9	4.7	5.15	5.5	6.25	6.5	6.8	5.7	4.55	4.3	4.3	4.3	4.55
10	4.7	5.0	5.45	6.2	6.35	7.05	5.65	4.55	4.2	4.25	4.3	4.55
11	4.7	5.1	5.55	6.15	6.3	7.15	5.6	4.55	4.25	4.2	4.3	4.5
12	4.6	5.0	[a]5.6	6.0	6.3	7.35	5.5	4.55	4.25	4.2	4.25	4.5
13	4.7	5.1	6.9	6.0	6.35	7.25	5.4	4.55	4.25	4.2	4.25	4.5
14	4.6	5.0	5.9	6.0	6.55	7.15	5.3	4.6	4.25	4.2	4.3	4.55
15	4.6	5.0	5.8	6.1	6.9	7.15	5.25	4.6	4.25	4.2	4.25	4.55
16	4.65	5.45	6.1	6.2	7.3	7.15	5.2	4.6	4.25	4.25	4.3	4.55
17	4.7	5.35	6.0	6.2	7.4	7.1	5.2	4.45	4.2	4.25	4.3	4.5
18	4.65	5.65	5.95	6.35	7.35	7.0	5.1	4.4	4.25	[a]4.25	4.4	4.5
19	4.7	5.3	7.0	6.3	7.4	6.95	5.1	4.4	4.2	4.25	4.3	4.55
20	4.7	5.2	6.2	6.25	7.3	6.9	5.0	4.35	4.25	4.25	4.45	4.6
21	4.95	5.2	6.1	6.15	7.45	6.8	5.0	4.4	4.25	4.2	4.5	4.6
22	4.95	5.15	5.9	6.15	7.4	6.7	5.0	4.4	4.2	4.2	4.4	4.5
23	4.8	5.1	[a]5.9	6.15	7.3	6.6	4.95	4.4	4.2	4.2	4.4	4.5
24	4.8	5.15	5.9	6.2	7.4	6.4	4.9	4.4	4.2	4.25	4.4	4.5
25	4.75	5.2	5.9	6.35	7.5	6.30	4.9	4.4	4.2	4.3	4.4	4.6
26	4.7	5.2	6.1	6.3	7.35	6.35	4.85	4.4	4.2	4.25	4.4	4.5
27	4.7	5.1	6.0	6.35	7.1	6.0	4.85	4.4	4.2	4.25	4.55	4.5
28	4.7	5.4	5.85	6.5	6.9	6.2	4.8	4.35	4.2	4.2	4.6	4.6
29	4.7	.....	6.2	6.75	6.75	6.15	4.7	4.3	4.4	4.2	4.6	4.6
30	4.7	.....	5.9	6.85	6.85	6.15	4.7	4.3	4.45	4.25	4.6	4.6
31	4.7	.....	5.7	.....	6.95	.....	4.7	4.25	.....	4.2	.....	4.65

Station rating table for Kaweah River below Three Rivers, Cal., 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.*
4.20	40	5.10	210	6.00	625	6.90	1,375
4.30	49	5.20	240	6.10	690	7.00	1,480
4.40	61	5.30	274	6.20	760	7.10	1,590
4.50	75	5.40	312	6.30	835	7.20	1,700
4.60	91	5.50	350	6.40	915	7.30	1,815
4.70	109	5.60	395	6.50	1,000	7.40	1,935
4.80	130	5.70	445	6.60	1,090	7.50	2,060
4.90	154	5.80	500	6.70	1,180		
5.00	180	5.90	560	6.80	1,275		

NOTE.—The above table is based on seven discharge measurements made during 1905. It is well defined throughout.

Estimated monthly discharge of Kaweah River below Three Rivers, Cal., for 1905.

[Drainage area, 520 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	167	91	116	7,133	0.223	0.257
February	592	154	258	14,330	.496	.516
March	1,480	312	553	34,000	1.06	1.22
April	1,325	500	783	46,590	1.51	1.68
May	2,060	835	1,386	85,220	2.67	3.08
June	1,998	625	1,348	80,210	2.59	2.89
July	658	109	303	18,630	.583	.672
August	100	44	76.6	4,710	.147	.170
September	68	40	45.2	2,690	.087	.097
October	55	40	43.4	2,669	.083	.096
November	91	40	56.6	3,368	.109	.122
December	100	75	83.0	5,103	.160	.184
The year	2,060	40	421	304,700	.810	10.98

MISCELLANEOUS MEASUREMENTS IN KAWEAH RIVER DRAINAGE BASIN.

Marble Fork in Sequoia National Park, Cal.—This stream is one of the principal tributaries of the Kaweah River. A measurement was made October 12 by W. B. Clapp at a point 100 yards above its junction with the Middle Fork of Kaweah River.

Width, 8.1 feet; area, 6.0 square feet; mean velocity, 0.83 foot per second; discharge, 5.0 second-feet.

Middle Fork of Kaweah River in Sequoia National Park, Cal.—This stream is one of the principal tributaries of Kaweah River. A measurement was made October 12 by W. B. Clapp at a point 100 yards above its junction with Marble Fork.

Width, 24.5 feet; area, 32.2 square feet; mean velocity, 0.51 foot per second; discharge, 16.3 second-feet.

South Fork of Kaweah River near Three Rivers, Cal.—A measurement of this stream was made October 11 by W. B. Clapp, 2 miles above junction of Grouse Creek with South Fork, about 8 miles above the town of Three Rivers.

Width, 3.5 feet; area, 1.7 square-feet; mean velocity, 2.53 feet per second; discharge, 4.3 second-feet.

East Fork of Kaweah River at power house of Mount Whitney Power Company.—Estimates of discharge of this stream were made by W. B. Clapp at the power house of Mount Whitney Power Company, 3 miles above the town of Three Rivers, Cal. The estimated discharge was calculated from discharge of nozzles at Mount Whitney Power Company's Plant.

September 28: Operating three Doble wheels. Wheel No. 1, 1½-inch nozzle; wheel No. 2, 2-inch nozzle; wheel No. 3, 2¼-inch nozzle; effective head 1,290 feet; coefficient used, 0.98; discharge, 17.4 second-feet.

October 13: Two wheels running. Wheel No. 2, 2-inch nozzle; wheel No. 3, 2¼-inch nozzle; wheel No. 1, not running; effective head, 1,290 feet; coefficient used, 0.98; discharge, 14 second-feet.

Mount Whitney Power Company's flume, 100 feet below head-gate at boundary line Sequoia National Park.—The following measurements were made during 1905 by W. B. Clapp.

September 28: Width, 6.6 feet; area, 7.9 square feet; mean velocity, 2.18 feet per second; discharge, 17.2 second-feet.

October 12: Width, 4.75 feet; area, 6.4 square feet; mean velocity, 2.95 feet per second; discharge, 18.9 second-feet.

These measurements give total flow of Middle Fork of Kaweah River, including Marble Fork.

North Fork Kaweah River near Three Rivers, Cal.—A measurement of this stream was made October 13 by W. B. Clapp at a point 5 miles above junction of South Fork with Middle Fork of Kaweah River.

Width, 12 feet; area, 3.2 square feet; mean velocity, 1.50 feet per second; discharge, 4.8 second-feet.

KINGS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Kings River rises on the western slope of the Sierra Nevada and drains the country located between the San Joaquin River on the north and the Kaweah and Kern rivers on the south. The crest of the Sierra Nevada at the head of this basin reaches elevations of over 14,000 feet, and here is the most rugged portion of the range; the sharp and precipitous peaks characteristic of this part of the Sierra Nevada produce the grandest scenery to be found in the United States. The main tributaries of this stream flow through great canyons cut in the granite, with high precipitous walls. The Kings River Canyon on the South Fork and Tehipite Valley on the Middle Fork rival the famed Yosemite Valley for grandeur of scenery. There are numerous tributaries, many of which have their sources in perpetual snow banks on the higher elevation. A large number of small lakes on the higher elevations are fed by small streams from perpetual snow banks or glaciers, and in them many of the tributaries have their source. The formation is of granite, which above an elevation of 10,000 feet is bare, with scanty vegetation, being carved by the action of glaciers; below the 10,000-foot contour is a heavy covering of timber and underbrush. Extensive groves of big trees are scattered throughout this basin. On the lower elevations along the foothills the soil covering is light with a grass growth used for pasturage. Fully 80 per cent of the drainage area is now included in the boundaries of the Sierra Forest Reserve which is patrolled for the prevention of fires and illegal herding. Below the gaging station, which is located at the point where the river leaves the foothills, canals divert the water for use in the valley lands of Fresno, Kings, and Tulare counties, where the climate and soil are especially adapted to the raising of grapes, fruits, etc., and the soil is under a high state of cultivation. During the period of flood discharge some water passes these canals and finds its way across Kings River delta in the natural channel to the old bed of Tulare Lake, which is now but an intermittent lake due largely to the diversion of water for irrigation purposes from the streams which drain into it.

There is a drainage area of 1,742 square miles above the Red Mountain gaging station. The mean annual precipitation for this area varies from about 30 to 60 inches, which over a greater portion of the basin falls in the form of snow. The greater discharge of this stream is in the spring months when the snow is melting.

KINGS RIVER NEAR SANGER, CAL.

This station was established September 3, 1895, by J. B. Lippincott. It is located 15 miles east of Sanger, Cal., near the mouth of the canyon, and is above all diversions.

The channel is nearly straight for 300 feet above and below the station, and has a width of 180 feet at ordinary stages. The bed of the stream is composed of gravel and small bowlders and changes but little. The right bank is high and not subject to overflow. The left bank is subject to overflow during extreme high water. The current is swift.

Discharge measurements are made by means of a cable and car. The initial point for soundings is an eyebolt embedded in concrete on the right bank of river. An automatic river stage register was installed April 18, 1903. There is also an inclined wooden gage near by from which readings were formerly taken and which is now used in checking the self-recording gage. Mr. O. G. Williams reads the gage once each day and also examines the automatic register to see that it is in proper working order. The mean daily gage height is determined from the register sheets by the use of planimeter. The bench mark is a cross marked on a rock which is 24 feet upstream from the self-recording register; elevation, 18.00 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, and 134 of the United States Geological Survey.

Discharge measurements of Kings River near Sanger, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 21	F. R. S. Buttemer	217	883	2.73	6.91	2,406
May 22	R. S. Hawley	317	1,827	4.95	10.10	9,046
June 15	do	314	1,808	4.67	10.10	8,446
July 24	do	169	584	1.69	5.42	986
August 19	do	145	390	.97	4.33	382
September 16	C. H. Lee	126	317	.63	3.82	199
October 21	Hawley and Lee	113	128	1.53	3.79	186

Mean daily gage height, in feet, of Kings River near Sanger, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.65	5.0	5.5	6.25	8.9	9.0	7.8	4.95	4.1	4.05	3.8	4.10
2	4.55	5.65	5.7	6.5	8.35	9.05	7.6	4.85	4.05	4.0	3.8	4.05
3	4.45	5.6	5.85	6.6	8.05	9.15	7.5	4.8	4.0	4.0	3.8	4.0
4	4.45	5.45	5.95	6.7	7.7	8.85	7.4	4.8	4.0	3.9	3.8	4.1
5	4.4	5.7	5.9	6.9	7.55	8.7	7.3	4.7	4.0	3.85	3.8	4.15
6	4.4	5.65	5.9	7.05	7.65	9.05	7.25	4.65	4.0	3.85	3.8	4.1
7	a 4.4	5.4	5.9	7.2	7.75	9.35	7.25	4.6	4.0	3.8	3.8	4.1
8	a 4.4	5.3	5.95	7.2	7.9	9.3	7.2	4.6	3.95	3.8	3.8	4.1
9	4.4	5.25	5.95	7.25	7.7	9.1	7.2	4.6	3.95	3.8	3.8	4.05
10	4.35	5.15	5.9	7.25	7.4	9.4	7.2	4.65	3.9	3.8	3.8	4.0
11	4.4	5.05	5.9	7.0	7.4	9.8	7.15	4.6	3.9	3.75	a 3.8	4.0
12	4.3	5.0	5.95	6.75	7.4	10.25	7.0	4.55	3.9	3.75	3.8	4.0
13	4.2	4.85	7.15	6.6	7.45	10.3	6.7	4.55	3.9	3.75	3.8	4.0
14	4.35	4.85	7.35	6.6	7.95	10.2	6.4	4.5	3.9	3.7	3.8	4.0
15	a 4.35	4.85	6.65	6.9	8.8	10.0	6.2	4.45	3.9	3.7	3.8	4.0
16	4.35	5.0	6.55	7.05	9.6	9.9	6.0	4.45	3.85	3.7	3.8	4.0
17	4.4	5.4	6.75	7.0	10.25	9.85	5.85	4.4	3.8	3.7	3.8	4.0
18	4.4	5.25	6.75	7.3	10.15	9.6	5.75	4.4	3.8	3.75	3.8	4.0
19	4.35	5.2	7.0	7.2	10.15	9.4	5.65	4.35	3.8	3.75	3.9	4.0
20	4.45	5.15	7.2	6.9	10.05	9.4	5.6	4.3	3.8	3.8	3.95	4.05
21	4.7	5.1	6.9	6.85	10.15	9.45	5.55	4.3	3.8	3.8	4.0	4.1
22	4.8	5.1	6.55	6.8	10.15	9.4	5.55	4.3	3.75	3.8	3.9	4.0
23	4.6	5.15	6.4	6.8	9.95	8.95	5.5	4.3	3.75	3.8	3.9	3.9
24	4.6	5.2	6.5	7.1	9.95	8.45	5.5	4.25	3.75	3.8	3.8	3.9
25	4.55	5.25	6.6	7.5	10.15	8.2	5.5	4.2	3.75	3.7	3.8	a 3.9
26	4.5	5.3	6.8	7.5	10.15	8.25	5.5	4.2	3.7	3.7	3.85	3.9
27	4.45	5.3	6.7	7.75	9.4	8.05	5.45	4.2	3.7	3.7	3.9	4.0
28	4.45	5.35	6.4	8.2	8.85	7.95	5.4	4.15	3.7	3.7	4.1	4.0
29	4.45	.....	6.55	8.75	8.5	8.0	5.25	4.1	3.75	3.75	4.0	4.0
30	4.45	.....	6.4	9.05	8.65	8.0	5.15	4.1	3.95	3.75	a 4.0	4.0
31	4.5	.....	6.25	.....	8.9	.....	5.05	4.1	.....	3.75	.....	3.9

a Gage height estimated.

Station rating table for Kings River near Sanger, Cal., 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.*
3.70	150	5.00	740	6.30	1,730	8.00	3,850
3.80	175	5.10	805	6.40	1,820	8.20	4,190
3.90	205	5.20	870	6.50	1,920	8.40	4,570
4.00	240	5.30	940	6.60	2,020	8.60	4,980
4.10	280	5.40	1,010	6.70	2,120	8.80	5,425
4.20	325	5.50	1,085	6.80	2,230	9.00	5,890
4.30	370	5.60	1,160	6.90	2,340	9.20	6,380
4.40	420	5.70	1,235	7.00	2,460	9.40	6,915
4.50	470	5.80	1,310	7.20	2,705	9.60	7,495
4.60	520	5.90	1,390	7.40	2,965	9.80	8,115
4.70	570	6.00	1,470	7.60	3,240	10.00	8,770
4.80	625	6.10	1,550	7.80	3,535	10.20	9,450
4.90	680	6.20	1,640				

NOTE.—The above table is based on discharge measurements made during 1895–1905. It is well defined throughout.

Estimated monthly discharge of Kings River near Sanger, Cal., for 1905.

[Drainage area, 1,742 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	625	325	447	27,480	0.257	0.296
February	1,235	652	899	49,930	.516	.537
March	2,900	1,085	1,844	113,400	1.06	1.22
April	6,010	1,685	2,731	162,500	1.57	1.75
May	9,622	2,965	5,887	361,600	3.38	3.90
June	9,795	3,770	6,448	383,700	3.70	4.13
July	3,535	772	1,859	114,300	1.07	1.23
August	710	280	448	27,550	.257	.296
September	280	150	198	11,780	.114	.127
October	260	150	174	10,700	.100	.115
November	280	175	191	11,360	.110	.123
December	302	205	246	15,130	.141	.163
The year	9,795	150	1,781	1,289,000	1.02	13.89

MISCELLANEOUS MEASUREMENTS IN KINGS RIVER DRAINAGE BASIN.

North Fork of Kings River.—This stream enters Kings River from the north about 20 miles above point where the main Kings River leaves the foothills and enters the San Joaquin Valley. A measurement was made 500 feet above its junction with main river and about 50 feet above lower trail crossing on August 22, 1905, by R. S. Hawley.

Width, 16 feet; area, 21 square feet; mean velocity, 1.86 feet per second; discharge, 39 second-feet.

Converse Creek.—This stream enters the Kings River 7 miles below the junction of Middle and South forks. A measurement was made 200 feet above its mouth on August 23, 1905, by R. S. Hawley.

Width, 4 feet; area, 1.6 square feet; mean velocity, 0.77 foot per second; discharge, 1.2 second-feet.

Ten Mile Creek.—This creek enters Kings River one-half mile below junction of Middle and South forks. A measurement was made on August 23, 1905, 100 feet above its mouth by R. S. Hawley.

Width, 2 feet; area, 1.6 square feet; mean velocity, 0.69 foot per second; discharge, 1.1 second-feet.

Boulder Creek.—This stream enters the South Fork of Kings River 5 miles above the junction of the Middle and South forks. A measurement was made on August 25, 1905, 2 miles above its mouth and 100 feet above lower trail crossing by R. S. Hawley.

Width, 6 feet; area, 2.8 square feet; mean velocity, 1.14 feet per second; discharge, 3.2 second-feet.

Lightning Creek.—This stream enters the South Fork of Kings River from the south about 10 miles above the junction of the Middle and South forks. An estimate was made of the discharge about 1 mile above its mouth at the trail crossing on August 25, 1905, by R. S. Hawley.

Discharge, 0.60 second-foot.

Lewis Creek.—This stream enters the South Fork of Kings River from the north in Kings River Canyon 2 miles below old Cedar Grove Hotel. A measurement was made August 26, 1905, 500 feet above its mouth by R. S. Hawley.

Width, 3 feet; area, 2.7 square feet; mean velocity, 1.00 foot per second; discharge, 2.7 second-feet.

South Fork of Kings River.—This stream is the principal tributary to Kings River. A measurement was made in the lower Kings River Canyon one-fourth mile above the mouth of Lewis Creek on August 26, 1905, by R. S. Hawley.

Width, 52 feet; area, 51 square feet; mean velocity, 2.73 feet per second; discharge, 139 second-feet.

South Fork of Kings River.—A measurement was made 700 feet above the mouth of Bubbs Creek on August 26, 1905, by R. S. Hawley.

Width, 35 feet; area, 36 square feet; mean velocity, 1.36 feet per second; discharge, 49 second-feet.

South Fork of Kings River.—A measurement was made August 26, 1905, one-fourth mile below the mouth of Bubbs Creek by R. S. Hawley.

Width, 65 feet; area, 68 square feet; mean velocity, 1.46 feet per second; discharge, 99 second-feet.

Bubbs Creek.—This is the principal tributary of South Fork of Kings River and joins it at the head of Kings River Canyon. From the measurements made on South Fork of Kings River above and below the junction of Bubbs Creek on August 26, 1905, by R. S. Hawley, the discharge of Bubbs Creek at the mouth was estimated to be 50 second-feet. On account of roughness of stream bed and high velocities in the creek it was impossible to make discharge measurement. (See measurement of South Fork of Kings River above and below mouth of Bubbs Creek.)

Copper Creek.—This stream enters the South Fork of Kings River from the north between North Dome and Buck Peak. A measurement was made on August 26, 1905, one-fourth mile above its mouth by R. S. Hawley.

Width, 4 feet; area, 1.0 square foot; mean velocity, 0.82 foot per second; discharge, 0.82 second-foot.

Roaring River.—This stream enters South Fork of Kings River from the south, 5 miles below the junction of South Fork and Bubbs Creek. A measurement was made August 26, 1905, 500 feet above its mouth by R. S. Hawley.

Width, 14 feet; area, 11 square feet; mean velocity, 0.87 foot per second; discharge, 9.6 second-feet.

Sheep Creek.—This stream enters the South Fork of Kings River from the south one-fourth mile below Cedar Grove Hotel. An estimate was made of the discharge at the mouth August 26, 1905, by R. S. Hawley.

Discharge, 1.8 second-feet.

Hotel Creek.—This stream enters South Fork of Kings River from the north at Cedar Grove Hotel. An estimate was made of the discharge at its mouth on August 26, 1905, by R. S. Hawley.

Discharge, 0.20 second-foot.

Granite Creek.—This stream enters South Fork of Kings River from the north between North Mountain and North Dome. An estimate was made of the discharge at the mouth August 26, 1905, by R. S. Hawley.

Discharge, 0.50 second-foot.

Horseshoe Creek.—This stream enters Middle Fork of Kings River from the south at Simpson Meadow. An estimate was made of the discharge at its mouth on August 28, 1905, by R. S. Hawley.

Discharge, 2.4 second-feet.

Middle Fork of Kings River.—This is one of the principal tributaries of Kings River and drains the high Sierra Nevadas in the northeastern portion of its watershed. A measurement was made on August 28, 1905, 50 feet above the mouth of Horseshoe Creek, at the lower end of Simpson Meadow, by R. S. Hawley.

Width, 41 feet; area, 65 square feet; mean velocity, 1.83 feet per second; discharge, 119 second-feet.

Goddard Creek.—This stream is the principal tributary of Middle Fork of Kings River, entering it from the north. A measurement was made August 28, 1905, one-fourth mile above its mouth at Simpson Meadow by R. S. Hawley.

Width, 26 feet; area, 29 square feet; mean velocity, 1.93 feet per second; discharge, 56 second-feet.

Dougherty Creek.—This stream enters Middle Fork of Kings River from the south about 1 mile below Simpson Meadow. A measurement was made August 29, 1905, 300 feet above its mouth by R. S. Hawley.

