Quality of
Surface Waters of the United States

1960

Parts 9-14. Colorado River Basin to Pacific Slope Basins in Oregon and Lower Columbia River Basin

Prepared under the direction of S. K. LOVE, Chief, Quality of Water Branch

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PREFACE

This report was prepared by the Geological Survey in co-operation with the States of California, New Mexico, Oregon, Utah and Washington, U. S. Bureau of Reclamation and with other agen-cies by personnel of the Water Resources Division under the di-rection of L. B. Leopold, chief hydrologist, and S. K. Love, chief, Quality of Water Branch. The data were collected and pre-pared for publication under the supervision of the following dis-trict chemists:

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QUALITY OF SURFACE WATERS

OF THE UNITED STATES, 1960

PARTS 9-14

INTRODUCTION

The quality-of-water investigations of the United States Geo-logical Survey are concerned with chemical and physical charac-teristics of the surface and ground water supplies of the Nation. Most of the investigations carried on in cooperation with State and Federal agencies deal with the amounts of matter in solution and in suspension in streams.
The records of chemical analysis, suspended sediment, and temperature for surface waters given in this volume serve as a basis for determining the suitability of the waters examined for all uses. The discharge of a stream and (to a lesser extent) the chem-ical quality are related to variations in rainfall and other forms of precipitation. In general, lower concentrations of dissolved solids maybe expected during the periods of high flow than during periods of low flow. The concentration in some streams may change ma-terially with relatively small variations in flow, whereas for other streams the quality may remain relatively uniform throughout large ranges in discharge. The quantities of suspended sediment carried by streams are also related to discharge, and during floodperiods the sediment content in streams may vary over wide ranges.
In 1941, the Geological Survey began publishing annual rec-ords of chemical quality, suspended sediment, and water temper-ature. The records prior to 1948 were published each year in a single volume for the entire country, and in two volumes in 1948 and 1949. Beginning in 1950, the records were published in four volumes and beginning in 1959 in five volumes. The drainage ba-sins covered in the five volumes are shown in Figure 1. The data given in this volume were collected during the water year Octo-ber 1, 1959, to September 30, 1960. The records are arranged by drainage basins in downstream order according to the Geolog-ical Survey method of reporting streamflow. Stations on tributary streams are listed between stations on the main stem in the order in which those tributaries enter the main stem.

QUALITY OF SURFACE WATERS, 1960

Parts 3-4; WSP 1742
Parts 5-6; WSP 1743
Parts 7-8; WSP 1744

Figure 1. --Map of the conterminous United States show-ing basins covered by the five water-supply papers on quality of surface waters in 1960. The shaded portion represents the section of the country covered by this vol-
ume; the unshaded portion represents the section of the country covered by other water-supply papers.

A station number has been assigned as an added means of iden-tification for each stream location where regular measurements of water quantity or quality have been made. The numbers have been assigned to conform with the standard downstream order of listing gaging stations. The numbering system consists of two digits followed by a hyphen and a six digit number. The notation to the left of the hyphen identifies the Part or hydrologic region used by the Geological Survey for reporting hydrologic data. The number to the right of the hyphen represents the position of the location in the standard downstream order listing measuring sta-tions within each of the 14 parts. The assigned numbers are in numerical order but are not consecutive. They are so selected from the complete 6 digit number scale that intervening numbers will be available for future assignments to new locations. The identification number for each station in this report is printed to the left of the station name and contains only the essential digits. For example, the number is printed as 4-100 for a station whose complete identification number is 04-0100. 00.

COLLECTION AND EXAMINATION OF SAMPLES 3

Descriptive statements are given for each sampling station where chemical analyses, temperature measurements, or sediment determinations have been made. These statements include the lo-cation of the station, drainage area, periods of records available, extremes of dissolved solids, hardness, specific conductance, tem-perature, sediment loads, and other pertinent data. Records of discharge of the streams at or near the sampling station are in-cluded in most tables of analyses.
During the water year ending September 30, 1960, the Geo-logical Survey maintained 368 stations on 250 streams for the study of chemical and physical characteristics of surface water. Sam-ples were collected daily and monthly at 278 of these locations for chemical-quality studies. Samples were also collected less fre-quently at many other points. Water temperatures were measured daily at 163 stations. Not all analyses of samples of surface water collected during the year have been included. Single analyses of an incomplete nature generally have been omitted. Also, analyses made of the daily samples before compositing have not been re-ported. The specific conductance of almost all daily samples was determined, and as noted in the table headings this information is available for reference at the district offices listed under Division of Work, on page 26.
Quantities of suspended sediment are reported for 40 stations during the year ending September 30, 1960 . Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 15 of the stations.

COLLECTION AND EXAMINATION OF SAMPLES

Samples for analyses are usually collected at or near points
on streams where gaging stations are maintained by Surface Water Branch of U. S. Geological Survey for measurement of water dis-charge. The concentration of solutes and sediments at different locations in the stream-cross section may vary widely with dif-ferent rates of water discharge depending on the source of the ma-terial and the turbulence and mixing of the stream. In general, the distribution of sediment in a stream section is much more variable than the distribution of solutes. It is necessary to sample some streams at several verticals across the channel and especially for sediment, to uniformly traverse the depth of flow. These meas-urements require special sampling equipment to adequately inte-grate the vertical and lateral variability of the concentration in the section. These procedures yield a velocity-weighted mean con-

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centration for the section in contrast to the average concentration that existed without regard to the variable velocities of the indi-vidual fluid elements.
The near uniformly dispersed ions of the solute load move with the velocity of the transporting water. Accordingly, the mean section concentration of solutes determined from samples is a precise measure of the total solute load. The mean section con-centration obtained from suspended sediment samples is a less precise measure of the total sediment load, because the sediment samplers do not traverse the bottom 0.3 foot of the sampling ver-tical where the concentration of suspended sediment is greatest and because a significant part of the coarser particles in many streams move in essentially continuous contact with the bed and are not represented in the suspended sediment sample. Hence, the computed sediment loads presented in this report are usually less than the total sediment loads. For most streams the differ-ence between the computed and total sediment loads will be small, in the order of a few percent.

CHEMICAL QUALITY

The methods of collecting and compositing water samples for chemical analysis are described in a manual by Rainwater and Thatcher (1960, 301 p.). No single method of compositing sam-ples is applicable to all problems related to the study of water quality. Although generally holding to the principle of 10 day pe-riods or equivalent to three composite samples per month modi-fications are usually made on the basis of dissolved-solids content as indicated by measurements of conductivity of daily samples , supplemented by other information such as chloride content, river stage, weather conditions and other background information of the
stream.

TEMPERATURE

Daily water temperatures were measured at most of the sta-tions at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day for an individual sta-tion in order that the data would be relatively unaffected by diurnal variations in temperature. Most large, swiftly flowing streams probably have a small diurnal variation in water temperature, whereas sluggish or shallow streams may have a daily range of several degrees and may follow closely the changes in air temper-ature. The thermometers used for determining water temperature were accurate to plus or minus 0. 5°F.

COLLECTION AND EXAMINATION OF SAMPLES 5

At stations where thermographs are located, the records con-sist of maximum and minimum temperatures for each day, and the monthly averages of maximum daily and minimum daily temperatures.

SEDIMENT

In general, suspended-sediment samples were collected daily with U. S. depth-integrating cable-suspended samplers (U. S. Interagency, 1963, p. 56-77 and U. S. Interagency, 1952, p. 86-90) from a fixed sampling point at one vertical in the cross section. The US DH-48 hand sampler was used at many stations during periods of low flow. Depth-integrated samples were collected periodically at three or more verticals in the cross section to de-termine the cross-sectional distribution of the concentration of suspended sediment with respect to that at the daily sampling vertical. In streams where transverse distribution of sediment concentration ranges widely, samples were taken at two or more verticals to define more accurately the average concentration of the cross section. During periods of high or rapidly changing flow, samples were taken two or more times throughout the day at most sampling stations.
Sediment concentrations were determined by filtration-evap-oration method. At many stations the daily mean concentration for some days was obtained by plotting the velocity-weighted in-stantaneous concentrations on the gage-height chart. The plotted concentrations, adjusted, if necessary for cross-sectional distri-bution were connected or averaged by continuous curves to obtain a concentration graph. This graph represented the estimated ve-locity-weighted concentration at any time, and for most periods daily mean concentrations were determined from the graph. The days were divided into shorter intervals when the concentration and water discharge were changing rapidly. During some periods of minor variation in concentration, the average concentration of the samples was used as the daily mean concentration. During extended periods of relatively uniform concentration and flow, samples for a number of days were composited to obtain average concentrations and average daily loads for each period.
For some periods when no samples were collected, daily loads
of suspended sediment were estimated on the basis of water dis-charge, sediment concentrations observed immediately preceding and folio wing the periods, and suspended-sediment loads for other periods of similar discharge, the estimates were further guided by weather conditions and sediment discharge for other stations. In many instances where there were no observations for sev-eral days, the suspended-sediment loads for individual days are

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not estimated, because numerous factors influencing the quantities of transported sediment made it very difficult to make accurate estimates for individual days. However, estimated loads of sus-pended sediment for missing days in otherwise continuous period of sampling have been included in monthly and annual totals in order to provide a complete record. For some streams, samples were collected weekly, monthly, or less frequently, and only rates of sediment discharge at the time of sampling are shown.
In addition to the records of quantities of suspended sediment transported, records of the particle sizes of sediment are in-cluded. The particle sizes of the suspended sediment for many of the stations, and the particle sizes of the bed material for some of the stations were determined periodically.
The size of particles in stream sediments commonly range from colloidal clay (finer than 0. 001 mm) to coarse sand or gravel (coarser than 1.0 mm). The common methods of particle-size analyses cannot accommodate such a wide range in particle size. Hence, it was necessary to separate most samples into two parts, one coarser than 0. 062 mm and one finer than 0. 062 mm. The separations were made by sieve or by a tube containing a settling medium of water. The coarse fractions were classified by sieve separation or by the visual accumulation tube (U. S. Interagency, 1957). The fine fractions were classified by the pipet method (Kilmer and Alexander, 1949) or the bottom withdrawal tube meth-od (U. S. Interagency, 1943, p. 82-90).

EXPRESSION OF RESULTS

Quantities of water for analysis are most conveniently meas-ured in the laboratory by use of volumetric glassware. The an-alytical results thus obtained in this report are expressed in weights of solute in a given volume of water. To express the re-sults in parts of solute per million (ppm) of water the data must be converted. For most waters this conversion is made by as-suming that the liter of water sample weighs 1 kilogram; and thus milligrams per liter are equal to parts per million.
Equivalents per million are not reported, although the expres-sion of analyses in equivalents per million is sometimes pre-ferred. An equivalent per million (epm) is a unit chemical com-bining .weight of a constituent in a million unit weights of water. Chemical equivalence in equivalents per million can be obtained by (a) dividing the concentration in parts per million by the com-bining weight of that ion, or (b) multiplying the concentration (in ppm) by the reciprocal of the combining weights. The following table lists the reciprocals of the combining weights of cations and anions generally reported in water analyses.

EXPRESSION OF RESULTS 7

The conversion factors are computed from atomic weights based on carbon-12 (International Union of Pure and Applied Chemistry, 1961).

Conversion factors: Parts per million to equivalents per million

Ion

Aluminum (Al+3). .....
Arsenic (As +3) ....
Barium (Ba+2) ....
Beryllium (Be+2) ....
Bicarbonate (HCOg'1) Bromide (Br'1). ...... Cadmium (Cd+2) ...... Calcium (Ca+2) .... Carbonate (CO3 - 2) .... Chloride (Cr1) .... Chromium (Cr+6). .... Cobalt (Co+2)......... Copper (Cu+2) .... Fluoride (F'1). .... Hydrogen (H+1) ....

Multiply
by

0.11119
. 04004
.01456
.22192
.01639
.01251
.01779
.04990
.03333
.02821
. 11539
.03394
.03148
.05264
. 99209

Ion

Hydroxide (OH-1) . . .
Iodide (I"1).........
Iron (Fe+3). ....
Lead (Pb+2) ....
Lithium (Li+1)......
Magnesium (Mg+2) . .
Manganese (Mn+2) . .
Nickel (Ni+2) ....
Nitrate (NO3 -*) .....
Phosphate (PO4 "3) . .
Potassium (K+1) ....
Sodium (Na+1) ......
Strontium (Sr+2) ....
Sulfate (SO4 -2) .....
Zinc (Zn+2) ....

Multiply
by

0.05880
.00788
.05372
.00965
. 14411
.08226
.03640
.03406
.01613
.03159
.02557
.04350
. 02283
.02082
.03060

Results given in parts per million can be converted to grains per United States gallon by dividing by 17. 12.
The hardness of water is conventionally expressed in all wa-ter analyses in terms of an equivalent quantity of calcium car-bonate. Such a procedure is required because hardness is caused by several different cations, present in variable proportions. It should be remembered that hardness is an expression in conven-tional terms of a property of water. The actual presence of cal-cium carbonate in the concentration given is not to be assumed. The hardness caused by calcium and magnesium (and other cations if significant) equivalent to the carbonate and bicarbonate is called carbonate hardness; the hardness in excess of this quantity is called noncarbonate hardness. Hardness or alkalinity values ex-pressed in parts per million as calcium carbonate may be con-verted to equivalents per million bv dividing by 50.
The value usually reported as dissolved solids is the residue
on evaporation after drying at 180°C for 1 hour. For some waters , particularly those containing moderately large quantities of soluble salts, the value reported is -calculated from the quantities of the various determined constituents using the carbonate equivalent of the reported bicarbonate. The calculated sum of the constituents may be given instead of or in addition to the residue. In the

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analyses of most waters used for irrigation, the quantity of dis-solved solids is given in tons per acre-foot as well as in parts per million.
Specific conductance is given for most analyses and was de-termined by means of a conductance bridge and using a standard potassium chloride solution as reference. Specific conductance values are expressed in micromhos per centimeter at 25°C. Spe-cific conductance in micromhos is 1 million times the reciprocal of specific resistance at 25°C. Specific resistance is the resist-ance in ohms of a column of water 1 centimeter long and 1 square centimeter in cross section.

The discharge of the streams is reported in cubic feet per second (see Streamflow, p. 24) and the temperature in degrees Fahrenheit. Color is expressed in units of the platinum-cobalt scale proposed by Hazen (1892, p. 427-428). A unit of color is produced by one milligram per liter of platinum in the form of the chloroplatinate ion. Hydrogen-ion concentration is expressed in terms of pH units. By definition the pH value of a solution is the negative logarithm of the concentration of gram ions of hydrogen. However, the pH meter that is generally used in Survey labora-tories determines the activity of the hydrogen ions as distinguished from concentration.

An average of analyses for the water year is given for most daily sampling stations. Most of these averages are arithmetical, time-weighted, or discharge-weighted; when analyses during a year are all on 10-day composites of daily samples with no miss-ing days, the arithmetical and time-weighted averages are equiv-alent. A time-weighted average represents the composition of water that would be contained in a vessel or reservoir that had

received equal quantities of water from the river each day for the water year. A discharge-weighted aver age approximates the com-position of water that would be found in a reservoir containing all of the water passing a given station during the year after thorough mixing in the reservoir. A discharge-weighted average is com-puted by multiplying the discharge for the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the dis-charges. Discharge-weighted averages are usually lower than arithmetical averages for most streams because at times of high discharge the rivers generally have lower concentrations of dis-solved solids.
A program for computing these averages on an electronic digital computer was instituted in the 1962 water year. This pro-gram extended computations to include averages for pH values expressed in terms of hydrogen ion and averages for the concen-tration of individual constituents expressed in tons per day. Con-centrations in tons per day are computed the same as daily sedi-ment loads.

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The concentration of sediment in parts per million is com-puted as 1,000,000 times the ratio of the weight of sediment to the weight of water-sediment mixture. Daily sediment loads are ex-pressed in tons per day and except for subdivided days are usually obtained by multiplying daily mean sediment concentration in parts per million by the daily mean discharge, and the appropriate con-version factor, normally 0. 0027.
Particle-size analyses are expressed in percentages of ma-terial finer than indicated sizes in millimeters. The size classi-fication used in this report is that recommended by the American Geophysical Union subcommittee on Terminology (Lane and others, 1947, p. 937). Other data included as pertinent to the size anal-yses for many streams are the date of collection, the stream dis-charge, sediment concentration when sample was collected, and the method of analysis.

COMPOSITION OF SURFACE WATERS

All natural waters contain dissolved mineral matter. Water
in contact with soils or rock, even for only a few hours, will dis-solve some mineral matter. The quantity of dissolved mineral matter in a natural water depends primarily on the type of rocks or soils with which the water has been in contact and the length of time of contact. Some streams are fed by both surface runoff and ground water from spring or seeps. Such streams reflect the chemical character of their concentrated underground sources dur-ing dry periods and are more dilute during periods of heavy rain-fall. Ground water is generally more highly mineralized than sur-face runoff because it remains in contact with the rocks and soils for much longer periods. The dissolved-solids content in a river is frequently increased by drainage from mines or oil fields, by the addition of industrial or municipal wastes, or--in irrigated regions--by drainage from irrigated lands.
The mineral constituents and physical properties of natural waters reported in the tables of analyses include those that have a practical bearing on the value, of the waters for most purposes. The analyses generally include results for silica, iron, calcium, magnesium, sodium, potassium (or sodium and potassium together calculated as sodium), alkalinity as carbonate and bicarbonate, sulfate, chloride, fluoride, nitrate, boron, pH, dissolved solids and specific conductance. Aluminum, manganese, color, acidity, oxygen consumed, and other dissolved constituents and physical properties are reported for certain streams. Phenolic material and minor elements including strontium, chromium, nickel, cop-per, lead, zinc, cobalt, arsenic, cadmium, and others are occa-sionally determined for a few streams in connection with specific

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problems in local areas and the results are reported when appro-priate.. The source and significance of the different constituents and properties of natural waters are discussed in the following paragraphs. The constituents are arranged in the order that they appear on standard analytical statement cards which are used to process the chemical quality data in this report.

MINERAL CONSTITUENTS IN SOLUTION

Silica (SiO2)

Silica is dissolved from practically all rocks. Some natural surface waters contain less than 5 parts per million of silica and few contain more than 50 parts, but the more common range is from 10 to 30 parts per million. Silica affects the usefulness of a water because it contributes to the formation of boiler scale; it usually is removed from feed water for high-pressure boilers. Silica also forms troublesome deposits on the blades of steam tur-bines.

Aluminum (Al)

Aluminum is usually present only in negligible quantities in natural waters except in areas where the waters have been in con-tact with the more soluble rocks of high aluminum content such as bauxite and certain shales. Acid waters of ten contain large amounts of aluminum. It maybe troublesome in feed waters where it tends to be deposited as a scale on boiler tubes.

Iron (Fe)

Iron is dissolved from many rocks and soils. On exposure to the air, normal basic waters that contain more than 1 part per million of iron soon become turbid with the insoluble reddish ferric oxide produced by oxidation. Surface waters, therefore, seldom contain as much as 1 part per million of dissolved iron, although some acid waters carry large quantities of iron in solution. Iron causes reddish-brown stains on white porcelain or enameled ware and fixtures and on fabrics washed in the water.

Manganese (Mn)

Manganese is dissolved in appreciable quantities from rocks in some sections of the country. It resembles iron in its chemical

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behavior and in its occurrence in natural waters. However, man-ganese in rocks is less 1 abundant than iron. As a result the con-centration of manganese is much less than that of iron and is not regularly determined in many areas. Waters impounded in large reservoirs may contain manganese that has been dissolved from the mud on the bottom of the reservoir by action of carbon dioxide produced by anaerobic fermentation of organic matter. It is es-pecially objectionable in water used in laundry work and in textile processing. Concentrations as low as 0. 2 part per million may cause a dark-brown or black stain on fabrics and porcelain fix-tures. Appreciable quantities of manganese are often found in waters containing objectionable quantities of iron.

Calcium (Ca)

Calcium is dissolved from almost all rocks and soils, but the highest concentrations are usually found in waters that have been in contact with limestone, dolomite, and gypsum. Calcium and magnesium make water hard and are largely responsible for the formation of boiler scale. Most waters associated with granite or s.iliciQus sands contain less than 10 parts per million of calcium; waters in areas where rocks are composed of dolomite and lime-stone contain from 30 to 100 parts per million; and waters that have come in contact with deposits of gypsum may contain several hundred parts per million.

Magnesium (Mg)

Magnesium is dissolved from many rocks, particularly from dolomitic rocks. Its effect in water is similar to that of calcium. The magnesium in soft waters may amount to only 1 or 2 parts per million, but water in areas that contain large quantities of dolomite or other magnesium-bearing rocks may contain from 20 to 100 parts per million or more of magnesium.

Strontium (Sr)

Strontium is a typical alkaline-earth element and is similar chemically to calcium. Strontium may be present in natural Water in amounts up to a few parts per million much more frequently than the available data indicate. In most surf ace water the amount of strontium is small in proportion to calcium. However, in sea water the i*atio of strontium to calcium is 1:30.

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Sodium and potassium (Na and K)

Sodium and potassium are dissolved from practically all rocks. Sodium is the predominant cation in some of the more highly min-eralized waters found in the western United States. Natural wa-ters that contain only 3 or 4 parts per million of the two together are likely to carry almost as much potassium as sodium. As the total quantity of these constituents increases, the proportion of sodium becomes much greater. Moderate quantities of sodium and potassium have little effect on the usefulness of the water for most purposes, but waters that carry more than 50 or 100 parts per million of the two may require careful operation of steam boilers to prevent foaming. More highly mineralized waters that contain a large proportion of sodium salts may be unsatisfactory for irrigation.

Lithium (Li)

Data concerning the quantity of lithium in water are scarce.
It is usually found in small amounts in thermal springs and saline waters. Lithium also occurs in streams where some industries

dump their waste water. The scarcity of lithium in rocks is re-sponsible more than other factors for relatively small amounts present in water.

Bicarbonate, carbonate and hydroxide (HCO3, CO3, OH)

Bicarbonate, carbonate, or hydroxide is sometimes reported as alkalinity. The alkalinity of a water is defined as its capacity to consume a strong acid to pH 4. 5. Since the major causes of alkalinity in most natural waters are carbonate and bicarbonate ions dissolved from carbonate rocks, the results are usually re-ported in terms of these constituents. Although alkalinity may suggest the presence of definite amounts of carbonate, bicarbonate or hydroxide, it may not be true due to other ions that contribute to alkalinity such as silicates, phosphates, borates, possibly fluo-ride, and certain organic anions which may occur in colored waters. The significance of alkalinity to the domestic, agricultural, and industrial user is usually dependent upon the nature of the cations (Ca, Mg, Na, K) associated with it. However, moderate amounts of alkalinity does not adversely affect most users.
Hydroxide may occur in water that has been softened by the lime process. Its presence in streams usually can be taken as an indication of contamination and does not represent the natural chemical character of the water.

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Sulfate (SO4)

Sulfate is dissolved from many rocks and soils in especially large quantities from gypsum and from beds of shale. It is formed also by the oxidation of sulfides of iron and is therefore present inconsiderable quantities in waters from mines. Sulfate in waters that contain much calcium and magnesium causes the formation of hard scale in steam boilers and may increase the cost of softening the water.

Chloride (Cl)

Chloride is dissolved from rock materials in all parts of the country. Surface waters in the humid regions are usually low in chloride, whereas streams in arid or semiarid regions may con-tain several hundred parts per million of chloride leached from soils and rocks, especially where the streams receive return drainage from irrigated lands or are affected by ground-water-in-flow carrying appreciable quantities of chloride. Large quantities of chloride may affect the industrial use of water by increasing the corrosiveness of waters that contain large quantities of cal-cium and magnesium.

Fluoride (F)

Fluoride has been reported as being present in some rocks to about the same extent as chloride. However, the quantity of fluo-ride in natural surface waters is ordinarily very small compared to that of chloride. Investigations have proved that fluoride con-centrations of about 0. 6 to 1.7 ppm reduced the incidence of den-tal caries and that concentrations greater than 1. 7 ppm also pro-tect the teeth from cavities but cause an undesirable black stain

(Durfor and Becker, 1964, p. 20). Public Health Service, 1962 (p. 8), states, "When fluoride is naturally present in drinking water, the concentration should not average more than the appro-priate upper control limit (0.6 to 1.7 ppm). Presence of fluoride in average concentration greater than two times the optimum val-ues shall constitute grounds for rejection of the supply." Concen-tration higher than the stated limits may cause mottled enamel in teeth, endemic cumulative fluorosis, and skeletal effects.

Nitrate (NO3)

Nitrate in water is considered a final oxidation product of ni-trogenous material and may indicate contamination by sewage or

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other organic matter. The quantities of nitrate present in surf ace waters are generally less than 5 parts per million (as NO3) and have no effect on the value of the water for ordinary uses.
It has been reported that as much as 2 parts per million of nitrate in boiler water tends to decrease intercrystalline cracking of boiler steel. Studies made in Illinois indicate that nitrates in excess of 70 parts per million (as NO3) may contribute to methe-moglobinemia ("blue babies") Faucett and Miller, 1946, p. 593), and more recent investigations conducted in Ohio show that drink-ing water containing nitrates in the range of 44 to 88 ppm (as NO3) may cause methemoglobinemia (Waring, 1949). In a report pub-lished by the National Research Council, Maxcy (1950> p. 271) concludes that a nitrate content in excess of 44 parts per million (as NO3) should be regarded as unsafe for infant feeding. U. S. Public Health Service (1962) sets 45 ppm as the upper limit.

Phosphate (PO4)

Phosphorus is an essential element in the growth of plants and animals, and some sources that contribute nitrate, such as or-ganic wastes and leaching of soils, may be important as sources for phosphate in water and its occurrence may add to the apparent alkalinity. The addition of phosphates in water treatment consti-tutes a possible source, although the dosage is usually small. In some areas, phosphate fertilizers may yield some phosphate to water. A more important source is the increasing use of phos-phates in detergents. Domestic and industrial sewage effluents may therefore contain considerable amounts of phosphate.

Boron (B)

Boron in small quantities has been found essential for plant growth, but irrigation water containing more than 1 part per mil-lion boron is detrimental to citrus and other boron-Sensitive crops . Boron is reported in Survey analyses of surface waters in arid and semiarid regions of the Southwest and West where irrigation is practiced or contemplated, but few of the surface waters analyzed have harmful concentrations of boron.

Dissolved solids

The reported quantity of dissolved solids--the residue on evap-oration--consists mainly of the dissolved mineral constituents in the water. It may also contain some organic matter and water of crystallization. Waters with less than 50Q parts per million of

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dissolved solids are usually satisfactory for domestic and some industrial uses. Water containing several thousand parts per mil-lion of dissolved solids are sometimes successfully used for irri-gation where practices permit the removal of soluble salts through the application of large volumes of water on well-drained lands, but generally water containing more than about 2,000 ppm is con-sidered to be unsuitable for long-term irrigation under average conditions.

Chromium (Cr)

Few if any waters contain chromium from natural sources. Natural waters can probably contain only traces of chromium as a cation unless the pH is very low. When chromium is present in water, it is usually the result of pollution by industrial wastes. Fairly high concentrations of chromate anions are possible in wa-ters having normal pH levels. Concentrations of more than 0. 05 ppm of chromium in the hexavalent form constitute grounds for rejection of a water for domestic use on the basis of the standards of the U. S. Public Health Service (1962).

Nickel and cobalt (Ni, Co)

Nickel and cobalt are very similar in chemical behavior and also closely related to iron. Both are present in igneous rocks in small amounts and are more prevalent in silicic rocks. Any nickel in water is likely to be in small amounts and could be in a colloidal state. Cobalt maybe taken into solution more readily than nickel. It may be taken into solution in small amounts through bacterio-logical activity similar to that causing solution of manganese. However, few data on the occurrence of either nickel or cobalt in natural water are available.

Copper (Cu)

Copper is a fairly common trace constituent of natural water. Small amounts maybe introduced into water by solution of copper and brass water pipes and other copper-bearing equipment in con-tact with the water, or from copper salts added to control algae in open reservoirs. Copper salts such as the sulfate and chloride are highly soluble in waters with a low pH but in water of normal alkalinity these salts hydrolyze and the copper may be precipi-tated. In the normal pH range of natural water containing carbon dioxide, the copper might be precipitated as carbonate. The oxi-dized portions of sulfide-copper ore bodies contain other copper compounds. The presence of copper in mine water is common.

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Copper imparts a disagreeable metallic taste to water. As little as 1. 5 ppm can usually be detected, and 5 ppm can render the water unpalatable. Copper is not considered to be a cumula-tive systemic poison like lead and mercury; most copper ingested is excreted by the body and very little is retained. The patholog-ical effects of copper are controversial, but it is generally be-lieved very unlikely that humans could unknowingly ingest toxic quantities from palatable drinking water. The U. S. Public Health Service (1962) recommends that copper should not exceed 1. 0 ppm in drinking and culinary water.

Lead (Pb)

Lead is only a minor element in most natural waters, but in-dustrial or mine and smelter effluents may contain relatively large amounts of lead. Many of the commonly used lead salts are water soluble.
Traces of lead in water usually are the result of solution of lead pipe through which the water has passed. Amounts of lead of the order of 0. 05 ppm are significant, as this concentration is the upper limit for drinking water in the standards adopted by the U. S. Public Health Service (1962). Higher concentrations may be added to water through industrial and mine-waste disposal. Lead in the form of sulfate is reported to be soluble in water to the ex-tent of 31 ppm (Seidell, 1940, p. 1409) at 25°C. In natural water this concentration would not be approached, however, since a pH of less than 4. 5 would probably be required to prevent formation of lead hydroxide and carbonate. It is reported (Pleissner, 1907) that at 18-°C water free of carbon dioxide will dissolve the equiv-alent of 1.4 ppm of lead and the solubility is increased nearly four fold by the presence of 2. 8 ppm of carbon dioxide in the solu-tion. Presence of other ions may increase the solubility of lead.

Zinc (Zn)

Zinc is abundant in rocks and ores but is only a minor con-stituent in natural water because the free metal and its oxides are only sparingly soluble. In most alkaline surf ace waters it is pres-ent only in trace quantities, but more may be present in acid water. Chlorides and sulfates of zinc are highly soluble. Zinc is used in many commercial products, and industrial wastes may contain large amounts.
Zinc in water does not cause serious effects on health, but produces undesirable esthetic effects. The U. S. Public Health Service (1962, p. 55) recommends that the zinc content not exceed 5 ppm in drinking and culinary water.

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Barium (Ba)

Barium may replace potassium in some of the igneous rock minerals, especially feldspar and barium sulfate (barite) is a com-mon barium mineral of secondary origin. Only traces of barium are present in surface water and sea water. Because natural water contains sulfate, barium will dissolve only in trace amounts. Barium sometimes occurs in brines from oil-well wastes.
The U. S. Public Health Service (1962) states that water con-taining concentrations of barium in excess of 1 ppmis not suitable for drinking and culinary use because of the serious toxic effects of barium on heart, blood vessels, and nerves.

Bromide (Br)

Bromine is a very minor element in the earth's crust and is normally present in surface waters in only minute quantities. Measurable amounts may be found in some streams that receive industrial wastes, and some natural brines may contain rather high concentrations. It resembles chloride in that it tends to be concentrated in sea water.

Iodide (I)

Iodide is considerably less abundant both in rocks and water thanbromine. Measurable amounts maybe found in some streams that receive industrial wastes, and some natural brines may con-tain rather high concentrations. It occurs in sea water to the ex-tent of less than 1 ppm. Rankama and Bahama (1950, p r 767) re-port iodide present in rainwater to the extent of 0. 001 to 0. 003 ppm and in river water in about the same amount. Few waters will contain over 2. 0 ppm.

PROPERTIES AND CHARACTERISTICS OF WATER

Hardness

Hardness is the characteristic of water that receives the most attention in industrial and domestic use. It is commonly recog-nized by the increased quantity of soap required to produce lather. The use of hard water is also objectionable because it contributes to the formation of scale in boilers, water heaters, radiators, and pipes, with the resultant decrease in rate of heat transfer, pos-sibility of boiler failure, and loss of flow.

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Hardness is caused almost entirely by compounds of calcium and magnesium. Other constituents--such as iron, manganese, aluminum, barium, strontium, and free acid--also cause hard-ness, although they usually are not present in quantities large enough to have any appreciable effect.
Generally, bicarbonate and carbonate determine the propor-tions of "carbonate" hardness of water. Carbonate hardness is the amount of hardness chemically equivalent to the amount of bicarbonate and carbonate in solution. Carbonate hardness is ap-proximately equal to the amount of hardness that is removed from water by boiling.
Noncarbonate hardness is the difference between the hardness calculated from the total amount of calcium and magnesium in so-lution and the carbonate hardness. If the carbonate hardness (ex-pressed as calcium carbonate) equal the amount of calcium and magnesium hardness (also expressed as calcium carbonate) there is no noncarbonate hardness. Noncarbonate hardness is about equal to the amount of hardness remaining after water is boiled. The scale formed at high temperatures by the evaporation of water containing noncarbonate hardness commonly is tough, heat re-sistant, and difficult to remove.
Although many people talk about soft water and hard water, there has been no firm line of demarcation. Water that seems hard to an easterner may seem soft to a westerner. In this re-port hardness of water is classified as follows:

Hardness range
(calcium carbonate
in ppm)
0-60
61-120
121-180
more than 180

Hardness description

Soft
Moderately hard
Hard
Very hard

For public use, water with hardness above 200 parts per million generally requires softening treatment (Durfor and Decker, 1964, p. 23-27).

Acidity (H+1)

The use of the terms acidity and alkalinity is widespread in
the literature of water analysis and is a cause of confusion to those who are more accustomed to seeing a pH of 7.0 used as a neutral point. Acidity of a natural water represents the content of free carbon dioxide and other uncombined gases, organic acids and salts of strong acids and weak bases that hydrolyze to give hydro-gen ions. Sulfates of iron and aluminum in mine and industrial

COMPOSITION OF SURFACE WATERS 19

wastes are common sources of acidity. The presence of acidity is reported in those waters which have a pH below 4. 5.

Sodium-adsorption-ratio (SAR)

The term "sodium-adsorption-ratio (SAR)" was introduced
by the U.S. Salinity Laboratory Staff (1954). It is a ratio express-ing the relative activity of sodium ions in exchange reaction with soil and is an index of the sodium or alkali hazard to the soil. Sodium-adsorption-ratio is expressed by the equation:

SAR= Na+

Ca+++Mg

where the concentrations of the ions are expressed in milliequiv-alents per liter (or equivalents per million for most irrigation waters).
Waters are divided into four classes with respect to sodium
or alkali hazard: low, medium, high, and very high, depending upon the SAR and the specific conductance. At a conductance of 100 micromhos per centimeter the dividing points are at SAR val-ues of 10, 18, and 26, but at 5,000 micromhos the corresponding dividing points are SAR values of approximately 2. 5, 6. 5, and 11. Waters range in respect to sodium hazard from those which can be used for irrigation on almost all soils to those which are gen-erally unsatisfactory for irrigation.

Specific conductance (micromhos per centimeter at 25°C)

Specif ic conductance is a convenient, rapid determination used
to estimate the amount of dissolved solids in water. It is a meas-ure of the ability of water to transmit a small electrical current (see p. 8). The more dissolved solids in water that can transmit electricity the greater the specif ic conductance of the water. Com-monly, the amount of dissolved solids (in parts per million) is about 65 percent of the specific conductance (in micromhos). This relation is not constant from stream to stream or from well to well and it may even vary in the same source with changes in the composition of the water (Durfor and Becker, 1964, p. 27-29). Specific conductance of most waters in the eastern United States is less than 1,000 micromhos, but in the arid western parts of the country, a specific conductance of more than 1,000 micro-mhos is common.

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Hydrogen-ion concentration (pH)

Hydrogen-ion concentration is expressed in terms of pH units (see p. 8). The values of pH often are used as a measure of the solvent power of water or as an indicator of the chemical behavior certain solutions may have toward rock minerals.
The degree of acidity or alkalinity of water, as indicated by the hydrogen-ion concentration, expressed as pH, is related to the corrosive properties of water and is useful in determining the proper treatment for coagulation that maybe necessary at water-treatment plants. A pH of 7. 0 indicates that the water is neither acid nor alkaline. pH readings progressively lower than 7. 0 de-note increasing acidity and those progressively higher than 7. 0 denote increasing alkalinity. The pH of most natural surface wa-ters ranges between 6 and 8. Some alkaline surface waters have pH values greater than 8.0, and waters containing free mineral acid or organic matter usually have pH values less than 4. 5. The investigator who utilizes pH data in his interpretations of water analyses should be careful to place pH values in their proper perspective.

Color

In water analysis the term "color" refers to the appearance
of water that is free from suspended solids. Many turbid waters that appear yellow, red, or brown when viewed in the stream show very little color after the suspended matter has been removed. The yellow-to-brown color of some waters is usually caused by organic matter extracted from leaves, roots, and other organic substances in the ground. In some areas objectionable color in water results from industrial wastes and sewage. Clear deep water may appear blue as the result of a scattering of sunlight by the water molecules. Water for domestic use and some industrial uses should be free from any perceptible color. A colorless than 15 units generally passes unnoticed (U. S. Public Health Service, 1962). Some swamp waters have natural color in excess of 300 units.

The extent to which a water is colored by material in solution
is commonly reported as a part of a water analysis because a sig-nificant color in water may indicate the presence of organic ma-terial that may have some bearing on the dissolved solids content. Color in water is expressed in terms of units between 0 and 500 or more based on the above standard (see p. 8).

COMPOSITION OF SURFACE WATERS 21

Oxygen consumed

Oxygen consumed is a measure of the amount of oxygen re-quired to oxidize unstable materials in water and may be corre-lated with natural-water color or with some carbonaceous organic pollution from sewage or industrial wastes.
Tolerances for oxygen consumed in feed water for low-and high-pressure boilers are 15 and 3 ppm, respectively (Northeast Water Works Association, 1940). Wash water containing more than 8 ppm has been reported to import a bad odor to textiles; concentrations for water used in beverages and brewing range from 0. 5 to 5. 0 ppm (California State Water Pollution Control Board, 1952, 1954).

Organics

Phenols. --Phenolic material in water resources is invariably the result of pollution. Phenols are widely used as disinfectants and in the synthesis of many organic compounds. Waste products from oil refineries, coke areas, and chemical plants may contain high concentrations. Fortunately, phenols decompose in the pres-ence of oxygen and organic material, and their persistence down-stream from point of entry is relatively short lived. The rate of decomposition is dependent on the environment.
Very low concentrations impart such a disagreeable taste to water that it is highly improbable that harmful amounts could be consumecLunknowingly. Reported thresholds of detection of taste and odor range from 0. 001 to 0. 01 ppm.
Detergents (ABS). --The chief surfactant in commercial de-tergents is anionic alkylbenzenesulfonate (ABS). ABS and other anionic surfactants resist chemical oxidation and biological break-down. Their persistence in water over long periods of time con-tributes to pollution of both ground water and surf ace water. Some of the effects produced from detergent pollution are unpleasant taste, odor, and foaming (Wyman, Robertson, and Page, 1962). Although the physiological implications of ABS to human beings is unknown, prolonged ingestion of this material by rats is believed to be nontoxic (Paynter, 1960). The U. S. Public Health Service (1962) recommends that ABS should not exceed 0. 5 ppm in drinking and culinary waters.

Temperature

Temperature is an important factor in property determining the quality of water. This is very evident for such a direct use

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as an industrial coolant. Temperature is also important, butper-haps not so evident, for its indirect influence upon aquatic biota, concentrations of dissolved gases, and distribution of chemical solutes in lakes and reservoirs as a consequence of thermal strati-fication and variation.
Surf ace water temperatures tend to change seasonally and daily with air temperatures, except for the outflow of large springs. Superimposed upon the annual temperature cycle is a daily fluctu-ation of temperature which is greater in warm seasons than in cold and greater in sunny periods than with a cloud cover. Natu-ral warming is due mainly to absorption of a solar radiation by the water and secondarily to transfer of heat from the air or from the bottom. Condensation of water vapor at the water surface is reported to furnish measurable quantities of heat. Heat loss takes place largely through radiation, with further losses through evap-oration and conduction to the air and bottom. Thus the temper-ature of a small stream generally reaches a maximum in mid-to late afternoon due to solar heating and reaches a minimum from early to mid-morning after nocturnal radiation.
Temperature variations which commonly occur during sum-mer in lakes and reservoirs of temperate regions results in a separation of the water volume into a circulating upper portion and a non-circulating lower portion. Separating the two is a stra-tum of water of variable vertical thickness in which the temperature decreases rapidly with increasing depth. This physical division of the water mass into a circulating and a stagnant portion is the result of density differences in the water column associated with the temperature distribution. Knowledge of the stratification in a body of water may result in increased utility by locating strata of more suitable characteristics. For example, the elevation of an intake pipe may be changed to obtain water of lower temperature, higher pH, less dissolved iron, or other desirable properties. Temperature is a major factor in determining the effect of pollution on aquatic organisms. The resistance of fish to certain toxin substances has been shown to vary widely with temperature. The quantity of dissolved oxygen which the water can contain is also temperature dependent. Oxygen is more soluble in cold wa-ter than in warm water, hence the reduction of oxygen concentra-tions by pollution is especially serious during periods of high temperature when oxygen levels are already low. Increased tem-peratures also accelerate biological activity including that of the oxygen-utilizing bacteria which decompose organic wastes. These pollutional effects may be especially serious when low flow con-ditions coincide with high temperatures. Summary temperature data of water are essential for planning multiple uses of water
resources.