Width, 4 feet; area 4.4 square feet; mean velocity, 0.86 foot per second; discharge, 3.8 second-feet.

Slide Creek.—This is a small stream entering Middle Fork of Kings River from the south 3 miles below Simpson Meadow. An estimate of its discharge was made 300 feet above its mouth August 29, 1905, by R. S. Hawley.

Discharge, 0.50 second-foot.

Crown Creek.—This stream enters Middle Fork of Kings River in Tehipite Valley one-half mile southwest of Tehipite Dome. An estimate of its discharge was made on August 29, 1905, 500 feet above its mouth, above the trail crossing, by R. S. Hawley.

Discharge, 8.0 second-feet.

Blue Canyon Creek.—This stream enters Middle Fork of Kings River 2 miles above Tehipite Dome. An estimate was made of the discharge August 29, 1905, 200 feet above its mouth by R. S. Hawley.

Discharge, 1.4 second-feet.

Rancheria Creek.—This stream enters North Fork of Kings River about 4 miles below Cliff Camp. A measurement was made on August 31, 1905, about 4 miles above its mouth and just below its junction with North Fork of Rancheria Creek by R. S. Hawley.

Width, 8 feet; area, 7.2 square feet; mean velocity, 0.78 foot per second; discharge, 5.6 second-feet.

North Fork of Rancheria Creek.—This stream joins Rancheria Creek about 4 miles above its mouth. A measurement was made August 31, 1905, 100 feet above its junction with Rancheria Creek, by R. S. Hawley.

Width, 2 feet; area, 1.2 square feet; mean velocity, 2.00 feet per second; discharge, 2.4 second-feet.

North Fork of Kings River.—A measurement was made on this stream on August 31, 1905, about one-half mile above Cliff Camp and about 15 miles above its mouth, by R. S. Hawley.

Width, 8.0 feet; area, 12.8 square feet; mean velocity, 0.73 foot per second; discharge, 9.4 second-feet.

Bear Creek.—This stream is tributary to North Fork of Kings River through Dinkey Creek. An estimate was made of the discharge of this stream on August 31, 1905, about 2 miles above its junction with Dinkey Creek at trail crossing, by R. S. Hawley.

Discharge, 0.70 second-foot.

Laurel Creek.—This stream is tributary to North Fork of Kings River through Bear Creek and Dinkey Creek. An estimate was made of the discharge on August 31, 1905, about one-fourth mile above junction with Bear Creek, by R. S. Hawley.

Discharge, 0.40 second-foot.

Dinkey Creek.—This stream is a tributary of North Fork of Kings River from the west. A measurement was made about 1½ miles above the mouth of Bear Creek at Dinkey Meadows on September 1, 1905, by R. S. Hawley.

Width, 6 feet; area, 4 square feet; mean velocity, 0.70 foot per second; discharge, 2.8 second-feet.

MERCED RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Merced River drains that portion of the western slope of the Sierra Nevada located between the Tuolumne River on the north and the San Joaquin River on the south. Its drainage area is much less than that of the Tuolumne River. It has numerous tributaries, several of which are of considerable size.

The topography of the country in this basin is similar to that of the Tuolumne River, being rough and broken in the upper reaches. In this basin is situated the famous Yosemite

Valley with its precipitous walls and domes and great waterfalls, which occur on the main stream and its tributaries, which discharge into the valley over precipitous cliffs rising 2,000 to 3,000 feet above the floor of the valley. The formation is of granite which on the upper reaches of the basin above Yosemite Valley is bare, rising in precipitous peaks and domes, and is smoothly marked by glacial action. The middle reaches of the basin are well timbered. The Mariposa grove of big trees is situated in the basin of the South Fork. The timber growth extends well down on the lower elevations to the foothills where the covering is of brush and grass, used extensively for pasturage. Numerous lakes are scattered over the upper portion of the basin. The mean annual precipitation varies from 25 inches in the foothills to 60 inches on the higher elevations, where it falls in the form of snow, which melts in the spring months, except on the extreme higher mountain peaks, where it often remains during the entire year. After leaving the foothills at Merced Falls, where the gaging station is located, canals divert the water for irrigation on lands along the river bottom and in San Joaquin Valley. The surplus water during flood discharge enters San Joaquin River.

MERCED RIVER IN YOSEMITE VALLEY, CALIFORNIA.

This station was established July 11, 1904, by A. E. Chandler and N. W. Currie. It is located at the wagon bridge, near the Sentinel Hotel.

The channel is straight for a distance of 150 feet above and 50 feet below station. The current is sluggish. The right bank is low and subject to overflow. The left bank is high and above high water. The bed of the stream is composed of coarse gravel and sand, with small bowlders, and is not subject to much change.

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

The gage is a vertical timber, securely fastened to a masonry abutment on west bank. The bench mark is the heads of two large nails driven into the stream face of the bridge-seat timber on the left abutment; elevation, 14.64 feet above the datum of the gage.

A description of this station, with gage height and discharge data, is contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Merced River in Yosemite Valley, California, in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
June 6	W. B. Clapp	93	593	2.40	6.15	1,421
June 8	do	93	626	2.58	6.45	1,617
June 11	N. W. Currie	93	730	3.14	6.95	2,289
June 12	do	93	782	3.52	7.52	2,751
June 20	do	93	730	3.07	6.92	2,240
June 25	do	93	594	2.28	6.00	1,354
June 28	do	90	568	2.15	5.70	1,221
July 4	do	90	518	1.90	5.40	984
July 13	do	90	448	1.44	4.80	647
July 17	do	90	396	.92	4.20	365
July 31	do	92	362	.52	3.78	190
August 25	do	92	308	.30	3.40	91
October 24	do	20	10.5	1.46	3.10	[a]15.3

[a] Wading 400 feet below bridge.

Daily gage height, in feet, of Merced River in Yosemite Valley, California, for 1905.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	6.2	5.5	3.7	3.3	3.3	17	.....	7.1	4.2	3.5	3.1	a 3.15
2	.....	6.2	5.5	3.7	3.3	a 3.3	18	.....	6.9	4.15	3.5	3.1	a 3.15
3	.....	6.1	5.3	3.7	3.3	3.25	19	.....	6.8	4.2	3.45	3.15	a 3.15
4	.....	5.95	5.4	3.7	3.25	a 3.25	20	.....	6.9	4.2	3.45	3.2	a 3.1
5	.....	5.8	5.35	3.65	3.2	a 3.25	21	.....	7.1	4.2	3.45	3.2	3.1
6	.....	6.2	5.35	3.6	3.2	a 3.25	22	.....	7.0	4.2	3.45	3.2	a 3.1
7	.....	6.5	5.3	3.6	3.2	3.25	23	6.8	6.5	4.2	3.45	3.3	a 3.1
8	.....	6.4	5.25	3.6	3.2	a 3.25	24	6.8	6.5	4.2	3.4	3.3	3.1
9	.....	6.2	5.5	3.7	3.2	a 3.2	25	7.1	6.0	4.1	3.4	3.3	.....
10	.....	6.55	5.5	3.7	3.2	3.2	26	7.1	6.0	4.1	3.35	3.3	.....
11	.....	7.0	5.3	3.7	3.2	a 3.2	27	6.3	5.8	4.1	3.3	3.3	.....
12	.....	7.5	5.1	3.6	3.15	3.2	28	a 6.0	5.7	4.0	3.3	3.4	.....
13	.....	7.45	4.8	3.6	3.1	a 3.2	29	5.7	5.95	3.9	3.3	3.4	.....
14	.....	7.35	4.5	3.5	3.1	3.15	30	6.1	5.8	3.8	3.3	3.35	.....
15	.....	7.3	4.35	3.5	3.1	3.15	31	6.1	.....	3.8	3.3	.....	.....
16	.....	7.4	4.3	3.5	3.1	a 3.15							

a Gage height estimated.

Station rating table for Merced River in Yosemite Valley, California, from July 11, 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.*
3.10	15	4.10	326	5.10	815	6.20	1,505
3.20	38	4.20	368	5.20	870	6.40	1,645
3.30	63	4.30	412	5.30	925	6.60	1,795
3.40	90	4.40	457	5.40	985	6.80	1,950
3.50	118	4.50	504	5.50	1,045	7.00	2,110
3.60	147	4.60	552	5.60	1,105	7.20	2,275
3.70	178	4.70	602	5.70	1,170	7.40	2,445
3.80	212	4.80	653	5.80	1,235		
3.90	248	4.90	706	5.90	1,300		
4.00	286	5.00	760	6.00	1,365		

NOTE.—The above table is based on 12 discharge measurements made during 1904–5. It is well defined between gage heights 3.1 feet and 6.5 feet.

Estimated monthly discharge of Merced River in Yosemite Valley, California, for 1904 and 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
1904.				
July 11–31	602	286	463	19,280
August	552	112	248	15,250
September 1–24	412	63	131	6,236
1905.				
May 23–31	2,190	1,170	1,696	30,280
June	2,530	1,170	1,771	105,400
July	1,170	212	610	37,510
August	178	63	123	7,563
September	90	15	44.4	2,642
October 1–24	63	15	35.3	1,680
The period				185,100

MERCED RIVER ABOVE MERCED FALLS, CAL.

The measurement of this stream was undertaken in response to numerous requests from mining and irrigation interests. The midsummer flow of the stream is less than the combined capacity of the irrigation and power canals taking water in the vicinity of Snelling. The station was established April 6, 1901, by H. H. Henderson. It is located 1 mile above Merced Falls.

Both banks are high and rocky and are not subject to overflow. The bed of the stream is composed of gravel and is subject to some change.

Discharge measurements are made from a cable and car.

The gage is a timber bolted to iron stakes driven in the bed of the stream on the left bank. During 1905 the gage was read by Charles Siegfeldt. The bench mark is a three-fourths inch round iron bolt set 10 inches in the slate rock on the right bank of the river; elevation, 69.20 feet above the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, and 134 of the United States Geological Survey.

Discharge measurements of Merced River above Merced Falls, California, in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 16	F. R. S. Buttemer	179	447	2.84	10.19	1,269
April 7	O. W. Peterson	184	597	3.79	10.75	2,263
May 24	R. S. Hawley	265	862	4.94	11.91	4,261
June 17	do	272	797	4.56	11.65	3,632
July 21	do	141	282	1.74	9.04	490
September 14	C. H. Lee	106	128	.43	7.82	56
October 19	Hawley and Lee	104	128	.37	7.80	48
October 19	do	44	38	1.34	7.80	51
December 7	Hawley and Eaton	65	57	1.58	8.00	90

Daily gage height, in feet, of Merced River above Merced Falls, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	9.2	9.2	9.5	10.15	11.55	11.45	10.4	8.6	8.0	7.85	7.85	8.1
2	8.95	13.45	9.6	10.2	11.2	11.35	10.25	8.5	7.95	7.8	7.8	8.1
3	8.85	10.75	9.7	10.3	10.95	11.35	10.15	8.5	7.95	7.9	7.85	8.0
4	8.8	10.45	9.8	10.4	10.8	11.2	10.05	8.45	8.0	7.8	7.8	7.95
5	8.7	10.8	9.8	10.5	10.7	11.05	10.05	8.4	8.05	7.9	7.8	8.0
6	8.7	10.35	9.75	10.6	10.6	11.2	9.95	8.4	8.0	7.9	7.8	8.0
7	8.7	9.85	9.8	10.7	10.7	11.45	9.95	8.35	7.9	7.9	7.8	8.0
8	8.7	9.65	9.85	10.7	11.05	11.45	9.9	8.35	7.9	7.9	7.8	8.0
9	8.7	9.5	9.85	10.7	10.85	11.35	9.95	8.4	7.9	7.9	7.8	8.0
10	8.7	9.4	9.85	10.75	10.65	11.35	10.0	8.3	7.9	7.9	7.85	8.0
11	8.7	9.3	9.85	10.6	10.6	11.6	9.9	8.35	7.9	7.9	7.85	8.0
12	8.65	9.25	9.8	10.4	10.5	11.95	9.8	8.4	7.9	7.8	7.9	7.9
13	8.6	9.1	10.95	10.3	10.6	11.85	9.7	8.4	7.9	7.8	7.8	7.9
14	8.6	9.1	10.6	10.25	10.85	11.75	9.55	8.35	7.85	7.85	7.8	7.9
15	8.6	9.1	10.25	10.4	11.35	11.7	9.35	8.3	7.8	7.85	7.8	7.95
16	8.7	9.1	10.15	10.6	12.05	11.7	9.25	8.25	7.85	7.8	7.85	7.95
17	8.7	9.3	11.3	10.5	12.7	11.6	9.1	8.2	7.85	7.8	7.85	8.0
18	8.6	9.3	10.7	10.55	12.5	11.45	9.1	8.2	7.85	7.8	7.85	8.1
19	8.7	9.3	13.55	10.8	12.25	11.4	9.05	8.15	7.85	7.8	7.85	8.1
20	8.7	9.35	11.75	10.55	12.35	11.3	9.0	8.1	7.8	7.8	7.9	8.05
21	8.9	9.35	10.9	10.4	12.25	11.3	9.0	8.1	7.8	7.8	7.9	8.1
22	9.05	9.3	10.55	10.35	11.95	11.3	9.0	8.1	7.8	7.85	7.9	8.05
23	8.9	9.25	10.3	10.35	11.8	11.05	9.0	8.1	7.75	7.9	7.9	8.05
24	8.85	9.25	10.3	10.55	11.9	10.85	9.0	8.1	7.8	7.85	7.9	8.0
25	8.85	9.3	10.25	10.8	12.05	10.65	9.0	8.1	7.7	7.85	7.9	8.0
26	8.8	9.4	10.3	10.85	12.05	10.6	8.9	8.1	7.7	7.85	7.9	8.0
27	8.75	9.4	10.45	11.0	11.65	10.55	8.9	8.1	7.8	7.85	8.0	8.0
28	8.7	9.4	10.2	11.4	11.4	10.45	8.85	8.1	7.8	7.85	7.95	8.05
29	8.7	.....	10.4	11.75	11.15	10.5	8.8	8.0	7.8	7.85	8.25	8.2
30	8.7	.....	10.35	11.8	11.2	10.5	8.75	8.0	7.8	7.8	8.15	8.2
31	8.8	.....	10.2	.....	11.35	.....	8.65	8.0	.....	7.8	.....	8.2

Station rating table for Merced River above Merced Falls, Cal., 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.*
7.70	35	9.00	465	10.30	1,570	11.60	3,570
7.80	50	9.10	520	10.40	1,690	11.70	3,755
7.90	70	9.20	580	10.50	1,820	11.80	3,945
8.00	90	9.30	645	10.60	1,955	11.90	4,140
8.10	115	9.40	715	10.70	2,095	12.00	4,340
8.20	140	9.50	790	10.80	2,240	12.20	4,755
8.30	170	9.60	870	10.90	2,390	12.40	5,200
8.40	200	9.70	955	11.00	2,545	12.60	5,665
8.50	235	9.80	1,045	11.10	2,705	12.80	6,140
8.60	275	9.90	1,140	11.20	2,870	13.00	6,630
8.70	315	10.00	1,240	11.30	3,040		
8.80	360	10.10	1,345	11.40	3,215		
8.90	410	10.20	1,455	11.50	3,390		

NOTE.—The above table is based on 9 discharge measurements made during 1905. It is well defined between gage heights 7.8 feet and 12 feet.

Estimated monthly discharge of Merced River above Merced Falls, Cal., for 1905.

[Drainage area, 1,090 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	580	275	345	21,210	0.317	0.366
February	7,760	520	1,105	61,370	1.01	1.05
March	8,020	790	1,774	109,100	1.63	1.88
April	3,945	1,400	2,050	122,000	1.88	2.10
May	5,900	1,820	3,316	203,900	3.04	3.50
June	4,240	1,755	2,980	177,300	2.73	3.05
July	1,690	295	804	49,440	.738	.851
August	275	90	158	9,715	.145	.167
September	102	35	62.8	3,737	.058	.065
October	70	50	59.0	3,628	.054	.062
November	155	50	66.4	3,951	.061	.068
December	140	70	97.5	5,995	.089	.103
The year	8,020	35	1,068	771,300	.979	13.26

YOSEMITE CREEK IN YOSEMITE VALLEY, CALIFORNIA.

This station was established July 9, 1904, by A. E. Chandler and N. W. Currie. It is located at the wagon bridge, about one-half mile from Yosemite, Cal.

The channel is straight for 50 feet above and 100 feet below station. Both banks are above high water. The bed of the stream is composed of small granite fragments and is permanent.

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

The gage is a vertical timber securely fastened to an alder tree on the right bank 50 feet above bridge. The bench mark is the heads of two nails driven in the alder tree, to which the gage is fastened. Elevation, 9.40 feet above the datum of the gage.

A description of this station, with gage height and discharge data, is contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Yosemite Creek in Yosemite Valley, California, in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
June 7	W. B. Clapp	39	106	2.19	6.05	232
June 13	N. W. Currie	37	122	2.39	6.55	290
June 19	do	40	100	2.8	5.78	208
June 24	do	35	82	1.72	5.40	141
June 27	do	35	76	1.54	5.15	117
July 4	do	33	57	1.16	4.75	66
July 14	do	31	42	.71	4.30	30
July 23	do	29	35	.42	4.10	14.7
August 1	do	28	29	.08	3.90	2.3

Daily gage height, in feet, of Yosemite Creek in Yosemite Valley, California, for 1905.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	6.3	5.0	3.9	3.7	3.7	17	.....	6.0	4.2	3.79	3.7	a3.65
2	.....	6.4	4.9	3.7	3.7	a3.7	18	.....	5.9	4.2	3.79	a3.7	a3.65
3	.....	6.3	4.8	3.85	3.7	3.65	19	.....	5.78	4.2	3.75	a3.7	a3.65
4	.....	5.95	4.75	3.85	3.7	a3.65	20	.....	5.75	4.2	3.75	a3.7	a3.65
5	.....	5.8	4.75	3.85	3.7	a3.65	21	.....	5.9	4.18	3.75	a3.7	3.65
6	.....	5.9	4.75	3.8	3.7	a3.65	22	.....	5.7	4.15	3.75	3.65	a3.65
7	.....	6.2	4.7	3.8	3.7	3.65	23	6.7	5.4	4.1	3.75	a3.65	a3.65
8	.....	6.1	4.7	3.7	3.7	a3.65	24	6.7	5.4	4.1	3.75	3.65	3.65
9	.....	6.0	4.75	3.8	3.7	a3.65	25	6.8	5.25	4.0	3.75	a3.65	.....
10	.....	6.5	4.7	3.8	3.7	a3.65	26	6.8	5.3	4.0	3.75	a3.65	.....
11	.....	6.3	4.6	3.8	3.7	a3.65	27	6.3	5.15	4.0	3.72	a3.65	.....
12	.....	6.4	4.5	3.8	a3.7	a3.65	28	6.2	5.0	3.95	3.7	3.7	.....
13	.....	6.55	4.4	3.78	3.7	a3.65	29	6.0	5.2	3.95	3.7	a3.7	.....
14	.....	6.35	4.3	3.8	3.7	3.65	30	6.3	5.0	3.9	3.7	3.7	.....
15	.....	6.35	4.25	3.8	3.7	a3.65	31	6.3	.....	3.9	3.7	.....	.....
16	.....	6.35	4.25	3.79	3.7	a3.65							

a Estimated.

Station rating table for Yosemite Creek in Yosemite Valley, California, 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.*
3.70	2	4.60	50	5.50	150	6.40	280
3.80	3	4.70	59	5.60	163	6.50	296
3.90	5	4.80	69	5.70	177	6.60	312
4.00	8	4.90	79	5.80	191	6.70	328
4.10	14	5.00	90	5.90	205	6.80	344
4.20	20	5.10	101	6.00	220	6.90	360
4.30	27	5.20	113	6.10	235	7.00	377
4.40	34	5.30	125	6.20	250		
4.50	42	5.40	137	6.30	265		

NOTE.—The above table is based on 11 discharge measurements made during 1904–5. It is well defined.

Estimated monthly discharge of Yosemite Creek in Yosemite Valley, California, for 1904 and 1905

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
1904.				
July 11 to 31	59	8	32.2	1,341
August	59	3	9.9	609
September 1 to 24	50	2.5	4.7	224
1905.				
May 23 to 31	344	220	290	5,177
June	304	90	206	12,260
July	90	5	34.3	2,109
August	5	2	2.8	172
September	2	1.5	1.9	113
October 1 to 24	2	1.5	1.5	71
The period				19,900

TENAYA CREEK IN YOSEMITE VALLEY, CALIFORNIA.

This station was established July 11, 1904, by A. E. Chandler and N. W. Currie. It is located by the wagon bridge, about 2 miles from Yosemite, Cal.

The channel is straight for 200 feet above and below the station. Both banks are above high water. The bed of the stream is composed of small granite fragments and is not subject to change.

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

The gage is a vertical timber securely fastened to the bridge stringer on upper side of bridge, 9 feet from left abutment. The bench mark is formed by the heads of two nails in the top of the bridge stringer near the gage; elevation, 12.70 feet above the datum of the gage.

A description of this station, with gage height and discharge data, is contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Tenaya Creek in Yosemite Valley, California, in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec-ft.*
June 7	W. B. Clapp	45	119	3.36	5.95	400
June 14	N. W. Currie	45	125	3.42	6.00	428
June 19	do	45	110	3.03	5.65	333
June 24	do	45	90	2.46	5.18	221
June 28	do	45	72	2.01	4.80	145
July 5	do	42	51	1.59	4.40	81
July 12	do	41	37	1.19	4.10	44
July 24	do	34	16.8	.84	3.60	14.1
October 1[a]	do				3.35	3

[a] Estimated.

Daily gage height, in feet, of Tenaya Creek in Yosemite Valley, California, for 1905.