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Turbidity

Turbidity is the optical property of a suspension with refer-ence to the extent to which the penetration of light is inhibited by the presence of insoluble material. Turbidity is a function on both the concentration and particle size of the suspended material. Al-though it is reported in terms of parts per million of silica, it is only partly synonymous with the weight of sediment per unit vol-ume of water.
Turbid water is abrasive in pipes, pumps, and turbine blades.
In process water, turbidities much more than 1 ppm are not tol-erated by several industries, but others permit up to 50 ppm higher (Rainwater, Thatcher, 1960, p. 289). Although turbidity does not directly measure the safety of drinking water, it is re-lated to the consumers acceptance of the water. A level of 5 units of turbidity becomes objectionable to a considerable number of people (U.S. Public Health, 1962).

SEDIMENT

Fluvial sediment is generally regarded as that sediment which
is transported by, suspended in, or deposited by water. Suspended sediment is that part of it which remains in suspension in water owing to the upward components of turbulent currents or by col-loidal suspension. Much fluvial sediment results from the natural process of erosion, which in turn is part of the geologic cycle of rock transformation. This natural process maybe accelerated by agricultural practices. Sediment is also contributed by a number of industrial and construction activities. In certain sections, waste materials from mining, logging, oil-field, and other industrial operations introduce large quantities of suspended as well as dis-solved material.
The quantity of sediment, transported or available for trans-portation, is affected by climatic conditions, form or nature of precipitation, character of the solid mantle, plant cover, topo-graphy, and land use. The mode and rate of sediment erosion, transport, and deposition is determined largely by the size dis-tribution of the particles or more precisely by the fall velocities of the particles in water. Sediment particles in the sandsize (larger than 0. 062 mm) range do not appear to be affected byfloc-culation or dispersion resulting from the mineral constituents in solution. In contrast, the sedimentation diameter of clay and silt particles in suspension may vary considerably from point to point in a stream or reservoir, depending on the mineral matter in so-lution and in suspension and the degree of turbulence present. The size of sediment particles in transport at any point depends on the type of erodible and soluble material in the drainage area, the

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degree of flocculation present, time in transport, and character-istics of the transporting flow. The flow characteristics include velocity of water, turbulence, and the depth, width, and roughness of the channel. As a result of these variable characteristics, the size of particles transported, as well as the total sediment load, is in constant adjustment with the characteristics and physical features of the stream and drainage area.

STREAMFLOW

Most of the records of stream discharge, used in conjunction with the chemical analyses and in the computation of sediment loads in this volume, are published in Geological Survey State re-ports on the surface-water supply of the United States. The dis-charge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges for the time at which samples were col-lected, computed from a stage-discharge relation or from a dis-charge measurement.

PUBLICATIONS

Reports giving records of chemical quality and temperatures of surface waters and suspended-sediment loads of streams in the area covered by this volume for the water years 1941-62, are listed below:

Numbers of water-supply papers containing records for
Parts 9-14, 1941-60

Year

1941
1942
1943
1944
1945
1946

WSP

942
950
970
1022
1030
1050

Year

1947
1948
1949
1950
1951
1952

WSP

1102
1133
1163
1189
1200
1253

Year

1953
1954
1955
1956
1957
1958

WSP

1293
1353
1403
1453
1523
1574

Year

1959
1960

WSP

1645
1745

Geological Survey reports containing chemical quality, tem-perature, and sediment data obtained before 1941 are listed below. Publications dealing largely with the quality of ground-water sup-plies and only incidentally covering the chemical composition of surface waters are not included. Publications that are out of print are preceded by an asterisk.

PUBLICATIONS 25

PROFESSIONAL PAPER

*135. Composition of river and lake waters of the United States, 1924.

BULLETINS

*479. The geochemical interpretation of water analyses, 1911.
770. The data of geochemistry, 1924.

WATER-SUPPLY PAPERS

*108. Quality of water in the Susquehanna River drainage basin, with an introductory chapter on physiographic features,
1904.

*161. Quality of water in the upper Ohio River basin and at Erie, Pa. , 1906.
*193. The quality of surface waters in Minnesota, 1907.
*236. The quality of surface waters in the United States, Part 1, Analyses of waters east of the one hundredth meridian,
1909.

*237. The quality of the surface waters of California, 1910. *239. The quality of the surface waters of Illinois, 1910.
*273. Quality of the water supplies of Kansas, with a prelimi-nary report on stream pollution by mine waters in south-eastern Kansas, 1911.
*274. Some stream waters of the western United States, with chapters on sediment carried by the Rio Grande and the industrial application of water analyses, 1911.
*339. Quality of the surface waters of Washington, 1914.
*363. Quality of the surface waters of Oregon, 1914.
*418. Mineral springs of Alaska, with a chapter on the chemical character of some surface waters of Alaska, 1917.
*596-B. Quality of water of Colorado River in 1925-26, 1928. *596-D. Quality of water of Pecos River in Texas, 1928. *596-E. Quality of the surface waters of New Jersey, 1928. *636-A. Quality of water of the Colorado River in 1926-28, 1930. *636-B. Suspended matter in the Colorado River in 1925-28, 1930. *638-D. Quality of water of the Colorado River in 1928-30, 1932. *839. Quality of water of the Rio Grande basin above Fort Quit-man, Tex. , 1938.
*889-E. Chemical character of surface water of Georgia, 1944. *998. Suspended sediment in the Colorado River, 1925-41, 1947. 1048. Discharge and sediment loads in the Boise River drainage basin, Idaho, 1939-40, 1948. 1110-C. Quality of water of Conchas Reservoir, New Mexico, 1939-49, 1952.

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Many of the reports listed are available for consultation in the larger public and institutional libraries. Copies of Geological Sur-vey publications still in print may be purchased at a nominal cost from the Superintendent of Documents, Government Printing Off ice, Washington, D. C. 20204, who will, upon request, furnish lists giving prices.

COOPERATION

Many municipal, State, and Federal agencies gave assistance
in collecting records for chemical-quality and sediment investiga-tions. The table on page 27 lists the State and local agencies that cooperated in water-quality investigations in the drainage basins included in this volume and the locations of the quality-of-water district offices responsible for the data collected.
The Bureau of Reclamation, United States Department of the Interior, continued financial assistance for the operation of some chemical-quality and sediment investigations in the Colorado River basin in Arizona, Colorado, New Mexico, Utah, and Wyoming, for chemical-quality investigations at Lake Mead and below Hoover Dam on the Colorado River, and for water-quality investigations in the Pacific slope basins in Oregon and lower Columbia River basin.
Assistance was also provided by the Metropolitan Water Dis-trict of Southern California at La Verne, Calif., in the analyses of samples for the chemical-quality program at Lake Mead.
In addition to the cooperative programs, many stations were operated from funds appropriated directly to the Geological Sur-vey. Chemical-quality and sediment load investigations in the Col-orado River basin in Arizona, Colorado, New Mexico, and Utah have been a continuing Federal project since 1925.

DIVISION OF WORK

The quality-of-water program was conducted by the Water Resources Division of the Geological Survey, L. B. Leopold, chief hydrologist, and S. K. Love, chief, Quality of Water Branch. The records were collected and prepared for publications under the supervision of district chemists as follows: In California, Eugene Brown; Colorado, Wyoming, Nevada, and Utah, J. G. Con-nor; Idaho, Montana, Oregon, and Washington, L. B. Laird; and in Arizona and New Mexico, J. M. Stow. Any additional informa-tion on file may be obtained by writing or visiting the responsible quality-of-water district office.

State Cooperating agency Drainage basin District office

California

New Mexico

Oregon

Utah

Washington

California Department of Water Re-sources, William Warne, director California Water Pollution Control Board, Paul R. Bonderson,
executive officer.

New Mexico Interstate Stream Com-

mission, S. E. Reynolds, secre-tary.

Oregon State Board of Higher Educa-tion, Dr. J. C. Richards, chan-
cellor.

University of Utah, College of Mines and Mineral Industries,
A. J. Eardley, dean.
Utah State Engineer, Wayne D.
Griddle.

Washington Department of Conser-vation and Development,
E. T. Coe, director.

The Great Basin

Pacific slope basins in
California.

Colorado River

Snake River
Pacific slope basins in
Oregon and lower
Columbia River.

Colorado River
The Great Basin

Pacific slope basins in
Washington and upper
Columbia River.

Room 8042 Federal Bldg.
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650 Capitol Avenue
Sacramento, Calif. 95814

Geology Bldg.
University of New Mexico
P. O. Box 4217

Albuquerque, N. Mex. 87106

P. O. Box 3202

830 N.E. Halladay
Portland, Oreg. 97208

8209 Federal Bldg.
125 S. State Street

Salt Lake City, Utah
84111

P. O. Box 3202

830 N.E. Halladay
Portland, Oreg. 97208

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State Cooperating agency Drainage basin District office

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CQ

Washington Washington State Pollution Control Commission, W. M. Burgerson,
director.

Pacific slope basins in
Washington and upper
Columbia River.

P. O. Box 3202

830 N. E. Halladay
Portland, Oreg. 97208

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CHEMICAL ANALYSES, WATER TEMPERATURES, AND SEDIMENT

PART 9. COLORADO RIVER BASIN

COLORADO RIVER MAIN STEM

9-345. COLORADO RIVER AT HOT SULPHUR SPRINGS, COLO.

LOCATION. At bridge at Hot Sulphur Springs, Grand County, 1 mile downstream from gaging station and 3.5 miles upstream from Beaver Creek. DRAINAGE AREA. 782 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: April 1947 to September 1960.
Water temperatures: April 1949 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 110 ppm July 1-31; minimum, 42 ppm Apr. 4.
Hardness: Maximum, 70 ppm July 1-31; minimum, 31 ppm Mar. 18-24, 30-31.
Specific conductance: Maximum daily, 176 micromhos July 21; minimum daily, 67 micromhos Mar. 21, 23.
Water temperatures: Maximum, 73°F Sept. 10; minimum, freezing point on many days during November to May.
EXTREMES, 1947-60.--Dissolved solids (1947-50, 1952-60): Maximum, 123 ppm July 16-31, 1955; minimum, 38 ppm June 21-30, 1947.
Hardness (1947-50, 1952-60): Maximum, 80 ppm Aug. 1-10, 1955; minimum, 20 ppm June 21-30, 1947.
Specific conductance: Maximum daily, 210 micromhos Apr. 13, 1958; minimum daily, 48 micromhos June 27, 1947.
Water temperatures (1949-60): Maximum, 75°F Aug. 8, 1957; minimum, freezing point on many days during winter months.
REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-31, 1959...

Dec. 1-31.........
Jan. 1-31, 1960...

Mar. 16-17, 25-29.
Mar. 18-24, 30-31.

Apr. 5-6, 8-21....

May 8-19..........

Mean

discharge
(cfs)

121
104
74.3
66.1
68.0

72.2
257
172
148
176

479
686
387
331
651

Silica

(S1Q,)

11
11
10
9.2
12

12
10
12

11

12
11
11

Iron

(Fe)

0.03
.02
.02
.01
.02

.00
.03
. 04

.03

. 03
. 02
.04

Cal-

cium

(Ca)

20
20
18
17
17

16
14
10
18
13

16
11
12
14
11

Mag-
ne-

sium

(Mg)

3.6
2.4
3.4
2.9
2.4

2.9
2.4
1.5
2.9
1.9

2.4
1.7
1.9
1.5
1.5

Sodium

(Na)

6.8
6.9
11
12
11

10
4.8
3.1
5.7
4.1

5.3
3.6
3.9
4.3
3.2

Po-
tas-

sium

(K)

1.9
1.9
1.6
1.6
1.6

1.4
2.7
.9
3.6
.9

2.4
.9
.9
1.0
1.0

Bi-
car-

bon-

ate

(HCO,)

82
77
81
78
79

71
58
37
74
52

66
40
48
54
42

bon-

ate

(CO,)

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

Sulfate

(S04)

11
11
8.8
8.8
8.4

8.6
6.2
4.3

6.4

5.6
7.2
5.1

Chloride

(Cl)

1.4
1.2
3.1
3.5
3.2

2.2
1.0
. 2

. 5

. 8
.8
.2

Fluo-
rlde

(F)

0.4
.4
.4
.4
.4

.4
.4
. 6

.3

. 3
.5
.5

Ni-
trate

(NO,)

0.3
.4
. 2
.4
.5

.3
1.0
. 7

. 7

. 6
.7
. 7

Bo-

ron

(B)

0.02
.02
. 05
.01
.02

.03

. 05

.04

.04
.04
.04

Dissolved solids

(residue at 180°C)

Parts

per
million

94
89
102
98
98

94
74
58
92
42

84
58
62
74
60

Tons

per
acre-

foot

0.13
. 12
. 14
. 13
. 13

. 13
. 10
. 08
. 13
.06

. 11
. 08
.08
. 10
.08

Tons

per

day

30.7
25.0
20.5
17.5
18.0

18.3
51.3
26.9
36.8
20.0

109
107
64.8
66.1
105

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

65
60
58
54
52

53
46
31
56
41

51
34
39
42
33

Non-
car-

bon-

ate

0
0
0
0
0

0
0
i
0
0

0

1
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
.6
. 7
. 7

.6
.3
. 2
. 3
. 3

.3
.3
.3
. 3
.2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

151
143
155
152
151

139
111
72
138
97

129
77
91
102
78

pH

7.4
7.4
7.5
7.5
7.5

6.8
6.9
7.1
6.4
6.7

6.7
6.9
6.8
7.5
7.5

COLORADO RIVER MAIN STEM Continued

9-705. COLORADO RIVER NEAR DOTSERO, COLO. Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Oct. 2, 1959.......

May 4..............

Sept . 29 ....

Time

(24 hour)

1520
1700
0930
1300
1300

1445
1145
1330
0845
1000

1215
1200
1515
1900
1515

1000
1400
1000
1530

Water
tem-

per-
ature

(°F)

50
50

1

Sam-

pling
point

Discharge
(cfs)

992
1290
1180
3210
3210

2710
2160
3770
5500
5540

7420
5290
5100
1450
1490

904
735
855
992

Sediment
concen-

tration

(ppm)

24
16
14
1080
1080

796
191
408
154
137

358
549
23
17
47

17
11
13
26

Sediment

discharge
(tons per day)

64
56
45
9360
9360

5820
1110
4150
2290
2050

7170
7840
317
67
189

41
22
30
70

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004

23
12

"

0.008 0.016

39
32

"

0.031 0.062

56
56

0.125

60
60

0.250

63
63

0.500

88
88

1.000

100
100

"

-

2.000

Method
of

analysis

VPWC
VPN

COLORADO RIVER MAIN STEM Continued

9-711. COLORADO RIVER NEAR GLENWOOD SPRINGS, COLO.

LOCATION. At Shoshone powerplant, 6 miles upstream from gaging station at Glenwood Springs, Garfield County, and 6.5 miles upstream from Roaring DRAINAGE AREA. 4,560 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1941 to September 1960.
Water temperatures; May 1949 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 504 ppm Nov. 28, 30; minimum, 164 ppm May 14-31.
Hardness: Maximum, 239 ppm Nov. 28, 30; minimum, 108 ppm May 14-31.
Specific conductance: Maximum daily, 889 micromhos Nov. 28; minimum daily, 246 micromhos June 7.
Water temperatures: Maximum, 66°F on several days during July to September; minimum, freezing point on many days during November to March. EXTREMES, 1941-60. Dissolved solids: Maximum, 2,030 ppm Aug. 10, 1947; minimum, 105 ppm June 1-10, 1942.
Hardness: Maximum, 1,480 ppm Aug. 10, 1947; minimum, 72 ppm June 1-20, 1942.
Specific conductance: Maximum daily, 2,260 micromhos Aug. 10, 1947; minimum daily, 153 micromhos May 24, 1948.
Water temperatures (1949-60): Maximum, 71°F July 31, 1954, Aug. 19, 1955; minimum, freezing point on many days during winter months. REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for gaging Glenwood Springs for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-31, 1959...

Dec. 2-20, 22-31..

Jan. 1-31, 1960...

Mar. 1-24. ....

July 1-17. ....

Mean

discharge
(cfs)

1,368
1,180
761
860
959

945
1,093
964
1,209
2,521

1,550
3,039
2,795
6,051
6,793

3,369
2.229

Silica

(SlQa)

9.5
9.9
9.2
10
10

10
8.4
8.1
10
11

12
11
11
10
8.0

7.8
7.9

Iron

(Fe)

0.01

.02
.01

.00

Cal-

cium

(Ca)

61
59
68
67
55

66
49
48
57
54

52
44
45
35
36

40
52

Mag-
ne-

sium

(Mg)

13
13
17
14
11

14
10
11
10
8.0

10
7.3
8.0
4.9
5.1

7.3
10

Sodium

(Na)

59
62
87
77
59

83
59
63
56
31

52
24
30
13
13

25
38

Po-
tas-

sium

(K)

2.1
2.1
2.1

2.1

2.1
2.1
3.0
5.2

3.1
.8
.5
. 1
.0

.3
.8

Bi-
car-

bon-

ate

(HCO,)

133
133
150
142
128

136
115
118
126
140

124
119
120
102
92

96
119

Car-
bon-

ate

(COJ

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

0
0

Sultate

(S04)

115
105
130
122
90

115
78
76
88
70

81
47
52
31
40

61
87

Chloride

(Cl)

76
84
125
105
83

120
86
92
82
40

72
30
40
16
17

33
49

Fluo-
ride

(F)

Ni-

trate

(NO,)

0.5
.4
.5
.4
.4

.4
.2
.2
.3
1.5

.5
.6
.5
.4
.8

.6
.5

Bo-

ron

(B)

0.06
.05
.05

. 10

.04
.07
.05
.06

.06
.07
.07
.06
.02

.03
.03

Dissolved solids
(residue at 180°C)

Farts

per
million

403
405
504
472
386

492
362
370
376
299

348
226
248
164
175

232
322

Tons

per
acre-

foot

0.55
.55
.69
.64
.52

.67
.49
.50
.51
.41

.47
.31
.34
.22
.24

.32
.44

Tons

per

day

1,490
1,290
1,040
1,100
999

1,260
1,070
963
1,230
2,040

1,460
1,850
1,870
2,680
3,210

2,110
1,940

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

206
199
239
224
183

220
166
164
184
168

172
139
145
108
110

131
171

Non-
car-

bon-

ate

97
90
116
108
78

108
72
67
81
53

70
41
47
24
35

52
73

So-

dium
ad-

sorp-
tion
ratio

1.8
1.9
2.4
2.2
1.9

2.4
2.0
2.1
1.8
1.0

1.7
.9
1.1
.5
.5

1.0
1.3

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

679
687
865
803
654

837
615
643
637
470

586
381
424
282
279

379
514

pH

7.7
7.7
8.1
7.7
7.6

7.5
7.6
7.6
7.8
7.8

7.6
7.6
7.8
7.7
7.6

7.7
7.6

COLORADO RIVER MAIN STEM Continued

9-725. COLORADO RIVER AT GLENWOOD SPRINGS, COLO. Continued

Periodic determinations of suspended-sediment discharge, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Oct. 2, 1959.......

Apr. 27............

May 19 ....
May 25.............

July 8. ....

Aug. 4.............
Aug. 18............

Sept. 1............

Sept. 29...........

Time

(24 hour)

1850
1915
1150
1800
1600

1400
1700
1515
0845
0930

0930
1215
1015
1630
1115

1530
1100
1800

Water
tem-

per-
ature

(°F)

Sam-

pling
point

Discharge
(cfs)

1360
1310
1360
3140
2830

2000
4160
5840
6O60
8320

5330
2160
1720
1410
1120

909
1280
1190

Sediment
concen-

tration

(ppm)

57
14
15
196
92

48
300
164
161
309

82
19
11
27
13

16
28
14

Sediment

discharge
(tons per day)

209
50
55
1660
703

259
3370
2590
2630
6940

1180
111
51
103
39

39
97
45

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004 0.008 0.016 0.031 0.062 0.125 0.250 0.500 1.000 2.000

Method
of

analysis

ROARING FORK BASIN Continued

9-S50. ROARING FORK AT GLENWOOD SPRINGS, COLO. Continued

P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Sept. 29...........

Time

(24 hour)

1800
1815
1045
1400
1630

170O
1245
1545
1430
1915

1900
0815
1315
1100
1230

1200
1630
1145
1700

Water
tem-

per-
ature

Sam-

pling
point

Discharge
(cfs)

877
706
599
1110
1180

1010
690
1730
2140
2340

5660
4110
1870
1010
772

480
4SO
425
450

Sediment
concen-

tration

(ppra)

26
9
7
92
107

44
15
448
98
81

943
52
8
11
16

22
23
20
6

Sediment

discharge
(tons per day)

62
17
11
276
341

120
28
2090
566
512

14400
577
40
30
33

29
30
23
7

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004 0.008 0.016 0.031 0.062 0.125 0.250 0.500 1.000 2.000

Method
of

analysis

GUNNISON RIVER BASIN--Continued

9-1495. UNCOMPAHGRE RIVER AT DELTA, COLO. Continued

Periodic determinations of suspended-sediment discharge, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Oct. 15............

Apr. 15, 1960......

Apr. 26... ....
May 3..............
May 10.............

May 24.............

June 2. . ...

July 20............

Aug. 31............

Sept. 29...........

Time

(24 hour)

1005
0915
1600
1200
0700

2030
2030
1945
1345
0815

2000
2000
2100
1945
1630

1630
2030
1900
1000

Water
tem-

per-
ature

(°F)

Sam-

pling
point

Discharge
(cfs)

835
452
413
535
370

118
105
195
310
219

546
568
140
115
194

125
132
178
258

Sediment
concen-

tration

(ppm)

1140
165
208
2000
912

271
267
586
430
322

1890
759
108
157
222

52
99
345
148

Sediment

discharge
(tons per day)

2570
201
232
2890
911

86
76
309
360
190

2790
1160
41
49
116

18
35
166
103

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004 0.008 0.016 0.031 0.062 0.125 0.250 0.500 1.000 2.000

Method
of

analysis

GUNNISON RIVER BASIN Continued

9-1525. GUNNISON RIVER NEAR GRAND JUNCTION, COLO.

LOCATION (revised).-At bridge on State Highway 141, 180 feet downstream from gaging station, 0.4 mile downstream from Whitewater Creek, 0.5 mile south of Whitewater, and 8 miles southeast of Grand Junction, Mesa County.
DRAINAGE AREA (revised). 7,870 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1931 to September 1960.
Water temperatures: April 1949 to September 1960.
EXTREMES, 1959-60. Dissolved solids; Maximum, 1,670 ppm Aug. 11-31; minimum, 235 ppm Apr. 23-26.
Hardness: Maximum, 910 ppm Aug. 11-31; minimum, 156 ppm Apr. 23-26.
Specific conductance: Maximum daily, 2,180 micromhos Sept. 30; minimum daily, 348 micromhos Apr. 25.
Water temperatures: Maximum, 79°F July 20; minimum, freezing point on several days during December to February.
EXTREMES, 1931-60.--Dissolved solids: Maximum, 2,820 ppm Sept. 11-20, 1934; minimum, 203 ppm May 11-20, 1944.
Hardness (1931-35, 1943-60): Maximum, 1,370 ppm Sept. 1-20, 1934; minimum, 138 ppm May 11-31, 1958.
Specific conductance (1941-60): Maximum daily, 2,730 micromhos Sept. 10, 1956; minimum daily, 280 micromhos May 23, 1948.
Water temperatures (1949-60): Maximum, 86°F Aug. 13, 1958; minimum, freezing point on many days during winter months.
REMARKS. Maximum observed during water year: Dissolved solids, 1,780 Sept. 29; hardness, 972 ppm Sept. 29. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Prior to October 1959, gaging station 11.5 miles downstream, and prior to January 1960, sampling site 12 miles downstream. Flow affected by ice Dec. 30 to Jan. 8, Jan. 15-25, 29-31, Feb. 1, 4.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-4, 1959....
Oct. 5-31.........

Dec. -31.........
Jan. -31, 1960...

Mar. -25.........

Apr. 1-7..........
Apr. 8-22, 27-30..

Apr. 23-26........

May 21-31........ .

June 25-30. ....

July 1-14.........

Mean

discharge
(cfs)

1895
1515
1211
818
798

711
1099
2757
2333
5055

5905
2043
6298
3914
6321

2938
1384

Silica

(SlCfe)

14
14
15
14
15

15
17
8.0
14
15

13
14
13
15
14

14
13

Iron

(Fe)

0.01
. 00

. 01

. 02
. 02

. 02

. 01

Cal-

cium

(Ca)

178
144
135
143
131

135
139
93
88
61

46
74
52
61
57

72
117

Mag-
ne-

sium

(Mg)

63
53
54
61
59

57
58
26
28
13

10
23
11
16
14

20
36

Sodium

(Na)

135
105
107
123
118

123
132
51
55
25

17
44
19
31
25

43
73

Po-
tas-

sium

(K)

4.9
4.2
4.7
4.8
4.5

4.5
5.1
3.4
4.0
2.4

1.6
2.3
1.6
1.6
1.6

2.1
3.0

Bi-
car-

bon-

ate

(HCO,)

237
213
217
239
230

219
213
192
185
154

121
143
125
121
121

142
178

Car-
bon-
ate

(cog

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

0
0

Sulfate

(S04)

759
589
578
644
611

623
669
275
286
121

84
238
107
176
144

227
433

Chloride

(Cl)

17
12
14
18
16

19
10
10
9.0
4.0

3.0
8.0
3.5
5.0
4.0

6.5
12

Fluo-

ride

(F)

Ni-

trate

(NO,)

6.1
5.1
4.7
6.6
4.4

4.6
5.5
3.1
1.6
. 8

. 5
. 7
. 5
. 3
. 5

1.6
. 8

Bo-

ron

(B)

0.20
. 16
. 17
. 15
. 19

. 17
. 20
. 10
. 09
. 06

. 07
. 12
. 10
. 09
. 09

. 11
. 13

Dissolved solids

(calculated)

Parts

per
million

1290
1030
1020
1130
1070

1090
1140
564
577
318

235
474
269
366
320

456
776

Tons

per
acre-

foot

. 75
. 40
. 39
. 54
. 46

. 48
. 55
. 77
. 78
. 43

. 32
. 64
. 37
. 50
. 44

. 62
1.06

Tons

per
day

6600
4210
3340
2500
2310

2090
338O
4200
3630
4340

3750
2610
4570
3870
5460

3620
2900

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

705
576
558
610
572

573
588
336
336
204

156
280
176
220
198

264
442

Non-
car-

bon-

ate

511
401
380
414
383

392
413
179
184
78

57
163
74
121
99

148
296

So-

dium
ad-

sorp-
tion
ratio

2.2
1.9
2.0
2.2
2.1

2.2
2.4
1.2
1.3
. 8

. 6
1.1
. 6
. 9
. 8

1.1
1.5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

1680
1390
1360
1500
1470

1460
1530
822
837
490

374
700
423
551
488

675
1060

PH

7.6
7.7
7.8
7.8
7.8

8.0
7.9
7.9
7.4
7.6

7.6
7.6
7.6
7.5
7.5

8.0
7.6

GUNNISON RIVER BASIN Continued

9-1525. GUNNISON RIVER NEAR GRAND JUNCTION, COLO. Continued

Periodic determinations of suspended-sediment discharge, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Oct. 3.............

Nov . 4 ....

July 21............

Sept. 29.. ....

Time

(24 hour)

1830
0930
0800
1215
1620

1800
1930
1900
1800
1730

1700
2030
1145
1800
1800

1845
1830
2030
1900
2130

1745
1830
1500
0800
1330

1800
1730
1900

Water
tem-

per-
ature

(°F)

Sam-

pling
point

Discharge
(cfs)

877
811
818
1200
1190

5500
4920
3930
1970
1970

4090
5810
5500
4400
6080

7750
6050
5790
1270
1250

475
520
984
654
401

457
654
636

Sediment

concen-

tration

(ppm)

181
878
115
64
34

837
687
327
162
146

769
1330
434
310
517

1050
327
273
33
30

35
43
265
148
64

119
103
69

Sediment

discharge
(tons per day)

429
1920
254
207
109

12400
9130
3470
862
777

8490
20900
6440
3680
8490

22000
5340
4270
113
101

45
60
704
261
69

147
182
118

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004 0.008 0.016 0.031 0.062 0.125 0.250 0.500 1.000 2.000

Method
of

analysis

DOLORES RIVER BASIN

9-1800. DOLORES RIVER NEAR CISCO, UTAH

LOCATION. At gaging station, 9 miles upstream from mouth and 14 miles southeast of Cisco, Grand County. DRAINAGE AREA. 4,580 square miles, approximately.
RECORDS AVAILABLE. Chemical analys.-s: March 1951 to September 1960.
Water temperatures: March 1951 to September 1959.
Sediment records: March 1951 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 4,270 ppm Sept. 4-9; minimum, 260 ppm June 1-26.
Hardness: Maximum, 1,120 ppm Sept. 4-9; minimum, 157 ppm June 1-26.
Specific conductance: Maximum daily, 6,690 micromhos Sept. 8; minimum daily, 370 micromhos June 21.
Sediment concentrations: Maximum daily, 51,900 ppm Mar. 9; minimum daily, 4 ppm July 25, 26.
Sediment loads: Maximum daily, 260,000 tons Mar. 9; minimum daily, 1 ton on several days during August and September.
EXTREMES, 1951-60. Dissolved solids (1953-60): Maximum, 7,920 ppm Oct. 1-10, 1956; minimum, 200 ppm June 1-10, 1957, May 1-31, 1958.
Hardness (1953-60): Maximum, 1,900 ppm Sept. 21-30, 1956; minimum, 132 ppm May 1-31, 1958.
Specific conductance: Maximum daily, 12,700 micromhos Oct. 7, 1956; minimum daily, 254 micromhos May 8, June 6, 1952.
Sediment concentrations: Maximum daily, 89,300 ppm Aug. 5, 1959; minimum daily, 0 ppm on several days during October 1956, September and October 1957. Sediment loads: Maximum daily, 480,000 tons Apr. 21, 1958; minimum daily, 0 tons on several days during October 1956, September and October 1957. REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year Octobei 1959 to September 1960 given in WSP 1713. Flow affected by ice Nov. 28 to Dec. 9, Dec. 11-20, Dec. 26 to Jan. 15, Jan. 18.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-20, 1959...

Nov. 1-20.........
Nov. 21-Dec. 10...
Dec. 11-22, 24-31.

Jan. 1-31, 1960...

Mar. 26-Apr. 5....

Apr. 11-26........

May 9-31. ....

Mean

discharge
(cfs)

161

174
98.0
112

114
138

1,381

2,998
1,322
1,255
2.001

Silica

(SIQJ

8.1

8.8
7.4

7.3
7.6

9.6

9.0

9.8
8.9

Iron

(Fe)

0.01

.01

__

- -

.04

_
_

Cal-

cium

(Ca)

170

138
126

116

91

53

64
52

Mag-
ne-

sium

(Mg)

73

77
66

72
62

21

10

15
9.7

Sodium

(Na)

285

604
493

414

66

24

50
30

tas-

sium

(K)

12

27
22

18

5.8

2.9

3.3
2.5

Bi-
car-

bon-

ate

(HCOj)

146

77
106

86
6

170

136

139
121

bon-

ate

(ccg

0

0
0

0

0

0

0

Sulfate

(SO,)

732

712
623

521

200

73

117
76

Chloride

(CD

340

860
675

640

74

27

59
36

Fluo-

ride

(F)

Ni-

trate

(Ncg

32

39
32

40
67

6.3

3.4

12
7.4

Bo-

ron

(B)

0.00

.11
.08

. 01

.06

.05

.06
.05

Dissolved solids
fcalculated)

Parts

per
million

1,720

1,790
2,500
2,100

1,820
2,410

558

270

398
283

Tons

per
acre-

2.34

3.40
2.86

2.48

. 76

. 37

.54
.38

Tons

per

day

748

841
662
635

1,010
678

2,080

2,190

1,350
1.530

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

724

572
660
584

630
545
570

312

174
220
222
169

Non-
car-

bon-

604

562
597
497

559
540
557

173

92
62
112
108
70

So-

ad-

sorp-
tion

4.6

7.1
10
8.9

16
7.7

1.6

. 8

1.5
1.0

con-

duct-

ance

[micro-
mhos at

2,690

2,960
4,190
3,580

5,550
3,140
4,190

902

459
676
653
478

pH

7.5
7 ?,
fi 0
6.9
6.9

6.9
5.9
6 3
7 8
7.5

8.1
7.8
7.1
7 8
7.7

DOLORES RIVER BASIN Continued

9-1800. DOLORES RIVER NEAR CISCO, UTAH Continued

Particle-size analyses of suspended sediment, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Apr. 7.............

Apr. 12............

June 4 ....

Time

(24 hour)

1045
1730
1345
1230
1230

1530
1530
1300
1200
1800
1530

Water
tem-

per-
ature

(°F)

52
51
44
54
51

49
49
55
61
70
72

Sam-

pling
point

Discharge
(da)

172
334
1260
588
3780

5180
5180
1150
3400
2810
1640

Sediment

concen-

tration

(ppm)

133
268
14500
6410
15700

5360
5360
276
2520
1790
429

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

69

16

0.004

86
64
65
72
39

20
12
30
20
13
22

0.008

92

29

0.016

95
91
88
97
59

32
28
46
34
23
38

0.031

97
97

42

0.062

99
100
100
100
89

58
58
81
77
48
54

0.125

98

80
80
95
81
82
72

0.250

100

95
95
100
96
96
92

0.500

100
100

100
100
100

1.000 2.000

Method
Of

analysis

SBWC
SPWC
VPWC
SPWC
VPWC

VPWC
VPN
VPWC
VPWC
VPWC
VBWC

GREEN RIVER BASIN

9-2170. GREEN RIVER NEAR GREEN RIVER, WYO.

LOCATION. At bridge on State Highway 530, about 1 mile upstream from gaging station, 0.8 mile upstream from Bitter Creek, at southeast edge of town of Green River, Sweetwater County, and 5 miles upstream from high waterline of proposed Flaming Gorge Reservoir.
DRAINAGE AREA. 10,000 square miles, approximately, upstream from gaging station, of which 300 square miles is probably noncontributing.
RECORDS AVAILABLE. Chemical analyses: May 1951 to September 1960.
Water temperatures: May 1951 to September 1960.
Sediment records: May 1951 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 688 ppm Nov. 17-20; minimum, 222 ppm June 3-30.
Hardness: Maximum, 342 ppm Nov. 17-20; minimum, 138 ppm June 3-30.
Specific conductance: Maximum daily, 970 micromhos Nov. 18; minimum daily, 286 micromhos June 7.
Water temperatures: Maximum, 78°F July 21, 27, 28; minimum, freezing point Mar. 22.
Sediment concentrations: Maximum daily, 1,450 ppm Mar. 24; minimum daily, 1 ppm Aug. 18, 23.
Sediment loads: Maximum daily, 12,400 tons Mar. 26; minimum daily, 2 tons Aug. 18, 23.
EXTREMES, 1951-60. Dissolved solids: Maximum, 855 ppm Nov. 15-20, 1955; minimum, 156 ppm May 23-31, 1958.
Hardness: Maximum, 420 ppm Nov. 15-20, 1955; minimum, 106 ppm May 23-31, 1958.
Specific conductance: Maximum daily, 1,240 micromhos Dec. 13, 1953, Nov. 19, 1955; minimum daily, 219 micromhos May 22, 1954.
Water temperatures: Maximum, 78°F on several days during July and August 1955, July 1960; minimum, freezing point on many days during winter months. Sediment concentrations: Maximum daily, 3,870 ppm Mar. 26, 1956; minimum daily, 1 ppm Aug. 18, 23, 1960.
Sediment loads: Maximum daily, 48,000 tons May 29, 1956; minimum daily, 2 tons on several days during December 1958, January 1959, August 1960. REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Nov. 18-22, Dec. 1 to Mar. 18.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-31, 1959...
Nov. 1-3, 7-16,

Nov. 17-20........
Nov. 30, Dec. 1-31

Mar. 20-25, 27-31,

Mar. 26. ....

Apr. 17-30........

June 3-30.........

Mean

discharge
(cfs)

834

744
787
524
444

2053
2320
1551
2137
943

885
1238
1235
3022

Silica

SiQ.)

11

11
11
11
9.7

13
11
14
13
10

10
9.2
8.3
11

Iron

(Fe)

0.01

. 04
. 01
. 04

Cal-

cium

(Ca)

57

60
50
79
75

52
74
59
49
64

64
45
43
37

Mag-
ne-

sium

(Mg)

23

22
17
35
28

18
22
19
15
21

23
15
13
11

Sodium

(Na)

49

48
25
96
64

52
79
41
27
46

47
31
32
20

Po-
tas-

sium

(K)

1.6

1.6
1.0
1.6
1.6

2.6
2.6
4.2
2.9
2.2

2.1
1.7
1.5
1.7

Bi-
car-

bon-

ate

(HCO,)

182

188
180
210
222

169
192
190
154
201

215
155
148
139

Car-
bon-

ate

(CO,)

0

0
0
0
0

0
0
0
8
0

0
0
0
0

Sulfate

(SO,)

175

170
93
353
241

154
259
146
92
164

171
101
95
60

Chloride

(Cl)

8.5

7.8
4.0
12
10

9.5
15
8.9
5.4
9.4

9.1
5.6
6.5
3.8

Fluo-
ride

(F)

Ni-

trate

(NOJ

1.1

1.1
. 8
. 8
. 8

2.3
2.6
1.5
1.4
. 6

. 6
. 7
. 7
. 8

Bo-

ron

(B)

0.07

. 06
. 14
. 16
. 08

. 09
. 11
. 09
. 09
. 08

. 07
. 07
. 07
. 07

Dissolved solids
(residue at 180°C)

Parts

per
million

421

418
282
688
546

388
560
398
291
430

454
296
285
222

Tons

per
acre-

foot

0.57

. 57
. 38
. 94
. 74

. 53
. 76
. 54
. 40
. 58

. 62
. 40
. 39
. 30

Tons

per
day

948

840
599
973
655

2150
3510
1670
1680
1090

1080
989
950
1810

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

234

238
195
342
302

201
274
226
183
247

256
173
160
138

Non-
car-

bon-

ate

85

84
47
170
120

62
117
70
44
82

80
46
39
24

So-

dium
ad-

sorp-
tion
ratio

1.4

1.3

.8
2.3
1.6

1.6
2.1
1.2
. 9
1.3

1.3
1.0
1.1
. 7

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

635

630
460
970
811

595
829
590
452
637

660
452
446
345

pH

8.1

8.1
8.1
8.1
8.2

7.8
7.5
8.2
8.5
8.1

8.0
7.9
8.0
7.9

GREEN RIVER BASIN Continued

9-2170. GREEN RIVER NEAR GREEN RIVER, WYO. Continued

Particle-size analyees of suspended sediment, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Mar. 22, 1960......
Mar. 22............

Time

(24 hour)

1745
1745
1830
1330

Water
tem-

per-
ature

(°F)

32
32
J8
64

Sam-

pling
point

Discharge
(cfs)

1520
1520
3680
4660

Sediment
concen-

tration

(ppm)

1690
1690
1650
403

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004

70
0
55
19

0.008 0.016

95
89
67
29

0.031 0.062

100
100
85
48

0.125

95
63

0.250

99
81

0.500

100
94

1.000

100

2.000

Method
of

analysis

VPWC
VPN
VPWC
VPWC

GREEN RIVER BASIN Continued

9-2295. HENRYS FORK AT LINWOOD, UTAH

LOCATION. About 1 mile downstream from gaging station, 0.4 mile north of Wyoming-Utah State line, In Sweetwater County, Wyo., 2 miles upstream from State Highway 530 at Linwood, 4 miles northeast of Manila, and 7 miles upstream from mouth.
DRAINAGE AREA. 520 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: March 1951 to September 1960.
Water temperatures: March 1951 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 2,510 ppm Sept. 1-7, 9-10, 15-17, 19-24, 26, 28-30; minimum, 412 ppm June 1-7.
Hardness: Maximum, 1,480 ppm Sept. 1-7, 9-10, 15-17, 19-24, 26, 28-30; minimum, 282 ppm June 1-7.
Specific conductance: Maximum daily, 3,010 micromhos Sept. 23; minimum daily, 539 micromhos May 14.
Water temperatures: Maximum, 81°F Aug. 6; minimum, freezing point on many days during December to March.
EXTREMES, 1951-60. Dissolved solids: Maximum, 2,960 ppm Sept. 23, 1959; minimum, 312 ppm June 1-6, 9-10, 1952.
Hardness: Maximum, 1,720 ppm Sept. 23, 1959; minimum, 208 ppm June 1-6, 9-10, 1952.
Specific conductance: Maximum daily, 3,280 micromhos Sept. 23, 1959; minimum daily, 395 micromhos May 15, June 2, 1952.
Water temperatures: Maximum, 81°F Aug. 6, 1980; minimum, freezing point on many days during winter months.
REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-31, 1959...
Nov. 1-30.........
Dec. 1-31.........
Jan. 1-31, 1960...

Mar. 20-31........

June 27-30........

July 1-2, 5, 7-8,
12-16, 18-20,

July 3-4, 6, 9-11,
17, 21, 23-25...