Day.	June.	July.	Aug.	Sept.	Oct.	Day.	June.	July.	Aug.	Sept.	Oct.
1	5.9	4.7	3.5	3.35	3.35	17	5.8	3.85	3.38	3.35	a 3.35
2	5.9	4.6	3.5	3.35	a 3.35	18	5.75	3.8	3.38	a 3.35	a 3.35
3	5.9	4.5	3.5	3.35	a 3.35	19	5.65	3.75	3.38	a 3.35	a 3.35
4	5.7	4.4	3.45	3.35	a 3.35	20	5.55	3.7	3.38	a 3.35	a 3.35
5	5.6	4.4	3.45	3.35	a 3.35	21	5.55	3.7	3.38	a 3.35	3.35
6	5.7	4.35	3.4	3.35	a 3.35	22	5.5	3.65	3.38	a 3.35	.....
7	6.0	4.3	3.4	3.35	3.35	23	5.3	3.6	3.38	3.35	.....
8	5.8	4.25	3.4	3.35	a 3.35	24	5.18	3.6	3.38	3.35	.....
9	5.75	4.2	3.4	3.35	a 3.35	25	5.1	3.6	3.38	a 3.35	.....
10	6.0	4.1	3.4	3.35	3.35	26	5.0	3.55	3.38	a 3.35	.....
11	6.01	4.1	3.38	3.35	a 3.35	27	4.9	3.55	3.38	a 3.35	.....
12	6.0	4.1	3.38	3.35	a 3.35	28	4.83	3.55	3.38	a 3.35	.....
13	6.15	4.0	3.38	3.35	a 3.35	29	4.8	3.5	3.35	a 3.35	.....
14	5.98	3.95	3.38	3.35	3.35	30	4.7	3.5	3.35	3.35	.....
15	5.95	3.9	3.38	3.35	3.35	31	.....	3.5	3.35	.....	.....
16	5.9	3.85	3.38	3.35	a 3.35						

a Gage heights estimated.

Station rating table for Tenaya Creek in Yosemite Valley, California, 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.*
3.40	4.5	4.20	54	5.00	184	5.80	368
3.50	8	4.30	66	5.10	204	5.90	395
3.60	12	4.40	80	5.20	225	6.00	422
3.70	17	4.50	95	5.30	247	6.10	450
3.80	22	4.60	111	5.40	270	6.20	480
3.90	28	4.70	128	5.50	293	6.30	512
4.00	35	4.80	146	5.60	317		
4.10	44	4.90	165	5.70	342		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 11 discharge measurements made during 1904–5. It is well defined between gage heights 3.3 feet and 6 feet.

Estimated monthly discharge of Tenaya Creek in Yosemite Valley, California, for 1904 and 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
1904.				
July 11–31	80	17	38.3	1,595
August	28	4.5	12.3	756
September 1–24	80	3.9	8.6	409
1905.				
May 23–31	512	368	425	7,587
June	465	128	323	19,220
July	128	8	38.8	2,386
August	8	3	4.4	270
September	3	3	3.0	179
October 1–21	3	3	3.0	125
The period				29,770

MISCELLANEOUS MEASUREMENTS IN MERCED RIVER DRAINAGE BASIN.

Bridal Veil Creek, Yosemite Valley, California.—This stream is a tributary of the Merced River. An estimate was made of the discharge at a point 500 feet above its junction with Merced River and about 1,000 feet below Bridal Veil Falls on June 7, 1905, by W. B. Clapp. It was impossible to make a measurement on account of the rough bed and heavy grade of the stream.

Estimated discharge, 100 second-feet.

Cascade Creek, Yosemite Valley, California.—This stream is a tributary of the Merced River. An estimate was made of the discharge at a point 500 feet below Cascade Falls near mouth of creek on June 6, 1905, by W. B. Clapp.

Estimated discharge, 150 second-feet.

Ribbon Falls Creek, Yosemite Valley, California.—This stream is tributary to Merced River in Yosemite Valley. A measurement was made where the creek crosses the road on the west side of the valley on June 7 by W. B. Clapp.

The stream was flowing in several shallow channels.

Total width, 20.5 feet; area, 9.0 square feet; mean velocity, 1.89 feet per second; discharge, 17.0 second-feet.

TUOLUMNE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Tuolumne River rises on the western slope of the Sierra Nevada and drains the country located between Stanislaus River on the north and Merced River on the south. It has numerous tributaries, several of which produce a heavy discharge. The country throughout this basin is rough and rugged, especially along the main river, which cuts through solid granite, with high precipitous cliffs on either side. Along this stream is found some of the grandest scenery of the Sierra Nevada. This stream drains the northern portion of the Yosemite National Park, where is located the Grand Canyon of the Tuolumne and the Hetch Hetchy Valley, which is pronounced by many to exceed the famed Yosemite Valley in grandeur and beauty. The formation is of granite, which on the higher elevations is bare and glaciated, often rising thousands of feet in vertical cliffs and domes. Along the middle reaches of this basin there is good soil covering, with a heavy timber growth of pine, fir, cedar, and other kindred trees. On the lower reaches the covering is a heavy growth of brush, which diminishes in the foothills where the stream enters the San Joaquin Valley. This portion of the basin has a light soil covering, with grass growth, which is used for pasturage. There are several glacial lakes throughout the upper reaches of this basin, many of the larger of which offer exceptional opportunities for the construction of storage reservoirs. There are also many reservoir sites on the main river. The stream has a heavy fall, and the opportunities for power development are numerous. Several diversions are made above the gaging station, which is located at Lagrange, where the stream breaks from the foothills. The precipitation on the upper half of this basin falls in the form of snow, a greater portion of which disappears in the spring months, but on the higher elevations remains until late in the summer. The mean annual rainfall varies from about 30 inches on the lower foothills to about 60 inches on the higher elevations.

TUOLUMNE RIVER AT LAGRANGE, CAL.

This station was established August 29, 1895, by J. B. Lippincott. It is located at the wagon bridge, in the town of Lagrange. It is below the high dam, where the diversions are made by the Turlock and Modesto canals, and also below the head of the canal of the Lagrange Ditch and Hydraulic Mining Company, which diverts water from the left bank of the river above the dam.

The channel is straight for 400 feet above and 600 feet below the station. It is broken by two iron piers and has a width at ordinary stages of 300 feet. During the season of

low flow all the water is taken out by the Turlock and Modesto canals above the station. The record of flow of these canals is kept. The bed of the stream is composed of gravel and is fairly permanent. The current is swift at high stages and very sluggish during low water. The discharge has gradually increased each year for the same gage heights. Both banks are high and not subject to overflow.

Discharge measurements are made from the downstream side of the bridge. The initial point for soundings is a mark on the railing of the bridge 100 feet north from the center of first pier on right bank of the river.

The gage is a vertical timber fastened to the right abutment of the bridge. During 1905 the gage was read by R. A. Trumbly. Bench marks were established as follows: (1) Top of a rock marked with white paint, situated on the left bank below the bridge and opposite the 573 foot mark of the cross section; elevation, 19.10 feet. (2) The top of rock marked with white paint, situated 75 feet downstream from bench mark No. 1; elevation, 16.89 feet. Elevations refer to the datum of the gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, and 134 of the United States Geological Survey.

Discharge measurements of Tuolumne River at Lagrange, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 15	F. R. S. Buttemer	325	1,426	1.79	6.10	2,548
April 6	O. W. Patterson	332	1,591	2.40	6.60	3,817
May 24	R. S. Hawley	344	2,068	3.79	7.90	7,846
June 16	do	344	2,068	3.66	7.90	7,574
June 17	do	344	1,906	3.28	7.45	6,249
September 13	C. H. Lee	30	20	.45	3.30	9.2
October 18	Lee and Hawley	38	36	1.47	3.68	53

Daily gage height, in feet, of Tuolumne River at Lagrange, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.7	5.75	5.7	5.9	7.3	7.0	6.05	3.2	3.1	3.7	3.65	4.05
2	5.1	8.1	5.85	6.05	6.7	7.0	6.0	3.2	3.1	3.85	3.65	4.05
3	5.0	6.3	5.9	5.9	6.3	6.9	5.8	3.2	3.1	3.8	3.65	4.0
4	4.8	6.0	5.9	5.9	6.35	6.85	5.45	3.2	3.1	3.7	3.65	4.0
5	4.8	6.35	5.9	5.95	6.15	6.75	5.5	3.2	3.1	3.6	3.65	4.0
6	4.8	6.1	5.9	6.3	6.15	6.7	5.5	3.2	3.1	3.6	3.65	4.0
7	4.75	5.6	5.9	6.65	6.35	6.85	5.35	3.2	3.1	3.6	3.65	4.0
8	4.75	5.5	5.9	6.6	6.5	7.1	5.4	3.2	3.1	3.6	3.65	4.0
9	4.75	5.4	5.85	6.45	6.2	7.6	5.15	3.2	3.1	3.5	3.65	4.0
10	4.75	5.4	5.8	6.5	6.1	7.9	5.0	3.2	3.1	3.5	3.65	4.0
11	4.8	5.2	5.85	6.4	6.0	8.0	4.85	3.2	3.1	3.5	3.65	3.9
12	4.8	5.1	5.8	6.05	6.0	8.05	4.7	3.2	3.4	3.5	3.65	3.9
13	4.8	5.1	6.95	5.8	5.9	8.0	4.55	3.2	3.3	3.5	3.65	4,0
14	4.8	5.0	6.55	5.75	6.1	7.85	4.5	3.2	3.3	3.5	3.7	3.95
15	4.8	5.0	6.1	5.9	6.8	7.85	4.75	3.2	3.2	3.5	3.7	3.95
16	4.8	4.9	6.1	5.95	7.7	7.8	4.7	3.2	3.2	3.5	3.7	3.95
17	4.8	5.1	7.3	5.9	8.7	7.6	3.65	3.2	3.2	3.5	3.7	4.0
18	4.8	5.1	7.0	5.95	8.25	7.45	3.4	3.1	3.2	3.6	3.7	4.0
19	4.8	5.1	9.3	5.9	8.0	7.3	3.3	3.1	3.2	3.65	3.7	4.0
20	4.85	5.85	7.6	5.9	8.0	7.25	3.2	3.1	3.2	3.65	3.75	4.05
21	5.0	5.65	6.85	5.9	8.25	7.35	3.2	3.1	3.2	3.7	3.8	4.15
22	5.1	5.4	6.6	5.95	7.9	6.9	3.2	3.1	3.2	3.7	3.75	4.1
23	5.15	5.4	6.5	6.6	7.6	6.25	3.2	3.1	3.2	3.7	3.75	4.05
24	5.2	5.4	6.3	7.1	7.8	6.15	3.2	3.1	3.2	3.7	3.75	4.05
25	5.1	5.55	6.1	7.1	8.0	6.15	3.2	3.1	3.2	3.7	3.8	4.05
26	5.0	5.8	6.1	7.2	7.85	6.1	3.2	3.1	3.2	3.7	3.8	4.0
27	4.85	5.7	6.2	7.2	7.65	6.05	3.2	3.1	3.3	3.7	3.85	4.0
28	4.8	5.8	6.1	7.35	7.35	6.05	3.2	3.1	3.25	3.7	4.0	4.1
29	4.8	.....	6.45	7.4	6.7	6.20	3.2	3.1	3.4	3.65	4.0	4.15
30	4.9	.....	6.25	7.7	6.85	6.05	3.2	3.1	3.5	3.65	4.05	4.15
31	4.9	.....	6.1	.....	6.9	.....	3.2	3.1	.....	3.65	.....	4.2

Station rating table for Tuolumne River at Lagrange, Cal., 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.*
3.10	1	4.50	340	5.90	2,200	7.60	6,700
3.20	5	4.60	410	6.00	2,400	7.80	7,360
3.30	10	4.70	490	6.10	2,610	8.00	8,060
3.40	20	4.80	580	6.20	2,830	8.20	8,780
3.50	30	4.90	680	6.30	3,060	8.40	9,500
3.60	40	5.00	790	6.40	3,300	8.60	10,260
3.70	55	5.10	910	6.50	3,550	8.80	11,050
3.80	70	5.20	1,030	6.60	3,800	9.00	11,850
3.90	90	5.30	1,170	6.70	4,060	9.20	12,660
4.00	120	5.40	1,310	6.80	4,320	9.40	13,480
4.10	150	5.50	1,470	6.90	4,600	9.60	14,320
4.20	190	5.60	1,630	7.00	4,880	9.80	15,160
4.30	230	5.70	1,810	7.20	5,470	10.00	16,000
4.40	280	5.80	2,000	7.40	6,070		

Estimated monthly discharge of Tuolumne River at Lagrange, Cal., for 1905.

[Drainage area, 1,501 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	1,810	535	745	45,810	0.496	0.572
February	8,420	745	1,926	107,000	1.28	1.33
March	13,070	1,871	3,487	214,400	2.32	2.68
April	7,770	2,696	4,016	239,000	2.68	2.99
May	11,360	2,866	5,927	364,400	3.95	4.55
June	9,075	3,258	5,969	355,200	3.98	4.44
July	3,403	427	1,344	82,640	.895	1.03
August	345	103	212	13,040	.141	.163
September	131	[a] 8	78.1	4,647	.052	.058
October	80	30	45.5	2,798	.030	.035
November	135	48	62.2	3,701	.041	.046
December	190	90	129	7,932	.086	.099
The year	13,070	8	1,995	1,441,000	1.33	17.99

[a] The minimum of 8 feet in September was caused by closing head-gate of Turlock Canal and holding water back in reservoir until dam overflowed.

NOTE.—The above discharge includes that of Turlock and Modesto canals.

MODESTO CANAL AT LAGRANGE, CAL.

The Modesto canal is the property of the Modesto irrigation district. The water is diverted from the right side of the Tuolumne River at the Lagrange dam. This canal was designed to carry 660 second-feet and to irrigate land in the vicinity of Modesto, Stanislaus County, Cal. The principal part of the construction work was done on this canal prior to 1892, but on account of litigation the canal was not completed until April, 1903.

On April 26, 1903, a gage rod was set in and a rating made of Indian Hill flume, near Lagrange, Cal. From May 10 to June 3 and from June 10 to June 25, inclusive, boards were placed in the flumes to back the water up and keep the flumes saturated. During this time gage heights were obtained by taking the depth of the water in the canal below Indian Hill flume.

On July 12, 1904, the station was moved to the flume near the intake. This was done so that more gage readings and explanations of their fluctuations could be obtained by having J. L. Montgomery, the regulator of the gates at the intake, act as gage observer. This flume is 11.85 feet in width.

Information in regard to this station is contained in Water-Supply Papers Nos. 100 and 134 of the United States Geological Survey.

Discharge measurements of Modesto canal at Lagrange, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
April 6	O. W. Peterson	11.8	40	7.28	3.40	291
May 24	R. S. Hawley	11.8	37	6.68	3.15	247
June 17	do	11.8	45	7.18	3.85	323
July 21	do	12	35	6.34	2.95	222

Daily gage height, in feet, of Modesto canal at Lagrange, Cal., for 1905.

Day.	Jan	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.0	2.8	a1.2	2.6	3.0	3.5	4.0	1.7	1.0
2	0	b0	1.2	2.9	3.0	3.5	4.0	1.8	.95
3	0	a1.3	1.2	3.1	3.0	3.5	b0	1.8	.95
4	0	2.0	1.2	3.2	3.0	3.5	a2.5	1.6	.95
5	0	2.1	1.2	3.3	3.0	3.5	3.5	1.65	.95
6	0	2.0	1.25	3.3	3.0	3.5	4.0	1.65	.8
7	0	1.95	1.25	3.3	3.0	3.6	4.0	1.4	.85
8	0	2.45	1.25	3.2	3.0	3.6	4.0	1.55	.8
9	0	2.8	1.25	3.2	3.0	3.6	4.5	1.55	.8
10	0	3.0	1.25	3.1	3.0	3.6	4.5	1.4	.8
11	0	3.0	1.25	3.2	3.0	2.5	4.5	1.5	.4
12	0	3.1	.85	3.2	3.0	3.5	4.0	1.4	.....
13	0	3.2	.5	3.2	3.0	2.75	4.0	1.4	.....
14	0	3.3	.7	3.1	3.0	3.7	4.0	1.4	.....
15	0	3.3	.7	3.0	3.0	3.7	4.0	1.3	.....
16	a1.0	3.3	.7	3.0	3.0	3.7	4.0	1.3	.....
17	.9	3.3	.8	3.0	3.0	3.7	4.0	1.3	.....
18	.9	3.3	.8	3.0	3.0	3.75	4.0	1.3	.....
19	.9	3.3	b0	3.0	3.0	3.75	3.0	1.25	.....
20	.9	3.0	0	3.0	3.2	3.75	3.0	1.0	.....
21	1.05	2.7	0	3.0	3.2	3.8	2.9	1.1	.....
22	1.05	3.3	a2.0	3.0	b0	3.9	2.9	1.15	.....
23	1.05	3.0	2.1	3.0	0	3.9	2.5	1.15	.....
24	1.05	2.75	2.5	3.0	a3.15	4.0	2.5	1.15	.....
25	1.05	2.75	2.5	3.0	3.3	1.75	2.75	1.15	.....
26	1.6	b0	2.8	3.0	3.35	1.55	2.7	1.15	.....
27	2.0	0	b0	3.0	3.35	4.0	2.55	1.1	.....
28	2.05	0	0	3.0	3.5	4.0	2.4	.9	.....
29	2.05	.....	0	3.0	3.5	4.0	2.55	.9	.....
30	2.35	.....	a1.5	3.0	3.5	4.0	2.1	.9	.....
31	2.7	.....	2.0	.....	3.5	.....	2.1	1.0	.....

a Water turned in. b Water turned out.

NOTE.—Canal dry September 12 to December 31.

Station rating table for Modesto canal at Lagrange, Cal., 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.*
0.10	2	1.10	53	2.10	140	3.20	252
20	4	1.20	61	2.20	150	3.40	274
30	7	1.30	69	2.30	160	3.60	296
40	11	1.40	77	2.40	170	3.80	318
50	16	1.50	85	2.50	180	4.00	340
60	21	1.60	94	2.60	190	4.20	364
70	26	1.70	103	2.70	200	4.40	388
80	32	1.80	112	2.80	210		
90	38	1.90	121	2.90	220		
1.00	45	2.00	130	3.00	230		

NOTE.—The above table is based on discharge measurements made during 1904–1905. It is well defined between gage heights 0.5 foot and 4 feet. Monthly estimates are included with those of Tuolumne River, p. 210.

TURLOCK CANAL AT LAGRANGE, CAL.

The Turlock canal, the property of the Turlock irrigation district, takes water from the left bank of the Tuolumne River at the Lagrange dam. This canal was designed to carry 1,500 second-feet and to irrigate a large area of fertile land in the vicinity of Turlock and Ceres, Stanislaus County, Cal.

During 1898 water was first turned into the canal in small quantities and used for puddling the banks. A record of the gage height has been kept since July, 1899. Meter measurements are made when the gaging station on the Tuolumne River at Lagrange is visited, and Morgan flume, or flume No. 2, has been rated. It is 13.75 feet in width.

In the spring of 1905 a station was established in flume No. 1 and used for some time, but it did not give satisfactory results during high stages of the canal. Gage readings were discontinued on this flume and resumed on the Morgan flume. The record since May 22, 1905, is on the Morgan flume. The observer is J. J. R. Johnson, the canal tender.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, and 134 of the United States Geological Survey.

Discharge measurements of Turlock canal at Lagrange, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
April 8	O. W. Peterson	19.5	24	1.96	1.22	47
April 8	do	19.5	40	3.20	2.05	128
April 8	do	19.5	55	3.82	2.80	210
April 8	do	19.5	81	4.60	4.15	375
May 24	R. S. Hawley	13.8	72	7.13	5.30	514
June 17	do	13.8	76	7.58	5.55	576
July 21	do	13.8	66	6.55	4.65	432
September 14	C. H. Lee	13.6	28	3.07	2.04	86

NOTE.—Measurements on April 8 were made on little flume near head of canal others made at Morgan flume.

Daily gage height, in feet, of Turlock canal at Lagrange, Cal., for 1905.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	4.15	5.3	5.4	5.55	3.1	2.0
2	.....	4.1	5.3	5.4	5.6	3.2	2.0
3	.....	4.1	5.4	5.4	5.6	3.15	1.9
4	.....	4.15	5.2	5.4	5.6	2.9	1.9
5	.....	4.2	5.2	5.4	5.6	2.95	1.9
6	.....	0	5.2	5.4	5.6	2.95	1.8
7	.....	0	4.1	5.4	5.6	2.65	1.8
8	.....	3.2	4.6	5.4	5.6	2.65	1.65
9	.....	3.0	4.7	5.4	5.6	2.65	1.65
10	.....	1.5	4.7	5.45	5.6	2.65	1.65
11	.....	4.6	4.7	5.4	5.6	2.65	1.65
12	.....	4.7	4.7	5.5	5.6	2.6	1.65
13	.....	4.8	4.7	5.5	5.6	2.7	1.8
14	.....	5.5	4.75	5.5	5.6	2.4	2.5
15	.....	5.5	4.85	5.5	3.6	2.4	2.1
16	.....	5.5	4.9	5.5	5.6	2.4	2.1
17	.....	5.5	5.0	5.5	5.2	2.4	1.8
18	.....	5.5	5.0	5.55	5.4	2.4	1.8
19	.....	5.2	5.0	5.5	5.0	2.4	1.7
20	.....	5.2	0	5.5	5.0	2.0	1.75
21	.....	5.3	0	5.5	4.8	2.15	1.75
22	1.6	5.2	5.3	5.5	4.8	2.2	1.75
23	2.1	5.25	5.25	5.5	4.2	2.2	1.75
24	2.1	5.25	5.25	5.5	4.55	2.2	1.75
25	3.0	5.25	5.3	5.55	4.55	2.2	1.75
26	3.4	5.2	5.4	5.55	4.5	2.2	1.75
27	4.1	5.3	5.4	5.55	4.25	2.2	.....
28	4.1	5.4	5.4	5.55	4.0	1.8	.....
29	2.1	5.3	5.4	5.6	4.1	1.8	.....
30	4.1	5.3	5.4	5.55	3.6	1.8	.....
31	4.0	.....	5.4	.....	3.6	2.0	.....

NOTE.—Canal dry January 1 to March 21 and September 26 to December 31.