Mean

discharge
(cfs)

33.3
52.6
46.7
38.8
35.6

28.8
263
57.1
101
106

172
349
189
58.4
13.7

1.3

1.8

Silica

S1Q,)

21
20
18
17
16

19
16
17
32
20

18
20
19
23
25

25

22

Iron

(Fe)

0.01

. 04

. 03

. 02

Cal-

cium

(Ca)

158
154
156
137
127

133
90
120
95
90

73
71
85
122
180

265

152

Mag-
lie-

slum

(Mg)

96
78
84
80
76

62
27
53
51
50

31
26
36
54
90

129

95

Sodium

(Na)

83
69
71
64
57

60
46
55
88
49

28
23
30

Jo
TJ8

155

91

Po-
tas-

sium

(K)

11
9.2
8.8
7.8
7.4

8.3
9.4
7.3
13
7.3

5.2
5.2
6.0
7.9
10

13

13

Bi-
car-

bon-

ate

(HCO,)

273
294
297
267
274

254
200
248
250
208

187
188
214
272
324

335

232

Car-
bon-
ate

(CO,)

0
0
0
0
0

0
0
8
0
0

0
0
0
0
0

0

3

Sulfate

(S04)

676
569
581
545
478

471
250
387
380
323

199
163
231
387
698

1140

705

Chloride

(Cl)

36
32
31
32
30

29
19
27
29
24

13
10
15
22
39

59

38

Fluo-

rlde

(F)

Ni-

trate

(NO,)

0.9
.6
. 7
. 7
. 9

1.8
1.7
. 9
1.7
. 7

. 9
1.2
. 9
. 7
. 8

. 8

. 7

Bo-

ron

(B)

0.28
. 21
. 26
. 30
. 22

. 22
. 15
. 20
. 21
. 19

. 15
. 16
. 19
. 22
. 41

. 46

. 31

Dissolved solids
(calculated)

Parts

per
million

1220
1080
1100
1010
926

909
557
797
811
666

460
412
528
801
1300

1950

1230

Tons

per
acre-

foot

1.68
1.47
1.50
1.37
1.26

1.24
. 76
1.08
1.10
. 91

. 83
. 56
. 72
1.09
1.77

2.65

1.67

Tons

per
day

110
153
139
106
89.0

70.7
396
123
221
191

214
388
269
126
48.1

8.84

5.31

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

790
705
735
672
630

588
338
516
448
428

310
282
362
528
820

1190

770

Non-
car-

bon-

ate

568
464
491
453
405

380
172
300
241
257

157
128
187
305
554

915

575

So-

dium
ad-

sorp-
tion
ratio

1.3
1.1
1.1
1.1
1.0

1.1
1.1
1.1
1.8
1.0

. 7
. 8
. 7
. 9
1.5

2.0

1.4

Specific
con-

duct-

ance

micro-

mhos at

25°C)

1600
1450
1470
1380
1300

124O
814
1110
1130
939

681
615
778
1100
1680

2330

1600

pH

8.1
8.1
8.0
8.2
8.1

8.1
8.0
8 3

s!o
8.0

7.9
7.8
7.8
8.2
7.9

8.2

8.3

GREEN RIVER BASIN Continued

9-2345. GREEN RIVER NEAR GREENDALE, UTAH

LOCATION. At gaging station, 0.5 mile downstream from Flaming Gorge dam, 2 miles south of Dutch John, 4 miles northeast of Greendale, Daggett County and 13 miles southeast of Linwood.
DRAINAGE AREA. 15,100 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: October 1956 to September 1960.
Water temperatures: October 1956 to September 1959.
Sediment records: October 1956 to September 1959.
EXTREMES, 1959-60. Dissolved solids: Maximum, 729 ppm Dec. 1-31; minimum, 316 ppm June 1-30.
Hardness: Maximum, 390 ppm Dec. 1-31; minimum, 182 ppm June 1-30.
Specific conductance: Maximum daily, 1,090 micromhos Dec. 9; minimum daily, 422 micromhos June 23.
EXTREMES, 1956-58, 1959-60. Dissolved solids: Maximum, 743 ppm Nov. 23, 27, 30, 1956; minimum, 204 ppm June 1-6, 1958.
Hardness: Maximum, 400 ppm Nov. 23, 27, 30, 1956; minimum, 130 ppm June 1-6, 1958.
Specific conductance: Maximum daily, 1,090 micromhos Dec. 9, 1959; minimum daily, 328 micromhos June 1-6, 1958.
REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-31, 1959...

Mar. 24-31, I960..

May 1-5, 8-16.... .

Weighted aver-

Mean

discharge
(cfs)

1101
851
607
4502
2498

3193
1564
1856
1975
2259

3637
1262
700
586

1542

Silica

SiQj)

10
13
11
14
13

12
11
12
11
9.5

11
6.3
6.8
4.7

11

Iron

(Fe)

0.00
.00
.02
. 12
.01

.01
.00
.01
.01
.02

.05
.01
.01
.01

0.03

Cal-

cium

(Ca)

67
71
91
63
64

54
67
67
83
53

49
48
45
50

58

Mag-
ne-

sium

(Mg)

27
30
39
21
22

17
22
22
28
17

15
19
18
21

21

Sodium

(Na)

65
65
82
100
63

32
52
67
111
38

33
46
48
60

53

Po-
tas-

sium

(K)

2.6
2.1
3.3
3.6
3.6

2.6
2.9
3.6

2.2

2.2
2.0
1.9
1.9

2.6

Bi-
car-

bon-

ate

(HCO,)

194
203
238
198
198

180
202
210
219
167

162
174
160
153

182

Car-
bon-

ate

(CO,)

0
0
0
0
0

0
0
0
0
0

0
0
0
0

0

Sulfate

(S04)

235
244
332
240
189

107
177
194
306
126

105
137
137
185

168

Chloride

(Cl)

18
18
26
40
23

12
20
24
46
14

11
12
11
12

17

Fluo-
ride

(F)

0.2
.2
.2
.6
.5

.4
.3
.3
.3
.3

.3
.3
.2
.2

0.3

Ni-

trate

(NO,)

0.9
.9
1.0
.7
1.2

1.5
1.0
1.5
3.3
.9

1.2
.9
.5
.4

1.0

Bo-

ron

(B)

0.12
. 11
. 12
.23
. 15

.09
. 10
. 12
. 12
. 13

.09
. 10
.07
.09

0.11

Dissolved solids
(residue at 180°C)

Parts

per
million

532
556
729
585
475

325
453
493
a 696
343

316
362
348
412

426

Tons

per
acre-

foot

0.72
.76
.99
.80
.65

.44
.62
.67
.95
.47

.43
.49
.47
.56

0.58

Tons

per

day

1580
1280
1190
7110
3200

2800
1910
2470
3710
2090

3100
1230
658
652

1770

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

278
300
390
244
252

202
258
258
324
202

182
198
187
210

231

Non-
car-

bon-

ate

119
134
195
82
90

54
92
86
144
65

49
55
56
85

82

So-

dium
ad-

sorp-
tion
ratio

1.7
1.6
1.8
2.8
1.7

1.0
1.4
1.8
2.7
1.2

1.1
1.4
1.5
1.8

1.5

Specific
con-

duct-

ance

micro-

mhos at

25°C)

800
819
1040
881
721

514
697
758
1030
540

486
564
545
634

650

pH

7.9
8.2
7.9
7.8
8.0

fi.O
8.0
7.9
7.8
7.8

7.7
7.9
7.7
7.7

-

a Calculated from determined constituents.
b Represents 87 percent of runoff for water year.

GREEN RIVER BASIN Continued

9-2510. YAMPA RIVER NEAR MAYBELL, COLO.

LOCATION. At county bridge, 1 mile north of Maybell, Moffat County, and about 3.5 miles downstream from gaging station. DRAINAGE AREA. 3,410 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: November 1950 to September 1960.
Water temperatures: November 1950 to September 1960.
Sediment records: December 1950 to May 1958.
EXTREMES, 1959-60. Dissolved solids: Maximum, 489 ppm Sept. 1-18, 20-23; minimum, 84 ppm June 1-17, 20.
Hardness: Maximum, 217 ppm Sept. 1-18, 20-23; minimum, 50 ppm June 1-17, 20.
Specific conductance: Maximum daily, 909 micromhos Sept. 14; minimum daily, 107 micromhos June 17.
Water temperatures: Maximum, 82°F July 26; minimum, freezing point Nov. 29.
EXTREMES, 1950-60. Dissolved solids: Maximum, 545 ppm Sept. 21-30, 1956; minimum, 72 ppm June 21-30, 1951.
Hardness: Maximum, 238 ppm Dec. 1-10, 1952; minimum, 43 ppm June 1-21, 1959.
Specific conductance: Maximum daily, 947 micromhos Sept. 24, 1955; minimum daily, 94 micromhos June 14, 1959.
Water temperatures: Maximum, 82°F July 26, 1960; minimum, freezing point on many days during winter months.
REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-25, 1959...

Nov. 28-Dec. 31...
Jan. 1-31, 1960...

Mar. 29-31........

Apr. 7-22.........

Apr. 23-30........
May 1-12, 21-24...
May 13-20, 25-31..
June 1-17, 20... ..
June 18-19, 21-26.

July 1-8. ....

Mean

discharge
(cfs)

582
1,010
559
369
235

221
498
2,200
2,183
4,708

4,078
3,537
5,889
5,562
3,461

1,770
1,062

Silica

(S1Q,)

8.7
9.1
6.8
6.4
10

12
12
9.3
13
12

12
13
11
8.7
9.4

8.5
9.0

Iron

(Fe)

0.05
. 10

.01

.07
. 14

.09

.02

Cal-

cium

(Ca)

33
24
30
37
38

38
53
38
38
29

25
27
18
15
16

18
22

Mag-
ne-

sium

(Mg)

12
.7.3
11
15
15

17
14
10
14
8.0

6.6
7.3
4.4
2.9
4.1

4.9
6.3

Sodium

(Na)

24
17
26
39
45

41
36
20
25
11

9.5
11
5.6
5.5
8.5

11
15

Po-
tas-

sium

(K)

2.1
1.9
1.9
2.3
2.1

1.7
4.0
4.3
4.5
2.7

. 5
. 7
. 1
.2
.4

.4
. 6

Bl-

car-

bon-

ate

(HCO,)

148
104
131
172
186

181
170
122
132
105

95
107
70
58
67

73
89

Car-
bon-
ate

(cog

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

0
0

Sullate

(S0«)

51
33
48
67
69

71
107
74
85
37

27
27
14
13
17

21
28

Chloride

(Cl)

ll
6.5
12
19
22

20
13
6.0
8.0
3.5

3.5
4.0
1.5
1.4
4.0

6.2
10

Fluo-

rlde

(F)

Ni-

trate

(NO,)

1.0
1.3
1.0
. 7
1.4

1.4
3.3
3.5
4.5
2.9

1.8
1.6
1.5
1.3
1.3

1.8
1.2

Bo-

ron

(B)

0.10
.09
.04
.06
.01

. 10
. 11
.09
.09
.06

.07
.05
.05
.06
.06

.07
.05

Dissolved solids
(residue at 180°C)

Parts

per
million

222
155
206
274
306

284
334
236
265
166

140
152
100
84
99

113
148

Tons

per
acre-

foot

0.30
.21
.28
.37
.42

.39
.45
.32
.36
.23

. 19
.21
. 14
. 11
. 13

. 15
.20

Tons

per

day

349
423
311
273
194

169
449
1,400
1,560
2,110

1,540
1,450
1,590
1,260
925

540
424

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

131
89
120
152
156

165
189
138
153
105

90
98
64
50
58

64
80

Non-
car-

bon-

ate

10
4
13
11
3

17
50
38
45
19

12
10
7
2
3

4
7

So-

dium
ad-

sorp-
tion
ratio

0.9
. 8
1.0
1.4
1.6

1.4
1.1
.7
.9
. 5

.4
.5
.3
. 3
.5

.6
. 7

Specific
con-

duct-

ance

micro-

mhos at

25°C)

370
250
349
462
489

471
516
356
413
257

220
237
148
124
156

180
226

pH

7.6
7.3
7.4
7.6
7.7

7.9
7.7
7.8
7.4
7.4

7.3
7.4
7.5
7.3
7.4

7.8
7.2

GREEN RIYEE BASIS CdBtintted

9-2599.54 LITTLE, SHAKE RIVER ABOVE LILT, CQLO.

LOCATION. At bridge on State Highway 318, about ft miles upstren froB gaging station, about 10 miles northeast of Lily, Moffat County, and 16 miles upstream from mouth.
DRAINAGE AREA. a,730 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE, Chemical analyses: December 19SO to September 1960.
Water te»pera.turesi December 1950 to September I960 (discontinued).
Sediment records; May 1958 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 1,020 ppja Aug. 26-31; minimum, 127 ppm Hay 11-13, 17, Hay 19 to June 9. Hardness: Maximum, 372 ppm Sept. 16-18} minimum,, 64 ppm Mar. 11.
Specific conductance: Maximum dally, 1,870 micromhos Aug. 26; minimum daily, 159 micromhos June 6.
Water temperatures: Maximum, 87°F July 20, tog. 3, 6, 7, 1O; minimom, freezing point Dec. 25, 30.
Sediment concentrations: Maximum daily, 3O,3OO ppm Aug. 27; minimum daily, no flow on nan; days during August and September.
Sediment loads: Maximum daily, 55,900 tons Apr. 12; minimum daily, 0 tons on many days during August and September.
EXTREMES, 1950-60. Dissolved solids (1950-51, 1952-6O): Maximum, 2,330 ppm July 24, 1955; minimum, 109 ppm July 1-8, 1O, 1957.
Hardness (1950-51, 1952-60): Maximum, 1,340 ppm July 24, 1955; minimum, 64 ppm July 1-8, 10, 1957, June 1-14, 1958, Mar. 11, 1960.
Specific conductance (1950-51, 1952-60): Maximum daily, 2,670 micromhos July 24, 1955; minimum daily, 135 micromhos June 10, 1958.
Water temperatures (1950-51, 1952-60): Maximum, 88°F July 17, 1955; minimum, freezing point on many days during winter months.
Sediment concentrations (1958-60): Maximum daily, 43,300 ppm Aug. 13, 1959; minimum daily, no flow on many days during September 1959, August and September 1960.

Sediment loads (1958-60): Maximum daily, 142,000 tons Sept. 25, 1959; minimum daily, 0 tons on many days during September 1959, August and September 1960. REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for gaging station near Lily for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Nov. 28 to Feb. 15, Mar. 4-9.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-11, 1959...
Oct. 12-26, 30....
Oct. 27-29, 31....
Nov. 1-29.........
Nov.. 30-Dec. 31...

Mar. 1-1O, 17,
1960... ....

Bar. 12-16, 18-31.

Kpr . 8-1 2 ....

Mean

discharge
(cfs)

168
156
263.
165
85.5

97.3
170
181
633
2.322

Silica

(sioj

13
14
13
9.7
12

15
17
11
13
15

Iron

(Fe)

O.Ol
.01
.04

.02
.29

Cal-

cium

(Ca)

30
35
27
38
52

41
19
35
42
36

Mag-
ne-

sium

(Mg)

7.1
8.5
5.8
9.2
13

7.1
3.9
5.6
11
8.3

Sodium

(Na)

96
49
34
45
69

102
104
76
38
19

Po-
tas-

sium

(K)

2.0
1.2
1.0
1.1
1.6

1.6

2.1
1.4
1.4

Bi-
car-

bon-

ate

(HCOJ

176
164
134
163
2O1

185
183
135
158
143

Car-
bon-

ate

(CO,)

0
o
0
0

11

0
0
0
0
0

Sulfate

(S0«)

117
70
41
70
117

119
85
103
85
41

Chloride

(Cl)

34
16
9.5
16
21

58
35
24
8.2
2.8

Fluo-
rlde

(P)

Ni-

trate

(NO,)

1.7
.8
1.0
.6
.6

1.6
2.5
2.2
1.4
.9

Bo-

ron

(B)

0.07
.05
.06
.06
.06

.08
.07
.05

Dissolved solids
(residue at 180°C)

Parts

per
million

390
280
202
279
402

440
a 356
343
287
204

Tons

per
acre-

foot

0.53
.as
.27
.38
.55

SO
.48
.47
.39
.26

Tons

per

day

177
118
143
124
92.8

116
163
168
491
1.280

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

104
J.23
92
132
184

132
64
111
148
124

Non-
car-

bon-

ate

0
0
0
0
1

0
0
0
18
7

So-

dium
ad-

rorp-
tion
ratio

4.1
1.9
l'.5
1.7
2.2

3.9
5.6
3.1
1.4
. 7

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

624
447
321
449
631

690
591
539
442
312

PH

8.1
8.0
8.1
8.2
8.5

7.9
8.2
8.1
7.8
7.7

a. Calculated from determined constituents.

COLORADO RIVER 6 AS IN

GREEN RIVER BASIN Continued

9-2610. GREEN RIVER NEAR JENSEN, UTAH

LOCATION. At gaging station, 1 mile downstream from Cub Creek and Chew Ranch, 4 miles southeast of Dinosaur National Monument headquarters, 6.5 miles northeast of Jensen, Uintah County, and 12 miles upstream from Brush Creek.
DRAINAGE AREA. 25,400 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: June 1947 to September 1952.
Water temperatures: March 1949 to September 1959.
Sediment records: May 1948 to September 1960.
EXTREMES, 1959-60. Sediment concentrations: Maximum daily, 39,800 ppm Aug. 23; minimum daily, 20 ppm Aug. 11.
Sediment loads: Maximum daily, 460,000 tons Mar. 29; minimum daily, 45 tons Aug. 19.
EXTREMES, 1948-60. Sediment concentrations: Maximum daily, 39,800 ppm Aug. 23, 1960; minimum daily, 9 ppm Oct. 7-11, 1953.
Sediment loads: Maximum daily, 567,000 tons Apr. 9, 1952; minimum daily, 19 tons Oct. 7-11, 1953. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Dec. 31 to Feb. 29.

Suspended sediment, water year October 1959 to S /Shere no concentrations are reported, loads ar

ptember 1960
estimated?

Day

1..
2..
3..
4..
5..

6..
7..
8..
9..
10..

11..
12..
13..
14..
15..

16..
17..
18..
19..
20..

21..
22..
23..
24..
25..

26..
27..
26..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

3340
2630
2370
2190
2030

1930
1860
1790
1750
1780

1600
1790
1790
1620
1830

1620
1800
1780
1760
1770

1750
1720
1730
1720
1720

1730
J030
2420
2510
2360
2510

61650

Suspended sediment

Mean

tration

(ppm)

8100
6400
6340

- _

_ .

_

_

- _

Tons
per

day

73000
45400
40600
32000
24000

20000
17000
14000
14000
14000

14000
14000
14000
14000
14000

14000
14000
14000
14000
14000

14000
11000
11000
11000
11000

11000
24000
43000
47000
41000
47000'

705000

NOVEMBER

Mean
dis-

charge
(cfs)

2600
2360
2220
2190
2150

2150
2040
1800
1690
1670

1890
2040
1990
2030
1790

1520
1320
1370
1360
1300

1110
1120
1400
1580
1760

1690
1730
1490
1070
1000

51650

Suspended sediment

Mean
concen-

<ppm"

- -

_

110

110

110

-

Tons
per
day

50000
3 000
3 000
3 000
3 000

3 000
2 000
1 000
800
000

1 000
2 000
2 000
2 000
1 000

3 00
70
00
00
90

40
40
20
60
30

30
30
00
500
500
" -1

387710

DECEMBER

Mean
dis-

charge
(cfs)

985
828
977
1190
1080

915
1000
906
663
656

961
993

Suspended sediment

Mean

tration

(ppm)

230

200

64

915
906
961 130

945 j
930
892
930
977

849
900
961
892
678

985
906
780
705
610
600

26062

~

Tons
per
day

510
510
510
640
310

190
240
160
150
160

330
390
280
250
330

190
190
190
190
190

190
190
190
190
190

190
190
110
80
53
50

7573

GREEN RIVER BASIN Continued

9-3065. WHITE RIVER NEAR WATSON, UTAH

LOCATION. At bridge on State Highway 45, 350 feet (revised) upstream from gaging station, about 1 mile downstream from Evacuation Creek, and 7 miles north of Watson, Uintah County.
DRAINAGE AREA. 4,020 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: December 1950 to September 1960.
Water temperatures: December 1950 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 1,140 ppm Aug. 24; minimum, 240 ppm June 1-8.
Hardness: Maximum, 396 ppm Aug. 24; minimum, 152 ppm June 1-8.
Specific conductance: Maximum daily, 1,810 micromhos Aug. 24; minimum daily, 325 micromhos June 7.
Water temperatures: Maximum, 78°F Aug. 6; minimum, freezing point on several days during December to March.
EXTREMES, 1950-60. Dissolved solids: Maximum, 1,740 ppm Aug. 20, 1959; minimum, 230 ppm June 21-30, 1951, June 1-10, 1956.
Hardness (1954-60): Maximum, 1,410 ppm Aug. 4, 1955; minimum, 152 ppm June 1-8, 1960.
Specific conductance: Maximum daily, 4,450 micromhos Aug. 4, 1955; minimum daily, 319 micromhos June 29, 1951.
Water temperatures: Maximum, 88°F Aug. 8, 1954; minimum, freezing point on many days during winter months.
REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Prior to October 1959, gaging station 250 feet upstream.

Chemical analyses, in parts per million, water year Oetoher 1959 to September 1960

Date
of
collection

Oct. 1-31, 1959...

Jan. 1-31, 1960...
Feb. 1-13, 16-25,
27-29...........

Feb. 14-15, 26....
Mar. 1-8, 10-18,

Apr. 23-30. ....
May 1-10. ....
May 11-20.........
May 21-31.........

Mean

discharge
(cfs)

459
381
329
272

338

343

572
600
557
529

716
814
583
1362
1398

Silica

(sicg

16
12
8.9
14

14

11

12
14
13
21

17
16
16
14
14

Iron

(Fe)

0.01

. 02

.02
.03

Cal-

cium

(Ca)

71
69
73
73

76

52

69
90
100
78

63
54
62
48
50

Mag-
ne-

sium

(Mg)

19
23
25
23

23

17

23
23
25
27

18
14
16
12
13

Sodium

(Na)

72
82
95
100

"94

70

97
134
110
90

50
37
51
27
28

Po-
tas-
sium

(K)

2.1
2.2
1.9
2.1

1.9

1.3

3.5

4.1
2.8

2.3
1.6
2.0
1.6
1.6

Bi-
car-

bon-

ate

(HCO,)

208
230
233
234

240

167

223
243
246
244

190
164
176
152
152

Car-
bon-
ate

(CO,)

0
0
0
0

0

0

0
0
0
0

0
0
0
0
0

Sulfate

(S04)

154
160
177
178

178

126

210
230
272
212

130
91
120
71
77

Chloride

(ci)

60
67
77
86

80

59

62
120
81
62

39
33
49
22
22

Fluo-

rlde

(F)

Ni-

trate

(NO,)

1.6
1.0
. 6
.8

1.4

. 8

4.3
5.1
2.8
2.6

2.4
2.8
1.9
2.8
1.0

Bo-

ron

(B)

0.13
. 07
. 06
. 10

. 11

.08

. 10

. 15
.09

.08
.07
.03
.06
.07

Dissolved solids

(residue at 180°C)

Parts

per
million

504
532
583
608

598

427

592
a 735
744
621

417
335
407
283
290

Tons

per
acre-

foot

0.69
. 72
. 79
. 83

.81

.58

.81
1.00
1.01
. 84

.57
.46
.55
. 38
.39

Tons

per

day

625
547
519
447

546

395

914
1190
1120
887

806
736
641
1040
1090

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

256
266
284
278

284

199

266
320
352
304

230
190
218
170
176

Non-
car-

bon-

ate

85
77
93
86

87

62

83
121
150
104

74
56
74
45
51

So-

dium
ad-

sorp-
tion
ratio

2.0
2.2
2.4
2.6

2.4

2.2

2.6
3.3
2.6
2.2

1.4
1.2
1.5
.9
.9

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

809
855
939
958

945

692

903
1140
1100
943

648
525
641
443
448

pH

7.9
7.9
8.2
8.2

8,0

8.1

7.9
7.9
7.7
7.8

7.9
8.0
7.9
8.0
8.0

a Calculated from determined constituents.

GREEN RIVER BASIN Continued

9-3070. GREEN RIVER NEAR OURAY, UTAH

LOCATION. At gaging station, 2.8 miles upstream from Willow Creek and 3 miles southwest of Ouray, Uintah County. DRAINAGE AREA. 35,500 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: December 1950 to September 1952, November 1956 to September 1960.
Water temperatures: December 1950 to September 1952, November 1956 to September 1960.
Sediment records: December 1950 to September 1955, October 1956 to September 1960.
'EXTREMES, 1959-60. Dissolved solids: Maximum, 797 ppm Aug. 25-26, 29; minimum, 224 ppm June 1-30.
Hardness: Maximum, 414 ppm Aug. 25-26, 29; minimum, 132 ppm June 1-30.
Specific conductance: Maximum daily, 1,130 micromhos Aug. 29; minimum daily, 296 micromhos June 4.
Water temperatures: Maximum, 84°F Aug. 14; minimum, freezing point Dec. 2, 4, 5, 21.
Sediment concentrations: Maximum daily, 12,500 ppm Oct. 1;-minimum daily, not determined.
Sediment loads: Maximum daily, 394,000 tons Mar. 30; minimum daily, 150 tons (estimated) Jan. 2, 3.
EXTREMES, 1956-60. Dissolved solids (1958-60): Maximum, 797 ppm Aug. 25-26, 29, 1960; minimum, 224 ppm June 1-30, 1960.
Hardness (1958-60): Maximum, 414 ppm Aug. 25-26, 29, 1960;' minimum, 132 ppm June 1-30, 1960.
Specific conductance (1958-60): Maximum daily, 1,190 micromhos Aug. 21, 1959; minimum daily, 287 micromhos June 17, 1959.
Water temperatures (1958-60): Maximum, 84°F Aug. 14, 1960; minimum, freezing point on several days during September and December 1959.
Sediment concentrations: Maximum daily, 67,000 ppm Aug. 31, 1957; minimum daily, 56 ppm Feb. 2, 1958.
Sediment loads: Maximum daily, 1,100,000 tons Aug. 31, 1957; minimum daily, 100 tons Dec. 31, 1958, to Jan. 7, 1959.
REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Dec. 17 to Mar. 21.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-31, 1959...

Mar. 15-31, I960..

Apr. 13-30........

May 15-31.........

Aug. 1-24, 27-28,
30-31...........

Mean

discharge
(cfs)

2762
2444
1678
8533
9496

9800
6401
11790
12250
3444

1981

1154

Silica

(SiO,)

12
12
12
16
14

13
16
14
12
12

10

7.3

Iron

(Fe)

0.03
. 00
.01
.05
.03

. 04
.01
. 07
.03
.00

. 00

.00

Cal-

cium

(Ca)

61
66
75
64
52

41
46
39
38
48

52

54

Mag-
ne-

sium

(Mg)

23
26
35
21
18

12
14
9.7
9.2
15

19

21

Sodium

(Na)

83
72
87
81
51

25
41
23
22
43

57

71

Po-
tas-

sium

(K)

3.1
2.2
2.5
3.3
2.9

1.8
2.2
1.7
1.7
2.0

2.3

2.6

Bi-
car-

bon-

ate

(HCO,)

198
199
228
198
166

142
155
134
128
155

177

181

Car-
bon-
ate

(CO,)

0
0
4
0
0

0
0
0
0
0

0

0

Sulfate

(S0<)

214
207
259
211
145

72
TO4
62
62
112

141

170

Chloride

(Cl)

36
34
44
32
21

12
18
10
10
23

31

42

Fluo-
rlde

(P)

0.3
.3
.3
.5
. 5

.4
.3
.4
.4
.4

. 3

.3

Ni-
trate

(NO,)

1.6
.7
.8
4.3
3.2

1.9
1.4
1.4
1.3
.8

. 8

.8

Bo-

ron

(B)

0.14
. 14
. 17
. 13
.09

. 11
.09
.09
.07
. 10

. 10

. 13

Dissolved solids
(residue at 180° C)

Parts

per
million

525
531
649
540
394

254
"325
234
224
342

411

470

Tons

per
acre-

foot

0.71
. 72
.88
.73
. 54

.35
.44
.32
.30
.47

. 56

.64

Tons

per

day

3920
3500
2940
12440
10100

6720
5620
7450
7410
3180

2200

1460

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

248
272
332
245
204

151
173
138
132
180

208

222

Non-
car-

bon-

ate

86
109
138
83
68

35
46
28
27
53

63

74

So-

dium
ad-

sorp-
tion
ratio

2.3
1.9
2.1
2.2
1.6

.9
1.4
.9
.8
1.4

1.7

2.1

Specific
con-

duct-

ance

[micro-

jnahos at
25°C)

815
812
967
811
611

405
5O1
363
353
526

634

727

pH

8.0
8.0
8.3
8.0
8.0

7.8
8.2
7.8
7.8
8.0

8.1

8.1

GREEN RIVER BASIN Continued

9-3150. GREEN RIVER AT GREEN RIVER, UTAH

LOCATION. At bridge on U.S. Highways 50 and 6 in town of Green River, Emery County, 1 mile upstream from gaging station. DRAINAGE AREA. 40,600 square miles, tipproximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: August 1928 to September 1960.
Water temperatures: May 1949 to September 1959.
Sediment records: May 1930 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 1,260 ppm Sept. 3; minimum, 243 ppm June 1-30.
Hardness: Maximum, 590 ppm Sept. 3; minimum, 142 ppm June 1-30.
Specific conductance: Maximum daily, 1,620 micromhos Sept. 3; minimum daily, 321 micromhos June 8.
Sediment concentrations: Maximum daily, 22,200 ppm Sept. 3; minimum daily, 32 ppm Feb. 25.
Sediment loads: Maximum daily, 531,000 tons Mar. 25; minimum daily, 160 tons Feb. 25.
EXTREMES, 1928-60. Dissolved solids: Maximum, 2,010 ppm Sept. 29, 1943; minimum, 194 ppm June 21-30, 1933.
Hardness: Maximum, 698 ppm Aug. 7, 1957; minimum, 128 ppm June 21-30, 1933.
Specific conductance (1941-60): Maximum daily, 2,420 micromhos Sept. 29, 1943; minimum daily, 272 micromhos May 13, 1956.
Sediment concentrations (1930-60): Maximum daily, 63,100 ppm July 11, 1936; minimum daily, 20 ppm Sept. 27, 1956.
Sediment loads (1930-60): Maximum daily, 2,230,000 tons July 11, 1936; minimum daily, 54 tons Sept. 27, 1956.
REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Jan. 2 to Feb. 9.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. -31, 1959...
Nov. -30.........

Jan. -31, 1960...

Apr. -11.........

Apr. 14-30. ....
May 1-4....... ....

May 5-14 ....
May 15-31.........

July 8-31........ .

Mean

discharge
(cfs)

2898
2552
1728
1547
1769

5210
8085
12400
9136
6220

5991
11350
11470
4259
2334

Silica

S1Q,)

9.0
11
11
12
15

15
17
16
15
14

15
13
11
12
LI

Iron

(Fe)

0.03

.00

. 10
.40
.07

.01
.03

Cal-

cium

(Ca)

69
70
83
78
83

71
63
53
46
44

49
42
40
44
55

Mag-
ne-

sium

(Mg)

26
29
38
43
34

25
19
16
13
13

16
11
10
13
18

Sodium

(Na)

104
88
105
103
97

92
69
36
31
35

50
26
25
33
55

Po-
tas-

sium

(K)

3.6
2.4
2.4
2.8
2.7

3.3
3.4
3.0
2.4
1.8

2.4
1.8
1.7
2.0
2.7

Bl-

car-

bon-

ate

(HCO,)

210
206
251
262
244

212
200
180
160
141

163
144
136
148
178

Car-
bon-

ate

{ccg

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

Sulfate

(S04)

266
259
318
298
290

250
189
106
89
100

129
71
68
94
146

Chloride

(Cl)

41
36
45
44
44

36
25
14
13
15

22
10
10
16
28

Fluo-

rlde

(F)

Ni-

trate

(NOJ

2.4
1.3
1.0
2.9
1.9

2.0
1.8
.6
1.7
.9

1.7
.8
1.4
1.3
1.3

Bo-

ron

(B)

0.17
. 18
. 16
. 18
. 19

. 18
. 15
. 12
.08
. 10

. 11
. 11
.08
.08
. 10

Dissolved solids
(residue at 180°C)

Parts

per
million

631
613
751
772
699

611
505
361
302
298"

1 370
254
243
304
426

Tons

per
acre-

foot

0.86
.83
1.02
1.05
.95

.83
.69
.49
.41
.41

.50
.35
.33
.41
.58

Tons

per

day

4940
4220
3500
3220
3340

8590
11020
12090
7450
5000

5990
7780
7530
3500
2680

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

280
295
364
372
345

279
237
196
171
164

188
151
142
164
210

Non-
car-

bon-

ate

108
126
158
157
145

105
73
48
40
48

54
33
30.
43
64

So-

dium
ad-

sorp-
tion
ratio

2.7
2.2
2.4
2.3
2.3

2.4
2.0
1.1
1.0
1.2

1.6
.9
.9
1.1
1.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

957
920
1100
1100
1010

900
736
543
464
465

569
400
381
457
638

pH

7.7
7.8
7.9
8.1
7.9

7.8
7.7
7.7
7.8
8.0

8.0
7.8
7.7
7.8
7.8

SAN JUAN RIVER BASIN

9-3555. SAN JUAN RIVER NEAR ARCHULETA, N. MEX.

LOCATION. At gaging station, 0.5 mile upstream from Gobernador Canyon, 1 mile north of Archuleta, San Juan County, and 6.8 miles downstream from Navajo Dam. Prior to December 29, 1959, at site 4.6 miles upstream.
DRAINAGE AREA. 3,260 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: December 1954 to September 1960.
Water temperatures: December 1954 to September 1960.
Sediment records: December 1954 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 472 ppm Jan. 5; minimum, 88 ppm June 18-24.
Hardness: Maximum, 226 ppm Jan 5; minimum, 45 ppm June 18-24.
Specific conductance: Maximum daily, 685 micromhos Jan. 5; minimum daily, 110 micromhos June 18.
Water temperatures: Maximum, 78°F July 24, 25, 27, Aug. 3, 4; minimum, freezing point on many days during winter months. Sediment concentrations: Maximum daily, 25,600 ppm Oct. 2; minimum daily, 36 ppm Feb. 22.
Sediment loads: Maximum daily, 350,000 tons Oct. 2; minimum daily, 23 tons Feb. 22.
EXTREMES, 1954-60. Dissolved solids (1956-60): Maximum, 472 ppm Jan. 5, I960; minimum, 85 ppm June 14 to July 11, 1957.
Hardness (1956-60): Maximum, 239 ppm Oct. 28-29, 1958; minimum, 40 ppm July 1-11, 1957.
Specific conductance: Maximum daily, 685 micromhos Jan. 5, 1960; minimum daily, 101 micromhos July 2, 1957.
Water temperatures: Maximum, 79°F Aug. 19, 1955; minimum, freezing point on many days during winter months of most years.
Sediment concentrations: Maximum daily, 34,200 ppm Aug. 17, 1956; minimum daily, 9 ppm Dec. 22, 1958, Jan. 31, 1959.
Sediment loads: Maximum daily, 522,000 tons July 27, 1957; minimum daily, 5 tons Dec. 22, 1958, Jan. 11, 31, 1959.
REMARKS Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October October 1959 to September 1960 given in WSP 1713. Flow affected by ice Nov. 29 to Dec. 7, Dec. 29 to Jan. 13, 19, 20, Jan. 26 to Feb. 8, 10-15.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Dais
of
collection

Oct. 1-7, 1959....

Dec 1 29

Dec. 30-Jan.4,1960

Jan . 10-31 ....

Mar 10-14

Mar. 24-31........

Apr. 1-5..........

Mean

discharge
(eta)

1636
645
771
1600
1230
628

326
163
140
172
265
279

1425
2600
1675
4667
5500
3278

Silica

(S10,)

20 o

18

Iron

(Fs)

-

0.06

-

. 10

Cal-

cium

(Ca)

52
38
29
34
48
36

42
60
72
60
51
50

41 >
41
54
44
40
34

Mag-
ne-

sium

(Mg)

9.4
6.6
3.8
4.6
9.2
5.6

6.3
8.6
11
12
6.8
8.3

4.7
6.7
9.8
9.2
7.5
6.3

Sodium

(Na)

29
23
17
24
28
23

30
47
62
44
37
36

29
39
39
27
13
12

Po-
tas-

sium

(K)

2.8

3.4

~

~

Bi-
car-

bon-

ate

(HCO,)

162
120
93
105
131
112

130
170
186
178
146
145

138
137
154
126
113
1O6

Car-
bon-

ate

(CO,)

Sulfate

(S04)

46

101

Chlorlds

(Cl)

-

2.8

-

7.4

-

~

Pluo-
rlde

(F)

0.4

.5

-

Ni-

trate

(NO,)

0.3

.5

~

Bo-

ron

(B)

0.04

.08

_

Dissolved solids

(residue at 180°C)

Parts

per
million

296
228
176
202
284
216

262
376
472
368
304
310

247
286
336
260
216
18fi

Tons

per
acre-

foot

0.40
.31
.24
.27
.39
.29

.36
.51
.64
.50
.41
.42

.34
.39
.46
.35
.29
.2S

Tons

per

day

1310
397
366
873
943
366

231
165
178
171
218
234

950
2010
1520
3280
3210
IfiRO

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

168
122
88
104
158
113

131
185
226
200
155
159

122
130
175
148
131
111

Non-
car-

bon-

ate

35
24
12
18
50
21

24
46
74
54
36
40

9
18
49
44
38
>A

So-

dium
ad-

sorp-
tion
ratio

1.0
.9
.8
1.0
1.0
.9

1.1
1.5
1.8
1.4
1.3
1.2

1.1
1.5
1.3
1.0
.5
R

Specific
con-

duct-

ance

imlcro-

jnhos at
25°C)

444
342
256
308
431
326

385
557
685
551
462
467

363
426
508
399
316
OT7

PH

7.7
7.5
7.4
8.1
7.2
7.8

8.0
7.3
7.4
7.3
7.7
7.8

7.3
7.6
7.5
7.8
7.7

SAN JUAN RIVER BASIN Continued

9-3555. SAN JUAN RIVER NEAR ARCHULETA, N. MEX. Continued

Particle-size analyses of suspended sediment, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

If&r 27

Sept . 10 ....

Time

(24 hour)

0900
0940
0700
0700
0800
1700

1700
1700
0800
1700
0700
1600

Water
tem-

per-
ature

(°F)

46
44
32
32
35
35

35
43
47
62
52
72

Sam-

pling
point

Discharge
(cfs)

4510
1270
301
480
4000
1800

1800
7320
4820
2460
5030
315

Sediment
concen-

tration

(ppm)

28800
994
198
212
11800
8340

8340
4240
516
272
256
381

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

46

10

- -

0.004

60

66
60

53
58

0.008

78

72

0.016
86

92
86

84
85

0.031

95

94

0.062
99
99
98
100
99
98

98
100
86
93
99
100

0.125
100
99
99

100
98

98

95
100
100

0.250

100
99

99

99

100

0.500

100

100

100

1.000 2.000

Method
of

analysis

VPWC
S
S
S
SPWC
VPWC

VPN
PWC
S
S
S
S

SAN JUAN RIVER BASIN Continued

9-3570. SAN JUAN RIVER AT BLOOMFIELD, N. HEX.

LOCATION. At gaging station at bridge on State Highway 44, 0.8 mile south of Bloomfield, San Juan County, 3 miles upstream from Kutz Canyon, and 10 miles downstream from Canyon Largo.
DRAINAGE AREA. 5,410 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: November 1955 to September 1960.
Sediment records: November 1955 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 82°r Aug. 3; minimum, freezing point on several days during November to February. Sediment concentrations: Maximum daily, 94,700 ppm Mar. 9; minimum daily, 29 ppm Sept. 30.
Sediment loads: Maximum daily, 1,900,000 tons Mar. 9; minimum daily, 16 tons Sept. 30.
EXTREMES, 1955-60. Water temperatures: Maximum, 85°F July 23, 1959; minimum, freezing point on many days during winter months. Sediment concentrations: Maximum daily, 101,000 ppm Aug. 1, 1956; minimum daily, 7 ppm July 16, 1958.
Sediment loads: Maximum daily, 1,900,000 tons Mar. 9, 1960; minimum daily, 4 tons July 26, 1959.
REMARKS. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Flow affected by ice Nov. 27 to Dec. 9, Dec. 15-20, Dec. 28 to Jan. 10, Jan. 13 to Feb. 8, 11-25. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Temperature (°F) of water, water year October 1959 to September 1960

October ....

December .....

February. ......
March ....

July...........

September .....

1

50

35

3?
39
40

4?
56
66

75
72
74

2

48

36

36
41

46
57
64

7?
RO
SO

3

50

35

32
1C,
40

^tj
5 a
63

72
8?

4

52

- -

32
38
45

5?
57
59

74
7H
76

5

55

3?

32
38
45

55

61

71
HO
80

6

55

33

32
33
45

5'.

5B

70

73

7

55

33

32
40
35

55
6T
58

70
HO
71

8

46

33

32
40
35

55
ft!
63

68
an
76

9

55

34

32
39
42

5?

63

74
78
75

10

54

36

33
40
38

53

60

73
78
74

1 1

58

36

33
46
44

53

70

75
78
73

12

60

-

36
41
47

50

78
78
74

13

60

40

35
36
44

5?

78
7fi
71

14

58

36

36
39
39

56
57

76
79
68

15

53

"

33
40
36

57
68
7u

65
fil
71

Day

16

58

37

32
38
31

5?
6?
68

77
75
74

17

"

36

32
35
43

61

73
70
63

18

58

39

32
35
43

56
58

77
74
72

19

56

39

32
35
51

55
54
69

80
73
68

20

48

38

32
36
53

53
57
68

RO
74
68

21

54

36

32

53

58
(SO
7U

SO
77
68

22

52

38

33

49

69

7?
7?
64

23

56

39

34
40
52

61
68

68
75
62

24

38

32
36
50

51
58
66

70
73
55

25

57

34

36
32

51
(SO
69

7?
75

26

57

33

40
40
55

50
63
71

68
75
68

27

54

32

35

52

51

(S?
73

SO
74
70

28

56

33

40
45
<*l

51
60
71

80
75
69

29

52

34

38
39
47

50
6?
74

70
74
67

30

49

33

38

51

55
65
75

73
74
66

31

51

35

41

53

78
75

Aver-
age

54

35

34
38
45

53
61
67

74
76
70

SAN JUAN RIVER BASIN -Continued

9-3570. SAN JUAN RIVER AT BLOOMFIELD, N. MEX. Continued

Particle-size analyses of suspended sediment, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, plpet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Aug. 24...........