Station rating table for Turlock canal at Lagrange, Cal., 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.*
0.30	1	1.50	40	2.70	166	3.90	324
.40	2	1.60	47	2.80	178	4.00	338
.50	3	1.70	55	2.90	190	4.20	366
.60	4	1.80	64	3.00	202	4.40	394
.70	5	1.90	74	3.10	215	4.60	422
.80	7	2.00	85	3.20	228	4.80	450
.90	10	2.10	96	3.30	241	5.00	478
1.00	14	2.20	107	3.40	254	5.20	506
1.10	18	2.30	118	3.50	268	5.40	535
1.20	23	2.40	130	3.60	282	5.60	565
1.30	28	2.50	142	3.70	296		
1.40	34	2.60	154	3.80	310		

NOTE.—The above table is based on discharge measurements made during 1904–5. It is well defined between gage heights 2 feet and 5.5 feet. Monthly estimates are included with those of Tuolumne River, p. 210.

MISCELLANEOUS MEASUREMENTS IN TUOLUMNE RIVER DRAINAGE BASIN.

Clavey River.—This stream is tributary to Tuolumne River from the north and enters it about 10 miles above the mouth of the North Fork. A measurement was made on September 15, 1905, just above the bridge for the new trail from Tuolumne to Lake Eleanor, by H. A. Campbell.

Width, 10 feet; area, 14.3 square feet; mean velocity, 0.87 foot per second; discharge, 12.5 second-feet.

Cherry River.—This stream is tributary to the Tuolumne River from the north and enters it about 15 miles below Hetch Hetchy Valley. A measurement was made one-third of a mile above the mouth of Eleanor Creek on September 16, 1905, by H. A. Campbell.

Width, 2 feet; area, 1.4 square feet; mean velocity, 1.00 foot per second; discharge, 1.4 second-feet.

Cherry River at Cherry Valley, Cal.—A measurement was made at the old gaging station in the lower end of Cherry Valley on main trail from Tuolumne to Lake Eleanor on September 17, 1905, by H. A. Campbell.

Width, 2.2 feet; area, 1.6 square feet; mean velocity, 0.58 foot per second; discharge, 0.92 second-foot.

Eleanor Creek.—A measurement was made on September 18, 1905, 1 mile below outlet from Lake Eleanor and about 3 miles above its junction with Cherry Creek, by H. A. Campbell.

Width, 2.0 feet; area, 0.50 square foot; mean velocity, 0.60 foot per second; discharge, 0.30 second-foot.

Tuolumne River at Hetch Hetchy, Cal.—A measurement was made on September 18, 1905, at the head of Hetch Hetchy Valley, one-half mile above mouth of Rancheria Creek, by H. A. Campbell.

Width, 14 feet; area, 12 square feet; mean velocity, 1.83 feet per second; discharge, 22 second-feet.

Rancheria Creek.—This stream enters Tuolumne River from the north in Hetch Hetchy Valley. A measurement was made on September 19, 1905, 100 yards above trail crossing, about 1½ miles above its junction with Tuolumne River, by H. A. Campbell.

Width, 4 feet; area, 3.3 square feet; mean velocity, 0.94 foot per second; discharge, 3.1 second-feet.

Tiltill Creek.—This stream enters the Tuolumne River from the north in Hetch Hetchy Valley. A measurement was made on September 19, 1905, at lower end of Tiltill Valley about 2 miles above its junction with Tuolumne River, by H. A. Campbell.

Width, 0.9 foot; area, 0.18 square foot; mean velocity, 0.67 foot per second; discharge, 0.12 second-foot.

Falls Creek.—This stream enters Tuolumne River from the north in Hetch Hetchy Valley. A measurement was made on September 19, 1905, at the outlet of Lake Vernon, by H. A. Campbell.

Width, 4.4 feet; area, 1.6 square feet; mean velocity, 0.75 foot per second; discharge, 1.2 second-feet.

Tuolumne River at Hetch Hetchy Valley, Cal.—A measurement was made on September 21, 1905, at the lower end of Hetch Hetchy Valley about one-half mile below trail to Lake Eleanor, by H. A. Campbell.

Width, 18.5 feet; area, 13.5 square feet; mean velocity, 1.78 feet per second; discharge, 24 second-feet.

Middle Fork of Tuolumne River.—A measurement was made on this stream on September 21, 1905, about 100 yards downstream from the bridge on the road from Sequoia to Hog Ranch by H. A. Campbell.

Width, 2 feet; area, 0.60 square foot; mean velocity, 0.93 foot per second; discharge, 0.56 second-foot.

South Fork of Tuolumne River.—A measurement was made on this stream on September 22, 1905, about 75 yards upstream from the bridge on the Big Oak Flat and Yosemite Toll Road, near Harden ranch, by H. A. Campbell.

Width, 11.2 feet; area, 10.6 square feet; mean velocity, 0.42 foot per second; discharge, 4.5 second-feet.

Mining ditch near Lagrange, Cal.—This ditch diverts water from the Tuolumne River several miles above the town of Lagrange, Cal. A measurement was made April 6 at a point on the hill above the Lagrange dam.

Width, 6 feet; area, 4.3 square feet; mean velocity, 1.58 feet per second; discharge, 6.8 second-feet.

STANISLAUS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Stanislaus River drains a portion of the western slope of the Sierra Nevada and heads well back on the crest, at elevations of from 10,000 to 12,000 feet. It drains the country between the basins of the Mokelumne River on the north and the Tuolumne River on the south, and flows in a general southwesterly direction, entering the San Joaquin River 23 miles above Stockton. It has numerous tributaries in the upper reaches of the basin, which have their source in numerous small glacial lakes. The topography is rough and broken with high mountain peaks. The formation is of granite, which is bare and destitute of timber growth above an elevation of 8,000 feet, except where small glacial lakes and moraines occur. In the middle reaches of the basin there is good soil covering and a heavy growth of timber. In this basin is situated the Calaveras grove of big trees (*Sequoia gigantea*), for which the Sierra Nevada are famous. This is the most northerly grove of these trees, groves of which extend as far south as the Kern River basin. The mean annual rainfall for the basin is about 50 inches. The precipitation falls chiefly in the form of snow on the higher elevations, remaining well into the summer months. Mining operations have been carried on extensively in this basin, and many canals have been taken out of the river, all of which discharge their water into the river again. The canal of the Stanislaus Water Company diverts water 3 miles above Knights Ferry, which is used to irrigate land between Knights Ferry and Stockton. A gaging station is maintained on this canal to determine its discharge.

STANISLAUS RIVER AT KNIGHTS FERRY, CAL.

A station was first established on this river on May 3, 1895, at the railroad bridge one-half mile north of the town of Oakdale. On July 30, 1898, a cable was placed 1,000 feet below the railroad bridge. This station was used until February 16, 1901.

The station at Knights Ferry was established May 19, 1903, by W. H. Stearns. It is located 200 feet from the post-office at Knights Ferry.

There is an island 800 feet above the gaging station, and a dam on each channel at the head of the island. The Stanislaus Milling and Power Company's power house is on the right bank of the river below one of these dams and about 1,000 feet above the gaging station. The channel is straight for 500 feet above and below the cable. At ordinary and high stages the stream has a fall of 0.47 foot in the 500 feet above the cable and of 0.68 foot in the 500 feet below. Both banks are composed of cemented gravel and are high. The left bank is not subject to overflow. In extreme floods the right bank has been known to be overflowed, flooding the yards and houses next to the river. The bed is of gravel and is subject to some change from the addition of material which is washed down from the island above.

Discharge measurements at high and medium stages are made from a car suspended from a cable. Low-water measurements are made by wading 300 feet above the cable. The initial point for soundings is the eyebolt to which the cable is fastened on the right bank.

Ordinary and low-water stages were read on an iron pipe driven into the bed of the stream. For high stages the gage was a plank nailed to a post on the right bank of the river. A new gage rod has been placed near the cable on the right bank and gage readings are now made on this rod. It consists of an inclined rod fastened securely to posts set in the ground. This portion of the rod is used for the lower stages. For high water there is a vertical section similar to the above at the north cable support. During 1905 the gage was read once each day by E. J. Coop. Bench marks were established as follows: (1) A spike in a locust tree 50 feet northeast of right cable support; elevation, 19.20 feet. (2) A rock under the spike at the foot of the above locust tree; elevation, 18.74 feet. Elevations refer to the datum of the new gage.

Information in regard to this station is contained in Water-Supply Papers Nos. 81, 100, and 134 of the United States Geological Survey.

Discharge measurements of Stanislaus River at Knights Ferry, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 14	F. R. S. Buttemer	197	751	3.36	9.15	2,523
April 6	O. W. Peterson	198	769	3.49	9.25	2,687
April 16	R. S. Hawley	194	771	3.27	9.30	2,518
May 23	do	217	944	4.30	10.05	4,062
July 20	do	148	363	1.17	7.00	425
September 12	Lee and Keeler	40	51	1.68	6.19	86
September 22	R. W. Keeler	40	49	1.57	6.11	77
September 29	do	40	49	1.63	6.17	80
October 6	do	40	49	1.69	6.14	83
October 13	do	40	48	1.77	6.19	85
October 16	Lee and Hawley	40	47	1.85	6.21	87
December 21	R. W. Keeler	120	268	.53	6.41	142

Daily gage height, in feet, of Stanislaus River at Knights Ferry, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.4	7.75	8.25	8.55	9.8	9.45	7.95	6.4	6.15	6.1	6.1	6.45
2	7.3	10.15	8.4	8.7	9.5	9.35	7.8	6.4	6.15	6.1	6.1	6.3
3	7.25	8.4	8.45	8.85	9.35	9.25	7.7	6.4	6.15	6.15	6.1	6.25
4	7.15	8.05	8.55	8.95	9.1	9.0	7.65	6.4	6.15	6.15	6.1	6.3
5	7.1	8.85	8.5	9.1	9.0	8.8	7.6	6.35	5.7	6.15	6.1	6.3
6	7.05	8.45	8.5	9.25	8.85	8.85	7.45	6.3	5.7	6.1	6.1	6.3
7	7.0	8.1	8.5	9.4	9.4	9.2	7.45	6.3	6.2	6.1	6.1	6.3
8	7.0	7.85	8.45	9.4	9.35	9.2	7.45	6.25	6.2	6.1	6.1	6.3
9	7.15	7.8	8.4	9.4	9.1	9.1	7.45	6.25	6.15	6.1	6.1	6.3
10	7.2	7.7	8.4	9.45	8.95	9.15	7.4	6.25	6.1	6.1	6.15	6.3
11	7.1	7.65	8.45	9.15	8.8	9.4	7.3	6.25	6.1	6.1	6.2	6.3
12	7.05	7.6	8.4	8.95	8.75	9.65	7.3	6.25	6.15	6.1	6.2	6.3
13	7.0	7.45	9.1	8.9	8.75	9.65	7.2	6.2	6.15	6.1	6.2	6.3
14	7.0	7.4	9.0	8.95	9.05	9.5	7.1	6.2	6.15	6.1	6.2	6.3
15	7.1	7.4	8.55	9.1	9.5	9.3	7.0	6.25	6.2	6.15	6.2	6.3
16	7.4	7.4	9.1	9.25	10.15	9.4	6.9	6.2	6.2	6.2	6.2	6.3
17	7.3	7.7	10.35	9.05	11.2	9.25	6.85	6.2	6.2	6.15	6.2	6.25
18	7.3	7.8	9.6	9.2	10.55	9.2	6.85	6.2	6.2	6.15	6.2	6.25
19	7.25	7.8	11.5	9.25	10.4	9.05	6.75	6.2	6.2	6.15	6.2	6.3
20	7.3	8.6	10.0	8.9	10.25	8.95	6.85	6.25	6.15	6.15	6.2	6.4
21	7.7	8.45	9.35	8.8	10.35	8.95	6.75	6.25	6.15	6.15	6.25	6.4
22	7.5	8.2	9.25	8.75	10.05	8.9	6.7	6.25	6.1	6.15	6.3	6.3
23	7.7	8.1	8.85	8.9	9.9	8.7	6.75	6.25	6.15	6.15	6.3	6.25
24	7.65	8.1	8.8	9.05	9.85	8.45	6.85	6.25	6.15	6.15	6.25	6.2
25	7.55	8.15	8.85	9.45	9.95	8.2	6.75	6.25	6.15	6.1	6.2	6.2
26	7.5	8.3	8.9	9.65	10.0	8.25	6.7	6.25	6.15	6.1	6.2	6.25
27	7.35	8.3	9.2	10.0	9.55	8.1	6.65	6.25	6.15	6.1	6.3	6.3
28	7.3	8.25	8.75	10.1	9.2	8.0	6.55	6.25	6.15	6.1	6.3	6.3
29	7.25	.....	8.95	10.35	9.1	8.0	6.55	6.15	6.15	6.1	6.4	6.4
30	7.05	.....	8.75	10.45	9.3	8.0	6.5	6.25	6.15	6.1	6.5	6.45
31	6.75	.....	8.65	.....	9.35	.....	6.45	6.2	6.15	6.1	.....	6.4

Station rating table for Stanislaus River at Knights Ferry, Cal., 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.*
6.00	60	7.30	630	8.60	1,840	9.90	3,550
6.10	70	7.40	710	8.70	1,960	10.00	3,700
6.20	80	7.50	800	8.80	2,080	10.20	4,040
6.30	95	7.60	890	8.90	2,200	10.40	4,400
6.40	125	7.70	980	9.00	2,320	10.60	4,800
6.50	160	7.80	1,070	9.10	2,440	10.80	5,230
6.60	200	7.90	1,160	9.20	2,560	11.00	5,730
6.70	245	8.00	1,250	9.30	2,680	11.20	6,330
6.80	295	8.10	1,340	9.40	2,800	11.40	6,990
6.90	350	8.20	1,440	9.50	2,950	11.60	7,700
7.00	410	8.30	1,540	9.60	3,100		
7.10	480	8.40	1,640	9.70	3,250		
7.20	550	8.50	1,740	9.80	3,400		

Estimated monthly discharge of Stanislaus River at Knights Ferry, Cal., for 1905.

[Drainage area, 935 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	1,015	294	642	39,480	0.687	0.792
February	4,002	731	1,326	73,640	1.42	1.48
March	7,394	1,533	2,395	147,300	2.56	2.95
April	4,625	1,905	2,774	165,100	2.97	3.31
May	6,445	2,124	3,247	99,650	3.47	4.00
June	3,296	1,351	2,392	142,300	2.56	2.86
July	1,309	225	613	37,690	.656	.756
August	211	97	150	9,223	.160	.184
September	137	90	103	6,129	.110	.123
October	138	85	97	5,964	.104	.120
November	189	77	91	5,415	.097	.108
December	185	96	131	8,055	.140	1.61
The year	7,394	77	1,163	739,900	1.24	18.29

NOTE.—The discharge of Stanislaus Water Company's ditch and Schell ditch is included above. Mean daily flow of Schell ditch is estimated at 7 second-feet.

STANISLAUS WATER COMPANY'S DITCH AT KNIGHTS FERRY, CAL.

This station was established June 11, 1904, by S. G. Bennett. The station is located below the point where Schell ditch diverts its water, about 1 mile below the Stanislaus Milling and Power Company's power house and 200 feet below the place where it passes under Schell ditch flume. The water diverted by this ditch is used for irrigation in the vicinity of Oakdale, Cal.

A meter measurement on Schell ditch 200 feet below its intake gave a discharge of about 7 second-feet, which is said to be its usual constant flow. In computing the estimated monthly discharge of Stanislaus River a mean daily discharge of 7 second-feet has been used as the capacity of Schell ditch.

The gage is fastened to the upstream side of a small bridge. During 1905 the gage was read once each day by E. J. Coop.

A description of this station, with gage height and discharge data, is contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Stanislaus Water Company's ditch at Knights Ferry, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 14	F. R. S. Buttemer	13.2	22	2.14	2.58	47
May 23	R. S. Hawley	8.7	27	4.24	3.65	114
June 16	do	8.5	24	4.00	3.45	96
July 20	do	9	21	3.67	3.00	77
September 12	C. H. Lee	11	6.1	.85	1.12	5.2
September 12	do	8.7	5.5	1.58	1.50	8.7
September 12	do	9.4	13.1	2.52	2.18	33
September 12	do	9.4	12.6	2.38	2.08	30
October 17	R. S. Hawley	7.5	2.1	.38	.80	.8

Daily gage height, in feet, of Stanislaus Water Company's canal at Knights Ferry, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.6	2.3	2.3	3.55	3.7	3.7	3.4	3.1	1.95	2.8	0.0	2.1
2	2.4	2.4	2.6	3.7	3.6	3.6	3.45	3.0	2.0	2.65	1.5	2.15
3	2.5	2.05	.0	3.5	3.5	3.6	3.35	3.05	2.1	2.4	1.8	2.2
4	2.5	1.9	.0	3.65	3.5	3.7	3.45	3.05	2.05	2.3	1.5	1.95
5	2.5	.0	.0	3.55	3.55	3.6	3.35	3.1	3.45	2.2	1.5	2.2
6	2.3	2.1	2.3	3.65	3.6	3.6	3.4	3.1	3.3	2.1	1.2	2.1
7	2.5	.0	2.5	3.7	3.5	2.55	3.3	3.1	2.0	2.15	.0	2.0
8	2.5	.0	2.25	3.65	3.3	3.45	3.4	3.05	2.0	2.2	.0	2.05
9	2.45	.0	2.55	3.6	3.2	3.6	3.4	3.0	2.1	2.05	.0	2.1
10	2.45	.0	2.5	3.6	3.3	3.7	3.45	2.95	2.2	1.70	.0	2.1
11	2.25	.0	3.4	3.55	3.4	3.65	3.3	2.95	2.15	1.75	.0	1.8
12	2.45	1.45	3.0	3.6	3.45	3.65	3.3	2.95	2.0	1.85	.0	1.95
13	2.05	.0	2.6	3.5	3.4	3.6	3.3	3.1	2.1	1.4	.0	2.0
14	2.0	1.8	2.45	3.65	3.45	3.6	3.25	2.8	1.6	1.2	.0	1.85
15	2.2	1.7	2.45	3.65	3.7	3.5	3.15	2.85	1.6	1.0	.0	1.65
16	2.15	1.9	2.6	3.7	3.7	3.5	3.35	2.9	1.5	1.4	.0	1.8
17	2.35	2.3	2.6	3.65	3.55	3.5	3.1	2.7	1.4	1.3	.0	2.2
18	2.1	2.2	2.5	3.55	3.6	3.5	3.1	2.5	1.4	1.2	.0	2.1
19	2.1	2.4	2.45	3.6	3.7	3.5	3.0	2.45	1.1	1.3	.0	1.95
20	2.3	2.0	2.8	3.55	3.65	3.45	3.2	2.3	1.35	1.4	.0	2.0
21	2.05	2.4	2.6	3.6	3.7	3.55	3.1	2.3	1.5	1.5	.0	2.0
22	2.2	2.3	2.8	3.6	3.65	3.45	3.0	2.05	1.6	1.55	.0	2.05
23	2.1	2.0	2.9	3.5	3.65	3.45	3.0	2.1	1.3	1.8	.0	1.95
24	2.1	2.0	3.0	3.6	3.6	3.45	.0	2.0	1.7	1.4	.0	1.25
25	2.15	2.0	3.15	3.65	3.65	3.4	2.95	2.05	1.5	1.2	.0	1.4
26	2.1	.0	3.2	3.7	3.65	3.35	3.0	1.9	1.65	1.3	.0	.9
27	2.2	2.25	3.3	3.7	3.6	3.35	3.1	1.85	1.65	1.6	1.7	2.2
28	2.2	2.35	3.35	3.7	3.6	3.35	3.0	1.7	1.7	1.5	1.95	2.3
29	2.3	.....	3.4	3.7	3.6	3.4	2.95	2.15	2.2	1.45	2.0	2.2
30	1.65	.....	3.6	3.7	3.6	3.45	3.1	1.7	2.25	1.45	1.95	2.3
31	1.8	.....	3.65	.....	3.65	.....	3.05	1.5	.....	1.4	.....	2.2

Station rating table for Stanislaus Water Company's ditch near Knights Ferry, Cal., 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.*
1.00	2.5	1.70	14	2.40	40	3.10	79
1.10	3.5	1.80	17	2.50	45	3.20	85
1.20	5	1.90	20	2.60	50	3.30	91
1.30	6.5	2.00	24	2.70	55	3.40	97
1.40	8	2.10	28	2.80	61	3.50	104
1.50	10	2.20	32	2.90	67	3.60	111
1.60	12	2.30	36	3.00	73	3.70	118

NOTE.—The above table is based on 9 discharge measurements made during 1905. It is well defined between gage heights 1 foot and 3.7 feet. Monthly estimates are included with those of Stanislaus River, page —.

MISCELLANEOUS MEASUREMENTS IN STANISLAUS RIVER DRAINAGE BASIN.

Stanislaus River at Parrotts Ferry, Cal.—A measurement was made on this stream from the downstream side of the wagon bridge at Parrotts Ferry on September 12, 1905, by H. A. Campbell.

Width, 35 feet; area, 138 square feet; mean velocity, 0.66 foot per second; discharge, 91 second-feet.

South Fork of Stanislaus.—A measurement was made on this stream on September 25, 1905, at trail crossing to Yancey's ranch about 14 miles above its junction with the main river and about 3 miles north of Confidence, Cal. Measurement made by H. A. Campbell.

Width, 5 feet; area, 2.4 square feet; mean velocity, 0.40 foot per second; discharge, 0.96 second-feet.

Middle Fork of Stanislaus.—A measurement was made on this stream on September 26, 1905, at the bridge on the trail to McCormicks, about 5 miles above its junction with the main river. Measurement made by H. A. Campbell.

Width, 21 feet; area, 350 square feet; mean velocity, 0.24 foot per second; discharge, 84 second-feet.

Griswald Creek.—This stream enters Stanislaus River about 2 miles above the mouth of the Middle Fork. A measurement was made on September 26, 1905, at trail crossing, about 5 miles above the mouth, by H. A. Campbell.