Time

(24 hour)

0700
1745
1700
1300
0715
1600

0930
1930
0700
1745
1205
0530

Water
tem-

per-
ature

(°F)

50
50
36
35
35
36

45
50
59
70
75
66

Sam-

pling
point

Discharge
(cfs)

1930
1100
d 350
d 300
8420
3110

4720
3090
4780
1330
490
371

Sediment
concen-

tration

(ppm)

98200
6400
1130
517
90900
18100

50200
652
740
777
1820
822

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

60

0.004

43
42

17
29
41

35

74

0.008 0.016

63
59

27
41
59

52

94

0.031 0.062

88
86
58
36
72
79

77
31
37
97
100
100

0.125

98
96
65
39
89
91

88
41
45
97

0.250

100
100
99
83
100
99

98
85
68
98

0.500

100
99

100

100
100
99
100

1.000

100

100

2,000

Method
of

analysis

VPWC
VPWC
V
VPWC
SPWC
VPWC

VPWC
V
V
S
PWC
S

d Daily mean discharge.

SAN JUAN RIVER BASIN Continued

9-3645. ANIMAS RIVER AT FARMINGTON, N. MEX.

LOCATION. At gaging station at bridge on former State Highway 17, 0.6 mile southeast of Farmington, San Juan County, and 1.3 miles upstream from mouth. DRAINAGE AREA. 1,360 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: June 1940 to September 1960.
Water temperatures: December 1950 to September 1960.
Sediment records: December 1950 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 785 ppm Jan. 1-10, 1960; minimum, 133 ppm June 14-23.
Hardness: Maximum, 420 ppm Jan. 1-10; minimum, 89 ppm June 14-23.
Specific conductance: Maximum daily, 1,190 micromhos Aug. 30; minimum daily, 196 micromhos June 18.
Water temperatures: Maximum, 87°F July 26; minimum, freezing point on several days during December and January.
Sediment concentrations: Maximum daily, 14,600 ppm Oct. 2; minimum daily, 2 ppm Aug. 26.
Sediment loads: Maximum daily, 37,200 tons Mar. 21; minimum daily, less than 0.50 ton on several days in August and September.
EXTREMES, 1940-60. Dissolved solids (1940-49, 1952-54, 1956-60): Maximum, 1,500 ppm Aug. 19, 1949; minimum, 111 ppm June 11-17, 19-20, 1944. Hardness (1956-60): Maximum, 512 ppm Sept. 11-19, 1959; minimum, 80 ppm July 1-7, 1957.
Specific conductance (1941-60): Maximum daily, 1,980 micromhos Aug. 19, 1944; minimum daily, 170 micromhos June 27, 1944.
Water temperatures (1950-60): Maximum, 88°F July 29, 1951; minimum, freezing point on many days during winter months.
Sediment concentrations (1950-60): Maximum daily 36,100 ppm July 23, 1954; minimum daily, 1 ppm on several days during September 1956, 1958. Sediment loads (1950-60): Maximum daily, 337,000 tons July 23, 1954; minimum daily, less than 0.50 ton on many days most years.
REMARKS. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Nov. 28-29, Dec. 5-9, Jan. 1-10, 15-26, Feb. 22-26.

Chemical analyses in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-2, 1959....

Dec. 1-21.. ....

Jan. 1-10, 1960...
Jan. 11-31. ....

Feb. 1-29. ....

Mar. 9-12, 15-18..
Mar. 13-14, 19-21.

Mar. 26-31. ....

Mean

discharge
(els)

723
405
434
262
245
170
229

238
316
537
840
1218
1402

Silica

(Si02)

10

11

Iron

(Fe)

0.06

.06

Cal-

cium

(Ca)

108
93
85
76
118
136
112

113
105
83
70
61
56

Mag-
ne-

sium

(Mg)

12
13
13
16
17
20
16

15
15
12
8.9
9.5
7.7

Sodium

(Na)

76
49
46
57
71
81
66

63
60
57
42
24
19

Po-
tas-

sium

(K)

5.0

5.9

Bi-
car-

bon-

ate

(HCO,)

199
155
146
83
192
223
191

189
177
173
159
143
129

Car-
bon-

ate

(CO,)

0
0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(S04)

212

264

Chloride

(Cl)

31

42

Fluo-
ride

(F)

0.6

.5

Ni-

trate

(NO,)

1.3

2.6

Bo-

ron

(B)

0.08

.09

Dissolved solids

Parts

per
million

645
517
483
515
679
785
633

623
580
489
378
307
260

Tons

per
acre-

loot

0.88
. 70
.66
.70
.92
1.07
.86

.85
. 79
.67
.51
.42
.35

Tons

per

day

1260
565
566
364
449
360
391

400
495
709
857
1010
984

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

320
286
266
256
366
420
344

342
324
256
211
191
171

Non-
car-

bon-

ate

157
159
146
188
208
238
188

187
179
114
80
74
66

So-

dium
ad-

sorp-
tion
ratio

1.9
1.3
1.2
.6
.6
.7
.5

. 5
.4
1.6
1.3
.8
.6

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

907
742
695
740
959
1090
909

902
847
723
580
472
410

pH

7.7
7.7
7.7
7.8
7.6
7.7
7.6

7.7
7.6
7.4
7.5
7.6
8.2

SAN JUAN RIVER BASIN Continued

9-3645. ANIMAS RIVER AT FARMINGTON, N. MEX. Continued

Date of collection

Time

(24 hour)

1800
1730
1000
1400

1830
1800
1915
1930

Water
tem-

per-
ature

(°F)

51
45
40
34

50
50
59
60

Sam-

pling
point

Discharge
(cfs)

534
692
228
d650

1500
2580
3340
4720

Sediment
concen-

tration

(ppm)

4740
13600
158
4090

4050
3780
3860
1640

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004

61
58

42

25
16
13

0.008 0.016

88
82

60

40
26
22

0.031 0.062

98
97
83
82

68
48
44
45

0.125

99
99
93
95

89
61
55
58

3.250

100
100
99
100

98
80
73
72

D.500

100

98
93
96
90

1.000

100
100
100
100

2.000

Method
of

analysis

SPWC
VPWC
S
VPWC

VPWC
VPWC
VPWC
V

d Daily mean discharge.

SAN JUAN RIVER BASIN Continued

9-3680. SAN JUAN RIVER AT SHIPROCK, N. MEX.

LOCATION. At gaging station, 3 miles west of Shiprock, San Juan County, and 6 miles downstream from Chaco River. DRAINAGE AREA. 12,900 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: February 1941 to September 1945, July 1957 to September 1960.
Water temperatures: December 1950 to September 1960.
Sediment records: December 1950 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 1,380 ppm Aug. 18-22; minimum, 123 ppm June 18-23.
Hardness: Maximum, 570 ppm Aug. 18-22; minimum, 76 ppm June 18-23.
Specific conductance: Maximum daily, 1,980 mlcromhos Aug. 19; minimum daily, 193 micromhos June 22,
Water temperatures: Maximum, 88°F Aug. 10; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 62,300 ppm Mar. 9; minimum daily, 30 ppra Sept. 26.
Sediment loads: Maximum daily, 1,290,000 tons Mar. 9; minimum daily, 11 tons Aug. 16, 20-22.
EXTREMES, 1941-45, 1950-60. Dissolved solids (1941-45, 1957-60): Maximum, 2,980 ppm July 30-31, 1959; minimum, 115 ppm June 21-28, 30, 1944. Hardness (1941-45, 1957-60): Maximum, 1,100 ppm July 30-31, 1959; minimum, 70 ppm June 21-28, 30, 1944.
Specific conductance (1957-60): Maximum daily, 4,360 micromhos July 31, 1959; minimum daily, 188 micromhos June 6, 1958,
Water temperatures (1950-60): Maximum, 88°F July 9, 1958, Aug. 10, 1960; minimum, freezing point on many days during winter months.
Sediment concentrations (1950-60): Maximum daily, 86,000 ppm Aug. 14, 1955; minimum daily, 6 ppm July 17-18, 1959.
Sediment loads (1950-60): Maximum daily, 1,700,000 tons July 27, 1957; minimum daily, 1 ton on several days in July and September 1959.
REMARKS. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Nov. 28 to Dec. 10, Dec. 28 to Jan. 10, Jan. 15-25, Feb. 15, 24, 25.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-13, 1959...
Oct 14 31
Mov 1-7

Nov., 30-D«c. 31...
Jan. 1-2, I960....

Jan. 10-16, 18-24.

Mar. 1-5..........

Mean

discharge
(cfs)

1922
1216
2171
1016
689
480

349
623
620
632
645
792

Silica

SK>2)

18
18
20
17
16
15

17
16
13
15
14
15

Iron

(Fe)

Cal-

cium

(Ca)

87
70
66
78
96
123

133
102
64
95
92
91

Mag-
ne-

sium

(Mg)

14
13
11
15
18
25

26
20
13
17
21
14

Sodium

(Na)

70
54
60
63
81
118

124
91
57
84
85
106

Po-
tas-

sium

(K)

Bl-
ear-

bon-

ate

(HCOJ

180
139
156
147
179
222

240
184
126
153
163
159

Car-
bon-

ate

(ccg

0
0
0
0 ,
0
0

0
0
0
5
2
7

Sulfate

(SO.)

230
190
173
225
285
402

428
312
193
297
300
321

Chloride

(Cl)

23
20
16
23
31
38

44
36
20
33
32
28

Fluo-

rlde

(F)

Ni-

trate

(NOJ

5,4
5.8
4.4
6.7
6.9
9.1

11
8.2
8.1
7.8
7.2
6.5

Bo-

ron

(B)

0.08
.09
.08
. 11
.08
. 12

14
13
14
12
09
11

Dissolved solids

(calculated)

Parts

per
million

536
439
427
500
622
839

901
675
430
629
633
667

Tons

per
acre-

foot

0.73
.60
.58
.68
.85
1.14

1.23
.92
.58
.86
.86
.91

Tons

per

day

2780
1440
2500
1370
1160
1090

849
1140
720
1070
1100
1430

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

274
230
208
256
314
410

440
338
212
308
316
286

Non-
car-

bon-

ate

126
116
80
136
168
228

244
187
108
174
179
144

So-

dium
ad-

sorp-
tion
ratio

1.8
1.5
1.8
1.7
2.0
2.5

2.6
2.1
1.7
2.1
2.1
2.7

Specific
con-

duct-

ance

micro-

mhos at

25'C)

796
661
646
745
913
1200

1280
1010
668
934
942
971

pH

7.6
7.6
7.7
7.8
7.8
7.5

8.0
8.0
7.7
8.5
8.4
8.5

SAN JUAN RIVER BASIN Continued

9-3680. SAN JUAN RIVER AT SHIPROCK, N. MEX. Continued

Particle-size analyses of suspended sediment, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, plpet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Oct. 4, 1959......

Jan. 26, I960.....

Sept. 15..........

Time

(24 hour)

1130
1415
1715
1645
1500
1400
1715

1030
1235
0655
0900
0915
1840

Water
tem-

per-
ature

(°F)

52
60
49
32
40
47
47

48
56
52
59
69
72

Sam-

pling
point

Discharge
(cfs)

1890
1080
2780
640
706
7650
5290

6250
2890
5080
6770
1660
197

Sediment
concen-

tration

(ppm)

20000
568
29700
305
598
65800
6260

1140
1680
1520
1420
869
1320

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

66

0.004

72
71
60

17
47
14

46

84

0.008 0.016

88
87
83

27
63
20

68

97

0.031 0.062

97
98
95
89
45
91
32

45
20
18
86
55
100

0.125

99
100
99
91
54
98
59

76
35
31
93
58

D.250

100

100
96
64
100
96

100
83
85
100
79

0.500

100
80

100

100
100

100

1.000

100

2.000

Method
of

analysis

VPWC
SPWC
VPWC
S
VPWC
VPWC
VPWC

V
V
V
VPfC
V
PWC

SAN JUAN RIVER BASIN Continued

9-3795. SAN JUAN RIVER NEAR BLUFF, UTAH

LOCATION. At bridge on State Highway 47, 1,800 feet downstream from gaging station, 20 miles southwest of Bluff, San Juan County, and 114 miles upstream from mouth.
DRAINAGE AREA. 23,000 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: February to June 1927, October 1929 to September 1960.
Water temperatures: May 1944 to September 1960.
Sediment records: August to September 1928, July 1929 to September 1960.
EXTREMES, 1959-60. Dissolved solids; Maximum, 1,590 ppm Aug. 27; minimum, 170 ppm June 17-25.
Hardness: Maximum, 704 ppm Aug. 27; minimum, 104 ppm June 17-25.
Specific conductance: Maximum daily, 2,060 micromhos Aug. 27; minimum daily, 250 micromhos June 21.
Water temperatures; Maximum, 84°F Sept. 4; minimum, freezing point on several days during January.
Sediment concentrations: Maximum daily, 55,200 ppm Oct. 3; minimum daily, 36 ppm Aug. 20, 22.
Sediment loads; Maximum daily, 1,130,000 tons Oct. 3; minimum daily, 10 tons Aug. 22.
EXTREMES, 1929-60. Dissolved solids: Maximum, 1,860 ppm July 21-31, 1934; minimum, 152 ppm June 11-20, 1952.
Hardness: Maximum, 874 ppm July 21-31, 1934; minimum, 102 ppm July 1-6, 8-10, 1957.
Specific conductance (1941-60): Maximum daily, 2,790 micromhos Sept. 19, 1959; minimum daily, 208 micromhos June 17, 1952.
Water temperatures (1944-60): Maximum, 92°F July 31, 1959; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 309,000 ppm Sept. 21, 1929; minimum daily, no flow on several days during July 1934 and August 1939. Sediment loads; Maximum daily, 12,000,000 tons Oct. 14, 1941: minimum daily, 0 tons on several days during July 1934 and August 1939.
REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Dec. 3-8.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-3, 1959....

Nov. 1-3, 6-30....
Nov. 4-5... ....

Jan. 1-5, 13-31,

Jan. 6-12.........

Mar. 1-10.........
Mar. 11-23. ....

Mar. 24-30........
Mar. 31-Apr. 8....
Apr. 9-29. ....

Mean

discharge
(cfs)

3435
1286
1290
2610
754

659
384
754
2514
4030

6840
4931
6044

Silica

(sicg

11
13
10
17
12

11
13
11
10
14

12
11
11

Iron

(Fe)

0.00
.00

.00
.01

.03
.07

Cal-

cium

(Ca)

110
79
84
98
101

116
143
101
105
79

62
51
39

Mag-
ne-

sium

(Mg)

27
18
21
15
28

34
45
34
23
13

11
11
7.8

Sodium

(Na)

142
72
74
114
98

111
151
101
126
93

30
23
17

Po-
tas-

sium

(K)

5.2
3.7
3.2
5.4
3.5

4.0
4.5
3.2
4.9
4.1

3.4
2.9
1.9

Bl-

car-

bon-

ate

(HCO,)

236
156
161
199
184

204
228
192
218
182

148
130
1O6

Car-
bon-

ate

(COJ

0
0
0
0
0

0
0
0
0
0

0
0
o

Sulfate

(S04)

443
254
276
355
370

440
586
398
407
285

130
110
72

Chloride

(Cl)

38
22
24
18
33

37
51
36
29
15

8.0
6.5
4.5

Fluo-
rlde

(F)

Ni-

trate

(NO,)

4.1
5.4
5.0
3.5
6.6

7.9
11
6.9
5.6
3.4

4.0
3.2
2.3

Bo-

ron

(B)

0.14
.07
.07
.09
. 08

.08
. 11
.09
. 10
.08

.08
. 08
.06

Dissolved solids
(residue at 180°C)

Parts

per
million

919
549
585
730
750

892
1160
803
829
597

343
284
215

Tons

per
acre-

foot

1.25
. 75
.80
.99
1.02

1.21
1.58
1.09
1.13
. 81

.47
.39
.29

Tons

per

day

8520
1910
2040
5140
1530

1590
1200
1630
5630
6500

6330
3780
3510

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

384
270
296
306
366

430
540
392
358
252

200
172
130

Non-
car-

bon-

ate

190
142
164
143
215

263
353
235
179
103

79
65
43

So-

dium
ad-

sorp-
tion
ratio

3.1
1.9
1.9
2.8
2.2

2.3
2.8
2.2
2.9
2.6

is
.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

1290
812
858
1040
1070

1230
1540
1120
1160
861

510
429
331

PH

7.6
7.8
7.8
7.8
8.2

8.1
8.1
8.2
8.1
8.0

8.0
8.0
8.0

COLORADO RIVER MAIN STEM

9-3800. COLORADO RIVER AT LEES FERRY, ARIZ.

LOCATION. At gaging station at head of Marble Gorge at Lees Ferry, Coconino County, just upstream from Paria River, 16 miles downstream from site of Glen Canyon dam, 28 miles downstream from Utah-Arizona State line, 61.5 miles upstream from Little Colorado River, and 79 miles downstream from San Juan River. DRAINAGE AREA. 107,900 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: January to July 1926, October 1926 to June 1927, October 1928 to September 1930, November 1942 to October 1945, October 1947 to September 1960.
Water temperatures: July 1949 to September 1960.
Sediment records: October 1928 to December 1933, November 1942 to September 1944, October 1947 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 1,410 ppm Oct. 1-4; minimum, 309 ppm June 9-30.
Hardness: Maximum, 620 ppm Aug. 31 to Sept. 30; minimum, 178 ppm June 9-30.
Specific conductance: Maximum daily, 1,980 micromhos Sept. 16; minimum daily, 412 micromhos June 14.
Water temperatures: Maximum, 84*F July 31; minimum, freezing point on several days during January.
Sediment concentrations: Maximum daily, 27,000 ppm Mar. 12; minimum daily, 330 ppm Feb. 29.
Sediment loads: Maximum daily, 940,000 tons Mar. 12; minimum daily, 3,500 tons Jan. 9-10.
EXTREMES, 1928-33, 1942-45, 1947-60. Dissolved solids (1928-30, 1942-45, 1947-60): Maximum, 1,530 ppm Oct. 15-16, 1957; minimum, 209 ppm June 11-20, 1929. Hardness (1928-30, 1942-45, 1947-60): Maximum, 846 ppm Oct. 15-16, 1958; minimum, 132 ppm June 11-20, 1944.
Specific conductance (1942-45, 1947-60): Maximum daily, 2,280 micromhos Oct. 15, 1945; minimum daily, 318 micromhos June 9, 1948.
Water temperatures (1949-60): Maximum, 85*F July 26, 1959; minimum, freezing point on many days during winter months.
Sediment concentrations (1928-33, 1942-44, 1947-60): Maximum daily, 83,300 ppm Aug. 11, 1930; minimum daily, 134 ppm Aug. 12, 1958.
Sediment loads (1928-33, 1942-44, 1947-60): Maximum daily, 9,450,000 tons Aug. 7, 1929; minimum daily, 1,220 tons Jan. 8, 1949.
REMARKS. Values reported for dissolved solids are residue at 180°C. Records of specific conductance of daily samples available in district offices at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Jan. 3-10, 20-23.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-4, 1959....

Dec. 1-31.........
Jan. 1-31, 1960...

July 1-7..........

Mean

discharge
(cfs)

5992
8487
8393
5721
4960
5537

9126
20710
23130
36180
27810
19750

17530
38680
30930
36210
38140
17940

Silica

(sicg

21

18

20

"

Iron

(Fe)

0.01

.00

.03

Cal-

cium

(Ca)

161
132
118
118
119
117

119
106
94
70
58
58

75
66
54
60
56
59

Mag-
ne-

sium

(Mg)

51
31
32
37
40
35

28
23
18
15
13
13

16
12
11
11
9.4
12

Sodium

(Na)

174
123
116
136
152
138

140
98
68
49
34
38

51
38
30
33
28
41

Po-
tas-

sium

(K)

5.8

6.0

4.5

:
~

_

Bi-
car-

bon-

ate

(HCOJ

208
238
213
226
228
238

243
234
242
186
165
157

183
177
149
156
145
134

Car-
bon-

ate

(COJ

Sulfate

(S04)

405

409

200

Chloride

(Cl)

78

126

39

_

Fluo-

ride

(F)

0.3

. 3

.4

»

Ni-

trate

(NOJ

8.3

8.8

6.9

~

~

_

Bo-

ron

(B)

0.16

15

12

~

_

Dissolved solids

(residue at 180°C)

Parts

per
million

1410
1000
891
1020
1130
984

948
755
588
450
364
375

472
372
323
343
309
375

Tons

per
acre-

foot

1.92
1.36
1.21
1.39
1.54
1.34

1.29
1.03
.80
.61
. 50
.51

.64
.51
.44
.47
.42
.51

Tons

per

day

22810
22910
20190
15760
15130
14710

23360
42220
36720
43960
27330
20000

22340
38850
26970
33530
31820
18160

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

610
458
425
448
460
436

414
358
308
236
198
200

253
213
180
195
178
196

Non-
car-

bon-

ate

440
263
250
263
273
241

215
166
110
84
63
72

103
68
58
67
59
86

So-

dium
ad-

sorp-
tion
ratio

3.1
2.5
2.4
2.8
3.1
2.9

3.0
2.2
1.7
1.4
1.1
1.2

1.4
1.1
1.0
1.0
.9
1.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

1780
1340
1250
1390
1480
1400

1350
1080
869
669
537
559

712
579
483
514
464
559

pH

8.1
7.5
7.8
7.7
7.8
7.4

7.5
7.6
7.5
7.7
7.8
7.7

7.5
7.7
7.8
7.4
7.5
7.6

COLORADO RIVER MAIH STEM Continued

9-3800. COLORADO RIVER AT LEES FERRY, ARIZ. Continued

Particle-size analyses of suspended sediment, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Time

(24 hour)

0950
1030
1430
1720
1720
1450

1500
1230
1530
1000
1350

Water
tem-

per-
ature

(°F)

57
48
37
32
32
50

57
62
71
81
78

Sam-

pling
point

Discharge
(cfs)

12100
11700
6570
3240
3240
5440

36600
31500
41100
8830
2460

Sediment

concen-

tration

(ppm)

9780
7660
1550
632
632
1030

2630
1240
1010
772
580

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

30
4

27
28
28
40

0.004

71
70
68
37
6
55

40
35
36
34
58

0.008

46
17

0.016

91
93
89
61
59
78

61
56
55
58
89

0.031

87
87

0.062

96
96
97
99
99
96

67
70
66
99
100

0.125

98
97
98
100
100
99

71
72
71
100

0.250

100
100
100

100

91
90
88

0.500

100
100
100

1.000 2.000

Method
of

analysis

VPWC
VPWC
VPWC
SPWC
SPN
VPWC

VPWC
VPWC
VPWC
SPWC
PWC

PARIA RIVER BASIN

9-3820. PARIA RIVER AT LEES FERRY, ARIZ.

LOCATION. At gaging station, 0.5 mile upstream from mouth and 1 mile northwest of Lees Ferry, Coconino County. DRAINAGE AREA. 1,570 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: October 1947 to February 1950.
Water temperatures: October 1956 to September 1960.
Sediment records: October 1947 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 96 8 F July 29; minimum, freezing point Jan. 18.
Sediment concentrations: Maximum daily, 248,000 ppm June 8; minimum daily, 10 ppm Aug. 4-13.
Sediment loads: Maximum daily, 113,000 tons June 8; minimum daily, 0.1 ton June 1-6, Aug. 4-13.
EXTREMES, 1947-60. Water temperatures (1956-60): Maximum, 96°F Aug. 11, 1958, July 29, 1960; minimum, freezing point Jan. 18, 1960.

Sediment concentrations: Maximum daily, 411,000 ppm Aug. 27, 1952; minimum daily, 1 ppm June 1-10, 1950.
Sediment loads: Maximum daily, 5,100,000 tons Sept. 12, 1958; minimum daily, less than 0.05 ton on many days.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in 1713. Flow affected by ice Jan. 2-10, 17-18, 20-24.

Temperature (°F) of water, water year October 1959 to September 1960

December .....

July...........

September .....

1

35

34

4-0

57
59
79

91
R5
71

2

45

35

3R
4?

ft4

(U

R?

R5
76

3

34

50

70
ftft
73

in
R4
81

4

_
_

_

75

as

70

5

40

_

7ft
75
73

_

6

33
40
54

ft 5
75

00
«7

7

33

33
35
47

7ft
65

97
R5
33

8

41

33
35
49

ftO
a?
70

79

Rl

9

4ft

57
ftR

R5
71

10

46

3ft
37
47

R3
7R

fl3
66

11

41

35
40
45

ft5
ftft
7B

aft

91

12

35

ftR

65
7'
ftR

a?
flft
86

13

35
43
51

74
R?
S3

R9
78
81

14

36

34
47
54

fil
7ft
Rl

R?
73
79

15

37

40
33
54

63
75
74

8?
74
78

Day

16

36

34
41
55

ft5
83
83

R5
84

17

37

34
34

74
75
83

Rl
73

18

32

__

49

57
7ft
79

aa
75
65

19

41

41
46
50

75
77

94

20

35

38
37

79
ftl
8?

9?

77

21

41

49
ft7

ftfl
ftB
75

9R
85
75

22

45

4a
57

ft?
73
7ft

fll
R?
66

23

42

43

(S3

ft5
55
fll

ftfl
58

24

45

41
33
5ft

5?
77
R4

84

25

35

_

55

41
77
8?

94
ee
77

26

38

37
39
ft5

ftl
78
fll

fl?
66
70

27

40

45
43
ft?

55

(S3
H9

H5
72
78

28

38

44

5(1
51

63
83
7fl

93
81
70

29

4U

35

ft6

55
74
7ft

96
65
77

30

35

43

_

57

73
9?

90
S3
8U

31

40

43

_

57

77

84
90

Aver-
age

37
40
54

64
73
79

81
75

PARIA RIVER BASIN Continued

9-3820. PARIA RIVER AT LEES FERRY, ARIZ. Continued

Particle-size analyses of suspended sediment, water years October 1958 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, plpet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Mar. 7. 1960......

Time

(24 hour)

0910
0950

Water
tem-
per-
ature

(°F)

73
47

Sam-

pling
point

Discharge
(cfs)

478
50

Sediment
concen-

tration

(ppm)

341000
26700

Sediment
discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004

27
73

0.008 0.016

37
91

0.031 0.062

62
96

0.125

83
98

0.250

98
100

0.500

100

1.000 2.000

Method
of
analysis

SPWC
vpwr

LITTLE COLORADO RIVER BASIN

9-4012. LITTLE COLORADO RIVER AT CAMERON, ARIZ.

LOCATION. At bridge on U.S. Highway 89 at Cameron, Cooonino County, 12 miles upstream from gaging station which is 3 miles down-stream from Coconino damsite, 9.5 miles downstream from Moenkopi Wash, 9.5 miles northwest of Cameron, and 45.5 miles upstream from mouth.
DRAINAGE AREA. 26,500 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1950 to September 1958.
Water temperatures: October 1951 to September 1960.
Sediment records: October 1947 to September 1956 (monthly), October 1956 to September 1960.
EXTREMES, 1959-60. Sediment concentrations: Maximum daily, 87,000 ppm Sept. 2; minimum daily, no flow on many days. Sediment loads: Maximum daily, 801,000 tons Nov. 1; minimum daily, 0 tons on many days.
EXTREMES, 1947-60. Sediment concentrations: Maximum daily, 162,000 ppm Aug. 22, 1958; minimum daily, no flow on many days. Sediment loads: Maximum daily, 2,580,000 toes Sept. 21, 1952; minimum daily, o tons on many days.
REMARKS. Sediment loads are computed at station with allowances made for inflow between sampling point and gaging station. Appreciable inflow between sampling site and gaging station during periods of storm runoff. Most of this inflow is from Moenkopi Wash, but other arroyos may at times become sizeable contributors. Records of discharge for station near Cameron (below Moenkopi Wash) for water year October 1959 to September 1960 given in WSP 1713.

Temperature (°P) of water, water year October 1959 to September 1960

Month

October ....

December .....

July...........
August........
September .....

Day

1

4a

40

33
36
54

52
78

65

2

60

41

33
39
51

57
63

B r'

3

f,0

41

33
36
45

60

4

r>?

42

34
39
57

65

5

M

38

35
39
55

67

6

6?

40

35
39
62

65

7

to

35

35
45
60

60

8

60

40

35
40
60

61

9

JR

42

35
42
56

62

10

65

36
42
55

65

1 1

65

49

37
42
56

55

12

52

38
38
55

53

13

33
36
54

56

14

34
42
48

62

15

36
36
50

62

16

55

34
40
42

60

17

52
42

32
35
52

60

18

53
44

38
35
55

64

19

54
45

34
35
58

65

20

45
45

34
40
62

72

21

44
44

34
41
64

69

22

41
42

33
40
64

62

23

47
45

34
36
55

54

24

46
43

36
33
60

49

25

41
47

35
45
55

60

26

40
40

34
45
57

60

27

38
38

34
47
52

58

28

34
36

39
45
52

75

29

33
34

38
37
62

75

30

<fU
35

34

62

75

31

34

39

52

Aver-

age

47
41

35
39
56

62

COLORADO RIVER MAIN STEM

9-4025. COLORADO RIVER NEAR GRAND CANYON, ARIZ.

LOCATION. At gaging station at Kaibab Bridge, 0.2 mile upstream from Bright Angel Creek, 11 miles by trail northeast of Grand Canyon, Coconino County, 26 miles downstream from Little Colorado River, and 267 miles upstream from Hoover Dam.
DRAINAGE AREA. 137,800 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: August 1925 to November 1942, September 1943 to September 1960.
Water temperatures: October 1936 to October 1942, September 1943 to September 1960.
Sediment records: October 1925 to November 1942. September 1943 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 1,700 ppm Oct. 1-4; minimum, 323 ppm June 26 to July 1.
Hardness: Maximum, 812 ppm Oct. 1-4; minimum, 185 ppm June 26 to July 1.
Specific conductance: Maximum daily, 2,280 micromhos Oct. 1; minimum daily, 453 micromhos June 13.
Water temperatures: Maximum, 84°F Aug. 1-3; minimum, 34°F Jan. 7-9.
Sediment concentrations: Maximum daily, 25,600 ppm Mar. 13; minimum daily, 46 ppm Aug. 31.
Sediment loads: Maximum daily, 1,150,000 tons Mar. 13; minimum daily, 350 tons Aug. 31.
EXTREMES, 1925-42, 1943-60. Dissolved solids: Maximum, 1.890 ppm Sept. 21-30, 1934; minimum, 225 ppm June 11-20, 1942.
Hardness: Maximum, 812 ppm Oct. 1-4, 1959; minimum, 127 ppm June 11-17, 1926.
Specific conductance (1937-42, 1943-60): Maximum daily, 2,900 micromhos Sept. 6, 1940; minimum daily, 341 micromhos June 15, 1942.
Water temperatures (1936-42, 1943-60): Maximum, 88°P July 17, 1944; minimum, freezing point Dec. 30, 31, 1954.
Sediment concentrations: Maximum daily, 138,000 ppm Sept. 13, 1927; minimum daily, 23 ppm Oct. 11, 1956.
Sediment loads: Maximum daily, 27,600,000 tons Sept. 13, 1927; minimum daily, 196 tons Oct. 11, 1956.
REMARKS. Values reported for dissolved solids are residue at 180°C. Records of specific conductance of daily samples available in district at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-4, 1959....

Oct. 17-31........

Dec. 28 -Jan. 4,

Apr. 1-15.........

May 1-5 ....

Mean

discharge
(cfs)

5560
10270
8061
12720
7991
6025

7756
4060
6263
6144
6733

13950
22570
25720
29740
21060

Silica

(SiO,)

21

18

12

Iron

(Fe)

- -

0.00

.00

.01

Cal-

cium

(Ca)

234
142
122
115
121
118

114
123
118
115
113

108
96
71
64
58

Mag-
ne-

sium

(Mg)

55
34
33
27
34
39

31
39
37
36
36

23
25
18
12
13

Sodium

(Na)

221
159
137
133
132
158

150
190
174
166
175

140
108
70
43
43

Po-
tas-
sium

(K)

-

6.3

6.4

4.7

Bi-
car-

bon-

ate

(HCOj)

229
273
231
245
240
236

252
256
250
240
241

241
222
184
174
166

Car-
bon-

ate

(cog

Sulfate

(S0«)

376

366

_

170

Chloride

(Cl)

117

169

52

Fluo-

ride

(P)

- -

0.5

.4

"2

_

Ni-
trate

(NOJ

6.8

9.9

2.8

Bo-

ron

(B)

-

0.18

. 18

~

. 07

Dissolved solids

Parts

per
million

1700
1090
974
888
946
1020

930
1120
1040
1030
1020

858
744
537
396
384

Tons

per
acre-

foot

2.31
1.48
1.32
1.21
1.29
1.39

1.26
1.52
1.41
1.40
1.39

1.17
1.01
.73
.54
. 52

Tons

per

day

25520
30220
21200
30500
20410
16590

19480
12280
17590
17090
18540

32320
45340
37290
31800
21840

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

812
496
442
396
440
456

412
466
448
436
432

366
344
250
210
200

Non-
car-

bon-

ate

624
272
252
195
244
262

206
256
243
240
234

162
99
68
64

So-
dium
ad-

sorp-
tion
ratio

3.4
3.1
2.8
2.9
2.7
3.2

3.2
3.8
3.6
3.5
3.7

3.2
2.5
1.9
1.3
1.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

2230
1550
1400
1290
1370
1520

1400
1660
1570
1520
1550

1270
1110
788
601
584

PH

7.7
7.5
7.6
7.7
7.5
7.5

7.7
7.5
7.7
7.6
7.5

7.4
7.7
7.7
7.5
7 6

COLORADO RIVER MAIN STEM Continued

9-4025. COLORADO RIVER NEAR GRAND CANYON, ARIZ, Continued

Particle-size analyses of suspended sediment, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Oct. 7, 1959......

M&y 14

Sept. 6...........

Time

(24 hour)

0950
1720
1535
1530
1545
0815

1205
1205
1830
1130
1730

Water
tem-

per-
ature

(°F)

59
57
49
36
51
51

70
70
67
72
77

Sam-

pling
point

Discharge
(da)

12900
13700
10300
3710
6200
16500

15600
15600
28400
40400
3440

Sediment
concen-

tration

(ppra)

22600
12900
6760
329
856
25000

789
789
1070
1850
2520

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

31
3
16
13
60

0.004

67
56
72
63
59
64

37
12
21
16
74

0.008

48
37

0.016

90
79
91
98
86
81

63
58
39
25
98

0.031

77
79

0.062

98
96
96
99
99
92

84
84
51
35
100

0.125

100
100
99
100
100
99

92
92
65
49

0.250

100

100

100
100
91
84

0.500

100
100

1.000 2.000

Method
of

analysis

VPWC
VPWC
VPWC
SPWC
SPWC
VPWC

VPWC
VPN
VPWC
VPWC
PWC

VIRGIN RIVER BASIN

9-4150. VIRGIN RIVER AT LITTLEFIELD, ASIZ.

LOCATION. At gaging station, 0.4 mile downstream from Beaver Dam Wash, 0.4 mile upstream from Littlefield, Mohave County, and 36 miles upstream from waterline of Lake Mead at elevation 1,221 feet above mean sea level.
DRAINAGE AREA. 5,090 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: July 1949 to September 1960.
Water temperatures: October 1947 to September 1960.
Sediment records: October 1947 to September 1960. ^
EXTREMES, 1959-60. Dissolved solids: Maximum, 3,620 ppm Sept. 2; minimum, 1,380 ppm Mar. 15.
Hardness: Maximum, 2,050 ppm Sept. 2; minimum, 740 ppm Mar. 15.
Specific conductance: Maximum daily, 4,070 micromhos Sept. 2; minimum daily, 1,970 micromhos Mar. 15.
Water temperatures: Maximum, 87°F Sept. 11; minimum, 41°F Jan. 5.
Sediment concentrations: Maximum daily, 62,300 ppm Nov. 3; minimum daily, 126 ppm June 20.
Sediment loads: Maximum daily, 272,000 tons Nov. 3; minimum daily, 19 tons June 20.
EXTREMES, 1947-60. Dissolved solids (1949-50, 1953-60): Maximum, 3,620 ppm Sept. 2, 1960; minimum, 524 ppm Mar. 16, 1958.
Hardness (1949-50, 1953-60): Maximum, 2,050 ppm Sept. 2, 1960; minimum, 334 ppm Mar. 16, 1958.
Specific conductance (1949-60): Maximum daily, 4,090 micromhos Oct. 5, 1955; minimum daily, 734 micromhos Apr. 28, 1952.
Water temperatures (1949-60): Maximum, 92°F July 7, 1953; minimum, 35°F Jan. 4, 1949, Jan. 4, 1950.
Sediment concentrations: Maximum daily, 150,000 ppm Oct. 9, 1954; minimum daily, 104 ppm July 9, 1959.
Sediment loads: Maximum daily, 1,740,000 tons Aug. 25, 1955; minimum daily, 16 tons July 9, 1959.
REMARKS. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-31, 1959...

Dec. 1-25.........

Jan. 1-31, 1960...

Feb. 1-29.........
Mar. 1-14, 16-31..
Mar. 15. ....
Apr. 1-28. ....
Apr. 29-30........

May 1-31.. ....

July 1-31.........

Mean

discharge
(cfs)

75.8
210
127
202
183

175
156
212
87.2
236

75.9
55.9
59.2

Silica

(Si02)

20
17
17
16
16

16
21
16
19
14

20
20
20

Iron

(Fe)

0.01

. 00

. 02

. 01

Cal-

cium

(Ca)

317
313
277
253
250

238
257
212
329
220

313
337
337

Mag-
ne-

sium

(Mg)

118
83
85
71
79

74
73
51
97
63

106
106
113

Sodium

(Na)

298
255
276
215
238

226
229
177
250
205

256
255
255

Po-
tas-

sium

(K)

29
22
23
19
21

20
21

25
19

25
27
26

Bi-
car-

bon-

ate

(HCO,)

308
318
327
314
324

322
308
278
330
280

297
281
300

Car-
bon-

ate

(CO,)

0
0
0
0
0

0
0
0
0
0

0
0
0

Sulfate

(S04)

1100
927
859
726
742

709
760
562
1010
658

1020
1090
1090

Chloride

(Cl)

400
350
360
300
310

305
310
220
350
265

340
345
350

Fluo-

ride

(F)

Ni-

trate

(NO,)

0.5
2.1
1.0
. 5
1.0

1.2
2.0
3.0
3.3
3.5

1.6
1.3
1.3

Bo-

ron

(B)

0.84
. 75
. 71
. 58
. 62

. 62
. 66

. 80
. 59

. 94
. 88
. 83

Dissolved solids

(residue at 180°C)

Parts

per
million

2430
2130
2060
1760
1820

1750
1820
1380
2250
1590

2230
2320
2340

Tons

per
acre-

foot

3.30
2.90
2.80
2.39
2.48

2.38
2.48
1.88
3.06
2.16

3.03
3.16
3.18

Tons

per
day

497
1210
706
960
899

827
767
790
530
1010

457
350
374

Hardness

as CaCOj,

Cal-

cium,
Mag-
ne-

sium

1280
1120
1040
920
950

900
940
740
1220
810

1220
1280
1300

Non-
car-

bon-

ate

1020
859
772
663
684

636
687
512
949
580

971
1040
1060

So-

dium
ad-

sorp-
tion
ratio

3.6
3.3
3.7
3.1
3.4

3.3
3.2
2.8
3.1
3.1

3.2
3.1
3.1

Specific
con-

duct-

ance

Imicro-

jnhos at
25°C)

3350
2950
2880
2490
2630

2550
2560
1970
2970
2280

2920
3070
3100

PH

7.8
7.6
7.8
7.8
7.7

7.9
7.9
7.6
7.8
7.8

7.8
8.0
8.0

COLORADO RIVER MAIN STEM

9-4210. LAKE MEAD AT HOOVER DAM, ARIZ.-NEV.
(Formerly published as Lake Mead near Boulder City, Nev.)

LOCATION. Midway between the intake towers, 225 feet upstream from the gaging station on State line between Mohave County, Ariz., and Clark County, Nev. DRAINAGE AREA. 167,800 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1940 to September 1960.
REMARKS. Samples are collected by the U.S. Bureau of Reclamation and analyzed by the Metropolitan Water District of Southern California, La Verne, Calif.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date of
collection

Nov. 3, 1959...

Nov. 3...... ...

Nov. 3.........

Nov. 3.........

Dec. 2.........

Dec. 2.........

Dec. 2. ....

Depth
(feet)

5
25

125

275

Eleva-
tion
(feet)

1,164
1,144

894

Tem-
per-
ature
(°F)

68.7

56.7

56.0

Silica
(Si02)

9.3

10

10

Cal-
cium
(Ca)

77

83

Mag-
ne-

sium
(Mg)

24

27

24

25

Sodium
(Na)

73

_

72

77

Po-
tas-
sium
(K)

7

3

2

3

Bicar-
bonate
(HC0 3)

126

151

131

132

132

149

Car-
bonate
(C0 3)

0

0

Sulfate
(S0 4)

253

252

251

252

Chloride
(Cl)

64

64

Ni-
trate

(N0 3)

1.1

2 o'

2.3

Dis-
solved
solids
(calcu-
lated)

572

579

591

Hard-
ness
as
CaC0 3

293

301

310

Noncar-
bonate
hardness
as CaC0 3

190

181

_

__

188

Specific
conduct-
ance

(micro-
mhos at
25°C)
905
903
883

882

886
874
886
881

944

pH

8.0
8.3
7.8

7.7
7.9

7.5
8.0
7.6
8.3

7.8

. 9
. 4
. 8

. 8

8.3

8.2

7.9

GILA RIVER BASIN

9-4305. GILA RIVER NEAR GILA. N. MEX.

LOCATION. Temperature recorder at gaging station at Hooker damsite, 1 mile upstream from Mogollon Creek, and 7 miles northeast of Gila, Grant County.
DRAINAGE AREA. 1,864 square miles.
RECORDS AVAILABLE. Water temperatures: July 1959 to September 1960.
Sediment records: July 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 85°F June 29, 30, Aug. 5; minimum, 34°F Jan. 16.
Sediment concentrations: Maximum daily, 12,100 ppm Aug. 12; minimum daily, 4 ppm Feb. 26-28.
Sediment loads: Maximum daily, 14,800 tons Mar. 9; minimum daily, 1 ton on many days.
EXTREMES, July 1959 to September 1960. Water temperatures: Maximum, 85°F June 29, 30, Aug. 5, 1960; minimum, 34°F Jan. 16, 1960. Sediment concentrations: Maximum daily, 12,100 ppm Aug. 13, 1960; minimum daily, 1 ppm Sept. 3, 1959.
Sediment loads: Maximum daily, 14,800 tons Mar. 9, 1960; minimum daily, less than 0.50 ton Sept. 3, 1959.
REMARKS. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of dis-charge for water year October 1959 to September 1960 given in WSP 1713.

Temperature (°F) of water, water year October 1959 to September 1960

October
November .....
December .....

January. ....
February. ......

April..........

July...........

September .....

1

62
50

47

40

6/

83
81
82

2

63
48

48

41

7ft

7S
69

3

If,
54

_

6!)
58

7*
69

4

52
5D

38

53

63
70

_

5

l?
54
55

37

5ft

71

3
fl".
79

6

49

40

54

ft5

75
79
76

7

49
49

39

5?

55

70

7S
R3
77

8

55
50

36

5?

59

70

73
7 a
77

9

7<>
60
50

36

49

58

73

73

_

7S

10

58
48

40

5?

63

ft«

R?
T-I

11

77
54
54

41

54

65

70

R?

_

12

70
57
50

40

49

63

70

R1
77
71

13

52
48

42

56

60

74

71
7?
75

14

ft9
54

40

54

58

flO

76
74
70

15

l?
49
45

50

65

7?

7R
73

Day

16

75
50
50

34

53

61

79

75
73
66

17

70
48

38

5ft

54

R?

73
75

18

ftfl
53
51

40

54

63

79

72
80
68

19

67
55
55

37

50

66

78

79

71

20

69
50
52

36

54

59

79

74
79
73

21

55
54
51

44

5S

64

78

70
71
72

22

71

52

45

51

63

7?

82
70
70

23

fil
51

43

56

65

80

8?
78
74

24

6H
53
48

49

54

56

77

84
HI

25

yy
53
45

52

53

67

76

83
70
72

26

69
48
40

44

63

65

75

83
7?
72

27

66
49
36

45

57

62

77

76
81
72

28

65
56
38

47

53

60

76

78
79
70

29

60
48
48

46

_

66

85

__

79
67

30

57
49

_

69

85

__

75
65

31

65

46

_

_

78

Aver-
age

69
54
48

42

53

62

74

77
77
72

GILA RIVER BASIN Continued

9-4305. GILA RIVER NEAR GILA, N. HEX. Continued

Particle-size analyses of suspended sediment, water year October 1959 to September 1960 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection

Sept. 21..........

Time

(24 hour)

1700
1700
1600
1700
0830
1800

0800
1930
1500
1900
1730

Water
tem-

per-
ature
(°F)

40
40
52
67
68
75

64
78
83
73
72

Sam-

pling
point

Discharge
(cfs)

520
1280
1120
123
55
70

90
37
56
102
56

Sediment
concen-

tration

(ppm)

2880
2920
5310
19
216
2040

2460
711
1860
1960
152

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

72

75
81
76
41

0.004

25
13
20

88

91
94
90
53

0.008 0.016

60
28
37

99

00
99
99
94

0.031 0.062

89
50
59
80
100
100

100
100
100
100

0.125

93
62
66
88

0.250

97
76
76
94

0.500

100
89
88
99

1.000

100
97
100

2.000

Method
of

analysis

VPWC
VPWC
VPWC
S
S
PWC

PWC
PWC
PWC
PWC
S

GILA RIVER BASIN Continued

9-4740. GILA RIVER AT KELVIN, ARIZ.

LOCATION. Just above mouth of Mineral Creek, 1,200 feet upstream from gaging station at Kelvin, Pinal County, 17 miles downstream from San Pedro River, and 19.5 miles upstream from Ashurst-Hayden Dam.
DRAINAGE AREA. 18,011 square miles (at gaging station), of which 5,125 square miles is below Coolidge Dam.
RECORDS AVAILABLE. Chemical analyses: December 1950 to September 1960.
Water temperatures: December 1950 to September 1960.
Sediment records: January 1958 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 1,660 ppm Sept. 27-30; minimum, 379 ppm Dec. 25-27. Hardness: Maximum, 815 ppm Sept. 27-30; minimum, 224 ppm Apr. 1-30.
Specific conductance: Maximum daily, 2,310 micromhos Sept. 30; minimum daily, 501 micromhos Jan. 13.
Water temperatures: Maximum, 87°F Aug. 8, 9; minimum, 43*F Jan. 18.
Sediment concentrations: Maximum daily, 31,100 ppm Jan. 13; minimum daily, 58 ppm Sept. 30.
Sediment loads: Maximum daily, 225,000 tons Oct. 30; minimum daily, 5 tons Sept. 30.
EXTREMES, 1950-60. Dissolved solids: Maximum, 3,080 ppm July 1-8, 1957; minimum, 294 ppm Sept. 24, 1954.
Hardness: Maximum, 1940 ppm July 11-18, 1956, July 1-8, 1957; minimum, 152 ppm Sept. 1-30, 1957.
Specific conductance: Maximum daily, 3,860 micromhos 5uly 15, 1955; minimum daily, 407 micromhos Jan. 20, 1952.
Water temperatures: Maximum, 98°F July 25, Aug. 20, 1953; minimum, 41°F Dec. 15, 25, 1950, Jan. 25, Feb. 23, 1955.
Sediment concentrations (1958-60): Maximum daily, 92,200 ppm July 17, 1959; minimum daily, 23 ppm July 12, 1959.
Sediment loads (1958-60): Maximum daily, 559,000 tons'Aug. 6, 1958; minimum daily, 2 tons July 12, 1959.
REMARKS. Values reported for dissolved solids are residue at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. No appreciable inflow from Mineral Creek between sampling point and gaging station except during periods of heavy local rains.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-30, 1959...

Dec 31

Jan. 1-6, I960....

Jan. 23-31........

Mean

discharge
(eta)

202
430
115
99.0
32.3
28.8

90.0
172
2830
197
244
185

132
2063
655
320
182

Silica

(S102)

"

"

~

42

Iron

(Fe)

-

0.00

Cal-

cium

(Ca)

68
104
97
121
LSI
124

95
88
80
L44
L04
141

1.73
72
80
121
158

Mag-
ne-

sium

(Mg)

15
9.4
15
20
37
40

19
18
8.9
28
17
25

34
11
13
20
31

Sodium

(Na)

94
28
69
96
164
175

144
103
29
93
89
113

150
34
56
93
132

Po-
tas-

sium

(K)

~

-

-

7.2

~

Bi-
car-

bon-
ate

(HCO,)

229
302
196
256
300
218

242
233
225
232
184
251

222
199
174
241
262

Car-
bon-

ate

(CO,)

Sulfate

(S04)

-

--

~

~

333

"

Chloride

(CD

E
"

100

»

Fluo-

ride

(F)

-

- -

- -

1.0

~

_

Ni-

trate

(NO,)

-

~

~

2.4

~

Bo-

ron

(B)

E
--

0.17

Dissolved solids

(residue at 180°C)

Parts

per
million

568
485
604
770
1160
1150

838
672
379
896
680
913

1190
389
505
766
1040

Tons

per
acre-

foot

0.77
.66
.82
1.05
1.58
1.56

1.14
.91
.52
1.22
.92
1.24

1.62
. 53
. 69
1.04
1.41

Tons

per

day

310
563
188
206
101
89.3

204
312
2900
477
448
456

424
2170
893
662
511

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

230
298
304
385
530
472

315
295
236
474
330
454

570
226
255
386
520

Non-
car-

bon-

ate

42
50
144
175
284
294

116
104
52
284
179
248

388
63
112
188
306

So-

dium
ad-

sorp-
tion
ratio

2.7
. 7
1.7
2.1
3.1
3.5

3.5
2.6
.8
1.9
2.1
2.3

2.7
1.0
1.5
2.1
2.5

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

859
675
877
1130
1640
1620

1260
1020
576
1250
1020
1280

1620
567
727
1090
1470

PH

8.1
7.9
8.0
7.6
8.0
8.0

7.7
7.8
7.6
7.7
7.6
7.8

7.8
7.7
7.8
7.7
7 7

GILA RIVER BASIN Continued

9-4740. GILA RIVER AT KELVIN, ARIZ. Continued

Particle-size analyses of suspended sediment, water year October 1959 to September (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in nati-P, plpet; S, sieve; V, visual accumulation tube; W, in distilled water)

1960
[ve water;

Date of collection

Sept . 27 ....

Time

(24 hour)

1700
1700
1500
1500
1700
2100
1500

Water
tem-

per-
ature

(°F)

48
63
64
85
85
80
85

Sam-

pling
point

Discharge
(cfs)

4450
444
420
845
615
845
41

Sediment
concen-

tration

(ppm)

15000
1250
258
2420
985
35800
72

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

36
62
46

0.004

41
16

51
79
62

0.008 0.016

67
28

81
88
93

0.031 0.062

100
70
57
97
97
97
96

0.125

94
90
99
98
99
99

0.250

100
99
100
100
100
100

0.500

100

1.000 2.000

Method
of

analysis

PWC
VPWC
S
SPWC
SPWC
VPWC
S

GILA RIVER BASIN Continued

9-5020. SALT RIVER BELOW STEWART MOUNTAIN DAM, ARIZ.

LOCATION. Just downstream from dam, 3.5 miles upstream from gaging station below Stewart Mountain Dam, which is 6 miles upstream from Verde River, Maricopa County.
DRAINAGE AREA. 6,211 square miles.
RECORDS AVAILABLE. Chemical analyses: December 1950 to September 1960.
Water temperatures: December 1950 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 618 ppm Oct. 1-31; minimum, 468 ppm May 1-31.
Hardness: Maximum, 168 ppm Oct. 1-31; minimum, 142 ppm June 1-16.
Specific conductance: Maximum daily, 1,220 micromhos Oct. 17; minimum daily, 791 micromhos May 30.
EXTREMES, 1950-60. Dissolved solids: Maximum, 1,300 ppm Aug. 21-28, 1951; minimum, 361 ppm Mar. 21-31, 1953.
Hardness: Maximum, 270 ppm Nov. 1-30, 1956; minimum, 138 ppm Apr. 1-10, 1953.
Specific conductance: Maximum daily, 2,490 micromhos Aug. 20, 1951; minimum daily, 620 micromhos Mar. 28, 1953.
Water temperatures: Maximum, 84°F Aug. 24, 26, 27, 1951; minimum, 49°F Feb. 14, 1951.
REMARKS. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. No inflow between sampling point and gaging station except during periods of heavy local rains.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-31,1959....

Jan. 1 -Feb. 15, I960.
Feb. 16-Mar. 31...

Weighted-average

Time-weighted
average.......

Tons per day....

Mean

discharge
(cfs)

285
43.7
48.0
141
98.0
305

530
776
1116
1302
1314
1077

__

554

Silica

(810,)

20

21

21

22

__

~

Iron

(Fe)

0.00

.00

.01

.01

_

Cal-

cium

(Ca)

51
44
45
42
41
42

44
42
46
47
46
45

45

45

68

Mag-
ne-

sium

(Mg)

10

11
11
11
11
10

8.3
9.0
10
11
11
9.6

10

10

15

Sodium

(Na)

163
131
144
118
116
114

112
117
148
160
142
122

137

132

205

Po-
tas-

sium

(K)

5.4

2.5

2.4

6.0

_

Bl-

car-

bon-

ate

(HCOJ

166
150
162
136
139
139

141
134
147
154
157
143

149

148

223

Car-
bon-
ate

(cog

Sulfate

(SO,)

39

35

36

42

_

_

Chloride

(CD

244

180

175

244

_

Fluo-
ride

(f)

0.4

.4

.4

.4

_

_

Ni-
trate

(NOJ

0.4

2.0

1.4

1.5

_

Bo-

ron

(B)

0.13

. 10

. 10

. 13

_

_

Dissolved solids

(residue at 180°C)

Parts

per
million

618
522
566
491
490
488

468
475
573
611
571
502

547

532

Tons

per
acre-

foot

0.84
.71
.77
.67
.67
.66

.64
.65
.78
.83
.78
.68

0.74

Tons

per

day

476
61.5
73.3
187
130
402

670
995
1730
2150
2030
1460

819

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

168
155
158
150
146
147

144
142
156
164
162
152

156

154

Non-
car-

bon-

ate

32
32
25
38
32
33

28
32
35
38
33
35

34

32

So-

dium
ad-

sorp-
tion
ratio

5.5
4.6
5.0
4.2
4.2
4.1

4.1
4.3
5.2
5.5
4.9
4.3

3.8

4.6

Specific
con-

duct-

ance

(micro-
mhos at

25eC)

1120
966
1020
873
864
858

824
844
1020
1100
1030
915

983

955

PH

7.6
8.0
7.9
7.6
7.6
7.6

7.7
7.6
7.8
7.7
7.8
7.8

7.7

7.7

GILA RIVER BASIN Continued

9-5100. VERDE RIVER BELOW BARTLETT DAM, ARIZ.

LOCATION. At gaging station, 2.2 miles downstream from Bartlett Dam, Maricopa County, and 3.5 miles upstream from Camp Creek. DRAINAGE AREA. 6,188 square miles.
RECORDS AVAILABLE. Chemical analyses: December 1950 to September 1960.
Water temperatures: December 1950 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 490 ppm July 21-26, 28; minimum, 186 ppm Nov. 2-5.
Hardness: Maximum, 321 ppm July 21-26, 28; minimum, 112 ppm Nov. 2-5.
Specific conductance: Maximum daily, 814 micromhos July 23-24; minimum daily, 281 micromhos Jan. 5.
Water temperatures: Maximum, 82°F Sept. 30; minimum, 42°F Jan. 6.
EXTREMES, 1950-60. Dissolved solids: Maximum, 550 ppm Dec. 18-21, 1956; minimum, 158 ppm Jan. 11-20, 1952.
Hardness: Maximum, 413 ppm Dec. 18-21, 1956; minimum, 108 ppm Jan. 11-20, 1952.
Specific conductance: Maximum daily, 958 micromhos Nov. 10, 1956; minimum daily, 234 micromhos Jan. 13, 15, 1952.
Water temperatures: Maximum, 90 °F July 18, Aug. 14, 1951; minimum, 41°F Jan. 30, 1952.
REMARKS. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-Nov. 1,1959

Jan. 1-31, 1960...

June 18-July 5....

Mean

discharge
(cfs)

24.3
20.8
69.8
88.3
86.6
208

592
2316
1328
848
1169
1069

Silica

(SiO,)

26

21

"

Iron

(Fe)

0.00

.08

.00

Cal-

cium

(Ca)

40
27
37
36
30
33

34
36
32
31
35
36

Mag-
ne-

sium

(Mg)

26
11
19
21
12
13

14
14
16
15
16
19

Sodium

(Na)

37
18
28
30
18
17

19
19
18
16
19
24

Po-
tas-

sium

(K)

4.4

2.3

2.4

Bi-
car-

bon-

ate

(HCO,)

234
130
193
199
147
153

162
169
174
166
184
206

Car-
bon-

ate

(CO,)

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(SO.)

64

27

24

Chloride

(Cl)

22

11

11

Fluo-

ride

(F)

0.4

.4

. 3

Ni-

trate

(Ncg

1.2

1.2

. 6

Bo-

ron

(B)

0.20

.07

. 12

Dissolved solids

(residue at 180°C)

Parts

per
million

330
186
274
282
204
202

206
213
214
208
229
262

Tons

per
acre-

foot

0.45
.25
.37
. 38
. 28
. 27

.28
.29
.29
.28
.31
.36

Tons

per

day

21.7
10.4
51.6
52.0
47.7
113

329
1330
767
476
723
756

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

208
112
170
175
126
135

141
146
145
138
152
170

Non-
car-

bon-

ate

16
6
12
12
6
10

8
8
2
2
1
1

So-

dium
ad-

sorp-
tion
ratio

l.l
.7
.9
1.0
. 7
. 6

.7
.7
.6
.6
.7
. 8

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

541
298
444
458
319
323

340
347
344
331
359
415

pH

8.1
7.8
8.0
8.2
7.9
7.7

7.8
7.9
8.0
7.9
7.9
8.1

GILA RIVER BASIN Continued

9-5195. GILA RIVER BELOW GILLESPIB DAM, AHIZ.

LOCATION. About 1 mile downstream from gaging station on Gila Bend Canal, which is 200 feet below Gillespie Dam, Maricopa County, and 8 miles downstream from Hassayampa Elver. Gila Bend Canal diverts from left bank and Enterprise Canal diverts from right bank at Gillespie Dam.
DRAINAGE AREA. 49,620 square miles.
RECORDS AVAILABLE. Chemical analyses: December 1950 to September 1960.
Waiter temperatures: December 1950 to September 1960.
EXTREMES., 1S59-6O. Dissolved solids: Maximum, 7,050 ppm Dec. 1-10; minimum, 337 ppm Dec. 1-10; minimum, 337 ppm Dec. 27-30.
Hardness: Maximum, 1,930 ppm Dec. 1-10; minimum, 153 ppm Dec. 27-30.
Specific conductance: Maximum daily, 10,400 micromhos Dec. 5; minimum daily, 505 micromhos Dec. 28.
Water temperatures: Maximum, 90°F July 27; minimum, 41°F Jan. 16.
EXTREMES, 1950-60. Dissolved solids: Maximum, 7,050 ppm Dec. 1-10, 1959; minimum, 227 ppm Aug. 2, 1955.
Hardness:, Maximum, 1,940 ppm Oct. 11-20, 1951; minimum, 95 ppm Aug. 2, 1955.
Specific conductance: Maximum daily, 1O,400 micromhos Dec. 5, 1959; minimum daily, 370 micromhos Aug. 2, 1955.
Water temperatures: Maximum, 98°F July 8, 1956, July 22, 1959; minimum, 35°F Jan. 1, 1951.
BEMAHKS. Values reported for sodium (Na) are determined by analyses and do not include potassium (K). Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Samples from canal are believed to be representative of total flow passing Gillespie Dam, including spill and amounts diverted into Gila Bend and Enterprise Canals. Records of separate and combined discharge for the river and canals. Records of dis-charge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-28, 1959...

Oct. 30-Nov. 2....

Dec 1 3 16

Dec, 31-Jan. 1,1960
Jan . 2^-14 ....

Mean

discharge
(cfs)

10.2
9.7
337
224
96.0
39.3

23.0
19.6
60.0
28.0
67.5
21.0

16.2
66.0
589
400
46.0

Silica

(SiOa)

32

40

Iron

(Fe)

0.01

~

.00

Cal-

cium

(Ca)

395
166
56
66
72
380

42O
460
72
300
50
245

460
64
5O
63
*2O

Mag-
ne-

sium

(Mg)

17*
56
9.4
11
20
156

210
190
9.8
115
7.1
90

183
10
6.8
12
173

Sodium

(Na)

1630
475
92
65
208
1340

1020
1650
125
1000
69
870

160O
119
54
110
1530

Po-
tas-

sium

(K)

13

12

Bl-

car-

bon-

ate

(HCOJ

311
180
166
164
168
372

349
366
160
318
148
284

412
146
156
169
376

Car-
bon-
ate

(CO,)

Sullate

(S04)

1580

~

14801

Chloride

(Cl)

2290

-

2260

Fluo-
rlde

(F)

2.8

- -

2.6

Ni-

trate

(NOJ

45

-

51

Bo-

ron

(B)

3.6

3.5

Dissolved solids

(residue at 180°C)

Parts

per
million

6500
2030
452
431
876
5760

6640
705O
628
4220
382
3500

6750
561
337
556
6340

Tons

per
acre-

foot

8.84
2.76
.61
.59
1.19
7.83

9,03
9.59
.85
5.74
.52
4.76

9.18
.76
.46
.76
8.62

Tons

per

day

179
53.2
411
261
227
611

412
373
102
319
69.6
198

295
100
536
60O
787

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

1700
645
178
210
262
1590

1910
1930
220
1220
154
980

1900
202
153
206
1760

Non-
car-

bon-

ate

1440
498
42
76
124
1280

1620
1630
89
960
32
748

1560
82
25
68
1450

So-

dium
ad-

sorp-
tion
ratio

17
8.1
3.0
2.0
5.6
15

16
16
3.7
12
2.4
12

16
3.7
1.9
3.3
16

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

9340
3260
783
693
1460
8250

9530
9940
1030
6300
637
5350

9620
962
545
910
9100

PH

7.8
7.6
7.8
7.8
7.8
7.9

7. ft
7.7
7.8
8.0
7,8
8.1

8.0
7.7
7.8
7.5
8.0

COLORADO RIVER MAIN STEM

9-5210. COLORADO RIVER AT YUMA, ARIZ.

LOCATION. At gaging station, 500 feet upstream from lower highway bridge, 1,800 feet downstream from upper highway bridge at Yuma, Yuma County, 0.5 mile upstream from Yuma Main Canal wasteway, 5 miles downstream from Gila River, 7 miles upstream from boundary between California and Mexico, and 19 miles down-stream from Imperial Dam.
DRAINAGE AREA. 242,900 square miles, approximately, including all closed basins entirely within the drainage boundary.
RECORDS AVAILABLE. Chemical analyses: September 1926 to September 1928, October 1942 to February 1943, June 1947 to July 1952, November 1952 to September 1960. Water temperatures: February 1954 to January 1956.
REMARKS. Sodium (Na) an potassium (K) values are calculated and reported as sodium. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 7, 1959.....

Sept. 23.........

Mean

discharge
(cfs)

975
968
675
1,180
614

905
1,450
1,110
928

Silica

(Si02)

Iron

(Fe)

Cal-

cium

(Ca)

90
80
98
100
118

101
87
98
106

Mag-
ne-

sium

(Mg)

30
30
30
28
31

30
30
28
30

Sodium

(Na)

136
148
148
108
169

134
128
140
150

Po-
tas-

sium

(K)

Bi-
car-

bon-

ate

(HCOJ

173
a!32
188
174
197

182
a 147
174
179

Car-
bon-

ate

(ccg

Sulfate

(S0«)

311
315
312
287
334

324
316
323
333

Chloride

(Cl)

126
147
149
110
196

127
119
131
156

Fluo-
ride

(P)

Ni-
trate

(NOJ

1.0
1.5
1.5
2.0
3.6

1.5
1.3
1.2
1.8

Bo-

ron

(B)

Dissolved solids

(residue at 180°C)

Parts

per
million

798
806
850
740
968

826
772
826
884

Tons

per
acre-

foot

1.09
1.10
1.16
1.01
1.32

1.12
1.05
1.12
1.20

Tons

per

day

2,100
2,110
1,550
2,360
1,600

2,020
3,020
2,480
2,210

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

slunt

348
324
368
364
422

376
340
360
388

Non-
car-

bon-

ate

206
216
214
222
260

227
220
218
242

So-

dium
ad-

sorp-
tion
ratio

3.2
3.7
3.3
2.4
3.6

3.0
3.0
3.2
3.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

1,220
,270
,340
,160
,530

,270
,190
1,270
1.370

PH

7.9
8.4
7.9
7.5
7.4

7.6
8.3
7.8
7.9

a Includes equivalent of 2 parts per million of carbonate

DIVERSIONS AND RETURN FLOWS AT AND BELOW IMPERIAL DAM Continued

9-5255. YUMA MAIN CANAL BELOW COLORADO RIVER SIPHON, AT YUMA, ARIZ.

LOCATION. At gaging station on Yuma Main Canal below Colorado River Siphon on Arizona side of river, 3.5 miles downstream from siphon-drop powerplant, and 0.2 mile downstream from upper highway bridge over Colorado River at Yuma, Yuma County.
RECORDS AVAILABLE. Chemical analyses: September 1926 to September 1928, October 1942 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 798 ppm Sept. 1-30; minimum, 726 ppm Mar. 1-31.
Hardness: Maximum, 360 ppm Sept. 1-30; minimum, 328 ppm Oct. 1-31.
Specific conductance: Maximum daily, 1,220 micromhos Aug. 30-31, Sept. 15, 26, 27; minimum daily, 1,040 micromhos Mar. 24.
EXTREMES, 1943-60. Dissolved solids: Maximum, 1,000 ppm Jan. 1-31, 1957; minimum, 532 ppm Jan. 1-10, 1953.
Hardness: Maximum, 478 ppm July 1-31, 1957; minimum, 260 ppm Jan. 1-10, 1953.
Specific conductance: Maximum daily, 1,520 micromhos Jan. 16, 1957; minimum daily, 795 micromhos Jan. 5, 1953.
REMARKS. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-31, 1959...

Jan. 1-31, 1960...

Weighted average

Time-weighted

Mean

discharge
(cfs)

431
326
165
188
483
452

523
535
595
642
522
572

450.2

Silica

S102)

20

20

16

19

- -

Iron

(Fe)

0.04

.02

.00

.00

- -

Cal-

cium

(Ca)

86
90
94
88
96
96

94
96
94
91
94
96

93

93

Mag-
ne-

sium

(Mg)

28
29
24
28
22
23

25
26
26
27
27
29

26

26

Sodium

(Na)

114
114
113
105
106
102

100
114
118
116
116
120

112

112

136

Po-
tas-

sium

(K)

4.8

4.6

4.6

4.7

--

Bl-

car-

bon-

ate

(HCO,)

156
156
163
162
164
168

166
171
161
162
160
164

163

163

Car-
bon-
ate

(CO,)

Sulfate

(S04)

289

282

285

302

-

Chloride

(Cl)

107

97

94

108

103

"

Fluo-

rlde

(P)

0.6

.6

.3

.4

- -

Ni-
trate

(NOJ

1.2

1.6

1.9

1.5

"

Bo-

ron

(B)

0.20

.20

. 16

. 16

- -

Dissolved solids

(residue at 180°C)

Parts

per
million

754
765
743
748
734
726

731
785
789
786
782
798

766

762

Tons

per
acre-

foot

1.03
1.04
1.01
1.02
1.00
.99

.99
1.07
1.07
1.07
1.06
1.09

1.04

- -

Tons

per

day

877
673
331
335
957
886

1030
1130
1270
1360
1100
1230

931

"

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

328
344
332
334
330
334

336
346
340
338
344
360

340

339

1 ^~

Non-
car-

bon-

ate

200
216
198
201
196
196

200
206
208
205
213
226

206

205

So-

dium
ad-

sorp-
tion
ratio

2.7
2.7
2.7
2.5
2.5
2.4

2.4
2.7
2.8
2.7
2.7
2.?

2.6

2.6

Specific
con-

duct-

ance

micro-

mhos at

25°C)

1120
1140
1120
1080
1070
1080

1090
1160
1160
1160
1180
1200

1140

1130

PH

7.7
7.8
7.7
7.8
7.9
7.7

7.7
7.8
7.9
7.9
7.9
7.9

7.8

7.8

WALKER LAKE BASIN

10-2930. EAST WALKER RIVER NEAR BRIDGEPORT, CALIF.

LOCATION. At gaging station 1,500 feet downstream from Bridgeport Reservoir, 5 miles north of Bridgeport, Mono County, and 10 miles upstream from Sweetwater Creek.

DRAINAGE AREA. 362 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS; Flow regulated by Bridgeport Reservoir. Records of discharge for water year October 1959 to September 1960 given in WSP 1714.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 5, 1960......

July 6............

_ Sept. 13...........

Di schar ge
(cfs)

38
15
2.5
2.5
2.5

60
176
164
110
154
40

Silica

(SiQ,)

23

21

27

Iron

(Fe)

0.06

Cal-

cium

(Ca)

22

24

20

Mag-
ne-

sium

(Mg)

4.4

~

6.3

5.4

Sodium

(Na)

14
14
14
14
15

18
19
18
14
15
14

Po-
tas-

sium

to

3.6

5.3

3.0

Bi-
car-

bon-

ate

(HCO,)

104
103
107
110
122

79
123
121
115
128
104

Car-
bon-

ate

(ccg

Sulfate

(S04)

14

~

25

15

Chloride

(Cl)

2.5
3.2
2.5
2.8
3.0

4.5
4.5
2.0
3.2
. 2
2.2

FhlO-

rlde

(F)

0.2

.3

,1

Ni-

trate

(NOj)

0.7

"

.8

3,4

Bo-

ron

(B)

0.1
.0
. 1
. 1
.0

. 1
.0

.1
.1
.1
.1

Dissolved solids

(calculated)

Parts

per
million

136

167

141

Tons

per
acre-

foot

0.18

--

.23

. 19

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

73
74
74
82
88

73
86
81
76
80
72

Non-
car-

bon-

ate

0
0
0
0
0

8
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.7
. 7
'.7

. 7
. 7

.9
.9
.9
. 7
. 7
. 7

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

202
195
206
213
234

226
234
239
215
223
200

PH

7.5
7.7
7.7
7.4
7.5

7.8
7.3
7.8
8.1
7.8
7.7

WALKER LAKE BASIN Continued

10-2960. WEST WALKER RIVER BELOW LITTLE WALKER RIVER, NEAR COLEVILLE, CALIF.

LOCATION. At bridge on U.S. Highway 395, 200 feet downstream from gaging station, 275 feet downstream from East Fork, and 13 miles southeast of Coleville, Mono County.
DRAINAGE AREA. 182 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1714.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 13, 1959.....

Dec. 2............

Apr. 7...... ......
May 12............

Aug. 10.... ....

Discharge
(cfs)

37
33
44
29
75

304
791
946
142
50
25

Silica

(SiQj)

17

4.9

15

Iron

(Fe)

0.04

.00

Cal-

cium

(Ca)

13

4.0

12

Mag-
ne-

sium

(Mg)

2.1

. 7

4.9

Sodium

(Na)

22
7.0
19
24
11

2.0
1.0
4.3
3.5
14
6.4

Po-
tas-

sium

(K)

2.1

.5

1.2

Bi-
car-

bon-

ate

(HCO,)

87
63
88
100
76

25
15
29
39
82
73

Car-
bon-

ate

(CO,)

Sulfate

(SO.)

11

1.0

6.0

Chloride

(Cl)

7.0
5.2
5.0
6.0
6.5

2.0
1.2
. 5
.4
2.6
1.2

Fluo-
ride

(F)

0.1

. 1

. 1

Ni-

trate

(NOJ

0.0

. 7

. 1

Bo-

ron

(B)

0.3
. 0
. 2
.3
. 1

. 1
. 1
. 0
. 1
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

118

21

83

Tons

per
acre-

foot

0.16

.03

.11

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

41
41
50
56
58

19
13
23
27
48
50

Non-
car-

bon-
ate

0
0
0
0
0

0
i
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.5
.5
1'.2
1.4
.6

. 2

.1
.4
.3
.9
.4

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

180
110
174
204
151

52
31
59
66
155
122

pH

7.9
7.6
7.6
7.7
7.6

6.8
7.0
7.3
7.3
8.0
7.8

CARSON RIVER BASIN

10-3055. EAST FORK CARSON RIVER NEAR MARKLEEVILLE, CALIF.

LOCATION. Approximately 100 yards upstream from Hangmans Bridge, 1.2 miles southeast of Markleeville, Alpine County, and 7 miles southeast of Woodfords. RECORDS AVAILABLE. Chemical analyses: September 1958 to September 1960.
REMARKS. No discharge records available.

Date
of
collection

Sept. 13..........

Mean

discharge
(eta)

Silica

(SIQ,)

23

14

23

C

Iron

(Fe)

0.07

.04

hemici

Cal-

cium

(Ca)

14

6.4

16

1 ana]

Mag-
ne-

sium

(Mg)

4.1

1.9

4.9

Sodium

(Na)

9.3
11
12
12
11

4.0
2.6
2.0
5.3
5.2
10

Po-
tas-

sium

(K)

1.5

1.0

1.9

Bi-
car-

bon-

ate

(HCOJ

72
74
78
82
76

63
28
22
54
54
83

Car-
bon-
ate

(COJ

Sulfate

(SO.)

7.0

5.0

10

Chloride

(Cl)

4.8
7.2
4.5
4.5
8.5

2.0
1.2
.2
1.4
.5
4.0

Fluo-
ride

(F)

0.0

.0

.1

Ni-
trate

(NOJ

0.0

.7

. 1

Bo-

ron

(B)

0.2
.2
. 1
.2
.3

.0
. 1
.4
. 1
.0
.2

Dissolved solids

(calculated)

Parts

per
million

99

47

111

Tons

per
acre-

foot

0.13

.06

. 15

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

52
56
62
64
61

72
24
22
35
36
60

Non-
car-

bon-

ate

0
0
0
0
0

20

i
4
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.6
.6
'.7

.6
.6

.2
.2
.2
.4
.4
.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

140
152
174
172
169

164
59
44
95
93
162

pH

7.7
7.7
7.5
7.6
7.8

7.6
7.0
7.1
7.8
7.8
8.0

CAESOtr RIVER BASIH Continued

1O-31OO. WEST FORK CARSON BIVEB AT TOODFORBS, CALIF.

LOCATION (revised). At bridge on State Highway 89, 0.3 mile upstream: tro» gaging station, 6.8 mile southwest of Woodfords. Alpine County, and 3.5 miles down-stream from Willow Creek.
DRAINAGE AREA. 66 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1714.

Chemical analyses, in parts per million, water year October 1969 to September I960

Date
of
collection

Mar. 2............

Sept. 13...,...,..

Discharge
(cfs)

16
12
16
23
262

248
162
68
11
6.9

Silica

(SiQ,)

20

13

23

Iron

(Fe)

0.06

.00

Cal-

cium

(Ca)

8.8

4.8

9.4

Mag-
ne-

sium

(Mg)

2.2

1.0

3.8

Sodium

(Na)

4.7
5.0
4.3
4.1
l.fl

1.2
1.0
1.7
3.7
4.0

Po-
tas-

sium

(K)

1.4

.6

1,7

Bi-
car-

bon-

ate

(HCOS)

46
42
42
41
23

22
20
35
51
56

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

1.0

1.0

3.0

Chloride

(Cl)

2.0
1.2
.8
6.0
2.0

1.0
.0
1.1
. 1
.5

Fluo-
ride

(F)

0.0

.2

.0

Ni-

trate

(NOJ

0.2

.7

. 1

Bo-

ron

(B)

0.0
.0
.0
.0
.0

.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

63

35

74

Tons

per
acre-

foot

0.09

.05

. 10

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

31
30
28
33
17

16
20
27
35
39

Non-
car-

bon-

ate

0
0
0
0
0

0
4
0
o
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
.4
.3
.2

. 1
. 1
. 1
.3
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

79
78
78
81
45

42
37
60
86
89

PH

7.4
7.3
7.3
7.3
7.1

7.0
7.2
7.2
7.8
7.7

HUMBOLDT RIVER BASIN

10-3350. HUMBOLDT RIVER NEAR RYE PATCH, NEV.

LOCATION (revised). At gaging station 1,000 feet downstream from Rye Patch Dam and 1.5 miles northwest of Rye Patch, Pershing County. DRAINAGE AREA (revised). 16,100 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: December 1951 to September 1958, October 1959 to September 1960.
Water temperatures: December 1951 to September 1958, October' 1959 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 981 ppm Apr. 4-30; minimum, 668 ppm May 9-31.
Hardness: Maximum, 232 ppm Aug. 12-18; minimum, 200 ppm May 9-31.
Specific conductance: Maximum daily, 1,670 micromhos Apr. 10; minimum daily, 1,060 micromhos May 14, 15, 17, July 15.
Water temperatures: Maximum, 72°F several days during July and August; minimum, 48°F Apr. 5.
EXTREMES, 1951-58, 1959-80. Dissolved solids: Maximum, 2,190 ppm Sept. 1-5, 1954; minimum, (sum) 253 ppm June 24, 1956.
Hardness: Maximum, 482 ppm Sept. 1-5, 1954; minimum, 86 ppm Jan. 25, 1958.
Specific conductance: Maximum daily, 4,010 micromhos Sept. 2, 1954; minimum daily, 384 micromhos June 24, 1956.
Water temperatures (1951-54, 1956-58, 1959-60): Maximum, 78°F Sept. 21, 1958; minimum, 33°F on many days during winter months. REMARKS. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for wate October 1959 to September 1960 given in WSP 1714. Flow completely regulated by Rye Patch Reservoir.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Apr. 4-30, 1960...

July 1-27.. ....
Aug. 12-18........

Weighted

Mean

discharge
(cfs)

254
348
174

77.4
185
21.2

172

Silica

(S1Q.)

42
36
35

34
35
41

37

Iron

(Fe)

0.01

Cal-

cium

(Ca)

51
46
50

56
54
54

51

Mag-
ne-

sium

(Mg)

24
22
18

20
19
24

21

Sodium

(Na)

257
207
154

174
160
232

199

Po-
tas-

sium

(K)

25
21
17

20
19
22

21

Bi-
car-

bon-

ate

(HCO,)

367
330
297

304
298
302

325

Car-
bon-

ate

(ccg

Sulfate

(S0«)

142
120
97

109
92
112

115

Chloride

(Cl)

259
200
150

182
168
275

201

Fluo-

ride

(F)

Ni-

trate

(NO,)

0.3
. 5
.4

.2
.2
. 2

0.3

Bo-

ron

(B)

1.2
1.0
. 7

«7
.7
1.0

0.9

Dissolved solids

(residue at 180°C)

Parts

per
million

981
815
668
747'

695
904

807

Tons

per
acre-

foot

1.33
1.11
.91

1.02
.95
1.23

1.10

Tons

per

day

673
766
314

156
347
51.7

375

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

226
206
200

224
212
232

214

Non-
car-

bon-

ate

0
0
0

0
0
0

0

So-

dium
ad-

sorp-
tion
ratio

7.5
6.3
4'. 7

5.0
4.8
6.7

5.9

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

1,620
1,350
1,100

1,220
1,140
1,510

1,330

PH

7.8
8.2
8.1

8.1
8.1
8.0

HUMBOLDT RIVER BASIN Continued

10-3350. HUMBOLDT RIVER NEAR RYE PATCH, NEV. Continued Temperature (°F) of water, water year October 1959 to September 1960

October . ....

February ....
March ....

August ....

1 2 3

C"

4

C"

5

C"

6 7 8 9 10 11 12 13 14 15

Day
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Aver-
age

PYRAMID AND WINN^MUCCA LAKES BASIN

10-3368. LAKE TAHOE AT BIJOU, CALIF.

LOCATION. At boat landing at Connoley s Resort, Bijou, El Dorado County. RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960. REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 12, 1959.....

Sept. 12. ....

Mean

discharge
(eta)

Silica

(S1Q,)

13

12

Iron

(Fe)

0.00

.00

Cal-

cium

(Ca)

8.0

8.3

Mag-
ne-

sium

(MB)

2.4

1 2.9

Sodium

(Na)

7.2
6.9
7.2
6.8
6.0

5.1
5.3
5.2
6.2
6.6
6.3

Po-
tas-

sium

to

1.7

1.7

Bi-
car-

bon-

ate

(HC03)

50
52
52
50
44

49
45
53
52
54
57

Car-
bon-
ate

(CO,)

Sulfate

(S04)

3.0

.8

Chloride

(Cl)

3.5
2.5
2.8
2.8
2.5

2.0
2.0
2.8
2.0
3.5
1.2

Fluo-

ride

(F)

0.0

.0

Ni-

trate

(Ncg

0.0

.2

Bo-

ron

(B)

0.1
.2
. 1
. 1
.0

.0
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

57

61

Tons

per
acre-

foot

0.08

.08

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

37
36
34
33
33

32
30
40
32
34
32

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.5
. 5

'.5

. 5
.5

.4
.4
.4
.5
.5
.5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

100
96
97
100
93

90
87
90
91
94
94

PH

7.2
7.7
7.5
7.4
7.2

7.5
6.9
7.7
7.6
7.9
7 1

PYRAMID AND WINNEMUCCA LAKES BASIN Continued

10-3369. LAKE TAHOE NEAR TAHOE VISTA, CALIF.

LOCATION. At boat landing at Edgewater Cottage (private residence) and 8 miles northeast of Tahoe Vista, Placer County. RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 195£

Date
of
collection

Sept. 12. ....

Mean

discharge
(eta)

Silica

(SiQ.)

13

13

Iron

(Fe)

0.00

.00

Cal-

cium

(Ca)

9.2

10

Mag-
ne-

sium

(Mg)

2.2

2.2

Sodium

(Na)

6.3
7.4
6.6
6.5
5.6

5.3
5.1
5.6
6.2
6.4
6.1

Po-
tas-

sium

(K)

1.8

1.7

Bi-
car-

bon-

ate

(HCOJ

56
50
54
51
56

51
55
53
51
54
56

Car-
bon-
ate

(CO,)

Sulfate

(SO,)

1.0

.8

Chloride

(Cl)

4.8
1.5
2.5
2.5
1.8

1.5
1.5
4.0
2.0
3.8
2.0

FlUO-
ride

(F)

.0

.0

Ni-
trate

(NO,)

0.0

.0

) to September 1960

Bo-

ron

(B)

0.0
.0
.1
.0
.0

.0
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

61

64

Tons

per
acre-

foot

0.08

.09

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

39
33
34
33
37

34
32
37
31
35
34

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.6
.5
.5
.4

.4
.4
.4
.5
.5
.5

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

99
94
95
95
100

94
91
94
91
94
92

PH

7.8
7.7
7.6
7.5
7.2

7.6
7.3
7.6
7.7
7.8
8.0

PYRAMID AND WINNEMUCCA LAKES BASIN Continued

10-3370. LAKE TAHOE AT TAHOE, CALIF.