Width, 6 feet; area, 5.4 square feet; mean velocity, 0.37 foot; discharge, 2.0 second-feet.

Beaver Creek.—This stream enters Stanislaus River from the east about 5 miles above the mouth of the Middle Fork. A measurement was made on September 26, 1905, at the trail crossing to the Calaveras big trees and about 5 miles above its junction with North Fork of Stanislaus River. Measurement made by H. A. Campbell.

Width, 2.5 feet; area, 2.8 square feet; mean velocity, 1.64 feet per second; discharge, 4.6 second-feet.

North Fork of Stanislaus River at Squaw Hollow, Cal.—A measurement was made about 75 yards upstream from trail bridge at Squaw Hollow on September 27, 1905, by H. A. Campbell.

Width, 29 feet; area, 48 square feet; mean velocity, 1.60 feet per second; discharge, 77 second-feet.

MOKELUMNE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Mokelumne River drains an area of 657 square miles of the western slope of the Sierra Nevada. It has numerous tributaries, the North, South, and Middle forks being the most important. This stream heads well back in the main crest of the Sierra Nevada at an elevation of 8,000 feet.

The formation is of granite with good soil covering and heavy timber growth on the middle and higher elevations. On the lower elevations the slopes are less rugged and the soil covering is of brush and scattering oak timber with large areas of cultivated land and pasture. There are numerous small glacial lakes and moraines in the upper reaches of this basin. The precipitation varies from 25 inches on the lower to 50 inches on the higher elevations, where it falls in the form of snow, which melts in the early spring. The greatest discharge usually occurs in April, May, and June. There is some artificial storage in this basin, but not enough to have much effect on the discharge.

Several diversions are made for mining and power purposes within the drainage basin, and this water is returned to the river above the gaging station, which is located at Clement, a few miles above Lodi, Cal.

MOKELUMNE RIVER NEAR CLEMENTS, CAL.

This station was established October 28, 1904, by O. W. Peterson. It is located at the highway bridge, 1 mile north of Clements.

The channel is straight for 150 feet above and 500 feet below the gaging station. The right bank is high and not subject to overflow. The left bank is subject to overflow when the gage reads above 15 feet. The bed of the stream is composed of gravel and is subject to slight changes.

Discharge measurements are made from the downstream side of the bridge. The initial point is on the end of the bridge near the right bank.

The gage is in two sections. The low-water section is an inclined rod nailed to posts driven in the ground, and the high-water section is a vertical rod nailed to a pile and near the inclined rod. Both are on the right bank. During 1905 the gage was read by Allen Gaskill. The bench mark is the head of a bolt driven in a pile, to which the upper section of the gage is fastened; elevation, 9.60 feet above the datum of the gage.

A description of this station, with gage height and discharge data, is contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Mokelumne River near Clements, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 23	F. R. S. Buttemer	132	293	2.69	5.15	788
January 24	do	128	258	2.40	4.85	620
January 24	do	128	250	2.38	4.79	596
January 30	do	121	191	2.01	4.28	384
February 9	do	126	259	2.39	4.87	620
February 15	do	122	193	2.27	4.31	438
February 20	do	210	562	2.54	6.14	1,425
May 18	W. B. Clapp	248	1,238	3.06	9.00	3,788
June 29	O. W. Peterson	130	237	2.36	4.64	559
July 28	Peterson and Lee	60	80	1.56	3.14	125
September 5	C. H. Lee	58	79	1.27	3.13	100
November 29	do	55	66	.86	2.90	57

Daily gage height, in feet, of Mokelumne River near Clements, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.0	4.85	5.4	6.05	7.5	7.65	4.3	3.2	3.3	3.4	3.25	3.25
2	4.55	7.55	5.45	6.2	7.0	7.45	4.3	3.3	3.3	3.25	3.2	3.1
3	4.5	5.8	5.5	6.3	6.9	7.15	4.1	3.3	3.25	3.3	3.25	3.1
4	4.4	5.35	5.65	6.45	6.65	6.9	4.0	3.3	3.3	3.25	3.1	3.0
5	4.15	6.55	5.6	6.7	6.5	6.6	3.85	3.2	3.3	3.3	3.1	2.95
6	4.3	5.7	5.7	6.8	6.4	6.8	3.85	3.25	3.3	3.3	3.1	2.95
7	4.1	5.3	5.5	6.95	6.6	7.1	3.8	3.15	3.3	3.45	3.1	3.1
8	4.1	5.0	5.6	7.05	6.9	7.05	4.05	3.3	3.35	3.4	2.95	3.1
9	4.3	4.9	5.45	6.85	6.55	7.0	3.65	3.25	3.3	3.25	3.0	3.05
10	4.3	4.65	5.45	7.0	6.4	7.15	3.6	3.3	3.3	3.35	2.95	3.05
11	4.1	4.65	5.5	6.6	6.3	7.55	3.7	3.2	3.2	3.3	2.95	3.0
12	4.1	4.55	5.45	6.25	6.3	7.75	3.6	3.3	3.3	3.35	2.95	3.1
13	4.15	4.5	6.1	6.25	6.25	7.75	3.65	3.2	3.3	3.35	2.9	3.05
14	4.15	4.55	6.15	6.45	6.2	7.1	3.45	2.9	3.35	3.15	2.95	3.1
15	4.2	4.35	5.55	6.6	7.4	6.95	3.45	3.35	3.35	3.15	2.85	3.05
16	4.7	4.4	5.6	6.75	8.25	6.85	3.35	3.3	3.3	3.25	2.85	3.05
17	4.3	4.95	6.2	6.35	10.55	6.65	3.3	3.3	3.3	3.25	2.8	3.1
18	4.25	4.9	6.55	6.9	9.0	6.5	3.3	3.35	3.35	3.05	2.8	3.15
19	4.35	4.85	7.05	6.8	8.85	6.25	3.3	3.4	3.35	3.2	2.85	3.15
20	4.4	5.8	7.3	6.35	8.8	6.15	3.3	3.25	3.35	3.1	2.9	3.2
21	4.45	5.5	6.85	6.05	8.85	6.0	3.3	3.25	3.35	3.05	3.05	3.3
22	4.45	5.25	6.65	6.05	8.25	5.75	3.3	3.25	3.4	3.0	2.85	3.35
23	5.0	5.15	6.3	6.25	7.9	5.45	3.3	3.25	3.35	2.9	2.9	3.3
24	4.85	5.1	6.55	6.7	8.65	5.35	3.3	3.25	3.4	2.95	2.95	3.2
25	4.6	5.25	6.5	7.25	8.6	4.9	3.3	3.3	3.3	3.1	2.85	3.0
26	4.55	5.45	6.3	7.6	8.95	5.1	3.25	3.35	3.35	3.0	2.85	2.95
27	4.45	5.55	6.9	8.3	7.35	4.9	3.2	3.35	3.35	3.2	3.2	3.05
28	4.2	5.35	6.45	8.3	7.1	4.75	3.2	3.3	3.35	3.15	3.25	3.1
29	4.25	.....	6.85	8.4	7.45	4.65	3.15	3.25	3.35	3.0	3.3	3.1
30	4.3	.....	6.4	8.15	7.45	4.4	3.15	3.3	3.45	3.05	3.15	3.1
31	4.35	.....	6.2	.....	7.6	.....	3.2	3.35	.....	3.15	.....	3.15

Station rating table for Mokelumne River near Clements, Cal., 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.*
3.00	78	4.30	391	5.60	1,059	6.90	2,000
3.10	96	4.40	427	5.70	1,124	7.00	2,080
3.20	115	4.50	465	5.80	1,191	7.20	2,240
3.30	134	4.60	506	5.90	1,260	7.40	2,400
3.40	154	4.70	550	6.00	1,330	7.60	2,560
3.50	174	4.80	597	6.10	1,400	7.80	2,730
3.60	195	4.90	647	6.20	1,475	8.00	2,900
3.70	218	5.00	700	6.30	1,550	8.20	3,070
3.80	242	5.10	755	6.40	1,625	8.40	3,250
3.90	268	5.20	812	6.50	1,700	8.60	3,430
4.00	295	5.30	871	6.60	1,775	8.80	3,610
4.10	325	5.40	932	6.70	1,850	9.00	3,800
4.20	357	5.50	995	6.80	1,925		

NOTE.—The above table is based on 12 discharge measurements made during 1905. It is well defined between gage heights 2.9 feet and 6.2 feet. The table has been extended beyond these limits, being based on 1 measurement at 9 feet gage height.

Estimated monthly discharge of Mokelumne River near Clements, Calif., for 1905.

[Drainage area, 642 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-feet per sq. mile.	Depth in inches.
January	700	325	428	26,320	.667	.769
February	2,520	409	853	47,370	1.33	1.38
March	2,320	932	1,410	86,700	2.20	2.54
April	3,250	1,365	1,959	116,600	3.05	3.40
May	5,260	1,475	2,547	156,600	3.97	4.58
June	2,688	427	1,665	99,070	2.59	2.89
July	391	106	188	11,560	.293	.338
August	154	60	128	7,870	.199	.229
September	164	115	139	8,271	.217	.242
October	164	60	114	7,010	.178	.205
November	134	43	794	4,725	.124	.138
December	144	69	970	5,964	.151	.174
The year	5,260	43	801	578,100	1.25	16.88

NORTHERN PACIFIC OCEAN DRAINAGE BASIN.

RUSSIAN RIVER DRAINAGE BASIN.

MISCELLANEOUS MEASUREMENTS.

The following is a list of miscellaneous discharge measurements made in Russian River drainage basin during 1905:

Russian River at Calpella, Cal.—A measurement of this stream was made on September 21, 1905, one-fourth mile east of Calpella and about 3 miles above mouth of East Fork of Russian River by R. S. Hawley.

Width, 6 feet; area, 1.6 square feet; mean velocity, 0.75 foot per second; discharge, 1.2 second-feet.

East Fork of Russian River near Ukiah, Cal.—A measurement of this stream was made September 21, 1905, one-fourth mile above its junction with Russian River by R. S. Hawley.

Width, 10 feet; area, 4.6 square feet; mean velocity, 0.48 foot per second; discharge, 2.2 second-feet.

Russian River at Preston, Cal.—A measurement of this stream was made September 22, 1905, 1 mile above Preston, Cal., by R. S. Hawley.

Width, 23 feet; area, 9.8 square feet; mean velocity, 1.05 feet per second; discharge, 10.3 second-feet.

EEL RIVER DRAINAGE BASIN.

MISCELLANEOUS MEASUREMENTS.

The following is a list of miscellaneous discharge measurements made in Eel River drainage basin during 1905:

South Eel River at Hearst, Cal.—This stream is tributary to the Eel River from the south. A measurement was made 600 feet below the Hearst bridge on September 19, 1905, by R. S. Hawley.

Width, 20 feet; area, 7.6 square feet; mean velocity, 1.25 feet per second; discharge, 9.5 second-feet.

Middle Eel River at Covelo, Cal.—A measurement of this stream was made September 19, 1905, at the road crossing between Willets and Covelo about 7 miles above its junction with South Eel by R. S. Hawley.

Width, 34 feet; area, 12.2 square feet; mean velocity, 0.57 foot per second; discharge, 7.0 second-feet.

Middle Eel River at Laytonville, Cal.—A measurement of this stream was made September 20, 1905, 50 feet above its junction with South Eel River by R. S. Hawley.

Width, 18 feet; area, 22 square feet; mean velocity, 0.36 foot per second; discharge, 8.0 second-feet.

Eel River at Laytonville, Cal.—A measurement of this stream was made September 20, 1905, 50 feet below the junction of Middle and South Eel rivers by R. S. Hawley.

Width, 20 feet; area, 16 square feet; mean velocity, 1.69 feet per second; discharge, 27 second-feet.

South Eel River at Laytonville, Cal.—From the difference of the measurement made below the junction of the Middle and South Eel and that made on Middle Eel above on September 20, 1905, the discharge of South Eel at the junction is 19.2 second-feet.

KLAMATH RIVER DRAINAGE BASIN.

LINK RIVER AT KLAMATH FALLS, OREG.[a]

This station was established May 15, 1904, by J. H. Lewis. It is located at the county bridge at Klamath Falls, Oreg., 1½ miles below the outlet of Klamath Lake.

The channel is straight for 400 feet above and below the station. The current is swift; the fall in the 1¼ miles between the lake and the gaging station is about 70 feet. The right bank is low and wooded, but not liable to overflow. The left bank is high and rocky. The bed of the stream is composed of gravel, free from vegetation, and subject to some change. There is but one channel at all stages. One irrigation ditch takes water from the river on the left bank about three-fourths mile above the station. Driftwood from a sawmill above the station collects around the bridge piers and interferes materially with the accuracy of measurements. A short distance below the gaging station the river discharges into a lake of considerable size. At flood stages the velocity is checked by water backing up from the lake below, which has a tendency to give decreased velocities with high gage readings. Gage heights may be affected by wind piling up the water of the upper and lower lakes.

Discharge measurements are made from the upstream side of the bridge. The initial point for soundings is the first vertical rod supporting the floor beam at the left end of the bridge, upstream side.

A staff gage is fastened vertically to the plank bracing between steel caissons near the left bank. During 1905 the gage was read once each day by G. H. Woodbury. Bench marks were established as follows: (1) A 30-penny nail driven into the floor beam over the gage; elevation, 12.50 feet. (2) The center of a cross cut in the first sandstone above the ground in the southwest corner of the foundation of the Linkville Hotel; elevation, 15.88 feet. Elevations refer to the datum of the gage.

Gage heights and discharge measurements taken at this station in 1904 are contained in Water-Supply Paper No. 134, United States Geological Survey.

[a] This station was known as Klamath River at Klamath Falls, Oreg., in report for 1904.

Discharge measurements of Link River at Klamath Falls, Oreg., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 4	C. T. Darley	282	1,571	1.82	4.05	2,862
January 17	do	282	1,570	1.76	4.10	2,768
January 17	do	282	1,571	1.83	4.10	2,872
January 17	do	282	1,571	1.67	4.10	2,627
February 1	do	287	1,660	2.01	4.30	3,338
February 13	do	288	1,683	1.78	4.50	2,994
February 17	do	288	1,648	1.70	4.40	2,802
March 2	do	288	1,642	1.82	4.40	2,984
April 12	do	290	1,733	2.10	4.49	3,645
June 5	do	279	1,494	1.56	3.88	2,324
June 20	do	277	1,410	1.28	3.59	1,800
June 28	do	283	1,354	1.12	3.40	1,517
July 11	do	297	1,280	1.15	3.14	1,466
July 18	do	272	1,234	.86	2.97	1,063
July 28	do	270	1,178	.89	2.80	1,049
August 7	do	267	1,162	.90	2.63	1,041
August 14	do	267	1,146	.93	2.59	1,066
August 16	W. B. Clapp and C. T. Darley	267	1,187	.93	2.60	1,104
September 7	C. T. Darley	267	1,141	.90	2.58	1,032
September 16	do	268	1,155	.93	2.58	1,073
November 2	do	272	1,254	1.02	2.90	1,283

Daily gage height, in feet, of Link River at Klamath Falls, Oreg., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.1	4.2	4.4	4.5	4.2	3.95	3.45	2.79	2.6	2.7	2.81	3.25
2	4.1	4.4	4.4	4.5	4.2	3.85	3.45	2.75	2.6	2.65	2.8	3.3
3	4.1	4.4	4.4	4.5	4.2	3.85	3.3	2.7	2.58	2.7	2.81	3.29
4	4.1	4.4	4.4	4.5	4.2	3.9	a3.3	2.67	2.6	2.7	2.84	3.2
5	4.1	4.5	4.4	4.5	4.2	3.88	3.25	2.67	2.58	2.9	2.82	3.2
6	4.1	4.5	4.4	4.5	4.2	3.88	3.3	2.67	2.6	2.9	2.88	3.2
7	4.1	4.4	4.4	4.5	4.2	3.81	3.2	2.5	2.58	2.95	2.86	3.21
8	4.1	4.4	4.4	4.5	4.2	3.88	3.2	2.63	2.58	2.7	2.99	3.23
9	4.1	4.4	4.4	4.5	4.2	3.85	a3.25	2.6	2.58	2.9	2.99	3.24
10	4.1	4.5	4.4	4.5	4.2	3.8	3.25	2.6	2.62	2.8	2.98	3.28
11	4.1	4.5	4.4	4.5	4.2	3.8	a3.25	2.59	2.63	2.75	2.99	3.25
12	4.1	4.5	4.4	4.5	4.2	3.78	a3.2	2.6	2.58	2.8	2.9	3.26
13	4.1	4.5	4.4	4.5	4.2	3.75	3.2	2.6	2.58	2.8	2.95	3.27
14	4.1	4.5	4.4	4.5	4.2	3.7	3.1	2.59	2.6	2.8	2.95	3.24
15	4.1	4.5	4.4	4.5	4.1	3.6	3.05	2.6	2.6	2.7	2.95	3.34
16	4.1	4.5	4.4	4.5	4.1	3.7	a3.0	2.6	2.55	2.8	2.9	3.26
17	4.1	4.4	4.4	4.5	4.1	3.62	2.9	2.60	2.5	2.8	2.9	3.33
18	4.1	4.4	4.4	4.45	4.05	a3.61	2.9	2.63	2.55	2.8	2.9	3.32
19	4.1	4.4	4.4	4.4	4.05	3.6	3.0	2.6	2.6	2.8	3.2	3.32
20	4.1	4.4	4.4	4.4	4.05	3.59	2.9	2.6	2.6	2.85	3.1	3.26
21	4.1	4.4	4.4	4.35	4.0	a3.55	2.9	2.6	2.6	2.85	3.3	3.27
22	4.1	4.4	4.4	4.35	4.0	3.5	2.95	2.6	2.58	2.79	3.2	3.33
23	4.1	4.4	4.4	4.35	4.0	3.5	2.85	2.6	2.6	2.8	3.15	3.3
24	4.2	4.4	4.4	4.3	4.0	3.5	2.85	2.6	2.68	2.85	3.1	3.32
25	4.2	4.4	4.4	4.3	4.0	3.4	a2.85	2.6	2.55	2.81	3.2	3.29
26	4.2	4.4	4.4	4.3	4.0	3.4	a2.85	2.7	2.58	2.8	3.25	3.35
27	4.2	4.4	4.4	4.3	4.0	3.4	a2.8	2.8	2.6	2.89	3.15	3.36
28	4.1	4.4	4.5	4.25	4.0	3.4	a2.8	2.6	2.62	2.88	3.15	3.33
29	4.2	.....	4.6	4.25	4.0	3.4	2.78	2.6	2.65	2.88	3.4	3.4
30	4.2	.....	4.5	4.25	3.95	3.35	2.79	2.65	2.65	2.81	3.2	3.53
31	4.2	.....	4.5	.....	3.95	.....	2.78	2.55	.....	2.9	.....	3.53

a Estimated.

Station rating table for Link River at Klamath Falls, Oreg., from May 15, 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.*
2.50	985	3.60	1,920	4.70	3,580	5.80	5,790
2.60	1,035	3.70	2,045	4.80	3,770	5.90	6,020
2.70	1,090	3.80	2,175	4.90	3,960	6.00	6,250
2.80	1,150	3.90	2,310	5.00	4,150	6.20	6,710
2.90	1,220	4.00	2,450	5.10	4,340	6.40	7,180
3.00	1,300	4.10	2,590	5.20	4,530	6.60	7,660
3.10	1,390	4.20	2,740	5.30	4,730	6.80	8,140
3.20	1,485	4.30	2,900	5.40	4,930	7.00	8,640
3.30	1,585	4.40	3,060	5.50	5,140	7.20	9,140
3.40	1,690	4.50	3,230	5.60	5,350		
3.50	1,800	4.60	3,400	5.70	5,570		

NOTE.—The above table is applicable only for open-channel conditions. It is based on twenty-eight discharge measurements made during 1904-5. It is not very well defined.

Estimated monthly discharge of Link River at Klamath Falls, Oreg., for 1904 and 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
1904.				
May 15–31	9,015	8,140	8,640	291,300
June	8,140	5,245	6,740	401,100
July	5,140	3,060	4,123	253,500
August	2,980	1,860	2,336	143,600
September	1,800	1,535	1,662	98,900
October	1,745	1,585	1,686	103,700
November	1,982	1,745	1,837	109,300
December	2,520	1,860	2,185	134,400
The period				1,536,000
1905.				
January	2,740	2,590	2,624	161,300
February	3,230	2,740	3,103	172,300
March	3,400	3,060	3,087	189,800
April	3,230	2,820	3,106	184,800
May	2,740	2,380	2,597	159,700
June	2,380	1,638	2,004	119,200
July	1,745	1,138	1,363	83,810
August	1,144	985	1,051	64,620
September	1,062	985	1,033	61,290
October	1,260	1,062	1,159	71,260
November	1,690	1,150	1,330	79,140
December	1,860	1,485	1,587	100,800
The year	3,400	985	2,004	1,448,000

KLAMATH RIVER AT KENO, OREG.

This station was established August 13, 1904, by T. H. Humphreys. It is located one-fourth mile below the county bridge at Keno, Oreg.

The channel is straight for one-fourth mile above and below the station. The current is sluggish at low and moderate at high stages. Both banks are low, clean, and liable to overflow. The bed of the stream is composed of bowlders. An up or down stream wind piles up the water near the gage on account of the low velocities.

Discharge measurements are made by means of a cable and car one-fourth mile downstream from the bridge. The initial point for soundings is at the cable support on the right bank.

A staff gage is fastened vertically to the downstream side of the second bent from the left end of the bridge. During 1905 the gage was read once each day by S. Padgett. Bench marks were established as follows: (1) The top of projecting cap of bridge bent to which the gage is nailed; elevation, 16.80 feet. (2) A 60-penny nail driven into the south gatepost on the west side of the road 58 feet from the south end of the bridge; elevation, 18.85 feet. Elevations refer to the datum of the gage.