LOCATION. At State Highway 89 bridge and upstream from headgate for Truckee River at Tahoe, Placer County. DRAINAGE AREA. 506 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of elevation for water year October 1959 to September 1960 given in WSP 1714. Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 12, 1959.....

May 11

Mean

discharge
(cfs)

Silica

(SiO,)

12

13

Iron

(Fe)

_

0.00

.00

Cal-

cium

(Ca)

9.6

8.0

Mag-
ne-

sium

(Mg)

_

1.9

3.3

Sodium

(Na)

6.8
6.8
6.6
6.0
6.0
5.2

5.4
5.4
5.3
6.2
6.4
6.3

Po-
tas-

sium

(K)

-

1.8

1.2

Bi-
car-

bon-

ate

(HCO,)

51
51
51
50
67
46

52
55
54
53
54
56

Car-
bon-

ate

(CO,)

Sulfate

(S04)

1.0

1.2

Chloride

(Cl)

3.0
2.5
2.0
2.5
4.5
2.0

1.5
1.2
2.0
2.5
2.5
1.4

Fluo-
rlde

(F)

0.0

. 0

Ni-

trate

(NOJ

_

0.0

. 1

Bo-

ron

(B)

0.1
.0

.1
.0
.0
.0

. 0
. 0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

60

62

Tons

per
acre-

foot

0.08

. 08

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

38
33
34
32
52
33

36
32
36
34
36
33

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.5
.5 '

1.1
.4
.4

.4
.4
.4
.5
.5
. 5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

94
93
96
94
124
93

96
93
94
94
94
93

pH

8.0
7.7
7.5
7.5
7.1
7.3

7.5
7.6
7.9
7.7
8.0
8.0

PYRAMID AND WINNEMUCCA LAKES BASIN Continued

10-3380. TRUCKEE RIVER NEAR TRUCKEE, CALIF.

LOCATION. At gaging station 1.4 miles upstream from Donner Creek and 2.5 miles southwest of Truckee, Nevada County. DRAINAGE AREA. 552 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1714.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 4, 1960......

July 5.... ....

Sept. 12. ....

Discharge
(cfs)

277
310
310
246
306

272
232
246
33
504
474

Silica

(SiQ,,)

13

13

Iron

(Fe)

0.02

.00

Cal-

cium

(Ca)

6.4

9.2

Mag-
ne-

sium

(MB)

1.5

2.2

Sodium

(Na)

6.9
7.3
7.7
6.6
5.2

2.1
1.9
1.5
4.8
6.5
6.3

Po-
tas-

sium

(K)

0.7

4.3

Bl-

ear-

bon-

ate

(HCO,)

50
54
57
49
50

28
24
23
44
54
57

Car-
bon-

ate

(ccg

Sulfate

(S04)

3.0

1.2

Chloride

(Cl)

4.0
4.2
2.2
2.2
2.5

1.5
2.5
2.5
4.5
5.0
1.6

Fluo-

rlde

(F)

0.0

. 1

Ni-
trate

(Ncg

0.0

.0

Bo-

ron

(B)

0.1
.0
.0
. 1
.0

.1
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

41

66

Tone

per
acre-

foot

0.06

.09

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

42
37
35
34
36

28
22
22
38
39
32

Non-
car-

bon-
ate

1
0
0
0
0

5
2
3
2
0
0

So-

dium
ad-

sorp-
tion
ratio

0.5
. 5
.6
.5
.4

.2
.2
. 1
.3
.4
.5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

98
94
102
98
102

66
53
45
97
97
95

PH

7.5
7.5
7.7
7.5
7.2

7.3
6.9
7.1
7.6
7.7
7.9

PYRAMID AND WINNEMUCCA LAKES BASIN Continued

10-3460. TRUCKEE RIVER AT FARAD, CALIF.

LOCATION. At gaging station 0.7 mile downstream from Farad powerplant, 2.5 miles north of Floriston, Nevada County, 3.4 miles downstream from Bronco Creek, and 3.5 miles upstream from California-Nevada State line.
DRAINAGE AHEA (revised). 932 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1714.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 12..........

Discharge
(cfs)

307
349
341
333
386

862
992
912
618
613
521

Silica

(SlQa)

15

17

Iron

(Fe)

0.02

0.00

Cal-

cium

(Ca)

5.6

10

Mag-
ne-

sium

(Mg)

1.9

3.6

Sodium

(Na)

6.9
8.1
9.4
7.0
5.5

2.3
2.0
2.1
2.6
6.5
6.5

Po-
tas-

sium

(K)

0.8

1.5

Bl-

car-

bon-

ate

(HCO,)

49
58
62
59
54

31
26
28
38
56
49

Car-
bon-

ate

<ccg

Sullate

(S04)

3.0

7.0

Chloride

(Cl)

5.2
4.8
3.0
2.0
3.5

2.0
.8
2.8
1.8
4.0
5.5

Fluo-
rlde

(P)

0.0

. 1

Ni-
trate

(NOj)

0.0

.1

Bo-

ron

(B)

0.0
. 0
.0

.1
.0

.1
.0
.0

.1
.1
.0

Dissolved solids

(calculated)

Parts

per
million

42

75

Tons

per
acre-

foot

0.06

. 10

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

38
38
39
38
38

25
22
22
27
38
40

Non-
car-

bon-

ate

0
0
0
0
0

0

1
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.5
.6

".7

. 5
.4

. 2
. 2
.2
.2
. 5
.4

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

98
103
106
107
108

64
53
51
66
97
96

PH

7.6
7.6
7.8
7.5
7.3

7.2
6.9
7.4
7.4
7.8
7.6

HQHET LAKE BASIN

1O-3565. SBSAN RIVER AT SUSANVIIiE, CALIF.

LOCATION. At gaging station O.5 mile west of Susanwille, Lassen County, and 1.1 miles upstream from Piute Creek. DRAINAGE AREA.--392 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September I960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1714.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

May 12

Sept. 9...........

Mean

discharge
(cfs)

8.8
9.8
10
9.8
a 49
a!02

a!04
a 63
al32
4.5
.9
2.2

Silica

(SiQ,)

22

36

Iron

(Fe)

O,«5

. 10

Cal-

cium

(Ca)

8.1

18

Mag-
ne-

sium

(Mg)

4.1

12
>

Sodium

(Na)

6.«
6.7
6.«
5.5
3.6
3.5

2.9
2.7
1.7
4.7
6.9
8.0

Po-
tas-
sium

(K)

=

0.7

2.4

Bi-
car-

bon-

ate

(Hccg

113
110
114
J.06
62
52

54
51
37
107
135
131

Car-
bon-

ate

(ceg

Sulfate

(S04)

0.6

1.0

Chloride

(Cl)

2.8
2.0
1.0
2.0
1.5
1.5

1.0
.6
2.8
.2
.5
1.5

Fluo-

rlde

(P)

e.i

.0

Ni-

trate

(NOJ

0.2

.0

Bo-

ron

(B)

O.O
.0
.0

.0
.0
.1

.0
. 1
.0
.0
.0
. 1

Dissolved solids

(calculated)

Parts

per
million

64

144

Tons

per
acre-

foot

O.O9

.20

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

82
79
82
76
51
42

40
37
29
80
94
94

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.3
.3
.3
.3
.2
.2

.2
.2
.1
.2
.3
.4

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

173
171
175
171
107
98

89
81
59
160
2O2
196

PH

.8
.7
.7
.0
.5
.4

.8
.5
.2
.9
.9
.8

a Instantaneous discharge.

PART 11. PACIFIC SLOPE BASINS IN CALIFORNIA

CARMEL RIVER BASIN

11-1432.5. CARMEL RIVER NEAR CARMEL, CALIF.

LOCATION. Approximately 30 feet downstream from Rancho San Carlos bridge, 2 miles east of Carmel, Monterey County, and 4.5 miles from mouth. DRAINAGE AREA. 195 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. No discharge records available. Stream dry during summer months.

Chemical ana

Date
of
collection

Feb. 4............
Mar. 3............

Mean

discharge
(eta)

Silica

(SiQ,)

25

Iron

(Fe)

0.07

Cal-
cium

(Ca)

38

Mag-
ne-

sium

(Mg)

10

Ivses. in Darts oer million, water vear 0

Sodium

(Na)

82
9.9
17
42
21
46

Po-
tas-
sium
00

2.2

Bi-
car-

bon-
ate

(HCOJ

275
70
112
184
131
206

Car-
bon-
ate

(CO,)

Sulfate

(S0«)

49

Chloride

(Cl)

120
10
18
48
22
51

ctober 195

Fluo-
ride
(F)

0.2

Ni-
trate

(NOJ

0.3

9 to September 1960

Bo-
ron

(B)

0.1
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

233

Tons

per
acre-

foot

0.32

Tons

per

day

Hardness
as CaCO,

Cal-

cium,
Mag-

slum

455
78
114
216
137
242

Non-
car-

bon-
ate

229
21
22
65
30
73

So-
dium
ad-
sorp-
tion
ratio

1.7
.5
7
1.2
.8
1.5

Specific
con-

duct-

ance

[micro-
mhos at

25 =C)

1,180
200
307
606
356
662

PH

7.8
7.3
7.9
7.2
7.9
7.7

SALINAS RIVER BASIN

11-1525. SALINAS RIVER NEAR SPRECKLES, CALIF.

LOCATION. At gaging station in El Toro Grant 80 feet upstream from bridge on Salinas-Monterey highway, 0.5 mile upstream from Toro Creek, 2 miles west of Spreckles, Monterey County, and 4 miles south of Salinas.
DRAINAGE AREA. 4,231 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 7...........

Mean

discharge
(cfs)

9.7
9.4
5.9
10
190
156

76
4.5
4.8
1.0
2.0
1.0
.8

Silica

(S1QJ

36

62

Iron

(Fe)

0.04

.07

Cal-

cium

(Ca)

152

33

Mag-
ne-

sium

(Mg)

57

40

Sodium

(Na)

135
127
133
128
15
36

54
132
157
173
150
146
142

Po-
tas-

sium

(K)

41

13

Bl-

car-

bon-

ate

(HCO,)

212
440
872
801
122
188

262
850
830
362
284
344
312

Car-
bon-
ate

(CO,)

Sulfate

(SO.)

91

117

Chloride

(Cl)

190
140
142
126
21
33

51
28
136
165
160
185
135

Fluo-

rlde

(P)

0.5

2.4

Ni-

trate

(NO,)

14

. 7

Bo-

ron

(B)

0.5
. 1
. 1
.2
.0
. 1

.2
. 3
. 2
. 7
. 5
.5
.4

Dissolved solids

(calculated)

Parts

per
million

1,090

699

Tons

per
acre-

foot

1.48

.95

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

232
624
616
580
139
218

308
615
612
470
334
350
249

Non-
car-

bon-

ate

58
263
0
0
39
64

93
0
0
173
101
68
0

So-

dlum
ad-

sorp-
tion
ratio

3.9
2.2
2.3
2.3
. 6
1.1

1.3
2.3
2.8
3.5
3.6
3.4
3.9

Specific
con-

duct-

ance

imicro-

mhos at

25°C)

1,050
1,680
1,630
1,590
327
573

793
1,650
1,650
1,580
1,340
1,360
1.150

PH

7.0
7.5
7.6
7.5
8.0
8.1

7.7
7.9
7.7
7.5
7.1
7.3
7 5

PAJARO RIVER BASIN

11-1540. WAS CREEK NEAR MORGAN HILL, CALIF.

LOCATION. At site of former gaging station 500 feet upstream from Uvas Dam, 0.6 mile downstream from Eastman Canyon, and 4.8 miles southwest of Morgan Hill, Santa Clara County.
DRAINAGE AREA. 30.4 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Aug. 3............
Sept. 6.. ....

Mean

discharge
(cfs)

Silica

(sicg

19

17

Iron

(Fe)

0.04

Cal-

cium

(Ca)

26

36

Mag-
ne-

sium

(Mg)

12

16

Sodium

(Na)

11
9.7
11
13
11
9.4

8.2
8.0
8.2
8.4
9.1
12

Po-
tas-

sium

(K)

1.5

1.5

Bl-

car-

bon-

ate

(HCOj)

177
151
174
206
176
a!82

141
136
140
145
160
187

Car-
bon-
ate

(ccg

Sulfate

(S0«)

23

15

Chloride

(Cl)

7.5
8.0
7.5
9.0
8.0
6.2

5.5
3.2
6.0
12
3.9
9.5

Fluo-

rlde

(F)

0.1

.0

Ni-

trate

(NOJ

0.4

. 0

Bo-

ron

(B)

0.0
.2
. 1
. 1
.0
. 1

. 1
. 1
. 1
. 1
. 1
. 0

Dissolved solids

(calculated)

Parts

per
million

160

199

Tons

per
acre-

foot

0.22

.27

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

156
142
161
188
164
144

131
116
121
118
134
154

Non-
car-

bon-

ate

11
18
18
19
20
0

15
4
6
0
3
1

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
.4
.4
.4
.3

.3
. 3
.3
.3
.3
.4

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

319
301
343
395
354
310

270
253
249
272
295
330

PH

7.9
7.5
7.7
7.6
7.6
8.5

7.9
8.0
8.0
8.0
8.1
8,1

a Includes equivalent of 16 ppm of carbonate (CO3).

PAJARO RIVER BASIN Continued

11-1565. SAN BENITO RIVER NEAR WILLOW CREEK SCHOOL, CALIF.

LOCATION. At gaging station 1.7 miles downstream from Willow Creek, San Benito County, 1.8 miles northwest of Willow Creek School, San Benito.
DRAINAGE AREA. 250 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

and 10.4 miles northwest of

Chemic

Date
of
collection

June 8 ....

Sept. 7.. ....

Discharge
(cfs)

1.0
1.8
a2.9
18
5.7

1.8
.2
.2
. 1
. 1

Silica

(SiQ,)

10

17

Iron

(Fe)

0.04

.04

Cal-

cium

(Ca)

51

63

Mag-
ne-

sium

(Mg)

116

116

Sodium

(Na)

216
209
244
97
169

200
241
231
250
273

Po-
tas-

sium

(K)

4.8

4.0

s ner million, water year October 1959 to September 1960

Bi-
car-

bon-

ate

(HCO,)

542
547
549
456
538

559
541
536
b551
603

Car-
bon-
ate

(CO,)

Sulfate

(S04)

408

475

Chloride

(Cl)

148
142
160
55
102

135
180
180
168
185

Fluo-
ride

(F)

0.1

. 3

Ni-
trate

(NO,)

0.3

.3

Bo-

ron

(B)

1.9
1.6
1.9
.8
1.5

1.8
2.0
2.0
2.0
2.3

Dissolved solids

(calculated)

Parts

per
million

1,200

1,430

Tons

per
acre-

foot

1.63

1.94

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

590
596
605
452
550

605
590
572
600
635

Non-
car-

bon-

ate

146
147
155
78
109

147
146
132
148
141

So-

dium
ad-

sorp-
tion
ratio

3.9
3.7
4'. 3
2.0
3.1

3.5
4.3
4.2
4.4
4.7

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

,880
,790
,980
,110
,580

,820
,990
,970
2,020
2,000

PH

8.4
8.4
8.4
8.5
8.4

8.4
8.4
8.2
8.4
8.4

a Daily mean discharge.
b Includes equivalent of 10 ppm of carbonate (C03).

PAJARO RIVER BASIN Continued

11-1590. PAJARO RIVER AT CHITTENDEN, CALIF.

LOCATION. At gaging station on State highway bridge in Salsipuedes Grant, 0.6 mile downstream from Pescadero Creek, 0.6 mile southeast of Chittenden, Santa Cruz County, and 2.3 miles downstream from San Benito River.
DRAINAGE AREA.--1,188 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 7, 1959......

Hay 4

Sept. 7..... ......

Discharge
(cfs)

2.0
12
13
20
121
36

28
26
6.3
3.4
5.0
7.0

Silica

(SiQ,)

29

22

8.2

Iron

(Fe)

0.02

.05

.05

Cal-

cium

(Ca)

100

89

76

Mag-
ne-

sium

(Mg)

75

72

1 78

Sodium

(Na)

94
126
85
73
34
86

89
114
124
150
142
176

Po-
tas-
sium

(K)

5.5

5.8

4.0

Bi-
car-

bon-

ate

(HCOJ

442
418
371
348
179
352

394
402
460
547
a 548
573

Car-
bon-
ate

(COJ

Sulfate

(S04)

298

264

226

Chloride

(Cl)

99
125
80
72
38
85

100
108
135
155
172
145

Fluo-

ride

(F)

0.3

.2

.4

Ni-

trate

(NOJ

3.9

12

.7

Bo-

ron

(B)

0.5
. 7
.5
.5
. 3
. 5

.5
. 7
. 6
. 9
.8
. 7

Dissolved solids

(calculated)

Farts

per
million

860

886

997

Tons

per
acre-

foot

1.17

1.20

1.36

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium
507
480
558
580
221
516

520
520
530
456
470
510

Non-
car-

bon-

ate

145
137
254
295
74
227

197
190
153
7
21
40

So-

dium
ad-

sorp-
tion
ratio

1.8
2.5
1.6
1.3
1.0
1.6

1.7
2.2
2.3
3.1
2.9
3.4

Specific
con-

duct-

ance

^micro-

mhos at

25°C)

1,250
1,350
1,270
1,270
553
1,240

1,280
1,310
1,430
1,420
1,490
1,500

PH

7.5
8.0
7.9
8.2
8.2
7.9

8.0
7.9
8.1
8.2
8.4
8.2

a Includes equivalent of 12 ppm of carbonate (C03).

SOQUEL CREEK BASIN

11-1600. SOQUEL CREEK AT SOQUEL, CALIF.

LOCATION. At gaging station 0.2 mile upstream from highway bridge in town of Sequel, Santa Cruz County, and 0.4 mile downstream from Bates Creek. D3AINAGE AREA (revised). 40.2 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 12, I960.....

Sept. 6...........

Discharge
(cfs)

5.7
5.7
4.3
24
102
19

12
12
5.7
2.9
2.1
2.1

Silica

(S1Q,)

28

36

Iron

(Fe)

0.06

. 04

Cal-

cium

(Ca)

70

75

Mag-
ne-

sium

(Mg)

20

29

Sodium

(Na)

58
56
67
42
24
41

42
48
54
43

45
51

Po-
tas-

sium

(K)

5.2

4.7

Bi-
car-

bon-

ate

(HCOJ

252
262
261
172
119
212

226
228
219
230
230
232

Car-
bon-

ate

(ccg

-

16
11
8
12

Sulfate

(SO.)

101

100

Chloride

(Cl)

92
76
80
42
30
37

46
48
72
64
72
72

Fluo-
ride

(F)

"

0.1

.2

Ni-

trate

(NO,)

0.3

.2

Bo-

ron

(B)

0.2
. 2
. 1
. 1
. 1
. 1

. 1
. 1
. 2
.0
.0

Dissolved solids

(calculated}

Farts

per
million

433

494

Tons

per
acre-

foot

0.59

.67

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

309
299
303
224
159
256

260
258
330
277
261
305

Non-
car-

bon-

ate

102
84
89
83
61
82

75
71
124
70
59
95

So-

dium
ad-

sorp-
tion
ratio

1.4
1.4
1.7
1.2
.8
1.1

. 1
.3
.3
. 1
. 2
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

803
810
810
603
403
652

667
657
732
721
692
715

PH

8.1
7.8
7.9
8.0
8.0
8.1

8.0
8.1
8.5
8.4
8.4
8.4

SAN LORENZO RIVER BASIN

11-1605. SAN LORENZO RIVER AT BIG TREES, CALIF.

LOCATION. In Canada del Rincon Grant at Sequoia Picnic and Camp Grounds at Big Trees, Santa Cruz County, approximately 0.5 mile upstream from gaging station, and 4 miles north of Santa Cruz.
DRAINAGE AREA (revised). 111 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Date
of
collection

Sept. 6... ....

Discharge
(cfs)

22
20
21
78
226
61

40
46
23
16
11
10

Silica

(SiOJ

24

28

Iron

(Fe)

0.14

.01

Cal-

cium

(Ca)

41

38

Mag-
ne-

sium

(Mg)

6.4

7.9

Sodium

(Na)

26
25
28
23
15
20

23
22
23
24
22
22

Po-
tas-

sium

(K)

2.5

1~7

Bi-
car-

bon-

ate

(HCO,)

140
150
145
103
83
126

136
132
145
151
140
144

Car-
bon-
ate

(CO,)

Sulfate

(SO.)

40

32

Chloride

(Cl)

32
25
28
23
22
19

23
20
26
24
35
20

Fluo-

ride

(F)

::

0.1

.1

Ni-

trate

(NOJ

0.3

. 0

Bo-

ron

(B)

0.1
. 1
.0
. 1
.0
.0

.0
. 1
.1
.0
.0
.1

Dissolved solids

(calculated)

Parts

per
million

222

221

Tons

per
acre-

foot

0.30

.30

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

140
137
137
122
105
133

130
129
130
135
126
127

Non-
car-

bon-

ate

25
14
18
38
37
30

18
21
11
11
11
9

So-

dium
ad-

sorp-
tion
ratio

1.0
.9
1.0
.9
.6
.8

.9
.8
.9
.9
.9
.9

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

371
370
380
334
266
356

360
341
353
367
340
340

pH

7.9
8.1
8.0
7.5
7.8
7.7

7.8
7.7
8.2
8.2
8.2
8.2

GUADALUPE RIVER BASIN

11-1680. LOS GATOS CREEK AT LOS GATOS, CALIF.

LOCATION. At gaging station, 0.3 mile downstream from Trout,.Creek, 0.5 mile downstream from Lexington Reservoir, and 1 mile south of Los Gatos, Santa Clara County.
DRAINAGE AREA. 38.9 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records ol discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

May 3............

Aug. 2............

Discharge
(cfs)

0.2
1.7
. 8
a2.0
3.8
83

1.4
2.1
. 7
.3
.9
. 3

Silica

(SiQ.)

15

16

Iron

(Fe)

"

0.06

.00

Cal-

cium

(Ca)

~

95

82

Mag-
ne-

sium

(Mg)

__

32

34

Sodium

(Na)

24
24
30
18
12
14

26
28
30
25
26
34

Po-
tas-

sium

(K)

3.5

2.5

Bi-
car-

bon-

ate

(HCO,)

348
353
424
188
119
129

314
304
369
361
b286
368

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

151

99

Chloride

(CD

20
15
23
12
13
10

20
20
28
21
22
16

Fluo-
ride

(F)

E

0.1

.1

Ni-

trate

(NO,)

::_

0.8

.0

Bo-

ron

(B)

0.1

.1
. 1
.1
.1
.0

.1
.1
.1
.2
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

--.

496

465

Tons

per
acre-

foot

-

0.67

.63

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

385
365
445
237
162
164

350
370
435
384
278
346

Non-
car-

bon-
ate

100
76
97
83
64
58

93
121
132
88
43
44

So-

dium
ad-

sorp-
tion
ratio

0.5
. 5
. 6
.5
.4
.5

.6
.6
. 6
. 6
. 7
.8

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

744
735
851
523
344
382

752
751
841
790
650
723

pH

8.0
8.1
8.1
8.0
7.9
7.6

8.1
7.9
8.1
8.0
8.4
8.2

a Daily mean discharge.
b Includes equivalent of 10 ppm of carbonate (CO3).

COYOTE CREEK BASIN

11-1700. COYOTE CHEEK NEAR MADRONE, CALIF.

LOCATION. At gaging station near southeast corner of La Laguna Seca Grant, 1.2 miles downstream from Anderson Dam, and 1.8 miles northeast of Madrone, Santa Clara County.
DRAINAGE AREA. 194 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 15, 1959....

May 4.............

July 13...........

Sept. 6.. ....

Discharge
(cfs)

79
104
98
1.8
1.6
20

50
92
112
127
124
115

Silica

(SiQ,)

13

12

Iron

(Fe)

0.04

.06

Cal-

cium

(Ca)

40

44

Mag-
ne-

sium

(Mg)

16

19

Sodium

(Na)

15
15
17
17
15
17

16
16
16
11
18
19

Po-
tas-

sium

(K)

~

2.6

2.3

Bi-
car-

bon-

ate

(HCOJ

166
172
184
al89
186
182

182
186
190
200
b202
219

Car-
bon-

ate

(ccg

Sulfate

(SO.)

36

32

Chloride

(CD

15
12
25
12
12
12

12
12
12
16
12
18

Fluo-
rlde

(P)

0.1

. 1

Ni-

trate

(NO,)

--

0.7

.5

Bo-

ron

(B)

0.2
. 1
. 1
.2
.0
. 1

. 1
. 1
. 1
.2
. 1
,1

Dissolved solids

(calculated)

Parts

per
million

229

256

Tons

per
acre-

foot

0.31

. 35

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

156
152
161
169
172
160

163
164
166
170
173
190

Non-
car-

bon-

ate

20
11
10
14
19

11

14
11
10
6
7
10

So-

dium
ad-

sorp-
tion
ratio

0.5
. 5
.6
.6
.5
. 6

. 5
. 5
.5
.4
.6
.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

338
347
361
385
380
376

376
375
374
385
389
427

PH

7.9
7.6
8.0
8.3
7.9
8.0

8.1
8.1
8.0
3.2
8.3
8.1

a Includes equivalent of 3 ppm of carbonate (CDs), b Includes equivalent of 8 ppm of carbonate (CO3).

ALAMEDA CREEK BASIN Continued

11-1790. ALAMEDA CREEK NEAR NILES, CALIF.

LOCATION. At gaging station 0.3 mile downstream from railroad bridge and 1.2 miles northeast of Niles, Alameda County. DRAINAGE AREA. 633 square miles.
RECORDS AVAILABLE. Chemical analyses: February 1952 to September 1960.
Water temperatures: July 1956 to September 1960.
Sediment records: January 1957 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 739 ppm Aug. 11, 18-20; minimum, 231 ppm Feb. 8-10.
Hardness: Maximum, 410 ppm Dec. 1-31; minimum, 136 ppm Feb. 8-10.
Specific conductance: Maximum daily, 1,170 micromhos Aug. 18; minimum daily, 312 micromhos Feb. 9.
Water temperatures: Maximum, 88°F June 1; minimum,- 43°F Jan. 14.
Sediment concentrations: Maximum daily, 1,900 ppm Feb. 8; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 5,770 tons Feb 8; minimum daily, 0 ton on many days.
EXTREMES, 1956-60. Dissolved solids (1956-57, 1959-60): Maximum, 739 ppm Aug. 11, 18-20, 1960; minimum, 215 ppm Feb. 8-10, 1960. Hardness (1956-57, 1959-60): Maximum, 430 ppm Jan. 16, 1957; minimum, 136 ppm Feb. 8-10, 1960.
Specific conductance (1956-57, 1959-60): Maximum daily, 1,270 micromhos Jan. 15, 1957; minimum daily, 312 micromhos Feb. 9, 1960.
Water temperatures (1956-60): Maximum, 88°F June 1, 1960; minimum, 38°F Dec. 22, 24, 28, 30, 1956, Jan. 9-10, 1957.
Sediment concentrations (1957-60): Maximum daily, 5,340 ppm Apr. 3, 1958; minimum daily, no flow on many days.
Sediment loads (1957-60): Maximum daily, 285,000 tons Apr. 3, 1958; minimum daily, 0 ton on many days.
REMARKS. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, September 1959 to September 1960

Date
of
collection

Sept. 18-21, 1959a

Jan. 1-31, 1960...

Mar. 10-31........

Mean

discharge
(cfs)

0.1
. 3
.5
2.3
17.2

52.0
1,315
225
10.7
3.7
3.1

Silica

(SiQ.)

17
23
12
16
13
14
18

18
15
21
21
14
14

Iron

(Fe)

0.02
.00
.00
. 00
.00
.01
.02

. 02
. 04
.01
.01
.00
.01

Cal-

cium

(Ca)

74
78
69
73
81
83
54

46
30
40
63
49
39

Mag-
ne-

sium

(Mg)

42
48
49
52
51
43
28

23
15
21
34
49
65

Sodium

(Na)

66
82
91
92
77
76
44

40
19
27
48
58
63

Po-
tas-

sium

(K)

12
8.8
4.7
3.6
4.4
4.6
18

8.4
4.9
4.9
6.0
6.1
6.2

Bi-
car-

bon-

ate

(HCO,)

285
324
328
336
334
314
226

164
140
178
268
260
315

Car-
bon-

ate

(CO,)

0
0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(S0t)

136
169
195
201
195
165
87

79

33 55 '

99
137
140

Chloride

(Cl)

88
100
80
78
78
78
50

43
21
28
55
69
77

Fluo-
ride

(F)

0.3
.4
.4
. 5
.4
.4

.4
.3
.3
.2
.3

Ni-

trate

(NOJ

7.4
2.6
2.7
2.3
2.3
1.1
10

23
7.6
6.7
4.9
.5
.4

Bo-

ron

(B)

0.9
1.1
1.1
1.0
1.0
1.0
.6

. 5
.3
.4
.6
. 7
.9

Dissolved solids

(residue at 180°C)

Parts

per
million

584
678
666
684
666
632
438

376
231
295
462
539
576

Tons

per
acre-

foot

0.79
.92
.91
.93
.91
.86
.60

.51
. 31
.40
. 63
. 73
. 78

Tons

per

day

0.13
. 55
.92
3.96
20.3

52.8
820
179
13.3
5.40
4.76

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

356
392
372
396
410
384
248

208
136
188
296
326
366

Non-
car-

bon-

ate

122
126
103
120
136
127
63

74
21
42
76
113
108

So-

dluzn
ad-

sorp-
tion
ratio

1.5
1.8
2'.1
2.0
1.7
1.7
1.2

1.2
.7
.9
1.2
1.4
1.4

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

939
1,020
1,020
1,030
1,030
977
688

582
330
469
747
880
943

PH

8.2
7.7
8.1
8.2
7.8
7.9
7.5

7.2
7.5
7.7
8.0
8.0
8.0

a Not included i n weighted average.

LOCATION. At gaging station 3 mil
DRAINAGE AREA. 865 square miles.
RECORDS AVAILABLE. Chemical analy
REMARKS. Records of discharge for

BUENA VISTA LAKE BASIN

11-1860. KERN RIVER NEAR KERNVILLE, CALIF.

5s upstream from Salmon Creek and 15 miles north of Kernville, Kern County.

ses: October 1955 to September 1960.
water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Aug. 29...........

Discharge
(cfs)

1.9
1.9
1.6
as. 4
3.5
3.2

2.9
55
588
1.7
1.4
1.1

Silica

(SiQ,,)

15

21

Iron

(Fe)

0.06

. 00

Cal-

cium

(Ca)

10

12

Mag-
ne-

sium

(Mg)

0.7

3.2

Sodium

(Na)

18
19
18
20
17
16

9.0
7.6
3.7
9.4
12
18

Po-
tas-
sium

(K)

1.2

1.6

Bi-
car-

bon-

ate

(HCOJ

73
79
83
90
83
68

50
42
24
42
52
76

Car-
bon-
ate

(CO,)

Sulfate

(SO,)

7.0

12

Chloride

(Cl)

8.2
10
8.2
9.5
12
7.0

5.0
3.0
3.5
5.0
7.8
7.2

Fluo-
ride

(F)

0.2

. 2

Ni-

trate

(NO,)

0.2

.2

Bo-

ron

(B)

0.2
. 1
.2
.3
.2
. 1

.2
.0
.0
. 1
. 1
.2

Dissolved solids

(calculated)

Parts

per
million

66

113

Tons

per
acre-

foot

0.09

. 15

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

45
50
50
57
58
55

35
28
17
26
34
43

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.2
1.2
1.1
1.2
1.0
. 9

. 7
.6
.4
. 8
.9
1.2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

169
180
182
201
184
172

108
91
53
97
115
167

pH

7.7
7.4
7.3
7.4
7.7
7.4

7.0
7.2
6.9
7.0
7.0
8.0

Daily mean discharge.

BUENA VISTA LAKE BASIN Continued

11-1910. KEEN RIVER BELOW ISABELLA DAM, CALIF.

LOCATION. At Isabella Dam, Kern County, approximately 0.6 mile upstream from gaging station, and 1 mile southwest of Isabella. DRAINAGE AREA. 2,094 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1955 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Feb. 1...... ......

AUK. 29... ....

Discharge
(cfs)

16
7.9
17
8.4
20
4.1

3.1
4.1
490
336
331
180

Silica

(SiQa)

5.5

14

Iron

(Fe)

0.01

.00

Cal-

cium

(Ca)

18

11

Mag-
ne-

sium

(Mg)

2.7

8.4

Sodium

(Na)

19
19
20
20
20
20

20
17
14
11
15
18

Po-
tas-

sium

(K)

3.0

2.3

Bi-
car-

bon-

ate

(HCO,)

91
106
106
108
111
112

112
90
81
72
77
97

Car-
bon-

ate

(CO,)

Sulfate

(S04)

9.0

11

Chloride

(Cl)

8.7
8.0
9.0
9.0
14
9.0

9.0
6.0
9.0
5.5
8.8
8.3

Fluo-
ride

(F)

0.4

.3

Ni-

trate

(NO,)

0.7

3.0

Bo-

ron

(B)

0.5
. 1
.2
.2
. 1
. 1

.2
. 1
.2
. 1
. 1
.2

Dissolved solids

(calculated)

Parts

per
million

106

124

Tons

per
acre-

foot

0.14

. 17

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

56
66
65
63
75
73

70
56
50
44
52
62

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

. 1
.0
. 1
.1
.0
.0

.0
.0
.9
. 7
.9
1.0

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

193
207
213
218
224
225

227
183
160
141
164
200

pH

7.3
7.4
7.3
7.1
7.8
7.4

7.5
7.4
7.2
6.9
6.8
8.1

BOENA VISTA LAKE BASIN Continued

11-1940. KEEN RIVER NEAR BAKERSFIELD, CALIF.

LOCATION. At gaging station at Kern County Land Co. diversion weir, approximately 2 miles east of Oil City, and 5 miles northeast of Bakersfield, Kern County. DRAINAGE AREA. 2,420 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Gaging station maintained and operated by State of California Department of Water Resources. Records of discharge for water year October 1953 to September 1960 given in State of California Bulletin No. 23-60.

(

Date
of
collection

June 2.. ....

Aug. 9............
Sept. 7. ....

Discharge
(cfs)

145
146
173
329
306

436
271
1,049
623
540
241

Silica

(S1Q.)

21

9.5

13

Iron

(Fe)

0.00

.01

?hemi c

Cal-

cium

(Ca)

22

18

17

il analyses, in parts per million, water year O<

Mag-
ne-

sium

(Mg)

4.6

4.1

4.3

Sodium

(Na)

23
25
24
18
19

11
20
15
11
17
22

Po-
tas-

sium

00

2.7

2.8

2.4

Bi-
car-

bon-

ate

(HCO,)

84
92
100
94
94

62
103
83
65
82
98

Car-
bon-
ate

(ccg

Sulfate

(SO,)

25

14

18

Chloride

(Cl)

14
13
12
13
12

6.2
9.5
10
6.5
12
10

:tober 1959 to !

Fluo-
ride

<F)

0.5

.4

.3

Ni-
trate

(NO,)

0.4

.2

. 7

Bo-

ron

(B)

0.4
.2
. 1
. 1
. 1

.2
.2
. 1
. 1
. 1
.2

September 1960

Dissolved solids

(calculated)

Parts

per
million

161

130

136

Tons

per
acre-

foot

0.22

. 18

. 18

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

59
64
74
76
69

48
62
55
41
51
60

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0
0
0

So-
dium
ad-

sorp-
tion
ratio

1.3
1.4
1.2
.9
1.0

. 7

1.1
.9
.7
1.0
1.2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

227
240
252
219
214

137
213
168
131
173
217

pH

7.9
7.6
7.7
7.7
7.7

7.5
7.7
7.4
7.4
7.7
8.1

TULARE LAKE BASIN

11-2035. TULE RIVER NEAR PORTERVILLE, CALIF.

LOCATION. At gaging station at highway bridge, 1 mile upstream from South Fork, and 6 miles east of Porterville, Tulare County. DRAINAGE AREA. 261 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. Stream dry during summer months.

Chei

Date
of
collection

July 7 ....
Aug. 9....... .....

Discharge
(cfs)

1.3
. 1
139
41
124

143
68
b .2
b .1

Silica

(SiQ,)

24

Iron

(Fe)

nical

Cal-

cium

(Ca)

27

analyses, in parts i

Mag-
ne-

sium

(Mg)

2.6

Sodium

(Na)

28
26
14
16
14

9.9
10
25
28

Po-
tas-

sium

(K)

1.9

Der million.

Bi-
car-

bon-

ate

(HCO,)

284
a220
118
151
136

103
136
257
224

Car-
bon-
ate

(COJ

water i

Sulfate

(S0«)

6.0

rear October 1959 to September 1960

Chloride

(CD

19
16
11
9.8
6.5

6.5
8.0
16
14

Fluo-
rlde

(F)

0.1

Ni-
trate

(NOJ

0.4

Bo-

ron

(B)

0.2
. 2
. 0
. 1
. 1

.0
. 1
. 2
. 1

Dissolved solids

(calculated)

Parts

per
million

130

Tons

per
acre-

foot

0.18

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

207
170
94
106
102

78
96
177
155

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.8
.9
. 6
. 7
. 6

.5
.4
. 8
1.0

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

500
418
238
278
254

182
228
420
404

PH

8.2
8.3
7.4
7.7
8.1

7.7
8.1
8.2
8.1

a Includes equivalent of 7 ppm of carbonate
b Daily mean discharge.

TIJLARE LAKE BASI»--Continned

11-2105. KAWEAH RIVER NEAR THREE RIVERS, CALIF.

LOCATION. At gaging station, 2.5 miles downstream from South Fork and 3 miles southwest of Three Rivers Post Office, Tulare County. DRAINAGE AREA. 520 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960°

Date
of
collection

Jan. 5, I960......

July 6.. ....

Sept . 7 ....

Discharge
(cfs)

29
26
26
37
250
159

759
530
960
97
39
24

Silica

(sicg

12

~

14

Iron

(Fe)

0.01

.01

Cal-

cium

(Ca)

7.2

15 _,

Mag-
ne-

sium

(Mg)

0.5

3.9

Sodium

(Na)

9.0
12
T.2
9.5
5.1
5.6

2.0
2.6
1.6
4.0
7.2
8.9

Po-
tas-

sium

(K)

0.8

2.2

Bi-
car-

bon-

ate

(HCO,)

66
80
88
80
47
60

26
29
17
40
62
74

Car-
bon-

ate

(CO,)

Sulfate

(S04)

0.0

5.0

Chloride

(Cl)

8.5
12
12
9.0
8.0
5.0

2.0
1.2
1.2
3.5
10
8.6

Pluo-

ride

(F)

0.2

. 2

Ni-

trate

(NO,)

- "

0.3

. 3

Bo-

ron

(B)

0.3
.0
. 0
.0
. 1
.0

. 1
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

39

94

Tons

per
acre-

foot

0.05

. 13

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

49
62
68
68
44
50

24
20
14
30
48
54

Non-
car-

bon-

ate

0
0
0
2
5
1

3
0
0
O
0
0

So-

dium
ad-

sorp-
tion
ratio

0.6
. 7
. 6
. 5
.3
.3

. 2
. 2
.2
.3
.4
. 5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

142
169
184
172
105
116

49
56
33
77
123
145

pH

7.7
8.1
8.0
7.9
7.3
7.5

7.0
7.2
7.O
7. 5
7.7
8.0

TULARE LAKE BASIN Continued

11-2185. KINGS RIVER BELOW NORTH FORK, CALIF.

LOCATION. At gaging station 0.8 mile downstream from North Fork, Fresno County, 2.4 miles southwest of Balch Camp, and 8.5 miles southeast of Trimmer. DRAINAGE AREA. 1,350 square miles, approximately.
RECORDS AVAILABLE, Chemical analyses: October 1955 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 6... ....

Discharge
(cfs)

253
141
128
139
220
315

1,190
2,020
3,760
1,260
1,080
1,040

Silica

(S1Q,)

8.7

7.1

Iron

(Fe)

0.01

.03

Cal-
cium

(Ca)

3.2

3.0

Mag-
ne-

sium

(Mg)

0.2

. 7

Sodium

(Na)

3.6
4.5
5.7
4.2
3.2
3.3

2.2
1.3
1.9
1.6
2.0
2.5

Po-
tas-

sium

(K)

0.4

. 7

Bi-
car-

bon-

ate

(HCO,)

22
28
28
28
24
27

18
11
9
14
11
17

Car-
bon-
ate

(CO,)

Sulfate

(S0«)

2.0

1.0

Chloride

(Cl)

5.2
4.0
3.8
3.5
4.5
4.5

1.5
1.2
2.0
.2
3.0
1.2

Fluo-
rlde

(F)

0.0

.1

Ni-

trate

(NOJ

.:;

0.0

.0

Bo-

ron

(B)

0.0
.0
.0
.0
.0
.0

.1
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

22

24

Tons

per
acre-

foot

0.03

.03

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

19
22
28
24
21
26

19
9
8
10
8
10

Non-
car-

bon-

ate

1
0
5
1
1
4

4
0
1
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
.5
.4
.3
.3

.2
.2
.3
.2
.3
.3

Specific
con-

duct-

ance

'micro-

mhos at

25"C)

54
66
71
69
58
62

42
28
19
31
25
30

PH

6.9
6.8
7.1
6.9
6.9
6.8

6.6
6.6
6.6
6.9
6.7
7.1

LOCATION. At gaging station 3,200
DRAINAGE AREA. 1,542 square miles
RECORDS AVAILABLE. Chemical analy:
REMARKS. Records of discharge for

TULARE LAKE BASIN Continued

11-2215. KINGS RIVER BELOW PINE FLAT DAM, CALIF,

feet downstream from Pine Flat Dam, Fresno County, and 2.9 miles northeast of Piedra. ;es: October 1955 to September 1960.
water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 1, 1960... . ..

Mar. 4.... ....

July 5.... ....

Discharge
(cfs)

49
100
129
48
406

1,440
992
3,930
2,310
1,740
775

Silica

(S1Q,)

8.1

7.8

Iron

(Fe)

0.00

.04

Cal-

cium

(Ca)

4.8

2.6

Mag-
ne-

sium

(Mg)

1.2

1.3

Sodium

(Na)

1.9
2.1
1.8
1.9
1.8

1.7
1.9

.9
1.7
2.4

Po-
tas-

sium

(K)

0.6

.6

Bl-
car-

bon-

ate

(HCOJ

16
13
16
16
24

23
20
17
14
14
18

Car-
bon-

ate

(ccg

Sulfate

(S04)

4.0

1.2

Chloride

(Cl)

2.0
2.0
1.5
4.0
5.5

2.2
1.2
3.8
2.2
1.0
1.2

FluO-
rlde

(P)

0.0

. 1

Ni-

trate

(NO,)

0.1

.4

Bo-

ron

(B)

0.0
. 0
. 0
. 2
.0

.0
. 0
. 0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

32

27

Tons

per
acre-

foot

0.04

.04

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

12
15
18
15
28

22
17
15
9
9
12

Non-
car-

bon-

ate

0
4
5
2
8

3
1
1
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.2
. 2
. 2
.2
.2

. 1
. 2
. 2
. 1
.2
.3

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

34
40
40
44
44

46
49
37
25
28
34

PH

6.5
6.3
6.8
6.4
6.7

6.8
6.7
6.7
6.7
6.6
7.1

TULARE LAKE BASIN Continued

11-2227. KINGS BIVER AT PEOPLES WEIR, NEAR KINGSBURG, CALIF.

LOCATION. Approximately 0.2 mile downstream from gaging station located on diversion weir, 2 miles south of Kingsburg, and approximately 12 miles northeast of Hanford, Kings County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Gaging station maintained, operated, and records of discharge for water year October 1959 to September 1960 furnished by Kings River Water Association.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 7... ....

Discharge
(cfs)

59
57
62
72
42
230

62
76
64
612
635
210

Silica

(SiOJ

12

8.5

Iron

(Fe)

0.03

.02

Cal-

cium

(Ca)

11

4.5

Mag-
ne-

sium

(Mg)

3.5

1.9

Sodium

(Na)

4.5
17
15
12
13
5.7

8.2
6.4
7.5
2.2
2.6
2.7

Po-
tas-
sium

(K)

2.1

.9

Bi-
car-

bon-

ate

(HCO,)

37
118
106
114
101
52

70
58
60
14
19
26

Car-
bon-
ate

(CO,)

Sulfate

(S0«)

7.0

2.8

Chloride

(CD

5.8
8.2
7.2
6.0
13
3.0

5.5
1.2
5.8
3.8
4.0
1.5

Fluo-
rlde

(F)

0.0

.2

Ni-

trate

(NO,)

0.6

.3

Bo-

ron

(B)

0.2
.0
.0
.0
.0
. 1

. 1
.0
.0
.0
. 1
.0

Dissolved solids

(calculated!

Parts

per
million

73

36

Tons

per
acre-

foot

0.10

.05

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

30
80
72
72
77
46

59
42
44
12
16
19

Non-
car-

bon-

ate

0
0
0
0
0
3

2
0
0
1
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.8
.8
.6
.7
.4

. 5
.4
.5
.3
.3
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

81
222
203
189
201
110

140
113
119
35
40
46

pH

7.1
7.7
7.7
7.9
7.8
7.4

.4
.4
.4
.8
. 1
.5

SAN JOAQUIN RIVER BASIN

11-2510. SAN JOAQUIN RIVER BELOW FRIANT, CALIF.

LOCATION. At gaging station 0.5 mile west of Friant, Fresno County, 1.5 miles downstream from Cottonwood Creek, and 2 miles downstream from Friant Dam.. DRAINAGE AREA. 1,675 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1952 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Mar 2

May 4....... ......
June 1 ....

July 6.. ....

Sept. 6.. ....

Discharge
(cfs)

111
112
77
25
27
97

119
119
169
227
217
201

Silica

(SiQ,,)

11

10

Iron

(Fe)

0.09

.01

Cal-

cium

(Ca)

4.4

5.6

Mag-
ne-

sium

(Mg)

1.9

.2

Sodium

(Na)

6.6
3.9
4.4
3.8
3.6
4.2

4.0
4.5
4.9
4.3
5.2
5.2

Po-
tas-

sium

(K)

1.0

.8

Bi-
car-

bon-

ate

(HCO,)

32
16
15
16
15
22

22
25
21
24
22
22

Car-
bon-
ate

(CO,)

Sulfate

(S04)

4.0

.0

Chloride

(Cl)

7.5
4.0
2.5
3.0
5.2
5.5

5.5
3.5
5.6
6.0
6.0
5.2

Fluo-

rlde

(F)

0.1

.1

Ni-

trate

(NO,)

0.2

.3

Bo-

ron

(B)

0.0
.0
.0
.0
.0

.1

.1
. 1
.1
. 1
.0
.0

Dissolved solids

(calculated)

Farts

per
million

43

38

Tons

per
acre-

foot

0.06

.05

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

24
12
16
17
14
21

20
19
16
16
16
15

Non-
car-

bon-

ate

0
0
4
4
2
3

2
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.6
.5
. 5
.4
.4
.4

.4
.5
.5
.5
.6
.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

72
45
50
49
49
55

55
57
58
59
58
57

PH

7.3
6.7
6.5
6.9
6.5
6.6

6.6
7.2
7.8
7.1
6.8
7.0

SAN JOAQUIN RIVER BASIN Continued

11-2535. SAN JOAQUIN RIVER NEAR BIOLA, CALIF.

LOCATION. At Skaggs Bridge, 1.9 miles upstream from gaging station, and approximately 2.5 miles northwest of Biola, Fresno County. DRAINAGE AREA. 1,805 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: November 1952 to September 1958, November 1959 to September 1960.
Water temperatures: November 1952 to September 1958, November 1959 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 85 ppm Jan. 7-14; minimum, 46 ppm June 17-30.
Hardness: Maximum, 40 ppm Jan. 1-6, Feb. 18-27; minimum, 18 ppm June 1-16, July 1-9, July 22-Aug. 19.
Specific conductance: Maximum daily, 133 micromhos Feb. 18; minimum daily, 64 micromhos June 28.
Water temperatures: Maximum, 93°F June 11; minimum, 43°F Jan. 5.
EXTREMES, 1952-58, 1959-60. Dissolved solids: Maximum, 131 ppm Nov. 29, 1957; minimum, 26 ppm May 30, 1956.
Hardness: Maximum, 54 ppm Nov. 29, 1957; minimum, 9 ppm Oct. 1-15, 1956.
Specific conductance: Maximum daily, 178 micromhos Mar. 18, 1958; minimum daily, 33 micromhos June 18, 1956.
Water temperatures: Maximum (revised), 94°F June 8, 1955; minimum, 36°F Feb. 23, 24, 28, Mar. 1, 2, 1953.
REMARKS. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No appreciable inflow between sampling point and gaging station except during periods of heavy runoff.

Chemical analyses, in parts oer million. November 1959 to September 1960

Date
of
collection

Nov. 18-
Dec. 5, 1959....

Jan. 1-6, I960....

Feb. 18-27........
Feb. 28-Mar. 10. . .

Mar. 21-31........

Apr . 10-21 ....

June 17-30....... .

Mean

discharge
(cfs)

70.0
51.8
29.0
12.4

23.5
26.5
37.5
56.9
110

83.3
86.8
77.4
94.7
120

78.5
98.8
99.0
97.1
121

Silica

(SiQ,,)

Iron

(Fe)

Cal-

cium

(Ca)

7.2
6.4
9.6
13

15
14
13
14
6.8

6.8
5.6
5.6
5.2
5.6

7.2
5.6
6.0
5.0
5.4

Mag-
ne-

sium

(Mg)

1.2
2.9
1.5
1.8

.4
.5
1.1
1.2
3.9

4.6
5.6
.9
.9
.9

.5
.5
.2
.5
.3

Sodium

(Na)

6.3
6.8
8.1
10

11
10
10
10
6.6

7.6
7.6
7.2
6.6
5.7

7.0
8.0
8.0
6.8
6.4

Po-
tas-

sium

(K)

Bi-
car-

bon-

ate

(HCO,)

30
35
43
57

57
52
52
52
33

35
33
38
35
42

34
32
29
31
30

Car-
bon-
ate

(CO,)

Sulfate

(S04)

Chloride

(CD

Fluo-
ride

(F)

Ni-
trate

(NOJ

Bo-

ron

(B)

Dissolved solids

(calculated) a

Parts

per
million

50
58
67
78

85
77
78
82
54

58
55
55
52
48

56
52
50
49
4fi

Tons

per
acre-

foot

0.07
.08
.09
. 11

. 12
. 10
. 11
. 11
.07

.08
.07
.07
.07
.07

.08
.07
.07
.07
.06

Tons

per

day

9.45
8.11
5.25
2.61

5.39
5.51
7.90
12.6
16.0

13.0
12.9
11.5
13.3
15.6

11.9
13.9
13.4
12.8
1 H.o

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

23
28
30
40

39
37
37
40
33

36
37
22
21
26

24
20
20
18
1 q

Non-
car-

bon-

ate

0
0
0
0

0
0
0
0
6

7
10
0
0
5

0
0
0
0
n

So-

dium
ad-

sorp-
tion
ratio

0.6
.6
.6
.7

.8
.7
.7
.7
. 5

.6
.5
. 7
.6
.6

.6
.8
.8
. 7
.fi

Specific
con-

duct-

ance

Imicro-

mhos at

25°C)

74
86
100
116

127
115
116
123
81

86
82
82
77
71

83
77
74
73
fid

pH

6.6
6.9
6.9
7.0

6.9
.2
.2
.2
.0

.6
.0
.4
.4
.3

6.9
6.8
6.8
6.8
R Q

SAN JOAQUIN RIVER BASIN Continued

11-2580. FRESNO RIVER NEAR DAULTON, CALIF.

LOCATION. At gaging station 0.5 mile downstream from Willow Creek and 5.3 miles southeast of Daulton, Madera County. DRAINAGE AREA. 259 square miles.
RECORDS AVAILABLE. Chemical analyses: January 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 7, 1959......

June 1 ....

July 6... ....

Discharge
(cfs)

3.0
3.4
6.0
6.8
98

36
. 88
98
58
3.9

Silica

(S1Q,)

23

Iron

(Fe)

0.07

Cal-

cium

(Ca)

8.8

Mag-
ne-

sium

(Mg)

1.0

Sodium

(Na)

39
30
38
25
8.9

14
8.8
7.6
5.7
16

Po-
tas-

sium

(K)

1.3

Bl-
car-

bon-

ate

(HCO,)

64
58
59
56
30

50
40
34
26
46

Car-
bon-

ate

(CO,)

Sulfate

(SO*)

2.0

Chloride

(CD

70
53
44
22
11

21
9.6
8.2
8.0
26

Fluo-
rlde

(F)

0.1

Ni-

trate

(NOJ

0.1

Bo-

ron

(B)

0.3
.0
. 1
.2
.0

. 1
.0
.0
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

69

Tons

per
acre-

foot

0.09

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

73
57
56
52
30

41
26
26
22
39

Non-
car-

bon-

ate

21
9
8
6
5

0
0
0

1
1

So-

dium
ad-

sorp-
tion
ratio

2.0
1.7
2.2
1.5
. 7

1.0
. 7
.6
. 5
1.1

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

336
273
252
238
103

152
97
90
69
162

PH

7.5
7.8
7.4
7.5
6.6

7.4
7.3
7.4
7.4
7 7

LOCATION. At gaging station
DRAINAGE AREA. 238 square m:
RECORDS AVAILABLE. Chemical
REMARKS. Records of dischari

SAN JOAQUIN RIVER BASIN Continued

11-2590. CHOWCHILLA RIVER AT BUCHANAN DAMSITE, CALIF.

1.9 miles upstream from Raynor Creek and 4.3 miles west of Raymond, Madera County.
Lies.
analyses: January 1958 to September 1960.
;e for water year October 1959 to September 1960 given in WSP 1715. No flow from July to September.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

June 1 ....

Discharge
(cfs)

0.6
al.5
2.3
4.2
352

28
44
46
7.5

Silica

(810,)

30

Iron

(Fe)

0.02

Cal-
cium

(Ca)

16

Mag-
ne-

sium

(Mg)

2.9

Sodium

(Na)

81
73
68
52
7.4

19
16
14
26

Po-
tas-
sium

(K)

2.2

Bl-

car-

bon-

ate

(HCO,)

118
111
106
114
40

84
81
73
94

Car-
bon-
ate

(CO,)

Sulfate

(S04)

3.0

Chloride

(CD

185
190
167
130
12

32
21
17
45

Fluo-

ride

(F)

0.1

Ni-
trate

(NO,)

0.3

Bo-

ron

(B)

0.2
.0
. 1
. 1
.0

.0
.0
. 0
. 1

Dissolved solids

(calculated)

Parts

per
million

122

Tons

per
acre-

foot

0.17

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

201
202
184
164
38

75
57
52
86

Non-
car-

bon-

ate

104

ill
97
71
5

6
0
0
9

So-

dium
ad-

sorp-
tion
ratio

2.5
2.2
2.2
1.8
. 5

1.0
.9
. 8
. 2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

783
781
709
566
115

239
191
168
289

PH

7.9
7.8
8.0
7.9
6.8

7.7
7.4
7.7
8.0

a Daily mean discharge.

SAN JOAQUIN RIVER BASIN Continued

11-2610. SALT SLOUGH NEAR LOS BANDS, CALIF.

LOCATION. At gaging station in Sanjon de Santa Rita Grant, at San Luis Ranch, 600 yards downstream from confluence with Mud Slough and 7.0 miles north of Los Banos, Merced County.
RECORDS AVAI LABLE. Chemical analyses: November 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 7...........

Discharge
(cfs)

38
24
62
66
74
77

88
65
58
75
64
59

Silica

(SiQg)

24

25

20

Iron

(Fe)

0.01

.06

Cal-

cium

(Ca)

60

66

47

Mag-
ne-

sium

(Mg)

33

37

27

Sodium

(Na)

172
270
287
342
338
296

162
198
113
148
127
142

Po-
tas-

sium

to

4.8

6.8

5.4

Bi-
car-

bon-

ate

(HCO,)

199
236
244
267
234
234

162
176
160
175
170
169

Car-
bon-

ate

(cog

Sulfate

(S04)

138

250
370
460
354

140
234
119
136
108
110

Chloride

(CD

254
425
360
418
408
372

202
265
160
180
174
210

Fluo-
ride

(F)

0.2

.3

.2

Ni-

trate

(NOj)

3.0

4.0

1.1

Bo-

ron

(B)

0.5
.8
1.1
1.7
2.2
1.9

.6
1.2
. 7
. 9
.6
.4

Dissolved solids

(calculated)

Parts

per
million

788

924

646

Tons

per
acre-

foot

1.07

1.26

.88

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

287
366
376
454
472
430

268
315
230
221
220
230

Non-
car-

bon-

ate

124
172
176
235
280
238

135
171
99
77
81
91

So-

dium
ad-

sorp-
tion
ratio

4.4
6.1
6.4
7.0
6.8
6.2

3.7
4.9
3.4
4.3
3.7
4.1

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

1,390
1,930
1,910
2,390
2,190
2,180

1,160
1,470
963
991
1,030
1,050

PH

7.8
7.2
7.5
7.9
7.5
7.7

7.3
7.5
7.3
7.5
7.4
7.7

SAN JOAQUIN RIVER BASIN Continued

11-2615. SAN JOAQUIN RIVER AT FREMONT FORD BRIDGE, CALIF.

LOCATION (revised). At gaging station in Orestimba Grant, 150 feet downstream from Fremont Ford Bridge, Merced County, 2.1 miles downstream from Salt Slough, 4.5 miles west of Stevinson, and 6.7 miles upstream, from Merced River.
DRAINAGE AREA. 8,090 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: July 1955 to September 1960.
Water temperatures: July 1955 to September 1959.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Dec. 10.. ....

Mar. 18.. ....

Mar. 25...........

May 5..... ....

July 14.. ....

Sept. 7... ....

Mean

discharge
(cfs)

35
24
70
75
276
114
101

81
144
172
119
94
71
63

Silica

(SiQ,)

22

23

20

15

Iron

(Fe)

0.08

.05

Cal-

cium

(Ca)

108

103

62

61

Mag-
ne-

sium

(Mg)

78

62

34

31

Sodium

(Na)

369
499
304
355
137
334
338

271
177
163
180
144
170
222

Po-
tas-

sium

(K)

6.0

6.0

6.2

3.6

Bi-
car-

bon-

ate

(HCO,)

248
250
246
262
164
228
231

227
187
175
193
192
191
a215

Car-
bon-

ate

(CO,)

Sulfate

(S0«)

376
266
286

410

250
156
162
164
151
133
151

Chloride

(CD

640
732
445
470
165
482
505

495
263
243
262
215
238
290

Fluo-
ride

(P)

0.2

. 5

.3

. 5

Ni-

trate

(NOJ

1.7

3.0

1.2

. 5

Bo-

ron

(B)

1.0
.8
1.0
1.2
.6
1.8
1.6

.7
.5
.7
.5
.6
.4
.4

Dissolved solids

(calculated)

Parts

per
million

1,580

1,330

778

881

Tons

per
acre-

foot

2.15

1.81

1.06

1.20

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

580
660
419
485
240
514
590

510
295
294
298
257
262
280

Non-
car-

bon-

ate

377
455
217
270
106
327
401

324
142
150
140
100
105
104

So-

dium
ad-

sorp-
tion
ratio

6.7
8.. 4
6.5
7.0
3.8
6.4
6.1

5.2
4,5
4.1
4.5
3.9
4.6
5.8

Specific
con-

duct-

ance

[micro-
mhos at

2S°C)

2,800
3,360
2,190
2,460
1,060
2,480
2,720

2,480
1,410
1,330
1,420
1,210
1,260
1,490

pH

8.1
7.8
7.4
7.9
7.4
7.6
7.3

8.2
7.3
7.5
7.6
7.6
7.5
8.3

a Includes equivalent of 3 ppm of carbonate (CO3).

SAN JOAQUIN RIVER BASIN Continued

11-2700. MERCED RIVER AT EXCHEQUER, CALIF.

LOCATION. At gaging station at Exchequer, Mariposa County, 0.65 mile downstream from Lake McClure, and 5 miles northeast of Merced Falls. DRAINAGE AREA. 1,029 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Feb. 2...........

Sept. 6... ....

Discharge
(cfs)

45
47
49
39
36
978

606
1,660
1,900
1,840
123

Silica

(SIQ.)

8.8

11

Iron

(Fe)

0.02

.05

Cal-

cium

(Ca)

4.4

9.8

Mag-
ne-

sium

(Mg)

0.2

7.2

Sodium

(Na)

2.9
3.9
4.3
5.1
2.4
3.0

1.2
1.9
. 9
2.3
3.8

Po-
tas-

sium

(K)

0.4

1.1

Bi-
car-

bon-
ate

(HCO,)

48
68
68
74
40
49

13
18
14
25
67

Car-
bon-

ate

(cog

Sulfate

(S04)

2.0

4.8

Chloride

(Cl)

5.0
4.5
4.5

3.0
4.2

1.5
2.8
3.0
2.5
3.4

Fluo-
ride

(F)

0.2

. 1

Ni-
trate

(NO,)

0.1

1.4

Bo-

ron

(B)

0.3
. 0
.0
.0
.0
. 1

.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

25

76

Tons

per
acre-

foot

0.03

. 10

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

44
57
62
72
40
52

12
16
11
21
54

Non-
car-

bon-

ate

5
1
6
11
7
12

1
1
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.2
. 2
.2
.3
.2
. 2

. 1
.2
. 1
. 2
. 2

Specific
con-

duct-

ance

|micro-
mhos at

25°C)

105
132
142
157
86
106

31
40
29
56
114

PH

7.1
7.2
7.7
7.7
7.1
7.4

6.9
6.8
7.0
7.5
7.6

SAN JOAQUIN RIVER BASIN--Continued

11-2725. MERCED RIVER NEAR STEVINSON, CALIF.

LOCATION.--At gaging station 5 miles upstream from mouth and 6 miles northwest of Stevinson, Merced County. DRAINAGE AREA. 1,274 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1952 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, n Darts pei

Date
of
collection

Sept. 8.. ....

Discharge
(cfs)

108
110
131
140
163
125
106

122
137
126
57
94
83

Silica

(S1Q.)

29

27

35

Iron

(Fe)

0.09

.02

Cal-

cium

(Ca)

21

19

22

Mag-
ne-

sium

(Mg)

8.0

6.0

6.6

Sodium

(Na)

34
36
34
30
26
32
30

28
28
22
31
25
41

Po-
tas-

sium

(K)

2.9

3.7

1.9

Bi-
car-

bon-

ate

(HCOS)

147
149
141
134
128
136
al40

128
117
104
146
118
148

million, water year October 19

Car-
bon-

ate

(ccg

Sulfate

(SO*)

14

13

13

Chloride

(Cl)

25
23
19
18
15
24
18

20
16
19
28
14
22

Fluo-
ride

(P)

0.2

.2

.2

Ni-

trate

(NOJ

5.1

4.6

1.5

9 to Sentember 1960

Bo-

ron

(B)

0.0
.0
.0
.0
.0
.0
.0

.0
.0
.0
.1
.0
.0

Dissolved solids

(calculated)

Parts

per
million

197

176

216

Tons

per
acre-

foot

0.27

.24

.29

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

95
92
92
88
84
92
86

83
72
67
86
75
82

Non-
car-

bon-

ate

0
0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

.5
.6
.5
.4
.2
.4
.4

.3
.4
.2
.5
1.3
2.0

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

332
345
316
301
278
308
305

287
258
222
317
244
321

PH

.9
.9
.5
.6
.6
.7

.9
.5
.6
.8
.5
.8

a Includes equivalent of 1 ppm of carbonate (CO3).

SAN JOAQUIN RIVER BASIN Continued

11-2740. SAN JOAQUIN RIVER NEAR NEWMAN, CALIF.

LOCATION. At gaging station at bridge on Hills Ferry Road, 300 feet downstream from Merced River and 3.5 miles northeast of Newman, Stanislaus County. DRAINAGE AREA. 9,990 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Nov. 5............

Sept . 8 ....

Discharge
(cfs)

153
160
202
250
608
384

268
244
166
172
129

Silica

(SIQ,)

26

18

Iron

(Fe)

0.03

Cal-

cium

(Ca)

61

60

Mag-
ne-

sium

(Mg)

39

32

Sodium

(Na)

194
295
344
388
192
225

165
172
148
153
232

Po-
tas-

sium

(K)

4.0

3.2

Bi-
car-

bon-

ate

(HCO,)

190
256
240
286
206
210

189
186
206
178
209

Car-
bon-

ate

(CO,)

Sulfate

(S04)

190
238

428
238
266

161
178
161
120
182

Chloride

(Cl)

277
388
445
490
165
280

214
223
219
222
290

Fluo-
ride

(F)

0.2

. 3

Ni-

trate

(NO,)

4.1

. 9

Bo-

ron

(B)

0.4
. 7
.8
1.5
1.5
1.1

. 5
. 7
.6
.3
. 6

Dissolved solids

(calculated)

Parts

per
million

890

922

Tons

per
acre-

foot

1.21

1.25

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

311
404
421
560
300
342

261
271
268
234
280

Non-
car-

bon-

ate

155
194
224
225
131
170

106
118
99
88
109

So-

dium
ad-

sorp-
tion
ratio

4.8
6.4
7.3
7.1
4.8
5.3

4.5
4.6
3.9
4.4
6.0

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

1,520
2,060
2,160
2,960
1,410
1,680

1,250
1,310
1,260
1,130
1.550

pH

7.9
7.7
7.4
7.9
7.7
7.9

7.5
7.7
7.7
7.7
8,0

SAN JOAQUIN RIVER BASIN Continued

11-2747. SAN JOAQUIN RIVER NEAR GRAYSON, CALIF.

LOCATION. At gaging station at Laird Slough Bridge 1.8 miles east of Grayson, Stanislaus County, 5 miles upstream from confluence with Tuolumne River,
and 14 miles southwest of Modesto.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960. ,
REMARKS. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-BO as San Joaquin River at Grayson Gaging station maintained and operated by City of San Francisco in cooperation with the State of California Department of Water Resources, Modesto Irrigation District, and Turlock Irrigation District. Flow is San Joaquin River diversion into Laird Slough which returns to San Joaquin River main channel 2.1 miles downstream.

Chemical analvseSj in parts per million, water vear October 1959 to September 1960

Date
of
collection

Sept. 27.. ....

Discharge
(cfs)

380
315
335
570
745
355
230

160
310
365
220
175
235
240

Silica

(SiCfe)

26

23

14

22

Iron

(Fe)

0.04

.00

Cal-

cium

(Ca)

62

77

72

58

62

Mag-
ne-

sium

(Mg)

36

44

57

31

34

Sodium

(Na)

134
190
211
219
155
247
222

172
180
173
163
144
138
170

Po-
tas-

sium

(K)

4.8

4.0

5.0

4.0

Bi-
car-

bon-

ate

(HCO,)

178
230
220
250
207
232
237

258
217
202
226
233
220
218

Car-
bon-
ate

(CO,)

Sulfate

(S04)

230

242

157

166

Chloride

(CD

181
225
280
250
205
306
305

252
248
213
248
210
191
238

Fluo-

ride

(F)

0.2

.3

.2

. 1

Ni-

trate

(NO,)

1.0

3.4

1.0

3,8

Bo-

ron

(B)

0.4
.4
.6
1.6
. 7
1.1
.9

.7
.7
.4
. 5
.5
.3
.5

Dissolved solids

(calculated)

Parts

per
million

1,030

953

753

807

Tons

per
acre-

foot

1.40

1.30

1.02

1.10

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

230
304
333
306
257
402
374

414
328
270
295
290
254
296

Non-
car-

bon-

ate

84
115
153
101
87
212
180

202
150
104
110
99
74
117

So-

dium
ad-

sorp-
tion
ratio

3.8
4.7
5.0
5.5
4.2
5.4
5.0

3.7
4.3
4.6
4.1
3.7
3.8
4.3

Specific
con-

duct-

ance

micro-

mhos at

25°C)

,070
,380
,550
,510
,280
,840
,680

,710
,430
,240
,270
,250
,100
,540

pH

.7
.3
.6
.8
. 5
. 5
. 5

8.2
7.9
7.5
7.5
7.7
7.6
7.4

SAN JOAQUIN RIVER BASIN Continued

11-2880. TUOLUMNE RIVER ABOVE LA GRANGE DAM, NEAR LA GRANGE, CALIF.

LOCATION. Approximately 0.5 mile upstream from gaging station at Don Pedro Dam, 4 miles upstream from La Grange Dam, and 5.5 miles upstream from La Grange, Stanislaus County.
DRAINAGE AREA (revised). 1,534 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1954, October 1956 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No appreciable inflow between sampling point and gaging station.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Mar. 11... ....

Apr. 7.. ....

Sept. 27..........

Mean

discharge
(cfs)

al,210
al,300
al,390
al,520
a264
613

2,440
1,400
2,350
2,400
1,860
794

Silica

(SiQ,)

9.0

5.5

Iron

(Fe)

0.05

.00

Cal-

cium

(Ca)

3.6

4.0

3.5

Mag-
ne-

sium

(Mg)

1.5

1.2

. 7

Sodium

(Na)

1.8
1.9
1.7
1.6
1.9
2.6

1.8
1.3
1.4
.9
1.6
1.2

Po-
tas-

sium

(K)

0.4

.5

Bi-
car-

bon-

ate

(HCO,)

14
15
16
15
26
32

28
20
17
10
13
13

Car-
bon-
ate

(CO,)

Sulfate

(S0«)

1.0

1.6

Chloride

(CD

2.5
1.5
2.2
1.5
3.4
4.0

2.8
. 5
3.0
1.8
2.2
.8

Fluo-

ride

(F)

0.0

.1

Ni-

trate

(Ncg

0.0

. 3

Bo-

ron

(B)

0.1

.1
.0
.0
.0
.0

. 1
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

27

20

Tons

per
acre-

foot

0.04

.03

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

15
15
13
14
26
39

24
15
15
9
11
11

Non-
car-

bon-

ate

4
3
0
2
5
13

1
0
1
1
0
0

So-

dium
ad-

sorp-
tion
ratio

0.2
.2
. 2
. 2
. 2
.2

.2
. 2
. 2
. . 1
.2
. 1

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

41
33
37
30
62
78

58
41
35
23
29
30

PH

6.5
6.8
6.6
6.5
6.9
6.9

6.9
6.6
6.8
6.7
6.6
6.6

a Instantaneous discharge

SAN JOAQUIN RIVER BASIN Continued

11-2898. TUOLUMNE RIVER AT HICKMAN, CALIF.

LOCATION. At gaging station approximately 0.6 mile south of Waterford and 1 mile north of Hickraan, Stanislaus County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60 as Tuolumne River at Hickman Bridge. Gaging station maintained and operated by State of California Department of Water Resources.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 27..........

Discharge
(cfs)

137
535
548
846
312
160

117
103
84
87
80
92

Silica

(S1Q.)

48

53

Iron

(Fe)

0.02

.00

Cal-

cium

(Ca)

8.4

30

31

Mag-
ne-

sium

(Mg)

3.2

10

,11

Sodium

(Na)

58
9.8
7.0
6.0
17
33

47
62
56
54
60
55

Po-
tas-

sium

(K)

6.8

5.7

Bi-
car-

bon-

ate

(HCO,)

110
33
26
24
46
74

100
107
113
114
116
112

Car-
bon-

ate

(COJ

Sulfate

(S0«)

5.0

6.0

Chloride

(CD

114
18
12
10
36
68

96
112
120
116
120
110

Fluo-
ride

(F)

0.1

.3

Ni-
trate

(NO,)

0.2

.6

Bo-

ron

(B)

0.1
.0
.0
.0

. 0

. 1

Dissolved solids

(calculated)

Parts

per
million

327

328

Tons

per
acre-

foot

0.44

.45

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

122
34
25
25
50
86

114
118
139
120
135
123

Non-
car-

bon-

ate

32
7
4
5
12
25

32
30
46
27
40
31

So-

dium
ad-

sorp-
tion
ratio

2.3
. 7
.6
. 5
1.0
1.6

1.9
2.5
2.1
2.1
2.2
2.2

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

519
118
91
87
197
346

481
538
551
548
558
552

pH

8.0
7.0
6.9
6.9
7.0
7.5

8.0
7.7
7.9
8.1
7.8
7.8

SAN JOAQUIN RIVER BASIN Continued

11-2902. TUOLUMNE RIVER AT TUOLUMNE CITY, CALIF.

LOCATION. At gaging station at bridge in Tuolumne City, Stanislaus County, and 3.4 miles from mouth.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60. operated by City of San Francisco in cooperation with State of California Department of Water Resources.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Gaging station maintained and

Date
of
collection

Apr. 7. ....

Sept. 27..........

Discharge
(cfs)

285
590
a965
1,030
1,085
545
410

270
260
250
230
225
210
250

Silica

(SiOj

16

38

43

46

Iron

(Fe)

0.00

.02

.00

Cal-

cium

(Ca)

25

16

54

55

58

Mag-
ne-

sium

(Mg)

8.6

3.6

16

14

18

Sodium

(Na)

127
49
30
26
37
48
58

104
101
120
108
104
117
106

Po-
tas-

sium

W

2.3

10

10

8.2

Bi-
car-

bon-

ate

(HCO,)

181
74
50
43
59
87
100

161
161
157
157
167
160
166

Car-
bon-
ate

(CO,)

Sulfate

(SO,)

6.0

16

11

18

Chloride

(Cl)

238
86
62
51
73
107
112

208
223
236
235
238
210
218

Fluo-
ride

(F)

0.1

.2

. 1

.3

Ni-
trate

(NO,)

0.8

7.5

2.2

3.8

Bo-

ron

(B)

0.2
. 1
.0
.0
.2
.2
.2

. 1
.2
. 1
. 1
. 1
. 1
.2

Dissolved solids

(calculated)

Parts

per
million

143

533

570

558

Tons

per
acre-

foot

0.19

.72

.78

. 76

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

220
98
65
55
77
105
123

201
214
196
235
204
207
216

Non-
car-

bon-

ate

72
37
24
20
29
34
41

69
82
67
106
67
76
80

So-

dium
ad-

sorp-
tion
ratio

3.7
2.2
1.6
1.5
1.8
2.0
2.3

3.2
3.0
3.7
3.1
3.2
3.6
3.1

Specific
con-

duct-

ance

micro-

mhos at

25°C)

1,030
415
288
241
346
487
554

957
979
947
968
1,000
969
1,060

PH

7.3
7.1
6.9
7.1
7.0
6.9
7.1

8.2
7.7
7.2
7.3
7.4
7.5
7.5

a Daily mean discharge.

SAN JOAQUIN RIVER BASIN Continued

11-2905. SAN JOAQUIN RIVER AT MAZE ROAD BRIDGE, NEAR MODESTO, CALIF.

LOCATION.--At Maze. Road Bridge, 0.2 mile downstream from gaging station at Hetch Hetchy Crossing, 2.7 miles upstream from Stanislaus River, and 12 miles west of Modesto, Stanislaus County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60 as San Joaquin River at Hetch Hetchy Aqueduct Crossing. Gaging station maintained and operated hy City of San Francisco in cooperation with State of California Department of Water Resources.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Feb. 9.......... ..

May 10. ....

July 7....... .....

Sept. 27. ....

Discharge
(cfs)

660
940
1,240
1,540
1,370
735

405
465
310
270
335
425

Silica

(SiQ,)

--

28

29

Iron

(Fe)

0.02

i-OO

Cal-

cium

(Ca)

38

64

67

Mag-
ne-

sium

(Mg)

18

26

33

Sodium

(Na)

153
90
65
106
106
111

153
161
135
135
150
163

Po-
tas-

sium

(K)

7.8

5.6

Bi-
car-

bon-

ate

(HCO,)

196
123
95
135
149
134

186
188
181
192
190
208

Car-
bon-

ate

(CO,)

Sulfate

(SO.)

95

116

Chloride

(Cl)

227
132
104
135
175
190

280
250
285
278
246
269

Fluo-

rlde

(F)

0.2

. 1

Ni-
trate

(NO,)

2.3

3.2

Bo-

ron

(B)

0.4
. 2
. 1
.7
.6
.4

.4
.3
.4
.4
.4
.4

Dissolved solids

(calculated)

Parts

per
million

728

788

Tons

per
acre-

foot

0.99

1.07

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

256
167
132
166
190
207

288
267
275
266
266
301

Non-
car-

bon-

ate

95
66
54
55
68
97

135
113
127
109
110
130

So-

dium
ad-

sorp-
tion
ratio

4.2
3.0
2.5
3.6
3.3
3.4

3.9
4.3
3.5
3.6
4.0
4.1

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

1,180
747
607
812
942
942

,280
,220
,210
,230
,200
1,520

PH

7.6
7.4
7.2
7.4
7.1
7.3

7.8
7.5
7.3
7.4
7.4
7.2

SAN JOAQUIN RIVER BASIN Continued

n-2999.98. STANISLAUS RIVER AT TULLOCH DAMSITE, NEAR KNIGHTS FERRY, CALIF.

LOCATION. Approximately 1 mile downstream from Tulloch Dam, 2.4 miles downstream from Goodwin Dam, and 4.(County.
RECORDS AVAILABLE. Chemical analyses: October 1956 to September 1960.
REMARKS. No discharge records available.

lies upstream from Knights Ferry, Stanislaus

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Apr. 4.. ....

Mean

discharge
(cfs)

Silica

(sicg

12

10

Iron

(Fe)

0.02

.00

Cal-

cium

(Ca)

6.8

7.6

Mag-
ne-

sium

(Mg)

1.9

1.8

Sodium

(Na)

3.4
2.8
3.2
2.2
2.6

2.5
1.9
2.6
1.3
2.5
2.5

Po-
tas-

sium

(K)

0.9

1.0

Bi-
car-

bon-

ate

(HCO,)

32
42
48
54
46

40
29
27
26
32
36

Car-
bon-

ate

(ccg

Sulfate

(SOJ

4.0

2.0

Chloride

(CD

2.6
3.2
2.0
4.2
3.0

2.5
1.2
1.2
2.2
2.6
1.0

Fluo-
ride

(F)

0.0

.0

Ni-
trate

(NOJ

0.0

.0

Bo-

ron

(B)

0.3
.0
.0
.0
.0

. 1
.0
. 1
.0
. 1
.0

Dissolved solids
(calculated)

Parts

per
million

43

44

Tons

per
acre-

foot

0.06

.06

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

27
34
48
50
42

36
25
19
19
25
27

Non-
car-

bon-

ate

1
0
9
6
4

3
1
0
0
0
0

So-
dium
ad-

sorp-
tion
ratio

0.3
.2
.2
. 1
. 2

.2
.2
. 3
. 1
. 2
.2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

68
82
96
111
94

80
56
53
47
62
65

pH

6.9
7.0
7.8
7.4
7.2

7.3
7.2
7.0
7.3
6.8
7.0

SAN JOAQUIN RIVER BASIN Continued

11-3034. STANISLAUS RIVER NEAR MOUTH, NEAR VERNALIS, CALIF.

LOCATION. At gaging station 2.9 miles upstream from mouth, and approximately 6 miles northeast of Vernalis, San Joaquin County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60 as Stanislaus River near Mouth. Gaging station maintained and operated by State of California Department of Water Resources.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Apr. 14.. ....

Sept . 8 ....

Discharge
(cfs)

145
109
162
149
191
36
1.4

44
39
12

a38

Silica

(SiQ.)

26

32

37

Iron

(Fe)

0.06

Cal-

cium

(Ca)

25

28

28

Mag-
ne-

sium

(Mg)

13

11

13

Sodium

(Na)

19
18
17
17
14
18
17

15
16
16
10
22
21

Po-
tas-

sium

(K)

3.2

3.1

2.2

Bi-
car-

bon-

ate

(HCO,)

163
156
136
140
127
158
163

146
167
166
163
195
180

Car-
bon-

ate

(CO,)

SuUate

(SO.)

11

8.0

11

Chloride

(CD

14
8.8
8.5
8.2
11
12
8.1

7.5
7.2
7.2
9.8
15
9.0

Fluo-

ride

(F)

0.4

. 2

. 2

Ni-

trate

(NO,)

1.3

1.6

. 3

Bo-

ron

(B)

0.1
.0
.0
. 0
. 0
. 0
.0

.1
. 0
. 0
.0
.0

.1

Dissolved solids

(calculated)

Parts

per
million

187

189

211

Tons

per
acre-

foot

0.25

. 26

. 29

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

116
113
107
110
98
127
116

104
116
111
120
147
122

Non-
car-

bon-

ate

0
0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.8
. 7
. 7
.7
.6
. 7
. 7

.6
.6
. 7
.4
. 8
.8

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

307
291
273
286
263
314
292

269
294
285
276
331
311

pH

8.0
7.8
7.4
8.0
7.7
7.6
7.7

7.5
7.3
7.7
7.4
7.8
7.7

a Daily mean discharge.

SAN JOAQUIN RIVER BASIN Continued

11-3035. SAN JOAQUIN RIVER NEAR VERNALIS, CALIF.

LOCATION. At gaging station at Durham Ferry highway bridge, 3 miles downstream from Stanislaus River, and 3.4 miles northeast of Vernalis, San Joaquin County.
DRAINAGE AREA. 14,010 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: March 1951 to September 1960.
Water temperatures: March 1951 to September 1960.
Sediment records: November 1956 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 839 ppm Sept. 1-3; minimum, 327 ppm Feb. 11-15. Hardness: Maximum, 332 ppm Mar. 18; minimum, 121 ppm Feb. 15.
Specific conductance: Maximum daily, 1,600 micromhos Aug. 19; minimum daily, 448 micromhos Feb. 14.
Water temperatures: Maximum, 79°F June 1; minimum, 41°F Jan. 5.
Sediment concentrations: Maximum daily, 222 ppm Feb. 11; minimum daily, 9 ppm Jan. 4.
Sediment loads: Maximum daily, 1,800 tons Feb. 11; minimum daily, 17 tons Mar. 25.
EXTREMES, 1951-60. Dissolved solids: Maximum, 839 ppm Sept. 1-3, 1960; minimum, 54 ppm June 1-10, 1952.
Hardness: Maximum, 332 ppm Mar. 18, 1960; minimum, 23 ppm June 1-10, 1952.
Specific conductance: Maximum daily, 1,600 micromhos Aug. 19, 1960; minimal daily, 60 micromhos June 21, 1953.
Water temperatures: Maximum, 79°F June 1, 1960; minimum, 39°F Jan. 10, 1952.
Sediment concentrations (1956-60) ; Maximum daily, 680 ppm Feb. 20, 1958; minimum daily, 9 ppm Jan. 4, 1960.
Sediment loads (1956-60): Maximum daily, 28,500 tons Apr. 5, 1958; minimum daily, 17 tons Mar. 25, 1960.
REMARKS. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-15, 1959...

Jan. 1-11, 1960...

Mar. 13-26. ....