Gage heights and discharge measurements taken at this station in 1904 are contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Klamath River at Keno, Oreg., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 10	C. T. Darley	407	3,800	0.68	13.00	2,590
January 23	do	420	3,794	.77	13.30	2,930
January 30	do	420	3,804	.76	13.20	2,875
February 9	do	425	3,700	.80	13.25	2,975
February 18	do	428	3,838	.83	13.30	3,192
March 3	do	432	3,850	.82	13.30	3,145
March 31	do	425	3,828	.83	13.32	3,159
April 13	do	425	3,760	.80	13.28	3,015
May 17	do	427	3,687	.73	13.03	2,676
June 19	do	410	3,545	.59	12.68	2,102
July 14	do	407	3,348	.43	12.90	1,445
August 14	do	402	3,129	.37	11.80	1,146
August 31	do	404	3,221	.29	11.75	924
November 3	do	409	3,325	.20	12.00	680
December 3	do	410	3,390	.25	12.28	851

Daily gage height, in feet, of Klamath River at Keno, Oreg., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12.9	13.2	13.3	13.4	13.2	13.0	12.5	11.9	11.8	11.9	12.1	12.3
2	12.9	13.2	13.3	13.4	13.2	13.0	12.4	11.9	11.8	11.9	12.1	12.3
3	13.0	13.3	13.3	13.4	13.2	13.0	12.4	11.9	11.8	11.9	12.1	12.3
4	13.0	13.3	13.3	13.4	13.2	13.0	12.4	11.9	11.8	11.9	12.1	12.3
5	13.0	13.3	13.3	13.4	13.2	13.0	12.4	11.9	11.8	11.9	12.1	12.3
6	13.0	13.3	13.3	13.4	13.2	12.9	12.3	11.8	11.8	11.9	12.1	12.3
7	13.0	13.3	13.3	13.4	13.2	12.9	12.3	11.8	11.8	11.9	12.1	12.3
8	13.1	13.3	13.3	13.4	13.1	12.9	12.2	11.8	11.8	11.9	12.1	12.4
9	13.1	13.3	13.3	13.4	13.1	12.9	12.2	11.8	11.8	11.9	12.1	12.4
10	13.1	13.3	13.3	13.4	13.1	12.9	12.2	11.8	11.8	11.9	12.1	12.4
11	13.1	13.3	13.3	13.4	13.1	12.9	12.2	11.8	11.8	11.9	12.1	12.4
12	13.1	13.3	13.3	13.3	13.1	12.8	12.2	11.8	11.8	11.9	12.1	12.4
13	13.1	13.3	13.2	13.3	13.1	12.8	12.2	11.8	11.8	11.9	12.1	12.4
14	13.1	13.3	13.2	13.3	13.1	12.8	12.2	11.8	11.8	11.9	12.1	12.4
15	13.1	13.3	13.2	13.3	13.1	12.7	12.2	11.8	11.8	11.9	12.1	12.4
16	13.1	13.3	13.2	13.3	13.1	12.7	12.2	11.8	11.8	11.9	12.2	12.4
17	13.1	13.3	13.2	13.3	13.0	12.7	12.2	11.8	11.8	12.0	12.2	12.4
18	13.1	13.3	13.2	13.3	13.0	12.7	12.2	11.8	11.8	12.0	12.2	12.4
19	13.1	13.3	13.2	13.2	13.0	12.6	12.1	11.8	11.8	12.0	12.2	12.4
20	13.1	13.3	13 2	13 2	13 0	12 6	12 1	11 8	11 8	12.0	12.2	12 4
21	13 1	13 3	13 2	13 2	13 0	12 6	12 1	11 8	11 8	12.0	12.3	12.4
22	13.1	13.3	13.2	13.2	13.0	12.5	12.1	11.8	11.8	12.0	12.3	12.4
23	13.3	13.3	13.2	13.2	13.0	12.5	12.1	11.8	11.8	12.0	12.3	12.4
24	13.1	13.3	13.2	13.2	13.0	12.5	12.1	11.8	11.8	12.0	12.3	12.4
25	13.1	13.3	13.3	13.2	13.0	12.5	12.0	11.8	11.8	12.0	12.3	12.4
26	13.1	13.3	13.3	13.2	13.0	12.5	12.0	11.8	11.8	12.0	12.3	12.4
27	13.1	13.3	13.3	13.2	13.0	12.5	12.0	11.8	11.8	12.0	12.3	12.5
28	13.2	13.3	13.4	13.2	13.0	12.5	12.0	11.8	11.8	12.1	12.3	12.5
29	13.2	.....	13.4	13.2	13.0	12.5	12.0	11.8	11.9	12.1	12.3	12.5
30	13.2	.....	13.4	13.2	13.0	12.5	12.0	11.8	11.9	12.1	12.3	12.5
31	13.2	.....	13.4	.....	13.0	.....	11.9	11.8	.....	12.1	.....	12.5

Station rating table for Klamath River at Keno, Oreg., from May 31, 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.*
11.60	900	12.60	1,960	13.60	3,730	14.60	6,590
11.70	970	12.70	2,100	13.70	3,960	14.70	6,940
11.80	1,050	12.80	2,250	13.80	4,200	14.80	7,300
11.90	1,140	12.90	2,400	13.90	4,460	14.90	7,670
12.00	1,240	13.00	2,560	14.00	4,730	15.00	8,050
12.10	1,350	13.10	2,730	14.10	5,010	15.10	8,440
12.20	1,460	13.20	2,910	14.20	5,300	15.20	8,840
12.30	1,580	13.30	3,100	14.30	5,600	15.30	9,250
12.40	1,700	13.40	3,300	14.40	5,920		
12.50	1,830	13.50	3,510	14.50	6,250		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 22 discharge measurements made during 1904–5. It is well defined between gage heights 12.2 feet and 13.3 feet.

Estimated monthly discharge of Klamath River at Keno, Oreg., for 1904 and 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
1904.				
June	8,440	5,300	7,076	421,100
July	5,300	3,300	4,177	256,800
August	3,100	2,100	2,513	154,500
September	2,100	1,700	1,778	105,800
October	1,830	1,700	1,775	109,100
November	2,100	1,960	2,007	119,400
December	2,400	2,100	2,235	137,400
The period				1,304,000
1905.				
January	3,100	2,400	2,716	167,000
February	3,100	2,910	3,086	171,400
March	3,300	2,910	3,052	187,700
April	3,300	2,910	3,097	184,200
May	2,910	2,560	2,688	165,300
June	2,560	1,830	2,157	128,400
July	1,830	1,140	1,436	88,300
August	1,140	1,050	1,065	65,480
September	1,140	1,050	1,056	62,840
October	1,350	1,140	1,203	73,970
November	1,580	1,350	1,445	85,980
December	1,830	1,580	1,694	104,200
The year	3,300	1,050	2,058	1,485,000

SYCAN RIVER NEAR SILVERLAKE, OREG.

This station was established May 2, 1905, by Ivan Landes. It is located about 30 miles south of Silverlake, Oreg., in sec. 19, T. 32 S., R. 14 E.

The channel is straight for about 20 feet above and 150 feet below the station. The current is swift. The right bank is high, rocky, and clean and does not overflow. The left bank is low, clean, and subject to overflow at extreme high stages. The bed of the stream is of rocks, gravel, and sand, free from vegetation, and permanent. There is but one channel at low and two channels at high stages.

Discharge measurements are made from a private bridge. The initial point for soundings is at the west end of the bridge.

A staff gage is fastened vertically to a bent of the bridge. During 1905 the gage was read by O. F. Griffith and J. S. Wakefield. The bench mark is a marked point of rock on the right bank a short distance upstream from the bridge; elevation, 6.79 feet above the datum of the gage.

Discharge measurements of Sycan River near Silverlake, Oreg., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
March 16	Ivan Landes	21	28	1.38	2.40	38
April 10	do	30	46	2.36	3.05	110
May 2	do	56	93	1.76	3.45	163
June 12	do	52	44	1.56	2.32	69
July 30	Landes and King	19	11.9	.86	1.27	10.2
October 3	Ivan Landes	14	14.9	.36	1.70	5.4
November 7	do	12	7.1	.85	1.12	6.0

Daily gage height, in feet, of Sycan River, near Silverlake, Oreg., for 1905.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	2.6	1.8	1.25	1.4	.....	17	3.5	2.15	1.45	1.0	1.75	1.8
2	3.45	2.6	1.8	1.25	1.4	1.7	18	3.4	2.05	1.45	1.05	1.8	1.8
3	3.35	2.6	1.75	1.1	1.5	1.85	19	3.3	2.2	a1.3	1.05	1.8	1.7
4	3.25	3.0	1.75	1.15	1.5	1.7	20	3.4	2.1	1.35	1.1	1.75	1.85
5	3.2	3.1	1.7	.8	1.55	1.85	21	2.9	2.0	1.4	1.1	1.75	1.7
6	3.2	3.1	1.7	.8	1.55	1.8	22	3.0	1.8	1.4	1.15	1.75	1.7
7	3.25	3.2	1.7	.8	1.55	2.0	23	3.1	1.9	1.4	1.15	1.75	1.85
8	3.6	3.0	1.6	.8	1.55	1.9	24	3.0	1.9	1.4	1.2	1.75	1.85
9	3.4	3.0	1.6	.8	1.6	1.8	25	2.9	1.9	1.3	1.25	1.75	1.85
10	3.35	a2.5	1.5	.8	1.65	1.7	26	3.2	1.95	1.25	1.25	1.75	1.85
11	3.35	2.4	1.5	.8	1.7	1.7	27	3.55	1.9	1.25	1.3	2.0	1.85
12	3.3	2.3	1.5	.8	1.7	1.8	28	3.1	1.9	1.25	1.3	1.9	1.7
13	3.4	2.4	1.5	.8	1.75	1.7	29	2.9	1.85	1.25	1.35	1.8	.....
14	3.25	2.6	1.5	1.0	1.75	1.7	30	2.8	1.85	1.25	1.35	1.8	.....
15	3.3	2.4	1.5	1.0	1.75	1.65	31	2.7	.....	1.25	1.4	1.8	.....
16	3.35	2.2	1.5	1.0	1.75	1.8							

a Water turned into ditch.

LOST RIVER NEAR CLEAR LAKE, CAL.

This station was established September 1, 1904, by T. H. Humphreys. It is located about 2 miles downstream from Jessie D. Carr's Clear Lake dam, a short distance below the dam site for Clear Lake reservoir, about 20 miles from Tule Lake post-office, Cal.

The channel is straight for about 150 feet above and below the station. The current is swift. Both banks are high, rocky, and clean. There is a flood plain about 150 feet in width along the left bank. The bed of the stream is composed of rock, gravel, and soil. The channel contains a considerable growth of tules during the spring and summer months.

Discharge measurements are made during flood stages by means of a cable and car, and at low stages by wading. The initial point for soundings is the left-bank end of the cable.

A gage is painted on the vertical rock cliff on the right bank. November 4, 1905, an automatic water-height register was installed for recording gage heights. The bench mark is a mark on the rock to which the left end of the cable is anchored; elevation, 16.62 feet above the datum of the gage.

Gage heights and discharge measurements taken at this station in 1904 are contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Lost River near Clear Lake, Cal., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 26	C. T. Darley	102	92	1.75	6.30	161
February 3	do	130	196	2.31	7.20	453
February 7	do	100	104	2.08	6.39	216
February 24	do	98	70	1.77	6.01	124
March 7	do	102	102	1.92	6.35	196
March 13	do	110	115	2.19	6.50	252
April 3	do	130	203	2.64	7.30	535
April 8	do	92	85	2.05	6.24	174
April 28	do	14	12.8	1.88	5.26	24
June 2	do	9.5	8.8	.90	5.00	7.9
September 11	do	10	8.8	.66	5.02	5.8
October 30	do	16	10.1	.75	5.10	7.6

Daily gage height, in feet, of Lost River near Clear Lake, Cal., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.4	7.3	6.3	6.9	5.3	5.0	.....	.....	.....	.....	5.1	5.15
2	5.4	7.8	6.2	7.5	5.3	5.0	.....	.....	.....	.....	5.1	5.15
3	5.4	7.3	6.3	7.2	5.2	5.05	.....	.....	.....	.....	5.1	5.2
4	5.4	7.1	6.3	6.9	5.2	5.1	.....	.....	.....	.....	5.1	5.2
5	5.4	6.8	6.4	6.7	5.1	5.15	.....	.....	.....	.....	5.1	5.2
6	5.4	6.5	6.3	6.6	5.1	5.2	.....	.....	.....	.....	5.1	5.2
7	5.4	6.3	6.5	6.4	5.15	5.35	.....	.....	.....	.....	5.1	5.2
8	5.4	6.1	6.4	6.2	5.2	5.6	.....	.....	.....	.....	5.1	5.15
9	5.4	5.8	6.3	6.0	5.2	5.9	.....	.....	.....	.....	5.1	5.15
10	5.4	5.6	6.2	5.8	5.2	5.8	.....	.....	.....	.....	5.1	5.15
11	5.4	5.2	6.2	5.7	5.3	5.7	.....	.....	.....	.....	5.1	5.15
12	5.4	6.05	6.3	5.8	5.4	5.6	.....	.....	.....	.....	5.1	5.15
13	5.4	6.95	6.5	5.7	5.35	5.4	.....	.....	.....	.....	5.1	5.15
14	5.6	6.9	6.2	5.5	5.3	5.25	.....	.....	.....	.....	5.1	5.15
15	5.8	6.7	6.1	5.5	5.25	5.1	.....	.....	.....	.....	5.1	5.15
16	6.0	6.2	6.3	5.55	5.2	5.0	.....	.....	.....	.....	5.1	5.2
17	6.25	5.6	6.9	5.6	5.15	5.0	.....	.....	.....	.....	5.1	5.2
18	6.3	5.5	6.7	5.6	5.1	5.0	.....	.....	.....	.....	5.1	5.2
19	6.3	5.8	6.3	5.7	5.05	5.0	.....	.....	.....	.....	5.1	5.2
20	6.3	6.4	6.4	5.5	5.05	5.0	.....	.....	.....	.....	5.2	5.2
21	6.35	6.3	6.6	5.5	5.0	5.0	.....	.....	.....	.....	5.15	5.2
22	6.4	6.2	6.9	5.5	5.0	5.0	.....	.....	.....	.....	5.15	5.2
23	6.4	6.0	6.9	5.45	5.0	5.0	.....	.....	.....	.....	5.15	5.2
24	6.45	6.1	6.5	5.4	4.95	5.0	.....	.....	.....	.....	5.15	5.2
25	6.5	6.2	6.3	5.4	4.9	5.0	.....	.....	.....	.....	5.15	5.2
26	6.3	6.0	6.5	5.5	4.9	5.0	.....	.....	.....	.....	5.2	5.2
27	6.0	6.1	6.9	5.4	4.95	5.0	.....	.....	.....	.....	5.2	5.2
28	6.2	6.2	6.6	5.3	5.0	5.0	.....	.....	.....	.....	5.2	5.2
29	6.4	.....	6.7	5.3	5.05	5.0	.....	.....	.....	5.1	5.15	5.2
30	6.6	.....	6.0	5.3	5.1	5.0	.....	.....	.....	5.1	5.15	5.2
31	6.8	.....	6.4	.....	5.05	.....	.....	.....	.....	5.1	.....	5.2

Station rating table for Lost River near Clear Lake, Cal., from September 4, 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.*
4.90	6	5.70	66	6.50	238	7.30	508
5.00	9	5.80	81	6.60	268	7.40	545
5.10	12	5.90	98	6.70	300	7.50	582
5.20	17	6.00	117	6.80	332	7.60	619
5.30	23	6.10	138	6.90	365	7.70	657
5.40	31	6.20	160	7.00	400	7.80	695
5.50	41	6.30	184	7.10	436	7.90	733
5.60	53	6.40	210	7.20	472	8.00	772

NOTE.—The above table is based on 16 discharge measurements made during 1904-5. It is fairly well defined.

Estimated monthly discharge of Lost River near Clear Lake, Cal., for 1904 and 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
1904.				
September	20	9	11.3	673
October	23	12	18.1	1,113
November	17	12	15.5	923
December	27	14	18.2	1,119
1905.				
January	332	31	120	7,379
February	695	17	217	12,050
March	365	117	224	13,770
April	582	23	127	7,557
May	31	6	14.6	898
June	98	9	21.6	1,286
July	.....	.....	[a]7.0	430
August	.....	.....	[a]6.0	369
September	.....	.....	[a]7.0	417
October	.....	.....	[a]10.0	615
November	17	12	13.0	774
December	12	14	16.0	984
The year	.....	.....	65.3	46,530

[a] Estimated.

LOST RIVER NEAR MERRILL, OREG.

This station was established July 26, 1904, by T. H. Humphreys. It is located about 1½ miles downstream from the Stukel Bridge, 4 miles northwest of Merrill, Oreg.

The channel is straight for 200 feet above and 400 feet below the station. The current is swift at high and medium at low stages. Both banks are high and not liable to overflow. The bed of the stream is composed of clay, rock, and gravel, and is not subject to change. There is but one channel at all stages. During low water the flow over the greater portion of the section is shallow and broken, making it difficult to obtain accurate results with a current meter. Near the right bank the channel is deeper. At low water in the fall of the year a considerable growth of water grass accumulates in the channel. An old rock dam located 200 feet above the gaging station does not materially interfere with the accuracy of discharge measurements.

Discharge measurements are made at flood stages by means of a cable and car and at low water by wading. The initial point for soundings is the stream face of the left-bank cable support.

A staff gage is fastened vertically at the left bank about 40 feet upstream from the cable. During 1905 the gage was read by Mrs. Joseph Stukel. Bench marks were established as follows: (1) A large wire nail driven into post supporting cable at left bank; elevation, 17.92 feet. (2) A nail driven into the sill at the northwest corner of a granary 200 feet downstream from the cable on the right bank; elevation, 20.61 feet. Elevations refer to the datum of the gage.

Gage heights and discharge measurements taken at this station in 1904 are contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Lost River near Merrill, Oreg., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 18	C. T. Darley	87	82	1.60	3.50	131
February 1	do	102	208	2.72	4.80	566
February 8	do	108	240	2.74	5.05	658
February 27	do	92	197	2.70	4.55	533
March 5	do	96	199	2.71	4.63	540
April 5	do	120	425	2.67	6.77	1,134
April 14	do	90	140	2.03	4.00	284
April 29	do	80	95	1.53	3.50	145
May 12	do	89	95	1.37	3.50	130
June 14	do	89	86	1.36	3.41	117
July 23	do	90	86	1.36	3.45	117
August 15	C. T. Darley and W. B. Clapp	88	82	1.26	3.41	103
August 26	C. T. Darley	87	84	1.21	3.31	102
September 15	do	87	83	1.22	3.32	101

Daily gage height, in feet, of Lost River near Merrill, Oreg., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.5	4.7	4.5	4.8	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
2	3.5	5.7	4.5	4.8	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
3	3.5	6.3	4.5	6.0	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
4	3.5	6.8	4.5	7.0	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
5	3.5	7.0	4.6	6.8	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
6	3.5	6.2	4.6	6.0	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
7	3.5	5.6	4.6	5.3	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
8	3.5	5.1	4.55	5.4	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
9	3.5	4.7	4.55	5.6	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
10	3.5	4.4	4.4	5.8	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
11	3.5	4.2	4.3	5.9	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.3
12	3.5	4.0	4.35	4.0	3.5	3.55	3.4	3.4	3.3	3.3	3.3	3.3
13	3.5	3.9	4.2	4.0	3.5	3.55	3.4	3.4	3.3	3.3	3.3	3.3
14	3.5	3.8	4.2	4.0	3.5	3.55	3.4	3.4	3.3	3.3	3.3	3.3
15	3.5	3.8	4.2	4.0	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
16	3.5	3.7	4.1	3.9	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
17	3.5	3.7	4.1	3.9	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
18	3.5	3.7	4.1	3.8	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
19	3.5	3.7	4.1	3.8	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
20	3.5	3.8	4.2	3.8	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
21	3.5	3.8	4.4	3.7	3.5	3.4	3.4	3.4	3 3	3.3	3.3	3.3
22	3.5	3.9	4.5	3.7	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
23	3.5	4.4	4.6	3.7	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
24	3.5	4.4	4.7	3.6	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
25	4.5	4.5	4.9	3.6	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
26	5.4	4.5	4.6	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
27	5.3	4.55	4.6	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
28	5.0	4.55	5.0	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
29	4.7	.....	4.9	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
30	4.5	.....	4.8	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.3
31	4.4	.....	4.8	.....	3.5	.....	3.4	3.4	.....	3.3	.....	3.3

Station rating table for Lost River near Merrill, Oreg., from July 16, 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.*
3.30	102	3.60	176	3.90	262	4.20	362
3.40	125	3.70	203	4.00	294		
3.50	150	3.80	232	4.10	328		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 20 discharge measurements made during 1904–5. It is not well defined. Above gage height 4.2 feet the rating curve is a tangent, the difference being 35 per tenth

Estimated monthly discharge of Lost River near Merrill, Oreg., for 1904 and 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
1904.				
July 26-31	203	203	203	2,415
August	203	176	199	12,240
September	176	163	165	9,818
October	163	150	158	9,715
November	150	150	150	8,926
December	150	150	150	9,223
The period				52,330
1905.				
January	782	150	248	15,250
February	1,342	203	514	28,550
March	642	328	461	28,350
April	1,342	150	470	27,970
May	150	150	150	9,223
June	163	125	138	8,212
July	125	125	125	7,686
August	125	125	125	7,686
September	102	102	102	6,069
October	102	102	102	6,272
November	102	102	102	6,069
December	102	102	102	6,272
The year	1,342	102	220	157,600

TULE LAKE NEAR MERRILL, OREG.

This station was established May 17, 1904, by John H. Lewis and Ivan Landes for recording the water level in Tule Lake. It is located on Tule Lake at the mouth of Lost River about 3 miles east of Merrill, Oreg , 25 miles south from Klamath Falls, and near the Oregon-California line.

The gage is a vertical timber fastened to posts driven in the lake bed, about 20 feet from the shore of the lake. It is in line with the east lane fence, one-fourth mile south of the residence of J. Frank Adams. The bench mark is a notch cut in large juniper gatepost on the north side of the gate entrance about 60 feet distant from the gage rod; elevation, 13.70 feet above the zero of the gage.

Daily gage height, in feet, of Tule Lake near Merrill, Oreg., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1												
2				9.25								
3						9.05	8.6					
4					9.2							
5												
6			9.1									
7								7.95				
8										7.05	6.85	6.85
9									7.4			
10						9.0	8.5					
11												
12		8.9										
13	8.6											
14								7.8	7.3			
15			9.15									6.7
16					9.15					7.0	6.8	
17							8.4					
18		8.9										
19						8.95						
20												
21								7.6				
22									7.2			
23				9.2	9.1					6.9	6.8	
24			9.1				8.3					
25												
26												6.6
27		9.0				8.7						
28												
29												
30									7.1	6.95	6.8	
31	8.65						8.05	7.5				6.55

NOTE.—Ice out of river, Jan. 31.

MILLER CREEK NEAR LORELLA, OREG.

This station was established August 10, 1904, by F. S. Chapman. It is located at Horsefly, 10 miles northeast of Lorella, Oreg.

The channel is straight for 600 feet above and 100 feet below the station. The current is sluggish at low and swift at high stages. Both banks are high, rocky, wooded, and not subject to overflow. The bed of the stream is of rock and gravel, and not liable to change. The channel is obstructed by much vegetation during the season of low stage.

Discharge measurements are made during high stages by means of a cable and car, and at low stages by wading. The initial point for soundings is the stream side of the cable support on the right bank.

A staff gage is fastened vertically at the right bank, 300 feet upstream from the cable, where the water stands in a pool. During 1905 the gage was read by Louis Gerber. On December 9, 1905, an automatic water-height register was installed for recording gage heights. The bench mark is a point on top of a large bowlder 25 feet downstream from the gage; elevation, 12.68 feet above the datum of the gage.

Gage heights and discharge measurements taken at this station during 1904 are contained in Water-Supply Paper No. 134, United States Geological Survey.

Discharge measurements of Miller Creek near Lorella, Oreg., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
January 28	C. T. Darley	110	72	2.03	7.25	146
February 4	do	124	86	1.87	7.30	161
February 6	do	90	58	1.50	6.99	87
February 25	do	118	88	2.01	7.30	177
March 8	do	91	72	1.72	7.14	124
March 15	F. S. Chapman	90	65	1.46	6.92	95
April 2	C. T. Darley	130	155	2.97	8.00	460
April 9	do	72	47	1.32	6.88	62
April 28	do	18	10.8	.29	6.19	3.1
June 1	do	20	11.2	.18	6.11	2.0

Daily gage height, in feet, of Miller Creek near Lorella, Oreg., for 1905.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.3	8.0	7.2	7.0	6.3	6.2						
2	6.3	8.2	7.2	8.0	6.3	6.1						
3	6.3	7.7	7.3	7.8	6.3	6.1						
4	6.3	7.3	7.3	7.6	6.3	6.2						
5	6.3	7.7	7.3	7.4	6.3	6.2						
6	6.3	7.0	7.2	7.2	6.3	6.3						
7	6.3	7.0	7.2	7.0	6.2	6.3						
8	6.3	7.0	7.2	6.9	6.2	6.3						
9	6.3	7.0	7.1	6.8	6.4	6.3						[a] 6.0
10	6.3	6.9	7.1	6.8	6.4	6.3						6.0
11	6.3	6.6	7.0	6.8	6.4	6.3						6.0
12	6.3	6.5	7.1	6.6	6.4	6.3						6.0
13	6.3	6.5	7.1	6.6	6.4	6.2						6.0
14	6.3	6.4	7.1	6.5	6.4	6.2						6.0
15	6.3	6.4	6.8	6.5	6.3	6.2						6.0
16	7.5	6.4	7.3	6.6	6.3	6.2						6.0
17	7.6	6.4	7.3	6.6	6.3							6.0
18	7.7	6.4	7.3	6.6	6.3							6.0
19	7.5	6.8	7.4	6.5	6.3							6.0
20	7.5	7.2	7.4	6.5	6.2							6.0
21	7.5	7.3	7.1	6.5	6.1							6.0
22	7.9	7.3	7.3	6.4	6.0							6.0
23	8.2	7.3	7.3	6.4	6.0							6.0
24	7.9	7.3	7.2	6.4	6.0						6.0	6.0
25	7.9	7.3	7.2	6.3	5.9						6.1	6.0
26	7.7	7.3	7.9	6.3	6.1							6.0
27	7.7	7.3	7.5	6.2	6.1							6.0
28	7.3	7.3	7.4	6.2	6.2							6.0
29	7.5		7.4	6.2	6.3							6.0
30	8.0		7.2	6.2	6.2							6.0
31	8.3		7.2		6.2							

[a] New gage.

NOTE.—No flow June 17 to December 31

Station rating table for Miller Creek near Lorella, Oreg., from August 7, 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.*
6.00	0	6.80	52	7.60	274	8.40	665
6.10	1.5	6.90	67	7.70	317	8.50	717
6.20	4	7.00	86	7.80	363	8.60	770
6.30	8	7.10	109	7.90	411	8.70	823
6.40	13	7.20	135	8.00	460	8.80	876
6.50	20	7.30	163	8.10	510	8.90	929
6.60	29	7.40	196	8.20	561	9.00	982
6.70	39	7.50	234	8.30	613		

NOTE.—The above table is based on 13 discharge measurements made during 1904–5. It is well defined between gage heights 6.1 feet and 8 feet.

Estimated monthly discharge of Miller Creek near Lorella, Oreg., for 1904 and 1905.

Month.	Discharge in second-feet.			Total in acre-feet.
	Maximum.	Minimum.	Mean.	
1904.				
August	1.5	.75	1.3	79
September	1.5	.0	.2	12
October	8	1.5	2.4	148
November	8	1.5	3.7	221
December	10.5	1.5	6.2	381
The period				841
1905.				
January	613	8	179	11,010
February	561	13	138	7,664
March	411	52	153	9,408
April	460	4	71.0	4,225
May	13	0	6.5	400
June	8	0	3.0	179
July	0	0	.0	0
August	0	0	.0	0
September	0	0	.0	0
October	0	0	.0	0
November	0	0	.0	0
December	0	0	.0	0
The year	613	0	46.	32,890

PRECIPITATION AND EVAPORATION DATA.

The following table gives the total precipitation in inches, by months, and also the annual totals:

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Keno, Oreg.:													
1904	.....	.....	.....	.....	.....	.....	.....	0.00	1.58	2.08	1.50	3.57	.....
1905	2.08	1.91	2.30	0.66	2.29	0.15	0.00	0.00	0.75	0.72	1.30	2.23	14.39
Tule Lake, Cal.:													
1904	.....	.....	.....	.....	.....	.....	.....	0.00	0.92	1.01	0.42	3.11	.....
1905	1.25	1.19	1.70	0.20	2.62	0.30	0.00	0.00	0.42	.....	1.25	0.93	.....
Horse Fly, near Lorella, Oreg.:													
1904	.....	.....	.....	.....	.....	.....	.....	0.00	0.71	1.11	1.07	2.61	.....
1905	1.43	1.09	2.22	0.28	2.56	1.23	0.00	0.00	0.32	0.32	0.83	2.41	12.69

The following table gives the total evaporation in inches, by months, at Keno, Oreg.:

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1904	.....	.....	.....	.....	.....	.....	.....	6.66	5.12	2.01	2.01	2.01	.....
1905	1.19	0.78	0.78	2.69	4.12	6.20	7.57	7.03	6.15	1.98	0.46	.....	.....

MISCELLANEOUS MEASUREMENTS IN NORTHERN PACIFIC OCEAN DRAINAGE BASIN.

Antelope Creek near Mount Hebron, Cal.—This creek rises on the eastern slope of Mount Shasta. It is tributary to Lower Klamath Lake, although its waters sink before reaching the lake. A measurement was made June 17 by C. T. Darley, 12 miles below its source.

Width, 25.5 feet; area, 37 square feet; mean velocity, 3.03 feet per second; discharge, 112 second-feet.

Another measurement was made August 28 by C. T. Darley 15 miles below its source.

Width, 13 feet; area, 9.4 square feet; mean velocity, 1.11 feet per second; discharge, 10.4 second-feet.

Adams ditch near Merrill, Oreg.—This canal diverts water from White Lake, an arm of Lower Klamath Lake. For the first mile this canal is common with the Van Brimmer canal. It is about 16 miles in length and is used for the irrigation of land in the vicinity of Merrill, Oreg. The following measurements were made during 1905 at a point one mile below the head of the canal and 300 feet below the point where the Adams and Van Brimmer canals separate. The gage rod is a 1 by 4 inch timber divided into feet and hundredths. There is no bench mark.

May 14: Width, 36 feet; area, 42 square feet; mean velocity, 1.10 feet per second; gage height, 1.73 feet; discharge, 46 second-feet.

May 21: Width, 37.6 feet; area, 47 square feet; mean velocity, 1.13 feet per second; gage height, 1.90 feet; discharge, 53 second-feet.

June 15: Width, 37.5 feet; area, 40 square feet; mean velocity, 1.28 feet per second; gage height, 2.14 feet; discharge, 51 second-feet.

July 22: Width, 37.5 feet; area, 43 square feet; mean velocity, 1.19 feet per second; gage height, 2.22 feet; discharge, 51 second-feet.

August 24: Width, 37.5 feet; area, 36 square feet; mean velocity, 1.03 feet per second; gage height, 2.13 feet; discharge, 37 second-feet.

August 25: Width, 36.7 feet; area, 32 square feet; mean velocity, 0.91 foot per second; gage height, 2.00 feet; area, 29 second-feet.

August 25: Width, 37.9 feet; area, 39 square feet: mean velocity, 1.05 feet per second; gage height, 2.26 feet; discharge, 41 second-feet.

Ankeny ditch, station No. 1, near Klamath Falls, Oreg.—Ankeny canal diverts water from Link River at the outlet of Upper Klamath Lake, 1½ miles above the town of Klamath Falls, Oreg. The water from this canal is used for electric power and irrigation purposes in the vicinity of Klamath Falls. This station is located about 500 feet above point of diversion to electric power plant. Discharges here given represent the amount of water used for both electric power and irrigation purposes. The following measurements were made during 1905 by C. T. Darley.:

June 29: Width, 17.4 feet; area, 21 square feet; mean velocity, 2.71 feet per second; gage height, 1.36 feet; discharge, 57 second-feet.

June 30: Width, 17.4 feet; area, 20 square feet; mean velocity, 2.70 feet per second; gage height, 1.34 feet; discharge, 54 second feet.

May 11: Width, 17.5 feet; area, 22 square feet; mean velocity, 2.86 feet per second; gage height, 1.39 feet; discharge, 63 second-feet.

June 29: Width, 17.4 feet; area, 21 square feet; mean velocity, 2.52 feet per second; gage height, 1.36 feet; discharge, 53 second-feet.

Ankeny canal station No. 2, near Klamath Falls, Oreg.—This station is located about 200 feet below point of diversion by electric power plant. Discharges here given represent the amount of water used for irrigation purposes.

April 23: Width, 13.5 feet; area, 7.0 square feet; mean velocity, 1.24 feet per second; gage height, 1.28 feet; discharge, 8.7 second-feet.

May 2: Width, 13.5 feet; area, 13.1 square feet; mean velocity, 2.21 feet per second; gage height, 1.68 feet; discharge, 29 second-feet.

May 11: Width, 13.5 feet; area, 15 square feet; mean velocity, 2.33 feet per second; gage height, 1.80 feet; discharge, 35 second-feet.

Butte Creek near Mount Hebron, Cal.—Butte Creek rises on the eastern slope of Mount Shasta. It is tributary to Lower Klamath Lake and its waters sink in Butte Valley before reaching the lake. This creek discharges over fissured lava and large quantities of water are lost by seepage. That portion which reaches Butte Valley is used for irrigation. The following measurements were made during 1905 by C. T. Darley, 1½ miles above Boyce ranch at county road crossing.

May 5: Width, 15.5 feet; area, 51 square feet; mean velocity, 1.33 feet per second; gage height, 3.77 feet; discharge, 68 second-feet.

May 19: Width, 15.9 feet; area, 51 square feet; mean velocity, 1.47 feet per second; gage height, 3.95 feet; discharge, 75 second-feet.

June 16: Width, 16 feet; area, 48 square feet; mean velocity, 1.08 feet per second; gage height, 3.72 feet; discharge, 52 second-feet.

August 29: Width, 14 feet; area, 35 square feet; mean velocity, 0.47 foot per second; gage height, 3.00 feet; discharge, 16.4 second-feet.

November 23: Width, 14 feet; area, 36 square feet; mean velocity, 0.23 foot per second; gage height, 3.30 feet; discharge, 8.1 second-feet.

Bowne's west canal, near Bonanza, Oreg.—This canal takes water from Lost River, the water being raised by means of pumps and used for irrigation in the vicinity of Bonanza, Oreg. A measurement was made on May 31 by C. T. Darley at a point 300 feet below head of flume.

Width, 9.5 feet; area, 5.9 square feet; mean velocity, 1.46 feet per second; discharge, 8.6 second-feet.

Boards ditch, Poe Valley, Oreg.—This ditch diverts water from Lost River. The water is raised by means of a water wheel and is used for irrigation in the vicinity of Olene, Oreg. A measurement was made on July 19 by C. T. Darley at a point 300 feet below head of canal.

Width, 2 feet; area, 1.56 square feet; mean velocity, 0.22 foot per second; discharge, 0.3 second-foot.

Coyote Creek, Oreg.—Coyote Creek is tributary to Sycan marsh. During 1905 discharge measurements were made by Ivan Landes as follows:

March 15: Width, 5.5 feet; area, 4.7 square feet; mean velocity, 0.89 foot per second; discharge, 4.2 second-feet.

April 10: Width, 6.0 feet; area, 6.1 square feet; mean velocity, 1.34 feet per second; discharge, 8.2 second-feet.

May 2: Width, 6.0 feet; area, 5.6 square feet; mean velocity, 1.05 feet per second; discharge, 5.9 second-feet.

June 12: Width, 5.0 feet; area, 3.4 square feet; mean velocity, 0.50 foot per second; discharge, 1.7 second-feet.

July 31: Width, 1.4 feet; area, 0.4 square foot; mean velocity, 1.38 feet per second; discharge, 0.6 second-foot.

Crooked Creek near Klamath Agency, Oreg.—This stream is a tributary of Wood River. A measurement was made May 27 by C. T. Darley at the bridge 1½ miles from Klamath Agency, on road to Fort Klamath.

Width, 24.8 feet; area, 88 square feet; mean velocity, 0.52 foot per second; discharge, 46 second-feet.

Cherry Creek near Crystal, Oreg.—This stream is tributary to Upper Klamath Lake from the west. A measurement was made on May 25 by C. T. Darley at road crossing between Pelican Bay and Fort Klamath.

Width, 27 feet; area, 25 square feet; mean velocity, 1.28 feet per second; discharge, 32 second-feet.

Crane Creek near Fort Klamath, Oreg.—Crane Creek is a tributary to Seven Mile Creek. A measurement was made on May 25 by C. T. Darley at the bridge on wagon road between Fort Klamath and Pelican Bay, Oreg.

Width, 11.5 feet; area, 20 square feet; mean velocity, 0.54 foot per second; discharge, 10.7 second-feet.

Cottonwood Creek near Brownell, Cal.—Cottonwood Creek is tributary to Lower Klamath Lake from the South. The following measurements were made during 1905, 1 mile below its source, at "F" ranch, Brownell:

June 15: Width, 19.5 feet; area, 41 square feet; mean velocity, 0.25 foot per second; discharge, 10.2 second-feet.

August 30: Width, 27.5 feet; area, 24 square feet; mean velocity, 0.53 foot per second; discharge, 12.6 second-feet.

Doris Creek near Picard, Cal.—Doris Creek is tributary to Lower Klamath Lake from the southwest. A measurement was made on June 18 by C. T. Darley at the Doris ranch.

Width, 5.4 feet; area, 4.9 square feet; mean velocity, 1.24 feet per second; discharge, 6.1 second-feet.

Dirty Creek, Oregon.—Dirty Creek is tributary to Sycan marsh. During 1905 discharge measurements were made by Ivan Landes, as follows:

March 15: Width, 3.0 feet; area, 1.4 square feet; mean velocity, 0.98 foot per second; discharge, 1.4 second-feet.

April 10: Width, 3.0 feet; area, 1.5 square feet; mean velocity, 0.99 foot per second; discharge, 1.3 second-feet.

May 2: Width, 3.0 feet; area, 1.4 square feet; mean velocity, 1.0 foot per second; discharge, 1.4 second-feet.

Edson Foulks ditch.—This ditch is in Shasta Valley. A measurement was made at head of ditch September 3, 1905, by L. G. Applegate.

Width, 6.3 feet; area, 6.3 square feet; mean velocity, 1.75 feet per second; discharge, 11 second-feet.

Four Mile Creek, Pelican Bay, Oregon.—Four Mile Creek is tributary to Upper Klamath Lake from the west. Its source is in Four Mile Lake. A measurement was made May 24 by C. T. Darley at road crossing between Klamath Falls and Pelican Bay.

Width, 50.5 feet; area, 75 square feet; mean velocity, 0.70 foot per second; discharge, 53 second-feet.

Grass Valley Creek near Lowden, Cal.—Grass Valley Creek is tributary to Trinity River. A measurement was made of this stream August 26, 1905, by W. B. Clapp at lower wagon bridge on Buckhorn road 2½ miles above junction of creek with Trinity River.

Width, 19 feet; area, 18.7 square feet; mean velocity, 0.98 foot per second; discharge, 18.4 second-feet.

Griffith canal near Olene, Oreg.—This canal diverts water from Lost River. The water is raised by means of a water wheel and used for irrigation of land in the vicinity of Olene. The following measurements were made during 1905 by C. T. Darley at head of canal:

June 2: Width, 2 feet; area, 1.4 square feet; mean velocity, 1.29 feet per second; discharge, 1.8 second-feet.

June 13: Width, 2 feet; area, 1.5 square feet; mean velocity, 1.27 feet per second; discharge, 1.9 second-feet.

June 25: Width, 2 feet; area, 1.16 square feet; mean velocity, 1.08 feet per second; discharge, 1.3 second-feet.

Hot Springs Creek near Klamath Falls, Oreg.—Hot Springs Creek rises about one-half mile east of Klamath Falls and discharges into Lower Klamath Lake. A measurement was made on August 18 by C. T. Darley near point where creek crosses county road east of Klamath Falls, Oreg.

Width, 1.5 feet; area, 0.36 square foot; mean velocity, 0.94 foot per second; discharge, 4.4 second-feet.

Horton ditch at Poe Valley, Oreg.—This ditch diverts water from Lost River, which is used for irrigation on the south side of the river. A measurement was made on June 23 by C. T. Darley at a point one-fourth of a mile below head of ditch.

Width, 7.5 feet; area, 7.4 square feet; mean velocity, 0.59 foot per second; discharge, 4.4 second-feet.

Little Shasta River at Little Shasta, Cal.—A measurement of this stream was made August 29, 1905, by M. D. Williams.

Width, 9 feet; area, 5.4 square feet; mean velocity, 0.70 foot per second; discharge, 3.8 second-feet.

Little Shasta Springs at Little Shasta, Cal.—A measurement was made August 29, 1905, by M. D. Williams.

Width, 9 feet; area, 5.6 square feet; mean velocity, 3.57 feet per second; discharge, 20 second-feet.

Long Creek, Oreg.—Long Creek is tributary to Sycan Marsh. During 1905 discharge measurements were made by Ivan Landes as follows:

March 15: Width, 22 feet; area, 21.8 square feet; mean velocity, 1.54 feet per second; discharge, 33.6 second-feet.

April 10: Width, 25 feet; area, 36.9 square feet; mean velocity, 1.48 feet per second; discharge, 54.6 second-feet.

May 1: Width, 26 feet; area, 46.8 square feet; mean velocity, 1.45 feet per second; discharge, 68.1 second-feet.

June 12: Width, 25 feet; area, 37.6 square feet; mean velocity, 1.56 feet per second; discharge, 58.6 second-feet.

July 31: Width, 20 feet; area, 10.8 square feet; mean velocity, 1.72 feet per second; discharge, 18.6 second-feet.

Moss Creek near Pelican Bay, Oregon.—Moss Creek is tributary to Upper Klamath Lake from the west. A measurement was made on May 23 by C. T. Darley at road crossing between Pelican Bay and Klamath Falls, Oreg.

Width, 5.5 feet; area, 3.3 square feet; mean velocity, 0.76 foot per second; discharge, 2.5 second-feet.

McCormick mill-race canal near Keno, Oreg.—This canal diverts water from Klamath River about 1 mile below Keno, Oreg. This water is used for power purposes in running a

sawmill. The following measurements were made during 1905 by C. T. Darley at a point one-fourth of a mile below head of canal:

June 19: Width, 17 feet; area, 43 square feet; mean velocity, 1.51 feet per second; discharge, 64 second-feet.

August 31: Width, 14.5 feet; area, 25 square feet; mean velocity, 2.12 feet per second; discharge, 53 second-feet.

Moore's power canal near Klamath Falls, Oreg.—This canal diverts water from the head of Link River and is used for power purposes in running a sawmill. The following measurement was made by C. T. Darley at a point one-half mile below head of canal:

March 25: Width, 9.9 feet; area, 34 square feet; mean velocity, 3.03 feet per second; discharge, 103 second-feet.

At a point 200 feet above Penstock the following measurements were made:

March 25: Width, 9 feet; area, 35 square feet; mean velocity, 2.14 feet per second; discharge, 75 second-feet.

June 21: Width, 9.5 feet; area, 34 square feet; mean velocity, 1.74 feet per second; discharge, 59 second-feet.

June 21: Width, 9.5 feet; area, 34 square feet; mean velocity, 1.56 feet per second; discharge, 53 second-feet.

Moore's irrigation canal near Klamath Falls, Oreg.—This canal diverts water from the head of Link River at same point at which water is diverted for Moore's mill-race canal on the west bank. This water is used for power purposes in running sawmill and the irrigation of town lots in the west addition of Klamath Falls, Oreg. The following measurements were made during 1905 by C. T. Darley at a point 300 feet below head of canal. These measurements show total amount of water used for power and irrigation purposes in this canal.

March 25: Width, 10 feet; area, 15.8 square feet; mean velocity, 0.82 foot per second; discharge, 12.9 second-feet.

June 21: Width, 12.4 feet; area, 10.1 square feet; mean velocity, 1.08 feet per second; discharge, 10.9 second-feet.

Phillip's wheel canal near Spring Lake, Oregon.—This canal diverts water from Lost River about 9 miles above Merrill, Oreg. The water is raised from the river by means of a water wheel and is used for irrigation purposes. The following measurements were made during 1905 by C. T. Darley at a point in flume 100 feet below point of diversion.

June 13: Width, 3 feet; area, 1.2 square feet; mean velocity, 1.00 foot per second; discharge, 1.2 second-feet.

July 25: Width, 1.2 feet; area, 0.1 square foot; discharge, 0.2 second-foot.

Rock Creek near Aspin Lake, Oregon.—This portion of Rock Creek is tributary to Upper Klamath Lake and has its source in Aspin Lake. A measurement was made on May 23 by C. T. Darley at bridge on wagon road between Klamath Falls and Pelican Bay.

Width, 23.5 feet; area, 16.9 square feet; mean velocity, 0.57 foot per second; discharge, 9.6 second-feet.

Rock Creek at Crystal, Oreg.—This stream is tributary to Crystal Creek and is a separate stream from the Rock Creek which discharges from Aspin Lake. A measurement was made on May 24 by C. T. Darley at bridge on wagon road between Klamath Falls and Pelican Bay.

Width, 19 feet; area, 8.9 square feet; mean velocity, 0.66 foot per second; discharge, 5.9 second-feet.

Scott River near Fort Jones, Cal.—Scott River is tributary to Klamath River. A measurement of this stream was made August 29, 1905, by W. B. Clapp 500 feet above wagon bridge on main road from Fort Jones to Etna, about 1 mile west from Fort Jones.

Width, 27 feet; area, 23 square feet; mean velocity, 1.17 feet per second; discharge, 27 second-feet.

Seven Mile Creek near Fort Klamath, Oreg.—This creek is tributary to Upper Klamath Lake from the north. A measurement was made on May 25 by C. T. Darley at bridge on wagon road between Fort Klamath and Pelican Bay.

Width, 33 feet; area, 129 square feet; mean velocity, 0.79 foot per second; discharge, 102 second-feet.

Shasta River near Yreka, Cal.—Shasta River is tributary to Klamath River. A measurement of this stream was made August 29, 1905, by W. B. Clapp 5 miles northeast of Yreka and 500 feet below diversion dam of the Yreka Light and Power Company.

Width, 11.5 feet; area, 8.2 square feet; mean velocity, 1.22 feet per second; discharge, 10 second-feet.

There was on this date 107 second-feet being diverted into canal 500 feet above this point, giving a total discharge of 117 second-feet for this stream.

Sheepy Creek near Brownell, Cal.—This creek is tributary to Lower Klamath Lake from the southwest. The following measurements were made during 1905 by C. T. Darley at a point 2 miles east of Doris ranch, at wagon bridge near rock ford:

May 18: Width, 78 feet; area, 226 square feet; mean velocity, 0.12 foot per second; discharge, 27 second-feet.

June 18: Width, 80 feet; area, 218 square feet; mean velocity, 0.12 foot per second; discharge, 27 second-feet.

Sprague River near Yainax, Oreg.—Sprague River is tributary to Williamson River. A measurement was made on February 22 by C. T. Darley at bridge 5 miles below Yainax Agency. The gage is a 2 by 8 inch plank graduated to feet and tenths and nailed in a vertical position on the downstream side of the second bent from the south end of the bridge. The bench mark is a 2 by 4 inch stake driven flush with the ground on left bank of the stream in line with upstream side of the bridge and distant 74 feet from end of bridge. The zero of the gage is 21.9 feet below the bench mark.

Width, 133.2 feet; area, 1,077 square feet; mean velocity, 0.55 foot per second; discharge, 589 second-feet; gage height, 14.10 feet.

Spring Creek near Fort Klamath, Oreg.—This creek is tributary to Williamson River from the west. A measurement was made on August 13 by J. B. Lippincott and W. B. Clapp at a point 200 feet above its junction with Williamson River.

Width, 110 feet; area, 195 square feet; mean velocity, 1.86 feet per second; discharge, 362 second-feet.

Swingle flume canal near Lorella, Oreg.—This canal diverts water from Miller Creek above Lorella Bridge. The water is used for irrigation purposes in the vicinity of Lorella. A measurement was made on June 2 by C. T. Darley in small flume at road crossing on Langell Valley and Lorella road.

Width, 2 feet; area, 1.0 square foot; mean velocity, 0.20 foot per second; discharge, 0.2 second-foot.

Three Mile Creek near Fort Klamath, Oreg.—This creek is tributary to Upper Klamath Lake from the northwest. A measurement was made on May 25 by C. T. Darley at crossing of wagon road between Fort Klamath and Pelican Bay.

Width, 13.2 feet; area, 6.2 square feet; mean velocity, 1.00 foot per second; discharge, 6.2 second-feet.

Trinity River near Lowden, Cal.—Trinity River is tributary to Klamath River. A measurement of this stream was made August 26, 1905, by W. B. Clapp from a temporary pontoon bridge 1 mile above Lowden's ranch post-office and 3 miles below Lewiston, Cal. A permanent county highway bridge was being constructed at this point.

Width, 190 feet; area, 468 square feet; mean velocity, 0.50 foot per second; discharge, 233 second-feet.

Varney Creek near Pelican Bay, Oregon.—Varney Creek is tributary to Four Mile Creek. A measurement was made May 24 by C. T. Darley at road crossing between Pelican Bay and Klamath Falls.

Width, 9 feet; area, 13 square feet; mean velocity, 0.70 foot per second; discharge, 9.1 second-feet.

Van Brimmer ditch, south branch, station No. 1, near Merrill, Oreg.—This canal diverts water from White Lake, an arm of Lower Klamath Lake. For the first mile this canal is

common with the Adams canal. This water is used for irrigation in the vicinity of Merrill, Oreg. The following measurements were made on this branch by C. T. Darley during 1905 at point 1 mile below the head of canal and at a point 300 feet below where Adams and Van Brimmer canals become separate and distinct. The gage rod is a 1 by 4 inch inclined timber graduated to feet and hundredths and nailed to posts set firmly in the bank of the canal. There is no bench mark.

May 14: Width, 20 feet; area, 23 square feet; mean velocity, 1.04 feet per second; gage, 4.01 feet; discharge, 24 second-feet.

May 21: Width, 18 feet; area, 17.2 square feet; mean velocity, 1.22 feet per second; gage, 3.78 feet; discharge, 21 second-feet.

June 14: Width, 18.6 feet; area, 16 square feet; mean velocity, 1.28 feet per second; gage, 3.92 feet; discharge, 20 second-feet.

July 22: Width, 18.3 feet; area, 13.9 square feet; mean velocity, 0.83 foot per second; gage, 3.84 feet; discharge, 11.5 second-feet.

August 24: Width, 17.5 feet; area, 10.4 square feet; mean velocity, 0.72 foot per second; gage, 3.72 feet; discharge, 7.5 second-feet.

August 24: Width, 18.2 feet; area, 12.3 square feet; mean velocity, 0.80 foot per second; gage, 3.85 feet; discharge, 9.9 second-feet.

August 25: Width, 19.8 feet; area, 17.9 square feet; mean velocity, 0.91 foot per second; gage, 4.12 feet; discharge, 16.3 second-feet.

August 25: Width, 16.5 feet; area, 5.3 square feet; mean velocity, 0.49 foot per second; gage, 3.40 feet; discharge, 2.6 second-feet.

August 25: Width, 17.0 feet; area, 6.9 square feet; mean velocity, 0.62 foot per second; gage, 3.55 feet; discharge, 4.3 second-feet.

Van Brimmer ditch, north branch, station No. 2, near Merrill, Oreg.—This canal diverts water from White Lake, an arm of Lower Klamath Lake. For the first mile this canal is common with the Adams canal. The following measurements were made of this branch during 1905 by C. T. Darley at a point 1 mile below heading and 300 feet below where Adams and Van Brimmer canals become separate and distinct. The gage is a 1 by 4 inch timber graduated to tenths and half tenths. It is set firmly to posts driven in the ground on the right bank. There is no bench mark.

May 14: Width, 13.8 feet; area, 8 square feet; mean velocity, 0.75 foot per second; gage, 1.95 feet; discharge, 6 second-feet.

May 21: Width, 14.3 feet; area, 7.5 square feet; mean velocity, 0.83 foot per second; gage, 1.99 feet; discharge, 6.2 second-feet.

June 15: Width, 15.4 feet; area, 7.4 square feet; mean velocity, 1.03 feet per second; gage, 2.21 feet; discharge, 7.6 second-feet.

July 24: Width, 16.5 feet; area, 10.4 square feet; mean velocity, 0.93 foot per second; gage, 2.34 feet; discharge 9.7 second-feet.

July 24: Width, 16.5 feet; area, 10.2 square feet; mean velocity, 0.93 foot per second; gage, 2.34 feet; discharge, 9.5 second-feet.

August 24: Width, 15.5 feet; area, 5.6 square feet; mean velocity, 0.79 foot per second; gage, 2.20 feet; discharge, 4.6 second-feet.

Willow Creek near Brownell, Cal.—Willow Creek is tributary to Lower Klamath Lake from the south. The following measurements were made during 1905 at bridge on Merrill and Brownell road by C. T. Darley:

May 20: Width, 20 feet; area, 17.2 square feet; mean velocity, 0.72 foot per second; discharge, 12.5 second-feet.

June 15 Width, 35.5 feet; area, 24 square feet; mean velocity, 0.48 foot per second; discharge, 11.5 second-feet.

August 30: Width, 18 feet; area, 13.9 square feet; mean velocity, 0.70 foot per second; discharge, 9.7 second-feet.

November 23: Width, 10 feet; area, 12.6 square feet; mean velocity, 0.87 foot per second; discharge, 11 second-feet.

Williamson River near Klamath Agency, Oreg.—This stream is tributary to Upper Klamath Lake from the north. The following measurements were made during 1905 at bridge on county road between Klamath Falls and Fort Klamath, Oreg.:

May 27: Width, 175.8 feet; area, 1,532 square feet; mean velocity, 0.89 foot per second; discharge, 1,371 second-feet.

August 22: Width, 176 feet; area, 1,479 square feet; mean velocity, 0.58 foot per second; discharge, 858 second-feet.

At Chillaquin Bridge on road between Klamath Agency and Yainax Agency, November 14: Width, 40 feet; area, 230 square feet; mean velocity, 2.72 feet per second; discharge, 625 second-feet.

Wood River near Fort Klamath, Oreg.—Wood River is tributary to Upper Klamath Lake from the north. The following measurements were made during 1905 by C. T. Darley at bridge on county road, 4 miles below Fort Klamath, Oreg.:

May 27: Width, 52.3 feet; area, 297 square feet; mean velocity, 1.54 feet per second; discharge, 458 second-feet.

At bridge one-fourth mile below Fort Klamath, Oreg.:

August 22: Width, 47.6 feet; area, 166 square feet; mean velocity, 1.60 feet per second; discharge, 266 second-feet.

November 14: Width, 49 feet; area, 162 square feet; mean velocity, 1.59 feet per second; discharge, 259 second-feet.

December 10: Width, 49 feet; area, 162 square feet; mean velocity, 1.69 feet per second; discharge, 274 second-feet.

Yreka Light and Power Company's canal near Yreka, Cal.—A measurement of this canal was made August 29, 1905, by W. B. Clapp from footbridge at house 500 feet below concrete diversion dam at head of canal and distant about 5 miles northeast from Yreka. This canal diverts water from Shasta River.

Width, 17.5 feet; area, 36 square feet; mean velocity, 2.97 feet per second; discharge, 107 second-feet.

For total flow of Shasta River see measurement made same date below diversion dam.

ROGUE RIVER DRAINAGE BASIN.

ROGUE RIVER AT GOLD RAY, OREG.

This station was established August 30, 1905, by L. R. Allen. It is located at Gold Ray, Oreg., 1½ miles below Tolo post-office, just below the Condor Water and Power Company's dam and bridge, and a short distance below the mouth of Stewart Creek.

The channel is straight for 400 feet above and 300 feet below the station. The current at the measuring section is uniform. Both banks are high and rocky and are covered with a light growth of brush. The bed of the stream is rocky, somewhat broken in places, free from vegetation, and permanent. There is but one channel at all stages.

Discharge measurements are made by means of a cable, car, tagged wire, and stay line. The initial point is a tag on the tagged wire, 6.2 feet from the cable support on the left bank.

The gage is a vertical staff bolted to concrete pier of bridge about 300 feet above the cable. During 1905 the gage heights were furnished by the Condor Water and Power Company, observations being taken twice each day by C. E. Wertz. The bench mark is the top of the anchor bolt for stay line on the right bank. This bolt is well wedged in solid rock; elevation, 21.34 feet above the datum of the gage.

Discharge measurements of Rogue River at Gold Ray, Oreg., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
August 30	L. R. Allen	180	1,013	1.29	1.10	1,307
October 17	do	180	1,023	1.18	1.20	1,210
December 26	do	184	1,100	1.38	1.57	1,514

Daily gage height, in feet, of Rogue River at Gold Ray, Oreg., for 1905.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	1.1	1.2	1.2	1.32	17	1.2	1.25	1.22	1.32
2	1.1	1.17	1.2	1.3	18	1.1	1.25	1.3	1.4
3	1.1	1.15	1.2	1.3	19	1.1	1.25	1.3	1.45
4	1.15	1.15	1.2	1.27	20	1.05	1.25	1.5	1.47
5	1.15	1.17	1.2	1.45	21	1.05	1.25	1.3	1.4
6	1.12	1.3	1.2	1.32	22	1.1	1.25	1.25	1.35
7	1.1	1.45	1.2	1.35	23	1.1	1.2	1.25	1.17
8	1.1	1.6	1.2	1.35	24	1.1	1.2	1.22	1.25
9	1.1	1.35	1.2	1.3	25	1.15	1.2	1.2	1.32
10	1.6	1.25	1.2	1.3	26	1.15	1.37	1.2	1.6
11	1.1	1.2	1.2	1.2	27	1.17	1.35	1.3	1.82
12	1.15	1.2	1.2	1.2	28	1.3	1.3	1.3	1.65
13	1.15	1.2	1.2	1.2	29	1.2	1.35	1.4	1.5
14	1.15	1.17	1.2	1.3	30	1.2	1.3	1.3	1.6
15	1.1	1.2	1.2	1.3	31	.....	1.22	.....	1.52
16	1.1	1.22	1.2	1.32					

UMPQUA RIVER DRAINAGE BASIN.

SOUTH FORK OF UMPQUA RIVER NEAR BROCKWAY, OREG.

This station was established December 6, 1905, by L. R. Allen. It is located just below Winston's highway bridge, 3 miles east of Brockway, Oreg., and 3 miles below the mouth of Lookingglass Creek.

The channel is straight for 700 feet above and below the station. The current is uniform, somewhat broken by riffles at low water. Both banks are high, covered with brush, and not liable to overflow. The bed of the stream is of sand and gravel, free from vegetation, and shifting. There is but one channel at all stages.

Discharge measurements are made by means of a cable, car, tagged wire, and stay wire. The initial point for soundings is a tin tag on the top of the cable support at the right bank.

The gage is a staff in two sections. The lower section is inclined; the upper section is vertical. During 1905 the gage was read once each day by George Brosi. The bench mark is the top of square-headed iron bolt driven into the downstream end of sill of the bridge at the left bank; elevation, 23.31 feet above the datum of the gage.

Discharge measurements of South Fork of Umpqua River near Brockway, Oreg., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
December 28	L. R. Allen	302	1,616	1.85	4.16	2,998

Daily gage height, in feet, of South Fork of Umpqua River near Brockway, Oreg., for 1905.

Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.
1	.....	8	2.3	15	1.1	22	2.65	29	3.4
2	.....	9	2.1	16	1.05	23	2.2	30	4.35
3	.....	10	1.4	17	1.05	24	1.85	31	6.1
4	.....	11	1.4	18	1.1	25	1.1		
5	.....	12	1.35	19	1.45	26	2.65		
6	1.9	13	1.2	20	3.65	27	4.4		
7	1.9	14	1.15	21	3.3	28	4.1		

NORTH FORK OF UMPQUA RIVER NEAR OAKCREEK, OREG.

This station was established September 6, 1905, by L. R. Allen. It is located 3 miles west of Oakcreek, Oreg., 1¼ miles above J. R. Dixon's farmhouse, about 10 miles below the mouth of East Fork of North Fork of Umpqua River.

The channel is straight for a half mile above and below the station. The current is swift. The right bank is low, covered with brush, and liable to overflow during floods. The left bank is similar, but somewhat higher, and not as apt to overflow. The bed of the stream is of gravel and rock, somewhat broken, free from vegetation, and shifting during floods. There is but one channel at all stages. Measurements may be affected by uncertainties of soundings due to the irregularities of the bed of the stream.

Discharge measurements are made by means of a cable, car, tagged wire, and stay wire. The initial point for soundings is a tag on the tagged wire, 2 feet from the cable support on the right bank.

Two gage rods were installed—one at the place of measurement and the other about 1 mile below. The lower portion of both rods is inclined, and the upper portion is vertical. During 1905 the gage was read once each day by Ethel Dixon. The bench mark at the lower gage is on top of a ¾-inch bolt, driven into sand rock about 50 feet east and 50 feet south of the gage; elevation, 28.47 feet above the datum of the gage.

Discharge measurements of North Fork of Umpqua River near Oakcreek, Oreg., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
September 6	L. R. Allen	215	457	1.94	1.35	886
October 19	do	222	580	2.45	2.10	1,419
December 27	do	279	1,447	4.91	5.35	7,110

Daily gage height, in feet, of North Fork of Umpqua River near Oakcreek, Oreg., for 1905.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	1.6	1.6	2.6	17	1.3	2.0	1.45	2.6
2	.....	1.5	1.6	3.3	18	1.3	2.2	1.75	2.4
3	.....	1.4	1.55	3.35	19	1.35	2.1	1.9	2.6
4	.....	1.4	1.5	3.7	20	1.35	1.8	2.8	2.7
5	.....	1.4	1.5	3.3	21	1.35	1.65	2.2	3.1
6	1.35	1.8	1.45	3.1	22	1.35	1.7	1.95	2.8
7	1.35	2.3	1.45	3.35	23	1.35	1.65	1.8	2.5
8	1.35	2.85	1.45	3.9	24	1.3	1.6	1.75	2.4
9	1.3	2.1	1.45	3.1	25	1.35	1.75	1.65	2.35
10	1.35	1.75	1.4	3.75	26	1.4	2.75	1.8	6.25
11	1.3	1.65	1.4	2.6	27	1.5	2.3	2.7	5.35
12	1.3	1.55	1.4	2.55	28	1.65	2.0	2.2	4.35
13	1.3	1.5	1.4	2.5	29	1.6	1.8	2.2	3.6
14	1.3	1.45	1.4	2.4	30	1.5	1.7	2.7	4.5
15	1.3	1.65	1.4	2.35	31	.....	1.6	.....	4.3
16	1.3	2.5	1.35	2.3					

SILETZ RIVER DRAINAGE BASIN.

SILETZ RIVER AT SILETZ, OREG.

This station was established November 25, 1905, by L. R. Allen. It is located at Siletz, Oreg., about 1 mile above the ferry on the Siletz and Toledo stage road, 6 miles below the mouth of Rock Creek.

The channel is straight for about 1,000 feet above and 400 feet below the station. The current is swift and rough. Both banks are high and not liable to overflow. The right bank is covered with brush; the left bank is timbered. The bed of the stream is of coarse gravel and sand, free from vegetation, and shifting. There is but one channel at all stages.

Discharge measurements are made by means of a cable, car, tagged wire, and stay wire. The initial point for soundings is a tin tag on the tagged wire, about 4 feet from the lower end of the turn-buckle on the right bank.

The gage is in two sections on the right bank. The lower section is inclined; the upper is vertical. During 1905 the gage was read once each day by John Kentta. The bench mark is the top of the head of a bolt driven into a large alder tree on the right bank, about 100 feet above the cable; elevation, 18.48 feet above the datum of the gage.

Discharge measurements of Siletz River at Siletz, Oreg., in 1905.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
November 26	L. R. Allen	157	394	2.95	2.15	1,167

Daily gage height, in feet, of Siletz River at Siletz, Oreg., for 1905.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1	.....	3.75	9	.....	2.9	17	.....	7.8	25	.....	3.2
2	.....	4.2	10	.....	2.6	18	.....	6.0	26	2.1	7.5
3	.....	3.8	11	.....	2.5	19	.....	5.3	27	2.0	5.2
4	.....	3.3	12	.....	2.3	20	.....	5.6	28	2.0	4.3
5	.....	3.0	13	.....	2.2	21	.....	4.9	29	2.7	3.8
6	.....	3.7	14	.....	2.1	22	.....	4.0	30	3.2	4.3
7	.....	3.3	15	.....	2.0	23	.....	3.9	31	.....	5.7
8	.....	3.1	16	.....	2.2	24	.....	3.1			

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P.

CLASSIFICATION OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY.

[Water-Supply Paper No. 177.]

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 can be had on application.

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

1. A limited number are delivered to the Director of the Survey, from whom they can 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 can be had at practically cost.

4. Copies of all Government publications are furnished to the principal public libraries in the large cities thruout the United States, where they can 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, Water-Supply Papers Nos. 165, 166, 167, 168, 169, 170, and 171.
West of Mississippi River, Water-Supply Papers 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 City, 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.

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THE DIRECTOR,
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OCTOBER, 1906.

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