Mean

discharge
(cfs)

763
983
1,012
1,091
1,133

1,314
1,093
1,318
1,535
1,254

1,522
2,756
1,496
980
317

Silica

(S1Q,)

38
31
30
29

33

27
27
30

34
32
45
30
35

Iron

(Fe)

0.01
.03
.02
.03
.00

.07

.00
.01
.01

.01
.04
.02
.01
.01

Cal-

cium

(Ca)

52
40
39
39
45

32
38
31
38
46

40
27
44
45
70

Mag-
ne-

sium

(Mg)

24
19
18
19
13

15
17
16
18
.23

23
13
26
31
33

Sodium

(Na)

113
86
86
91
83

72
91
80
94
122

106
58
116
122
157

Po-
tas-

sium

(K)

5.4
4.6
4.0
3.6
4.0

4.2
5.0
5.8
7.4
8.2

6.2
6.5
5.8
5.6
8.6

Bi-
car-

bon-

ate

(HCOJ

190
144
136
134
131

113
135
110
136
158

157
117
163
150
164

Car-
bon-
ate

(cog

0
0
0
0
0

0
0
0
0
0

0
0
5
3
10

Sulfate

(SO.)

77
65
61
69
63

51
71
59
89
109

98
52
102
107
92

Chloride

(CD

185
137
135
141
126

114
132
118
128
170

153
72
152
184
301

Fluo-
ride

(P)

0.2
.2
.2
.2
.2

.2
.2
.2
.2
.2

.3
.2
. 1
.2
.3

Ni-

trate

(NO,)

3.1
3.6
3.6
4.7
5.1

3.9
6.0
3.3
4.4
3.3

3.5
3.2
3.6
1.9
3.3

Bo-

ron

(B)

0.3
.1
.2
.2
.2

.2
.3
.3
.3
.4

.5
.4
. 7
.3
.4

Dissolved solids

(residue at 180°C)

Parts

per
million

600
464
451
475
425

389
a428
396
485
589

525
327
563
595
817

Tons

per
acre-

foot

0.82
.63
.61
.65
.58

.53
.58
.54
.66
.80

. 71
.44
.77
.81
1.11

Tons

per

day

1,240
1,230
1,230
1,400
1,300

1,380
1,260
1,410
2,010
1,990

2,160
2,430
2,270
1,570
699

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium
230
178
171
177
165

144
165
144
168
210

194
122
217
242
310

Non-
car-

bon-

ate

74
60
59
67
58

51
54
54
56
80

65
26
75
114
159

So-

dium
ad-

sorp-
tion
ratio

3.2
.2.8
2.9
3.0
2.8

2.6
3.1
2.9
3.2
3.7

3.3
2.3
3.4
3.4
3.9

Specific
con-

duct-

ance

micro-

mhos at

25°C)

i ,010
781
764
783
743

623
743
667
783
1,010

862
520
912
997
1,370

PH

7.b
7.3
7.3
7.4
7.9

7.8
7.4
8.0
8.2
7.6

8.2
7.3
8.3
8.3
8.3

SAN JOAQUIN RIVER BASIN Continued

11-3042. SAN JOAQUIN RIVER AT MOSSDALE, CALIF.

LOCATION. Boat landing at Mossdale Bridge at Mossdale, San Joaquin County, opposite tidal gaging station, and 7.6 miles northeast of Tracy. RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Tidal gaging station maintained and operated by State of California Department of Water Resources.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Mar. 15...........

Mar. 24...........

Sept. 8........ ...

Mean

discharge
(cfs)

Silica

(S1Q,)

28
34

19

23

Iron

(Fe)

0.01

.04

Cal-

cium

(Ca)

73
72

58

65

Mag-
ne-

sium

(Mg)

33
33

27

29

Sodium

(Na)

127
83
90
76
55
140
150
159

116
139
128
110
116
149

Po-
tas-

sium

(K)

5.2
7.2

8.0

7.8

Bl-
car-

bon-

ate

(HCO,)

195
141
130
108
106
166
182
a!81

200
178
200
176
172
222

Car-
bon-
ate

(CO,)

Sulfate

(S04)

94
82

81

57

Chloride

(Cl)

198
130
142
114
72
251
290
307

197
255
245
217
211
260

Fluo-
ride

(F)

0.2
.2

.2

. 1

Ni-

trate

(NOJ

2.3
3.1

2.0

.0

Bo-

ron

(B)

0.2
.3
.2
.2
.2
.4
.5
.3

.3
.4
.3
.3
.3
.3

Dissolved solids

(calculated)

Parts

per
million

766
787

678

700

Tons

per
acre-

foot

1.04
1.07

.92

.95

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

237
173
174
141
116
273
316
314

264
256
270
232
220
280

Non-
car-

bon-

ate

77
57
67
52
29
137
167
166

100
110
106
88
79
98

So-

dium
ad-

sorp-
tion
ratio

3.6
2.7
3.0
2.8
2.2
3.7
3.7
3.9

3.1
3.8
3.4
3 2
3*.4
3.9

Specific
con-

duct-

ance

micro-

mhos at

25°C)

1,050
767
771
652
526
1,240
1,370
1,420

1,070
1,180
1,180
1,050
1,050
1,190

pH

7.9
7.7
7.7
7.7
7.2
7.6
7.4
8.3

8.0
7.5
7.4
7.6
7.7
8.0

a Includes equivalent of 3 ppm of carbonate (CO3).

SAN JOAQUIN RIVER BASIN Continued

11-304$. SAN JOAQUIN RIVER AT GARWOOD BRIDGE, HEAR STOCKTON, CALIF.

LOCATION. Boat landing at Garwood Bridge on State Highway 4 opposite tidal gaging station and 1.8 miles west of Stockton, San Joaquin County. RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Tidal gaging station maintained and operated by U.S. Bureau of Reclamation.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 8, 1960......

Mar. 15. ....

Apr. 15. ....

July 15...........

Sept. 5. ....

Mean

discharge
(cfs)

Silica

(SiQ.)

16

14

Iron

(Fe)

0.03

.00

Cal-

cium

(Ca)

39

32

Mag-
ne-

sium

(Mg)

20

14

Sodium

(Na)

100
101
92
100
46
128

101
86
80
46
54
76

Po-
tas-

sium

(K)

7.8

5.6

Bi-
car-

bon-

ate

(Hccg

187
158
142
142
94
166

152
178
142
124
108
164

Car-
bon-

ate

(CO,)

Sulfate

(S0«)

51

31

Chloride

(CD

136
145
135
158
60
179

152
118
128
79
79
108

Fluo-
ride

(F)

0.2

.0

Ni-
trate

(Ncg

3.1

2.8

Bo-

ron

(B)

0.1
.3
.2
.3
. 1
.5

.4
.4
.3
. 1
. 1
.2

Dissolved solids

(calculated)

Parts

per
million

430

365

Tons

per
acre-

foot

0.58

.50

TOns

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

183
185
180
186
104
209

193
180
154
134
114
137

Non-
car-

bon-

ate

30
55
64
70
27
73

68
34
38
32
25
3

So-

dium
ad-

sorp-
tion
ratio

3.2
3.2
3.0
2.7
2.0
3.8

3.2
2.8
2.8
1.7
2.2
2.8

Specific
con-

duct-

ance

[micro-
mhos at

25"C)

802
825
777
854
446
1,000

872
745
705
497
487
653

PH

7.4
7.7
7.7
7.9
6.9
7.3

7.5
7.8
7.6
7.7
7.5
7.8

SAN JOAQUIN RIVER BASIN Continued

11-3095. CALAVERAS RIVER AT JENNY LIND, CALIF.

LOCATION. At bridge on Milton Road 70 feet upstream from gaging station, 0.2 mile south of Jenny Lind, Calaveras County, and 6.5 miles downstream from Cosgrove Creek.
DRAINAGE AREA. 395 square miles.
RECORDS AVAILABLE. Chemical analyses: November 1954 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No flow during summer months.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 4, 1960......

July 5.. ....

Discharge
(cfs)

13
56
1.9
3.7
6.5
3.0
13

Silica

(StQ.)

14

Iron

(Fe)

0.02

Cal-

cium

(Ca)

27

Mag-
ne-

sium

(Mg)

11

Sodium

(Na)

12
7.7
6.7
11
8.8
8.1
7.2

Po-
tas-

sium

(K)

2.1

Bl-

car-

bon-

ate

(HCO,)

134
104
100
a!43
123
128
135

Car-
bon-

ate

(CO,)

Sulfate

(S04)

21

Chloride

(Cl)

15
9.8
8.0
15
8.8
8.5
7.2

Fluo-

rlde

(F)

0.1

Ni-
trate

(NCg

0.3

Bo-

ron

(B)

0.1
.0
. 0
. 2
. 1
.0
.0

Dissolved solids

(calculated)

Parts

per
million

154

Tons

per
acre-

foot

0.21

Tons

per

day

Hardness
as CaCO,

Cal-

cium,
Mag-
ne-

sium

145
106
100
128
114
105
114

Non-
car-

bon-

ate

35
21
18
11
13
0
3

So-

dium
ad-

sorp-
tion
ratio

0.4
.3
. 3
.4
.4
.3
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

332
238
225
307
245
236
250

pH

8.0
7.7
7.7
8.4
7.8
8.0
8.0

a Includes equivalent of 4 ppm of carbonate (CO3).

SAN JOAQUIN RIVER BASIN Continued

11-3112. STOCKTON SHIP CHANNEL NEAR RINDGE PUMP, ON RINDGE TRACT, CALIF.

LOCATION. Boat landing at ship channel downstream from confluence with Fourteen Mile Slough, downstream from tidal gaging station, miles northwest of Stockton, San Joaquin County.
RECOHDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Tidal gaging station maintained and operated by State of California Department of Water Resources.

and approximately 9.6

Chemical analyses, in parts per million, water year October 19 9 to September 1960

Date
of
collection

Sept. 9.. ....

Mean

discharge
(cfs)

Silica

(S1Q,)

10

17

Iron

(Fe)

0.06

.00

Cal-

cium

(Ca)

25

19

Mag-
ne-

sium

(Mg)

11

14

Sodium

(Na)

98
89
88
89
53
82

32
47
27
25
34
37

Po-
tas-

sium

(K)

3.9

2.5

Bl-
car-

bon-

ate

(HCO,)

186
162
142
112
100
130

82
96
88
108
86
90

Car-
bon-

ate

(ccg

Sulfate

(».)

39

14

Chloride

(Cl)

142
132
135
158
80
117

48
70
39
34
49
73

Fluo-

rlde

(P)

0.1

.1

Ni-

trate

(NO,)

2.7

.6

Bo-

ron

(B)

0.2
.3
.2
.3
. 1
.3

.2
.2
. 1
. 1
.0
. 1

Dissolved solids

(calculated)

Parts

per
million

256

221

Tons

per
acre-

foot

0.35

.30

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

182
174
174
208
135
174

103
108
88
82
80
105

Non-
car-

bon-

ate

29
41
58
116
53
67

36
29
16
0
9
31

So-

dium
ad-

sorp-
tion
ratio

3.2
2.9
2.9
2.7
2.0
2.7

1.4
2.0
1.2
1.2
1.7
1.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

787
770
752
850
512
728

351
444
314
282
329
422

PH

7.4
7.6
7.6
7.3
7.0
7.5

7.3
7.4
7.2
7.6
7.7
7.6

SAN JOAQUIN RIVER BASIN Continued

11-3127. OLD RIVER AT SOUTH TIP OF FABIAN TRACT, NEAR TRACY, CALIF.

les east of Bethany, and 6.1 miles north of LOCATION. At southern tip of Fabian Tract at trash rack of pump intake at end of Lammers Road, approximately 3 Tracy, San Joaquin County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. No discharge records available.

Date
of
collection

Oct. 8, 1959......

Feb. 15.... ....

Sept. 8...........

Mean

discharge
(cfs)

Silica

(SiQ,,)

16

5.2

Iron

(Fe)

0.03

. 05

Cal-

cium

(Ca)

44

48

Mag-
ne-

sium

(Mg)

23

24

Sodium

(Na)

129
92
108
100
70
122

132
99
119
88
87
122

Po-
tas-

sium

(K)

6.2

7.4

Bi-
car-

bon-

ate

(HCO,)

215
159
164
172
120
164

197
170
190
173
141
185

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

67

71

Chloride

(Cl)

202
142
152
160
96
199

228
148
220
158
134
182

Fluo-

ride

(F)

0.1

. 2

Ni-

trate

(NOJ

1.4

.3

Bo-

ron

(B)

0.2
. 3
. 3
.4
.2
. 6

.4
.5
.5
. 6
. 3
.4

Dissolved solids

(calculated)

Parts

per
million

489

552

Tons

per
acre-

foot

0.67

. 75

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

254
194
206
211
142
251

294
204
250
200
210
220

Non-
car-

bon-

ate

78
64
72
70
44
117

132
65
94
58
94
68

So-

dium
ad-

sorp-
tion
ratio

3.5
2.9
3.3
3.0
2.6
3.4

3.3
3.0
3.3
2.7
2.6
3.6

Specific
con-

duct-

ance

micro-

mhos at

25"C)

1,110
828
890
914
647
1,110

1,220
851
1,080
846
835
991

pH

7.8
7.5
7.4
7.5
7.5
7.6

7.7
8.0
7.7
8.0
7.7
7.8

SAN JOAQUIN RIVER BASIN Continued

11-3129.9. DELTA-MENDOTA CANAL. ABOVE TRACT PUMPING PLANT, NEAR TRACY, CALIF.

LOCATION. At Byron Road bridge, 1.1 miles upstream from Tracy Pumping Plant, Alameda-Contra Costa County line, and 9.2 miles northwest of Tracy, San Joaquin County.
RECORDS AVAILABLE. Chemical analyses : October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715 as Delta-Mendota Canal at Tracy pumping plant, near Tracy. No appreciable inflow between sampling point and gaging station.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 5, 1959......

Dec. 7............
Jan. 12, I960.....

Sept, 13.,.,......

Mean

discharge
(eta)

1,989
608
284
104
285
1,359
2,606

2,811
2,370
1,715
3,359
3,794
3,458
2,051

Silica

(S1Q,)

22

21

16

17

Iron

(Fe)

0.13

. 15

Cal-

cium

(Ca)

38

24

18

21

Mag-
ne-

sium

(Mg)

18

14

8.3

20

Sodium

(Via.)

56
94
107
104
125
120
62

42
49
25
19
39
56
86

Po-
tas-

sium

(K)

3.8

3.2

i.a

3.6

Bi-
car-

bon-

ate

(HCO,)

105
150
146
141
164
172
98

95
94
69
78
82
86
' 92

Car-
bon-
ate

(ccg

Sulfate

(SO,)

79

SO

31

38

Chloride

(Cl)

81
142
160
154
188
172
98

60
80
32
27
56
85
150

Fluo-

rlde

(P)

0.2

.2

.2

. 1

Ni-

trate

(Ncg

0.6

3.1

1.6

.5

Bo-

ron

(B)

0.1
.4
.2
.4
.6
.6
.3

. 1
.2
.2
.2
. 1
. 1
.2

Dissolved solids

(calculated)

Parts

per
million

370

265

168

382

Tons

per
acre-

foot

0.50

.36

.23

.52

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

108
182
193
193
218
212
168

118
130
79
72
79
95
135

Non-
car-

bon-

ate

22
59
73
77
84
71
88

40
53
22
8
12
24
60

So-

dium
ad-

sorp-
tion
ratio

2.3
3.0
3.9
3.3
3.7
3.6
2.1

1.7
1.9
1.2
1.0
1.9
2.5
3.2

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

465
813
857
869
1,030
1,010
620

444
496
276
240
318
465
666

PH

7.3
7.9
7.8
7.4
7.8
8.0
7.3

7.7
7.4
7.5
7.2
7.6
7.9
7.5

SAN JOAQUIN RIVER BASIN Continued

11-3130.1. DELTA-MENDOTA CANAL BELOW TRACT PUMPING PLANT, NEAR TRACY, CALIF.

LOCATION. At canal bridge 4.98, 0.5 mile downstream from Mountain House Road siphon, 2.9 miles downstream from Tracy Pumping Plant, and 8.5 miles northwest of Tracy, San Joaquin County.
RECORDS AVAILABLE. Chemical analyses: July to September 1960.
Water temperatures: July 1959 to September 1960.
Sediment records: October 1959 to June 1960 (discontinued).
EXTREMES, 1959-60. Water temperatures: Maximum, 81°F July 25, 1960.
Sediment concentrations: Maximum daily, 155 ppm June 9;.minimum daily, 10 ppm on several days.
Sediment loads: Maximum daily, 1,540 tons June 10; minimum daily, 2 tons Dec. 21-31, Jan. 1-5.
REMARKS. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1714 and 1715, respectively, as Delta-Mendota Canal at Tracy pumping plant, near Tracy.

Date
of
collection

July 1-10, 1960...

Aug. 11-17........

Sept. 26-30.......

Mean

discharge
(cfs)

3,833
3,969
3,972
3,642
3,700

3,066
1,976
1,727
1,976
2,004

Silica

(S1Q,)

20
19
19
19
19

19
19
20
19
21

Iron

(Fe)

0.00
.00
.00
.00
.00

. 00
.00
.00
.00
. 00

Cal-

cium

(Ca)

17
18
17
18
19

20
20
24
34
24

Cl

Mag-
ne-

sium

(Mg)

7.9
10
11
13
13

15
15
15
20
15

Sodium

(Na)

25
33
41
60
67

79
81
81
95
70

Po-
tas-

sium

to

2.1
2.3
3.2
2.7
3.4

3.2
3.3
3.5
3.8
3.0

Bl-
car-

bon-

ate

(HCO,)

78
77
79
80
82

84
87
96
123
106

Car-
bon-
ate

(CO,)

Sulfate

(SO.)

22
25
24
29
31

34
40
42
47
38

Chloride

(Cl)

30
52
68
94
108

129
132
132
152
110

Fluo-
ride

(F)

0.2
.4
. 1
. 1
. 2

.3
. 1
. 1
. 2
.2

Ni-

trate

(NO,)

0.0
. 1
1.0
. 0
. 0

.0
.5
. 6
1.1
. 5

Bo-

ron

(B)

0.1
. 1
. 1
. 2
.4

.2
.2
. 2
. 3
.2

Dissolved solids

(residue at 180°C)

Parts

per
million

168
201
217
soa
324

357
367
387
440
336

Tons

per
acre-

foot

0.23
.27
.30
. 37
.41

1.11
.50
. 53
.60
.46

Tons

per

day

1,740
2,150
2,330
2,980
3,240

2,960
1,960
1,800
2,350
1,820

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

75
86
87
97
103

110
113
123
166
121

Non-
car-

bon-

ate

11
23
22
31
36

41
42
44
65
34

So-

dium
ad-

sorp-
tion
ratio

1.3
1..6
1.9
2.6
2.9

3.3
3.3
3.2
3.2
2.8

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

286
357
407
505
559

635
661
676
803
606

PH

7.2
7.2
7.3
7.0
6.4

6.3
7.3
7.8
7.5
7.4

SAN JOAQUIN RIVER BASIN Continued

11-3130.5. DELTA-MENDOTA CANAL NEAR MENDOTA, CALIF.

LOCATION. Approximately 1 mile upstream from control gates into Mendota Pool and 2 miles north of Mendota, Fresno County. RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 8........ ...

Mean

discharge
(cfs)

Silica

(SiQ.)

22

16

17

Iron

(Fe)

0.00

Cal-

cium

(Ca)

27

19

22

Mag-
ne-

sium

(Mg)

16

' 9.4

18

Sodium

(Na)

87
86
115
125
104
111
49

43
31
26
44
53
82

Po-
tas-

sium

(K)

3.9

2.6

4.1

Bi-
car-

bon-

ate

(HCOS)

142
144
150
148
144
154
95

84
72
80
88
86
86

bon-
ate

(CO,)

SuUate

(S04)

58

43

52

Chloride

(Cl)

128
130
168
168
160
68
69

68
38
36
54
80
137

Fluo-
ride

(F)

0.4

. 1

. 1

Ni-
trate

(NOJ

4.3

1.4

.8

Bo-

ron

(B)

0.1
.4
.4
. 7
.4
. 7
. 1

.3
.3
.2
.2
. 1
.2

Dissolved solids

(calculated)

Parts

per
million

297

196

375

Tons

per
acre-

foot

0.40

.27

.51

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

165
173
210
219
208
201
132

119
86
82
89
95
127

Non-
car-

bon-

ate

49
55
87
98
90
75
54

50
27
16
17
24
56

So-

dium
ad-

sorp-
tion
ratio

2.9
2.8
3.5
3.7
3.1
3.4
1.9

1.7
1.5
1.2
2.0
2.4
3.2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

731
781
932
1,010
926
932
483

431
314
298
350
455
659

PH

7.8
7.9
7.8
7.9
7.8
8.0
8.0

7.5
7.5
7.5
7.9
7.7
7.8

SAN JOAQUIN RIVER BASIN Continued

11-3132. GRANT LINE CANAL AT TRACY ROAD BRIDGE, CALIF.

LOCATION. At bridge on Tracy Road approximately 5 miles north of Tracy San Joaqui RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960. REMARKS. No discharge records available.

Chemical analyses, in Dai

Date
of
collection

Nov. 6.. ....

May 6.... ....

Sept. 8.. ....

Mean

discharge
(cfs)

Silica

(SiQa)

19

6.5

Iron

(Fe)

0.04

.04

Cal-

cium

(Ca)

46

43

Mag-
ne-

sium

(Mg)

20

19

Sodium

(Na)

127
96
96
98
48
125

119
99
63
62
55
115

Po-
tas-

sium

(K)

5.8

6.2

ts per million, wat

Bi-
car-

bon-

ate

(HCO,)

197
146
134
140
102
159

190
168
128
140
90
165

Car-
bon-

ate

(CO,)

Sulfate

(S04)

75

45

er year Octob<

Chloride

(Cl)

198
149
152
155
66
199

209
146
104
115
80
182

Fluo-
ride

(F)

0.2

. 1

*r 1959 to Sectember 1960

Ni-

trate

(NO,)

1.2

.0

Bo-

ron

(B)

0.2
.2
.2
.4
. 1
.4

.4
.3
.2
.2
.0
.3

Dissolved solids

(calculated)

Parts

per
million

496

498

Tons

per
acre-

foot

0.67

.68

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

239
192
186
188
108
244

262
196
156
158
100
188

Non-
car-

bon-

ate

77
72
72
73
24
114

106
58
51
43
26
53

So-
dium
ad-

sorp-
tion
ratio

3.6
3.0
2.9
3.1
2.0
3.5

3.2
3.1
2.2
2.1
2.4
3.7

Specific
con-

duct-

ance

Imicro-

mhos at

25°C)

1,040
836
799
847
469
1,080

1,110
851
621
635
467
882

PH

7.9
7.8
7.7
7.9
7.1
7.8

7.8
7.8
7.5
7.9
7.9
7.9

SAN JOAQUIN RIVER BASIN Continued

11-3132.5. OLD RIVER AT CLIFTON COURT FERRY, CALIF.

LOCATION. At Clifton Court Ferry Crossing, 0.3 mile downstream from tidal gaging station, 2.1 miles east of Herdlyn, and 3.6 miles north of Bethany, San Joaquin County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Tidal gaging station maintained and operated by U.S. Bureau of Reclamation.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 5...........

Mean

discharge
(cfs)

Silica

(SiQs)

15

11

Iron

(Fe)

_

~

0.05

. 05

Cal-

cium

(Ca)

17

24

Mag-
ne-

sium

(Mg)

7.7

16

Sodium

(Na)

50
94
103
81
119
104

24
19
17
27
49
95

Po-
tas-

sium

(K)

1.7

3.4

Bt-
car-

bon-

ate

(HCOa)

101
150
142
112
160
139

70
64
78
81
84
102

Car-
bon-

ate

(ccg

Sulfate

(SO,)

~

27

37

Chloride

(Cl)

75
139
160
122
175
149

32
26
23
45
72
144

Fluo-
ride

(P)

::

0.2

. 1

Ni-
trate

(NO,)

-

1.4

.5

Bo-

ron

(B)

0.2
. 3
.2
.2
.4
. 5

. 2
. 1
.2
. 1
.0
. 1

Dissolved solids

(calculated)

Parts

per
million

_

~~

147

381

Tons

per
acre-

foot

0.20

.52

Tons

per

day

Hardness
as CaCOa

Cal-

cium,
Mag-
ne-

sium

100
186
178
156
236
204

87
74
74
81
87
125

Non-
car-

bon-

ate

17
63
62
64
105
90

30
22
10
15
18
41

So-

dium
ad-

sorp-
tion
ratio

2.2
3.0
3.4
2.8
3.4
3.2

1.1
1.0
.9
1.3
2.3
3.7

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

429
811
859
703
1,020
917

282
248
227
307
417
653

PH

7.5
7.9
7.8
7.4
7.6
7.6

7.4
7.3
7.3
7.6
7.7
7.7

SAN JOAQUIN RIVER BASIN Continued

11-3133. ITALIAN SLOUGH AT MOUTH, NEAR BYRON, CALIF.

LOCATION. At confluence of Italian Slough and Old River, 3.6 miles east of Byron, Contra Costa County, and 12 miles northwest of Tracy. RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 5...........

Mean

discharge
(cfs)

Silica

(S1Q,)

16

15

Iron

(Fe)

0.04

Cal-

cium

(Ca)

17

21

Mag-
ne-

sium

(Mg)

"

7.7

14

Sodium

(Na)

57
71
113
132
104
144

29
20
18
26
57
100

Po-
tas-

sium

(K)

1.8

3.6

Bi-
car-

bon-

ate

(HCOS)

97
124
113
134
132
142

74
65
80
83
82
87

Car-
bon-

ate

(ccg

Sulfate

(SO.)

25

37

Chloride

(Cl)

81
97
181
191
170
220

43
27
22
45
83
149

Fluo-
rlde

(P)

"

0.2

Ni-
trate

(NO,)

"

1.3

.8

Bo-

ron

(B)

0.2
.2
.6
1.2
.7
1.7

.2
. 1
.2
.2
. 1
.0

Dissolved solids

(calculated)

Parts

per
million

-

148

384

Tons

per
acre-

foot

0.20

.52

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

103
137
228
196
190
185

97
74
78
80
91
109

Non-
car-

bon-
ate

23
35
135
86
82
69

36
21
12
12
24
38

So-

dium
ad-

sorp-
tion
ratio

2.4
2.6
3.2
4.1
3.3
4. 6

1.3
1.0
.9
1.3
2.6
4.2

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

463
578
982
997
931
1,040

334
243
224
296
457
653

pH

7.7
7.6
7.1
7.4
7.4
7.5

7.3
7.3
7.7
7.9
7.8
7.5

SAN JOAQUIN RIVER BASIN Continued

11-3133,5. INDIAN SLOUGH NEAR BRENTWOOD, CALIF.

LOCATION. At East Contra Costa Irrigation District Pumping station on Bixler Road, 3.6 miles north of Byron, and 4.1 miles southeast of Brentwood, Contra Costa County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September I960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 11, I960.....
Feb. 3............

May 3.............
June 7........ ....

Mean

discharge
(cfs)

Silica

(sicy

15

15

Iron

(Fe)

0.07

Cal-

cium

(Ca)

16

28

Mag-
ne-

sium

(Mg)

8.3

20

Sodium

<Na)

93
135
161
122
157
250

24
25
17
36
86
133

Po-
tas-

sium

(K)

1.8

4.0

Bi-
car-

bon-

ate

(HCO,)

141
238
370
293
260
325

76
80
80
90
86
125

Car-
bon-
ate

(CO,)

Sulfate

(S04)

22

53

Chloride

(Cl)

122
160
208
151
205
290

30
28
19
63
123
203

FluO-

ride

(F)

0.2

. 1

Ni-
trate

(NO,)

0.7

1.6

Bo-

ron

(B)

0.7
.6
2.7
1.8
2.2
2.7

.2
.3
.2
. 1
.0
.5

Dissolved solids

(calculated)

Parts

per
million

156

520

Tons

per
acre-

foot

0.21

.71

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

150
241
405
328
285
338

83
74
74
92
107
153

Non-
car-

bon-
ate

34
46
102
88
72
72

21
8
8
18
36
51

So-

dium
ad-

sorp-
tion
ratio

3.3
3.8
3.5
2.9
4.0
5.9

1.1
1.3
.9
1.6
3.6
4.7

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

705
1,010
1,420
1,120
1,310
1,810

274
263
220
362
603
889

pH

7.4
7.9
8.0
7.9
7.7
8.0

7.4
7.3
7.7
7.5
7.5
7.6

SAN JOAQUIN RIVER BASIN Continued

11-3134. OLD RIVER AT ORWOOD BRIDGE, NEAR MIDDLE RIVER, CALIF.

LOCATION. At Atchison, Topeka and Santa Fe Railroad bridge, 1.6 miles west of Middle River, San Joaquin County, and 7.9 miles east of Brentwood. RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 5...........

Mean

discharge
(cfs)

Silica

(S1Q,)

16

15

Iron

(Fe)

0.08

Cal-

cium

(Ca)

13

21

Mag-
ne-

sium

(Mg)

--

5.7

14

Sodium

(Na)

45
40
84
99
105
97

15
11
16
40
59
109

Po-
tas-
sium

(K)

1.5

3.8

Bi-
car-

bon-

ate

(HCO,)

102
108
134
109
114
118

66
60
78
90
85
91

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

13

38

Chloride

(Cl)

67
55
126
150
170
158

22
14
17
64
96
164

Fluo-
rlde

(F)

0.2

. 1

Ni-

trate

(NO,)

0.6

.8

Bo-

ron

(B)

0.2
. 1
.2
.4
.5
.6

. 1
. 1
.2
.0
. 1
.0

Dissolved solids

(calculated)

Parts

per
million

-

105

411

Tons

per
acre-

foot

"

0.14

.56

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

95
106
171
252
270
214

64
56
72
81
96
110

Non-
car-

bon-

ate

11
17
61
163
177
117

10
7
8
7
26
35

So-

dium
ad-

sorp-
tion
ratio

2.0
1.7
2.8
2.7
2.8
2.9

.8
.6
.8
1.9
2.6
4.5

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

391
396
737
951
1,080
871

206
171
204
376
507
728

PH

7.5
7.5
7.8
7.2
7.4
7.5

7.4
7.2
7.6
7.6
8.0
7.2

SAN JOAQUIN RIVER BASIN Continued

11-3134.2. ROCK SLOUGH NEAR KNIGHTSEN, CALIF.

LOCATION. At Contra Costa Canal intake at the end of Tule Lane, 2 miles northeast of Knightsen, Contra Costa County, and 4.2 miles southeast of Oakley. RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

June 6 ....

Aug. 1............
Sept. 5...........

Mean

discharge
(cfs)

Silica

(SiQ,)

16

15

Iron

(Fe)

0.05

. 09

Cal-

cium

(Ca)

14

21

Mag-
ne-

sium

(Mg)

6.6

18

Sodium

(Na)

50
33
40
88
97
104

20
16
16
44
81
129

Po-
tas-

sium

(K)

1.5

4.4

Bi-
car-

bon-

ate

(HCO,)

103
106
119
114
124
127

74
68
82
86
88
116

Car-
bon-
ate

(ccg

Sulfate

(S0«)

17

39

Chloride

(CD

74
47
74
128
145
162

27
18
17
73
124
193

Fluo-

ride

(P)

0.2

. 1

Ni-
trate

(NOJ

0.5

.8

Bo-

ron

(B)

0.2
. 1
. 2
;3
.3
.7

. 1
. 1
.2
.5
.0
. 1

Dissolved solids

(calculated)

Parts

per
million

123

477

Tons

per
acre-

foot

0.17

. 65

Tons

per

day

Hardness
as CaCO,

Cal-

cium,
Mag-
ne-

sium

99
98
127
212
248
223

71
62
70
88
« 114
127

Non-
car-

bon-

ate

15
11
29
119
146
119

10
6
3
17
42
32

So-

dium
ad-

sorp-
tion
ratio

2.2
1.5
1.5
2.6
2.7
3.0

1.0
.9
.8
2.0
3.3
5.0

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

415
355
505
822
988
931

244
203
213
402
615
822

pH

7.4
7.5
7.6
7.4
7.7
7.4

7.3
7.2
7.6
7.8
7.7
7.5

SAN JOAQUIN RIVER BASIN Continued

11-3134.5. OLD RIVER AT MANDEVILLE ISLAND, CALIF.

LOCATION. On northwest side of Mandeville Island, San Joaquin County, approximately 0.5 mile upstream from confluence with San Joaquin River, and approximately 5.5 miles southwest of Terminous.
RECORDS AVAILABLE. Chemical analyses: December 1954 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts pe

Date
of
collection

Mar. 15...........

Sept . 5 ....

Mean

discharge
(cfs)

Silica

(SlQa)

16

19

Iron

(Fe)

0.06

.03

Cal-

cium

(Ca)

11

19

Mag-
ne-

sium

(Mg)

6.0

18

Sodium

(Na)

43
26
32
41
54
29

8.2
9.1
13
47
82
102

Po-
tas-

sium

(K)

1.3

4.4

Bi-
car-

bon-

ate

(HCO,)

101
101
105
104
92
78

57
61
78
81
73
86

r million, water year October 1959 to September 1960

Car-
bon-
ate

(CO,)

Sullate

(S0«)

9.0

35

Chloride

(Cl)

60
34
39
60
90
42

11
11
12
83
136
181

Fluo-

rlde

(P)

0.1

. 1

Ni-

trate

(NOJ

0.3

.8

Bo-

ron

(B)

0.2
. 1
. 1
.2
.0
. 1

.0
. 1
.2
.2
.0
.2

Dissolved solids

(calculated)

Parts

per
million

94

422

Tons

per
acre-

foot

0.13

.57

Tons

per

day

Hardness
as CaCO8

Cal-

cium,
Mag-
ne-

sium

94
88
95
126
166
102

49
52
78
85
104
123

Non-
car-

bon-

ate

11
5
9
41
91
38

2
2
14
19
44
52

So-

dium
ad-

sorp-
tion
ratio

1.9
1.2
1.4
1.6
1.8
1.2

.5
.6
.6
2.2
3.5
4.0

Specific
con-

duct-

ance

(micro-
mhos at

25"C)

379
289
331
452
616
343

140
145
184
426
640
810

pH

7.4
7.6
7.6
7.7
7.4
7.5

7.4
7.5
7.7
7.8
7.8
8.1

SAN JOAQUIN RIVER BASIN Continued

11-3210. MOKELUMNE RIVER AT LANCHA PLANA, CALIF.

LOCATION. Approximately 500 feet downstream from gaging station 1 mile east of Lancha Plana, Amador County, 3 miles downstream from Pardee Dam, and 5 miles upstream from Camanche Creek.
DRAINAGE AREA. 584 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses,. in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 8, 1959.. ....

Feb. 1. ....

Sept. 5. ....

Discharge
(cfs)

108
60
61
allS
67
85

267
293
743
162
164
153

Silica

(810,)

12

10

Iron

(Fe)

0.08

.00

Cal-
cium

(Ca)

4.8

4.4

Mag-
ne-

sium

(Mg)

2.2

. 7

Sodium

(Na)

2.3
2.5
2.3
2.2
3.2
2.1

2.0
2.1
2.2
1.9
2.5
2.6

Po-
tas-

sium

(K)

0.7

. 5

Bi-
car-

bon-

ate

(HCOS)

18
16
15
16
13
20

21
22
20
21
21
20

Car-
bon-

ate

(CO,)

Sulfate

(S04)

3.0

1.0

Chloride

(Cl)

3.0
3.5
2.8
2.0
2.8
4.5

3.5
3.5
2.6
3.8
2.8
1.8

Fluo-

ride

(F)

0.1

.0

Ni-

trate

(NO,)

0.2

.0

Bo-

ron

(B)

0.0
.0
.0
.0
. 1
.0

.1
.1
.0
.1
.0
.0

Dissolved solids

(calculated)

Parts

per
million

40

31

Tons

per
acre-

foot

- -

0.05

.04

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

15
15
14
18
18
22

24
21
17
18
16
14

Non-
car-

bon-

ate

0
2
2
5
7
6

7
3
1
1
0
0

So-

dium
ad-

sorp-
tion
ratio

0.3
.3
.3
.2
.3
.2

.2
.2
.2
.2
.3
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

45
40
40
40
53
54

54
49
48
47
46
39

PH

6.8
6.8
6.7
7.3
6.6
6.7

6.8
7.0
6.9
7.4
7.1
7.0

a Daily mean discharge.

SAN JOAQUIN RIVER BASIN Continued

11-3255. MOKELUMNE RIVER AT WOODBRIDGE, CALIF.

LOCATION. At dam of Woodbridge Irrigation District, 0.4 mile upstream from gaging station at Woodbridge, San Joaquin County. DRAINAGE AREA. 644 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: March 1951 to September 1960.
Water temperatures: March 1951 to September 1958.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

May 3 ....

July 8.......... ..

Sept. 9...........

Discharge
(cfs)

35
25
25
54
112
123

a20
24
185
26
25
30

Silica

(SiQ,)

14

13

Iron

(Fe)

Cal-

cium

(Ca)

4.8

5.2

Mag-
ne-

sium

(Mg)

3.4

1.5

Sodium

(Na)

4.0
3.9
3.4
3.2
2.9
2.7

2.6
2.6
2.2
2.2
2.8
2.6

Po-
tas-

sium

(K)

0.7

. 7

Bi-
car-

bon-

ate

(HCO,)

29
28
24
20
20
22

27
27
21
24
22
24

Car-
bon-
ate

(CO,)

SuUtate

(S0«)

5.0

.0

Chloride

(CD

2.6
4.2
3.0
4.0
4.0
4.0

4.0

2! 8
3.2
2.5
2.5

Fluo-
ride

<*)

0.1

.1

Ni-
trate

(NO,)

0.1

.0

Bo-

ron

(B)

0.1
.0
.0
.0
.0
.0

.2
.0
.0
.0
.0
. 1

Dissolved solids

(calculated)

Parts

per
million

48

38

Tons

per
acre-

foot

0.07

.05

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

24
22
20
20
22
25

28
26
18
21
18
19

Non-
car-

bon-

ate

0
0
0
4
6
7

6
4
1
1
0
0

So-

dium
ad-

sorp-
tion
ratio

0.3
.4
.3
.3
.3
.2

.2
.2
.2
.2
.3
.3

Specific
con-

duct-

ance

(micro-
mhos at

25eC)

67
59
56
55
62
60

65
64
50
53
51
52

PH

7.1
6.7
7.0
7.0
6.8
6.5

7.1
7.0
6.7
7.4
7.0
7.1

a Daily mean discharge.

SAN JOAQUIN RIVER BASIN Continued

11-3350. COSUMNES RIVER AT MICHIGAN BAR, CALIF.

LOCATION. At gaging station at Michigan Bar, Sacramento County, 5.5 miles southwest of Latrobe and 12 miles downstream from confluence of North and Middle Forks.
DRAINAGE AREA. 537 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1939 to September 1960

Date
of
collection

Mar. 1.. ....

Aug. 8............

Discharge
(cfs)

11
15
15
25
88
174

722
390
123
46
14
6.2

Silica

(SiQs)

19

15

Iron

(Fe)

0.09

.00

Cal-

cium

(Ca)

6.4

7.6

Mag-
ne-

sium

(Mg)

2.2

3.4

Sodium

(Na)

4.9
5.1
4.8
4.2
4.4
2.9

2.5
2.4
2.7
2.8
3.1
3.3

Po-
tas-

sium

(K)

0.9

1.0

Bi-
car-

bon-

ate

(Hccg

42
55
52
45
48
52

30
33
34
42
44
38

Car-
bon-
ate

(ccg

Sulfate

(S04)

2.0

12

Chloride

(Cl)

4.4
5.2
2.0
3.5
5.0
2.2

1.5
2.0
2.5
3.0
. 5
1.5

Fluo-
ride

(P)

0.0

.0

Ni-

trate

(NO,)

0.0

.0

Bo-

ron

(B)

0.0
. 0
. 0

.1
.0

.1

.0

.1
. 0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

51

63

Tons

per
acre-

foot

0.07

.09

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

36
43
47
37
50
40

24
25
26
32
31
33

Non-
car-

bon-

ate

2
0
4
0
11
0

0
0
0
0
0
2

So-

dium
ad-

sorp-
tion
ratio

0.4
. 3
. 3
.3
.3
.2

. 2
.2
.2
.2
.2
. 2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

96
105
107
98
118
90

59
61
64
71
75
77

PH

7.4
7.4
7.5
7.5
7.1
8.2

7.1
7.4
7.0
7.7
7.7
7.4

SAN JOAQUIN RIVER BASIN Continued

11-3360. COSUMNES RIVER AT MCCQNNELL, CALIF.

LOCATION At gaging station on U.S. Highway 99 bridge, 0.2 mile south of McConnell, Sacramento County, 1 mile downstream from Deer Creek, and 7 miles north of Gait.
DRAINAGE AREA. 730 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No flow during summer months.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 14, I960.....

Mar. 4............

Discharge
(cfs)

91
205
160
668
393
65

Silica

(S1Q,)

18

19

Iron

(Fe)

Cal-
cium

(Ca)

9.6

7.2

Mag-
ne-

sium

(Mg)

2.9

6.7

Sodium

(Na)

4.4
4.0
3.1
2.1
2.4
2.6

Po-
tas-
sium

(K)

1.0

.8

Bl-

car-

bon-
ate

(HCO,)

39
44
41
27
32
36

Car-
bon-
ate

(cog

Sulfate

(S04)

7.0

3.0

Chloride

(Cl)

4.5
4.5
3.2
.5
2.0
2.0

Fluo-
rlde

(F)

0.3

.0

Ni-
trate

(NO,)

0.0

.0

Bo-

ron

(B)

0.1
.2
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

67

52

Tons

per
acre-

foot

0.09

.07

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

36
44
39
22
25
29

Non-
car-

bon-
ate

4
8
5
0
0
0

So-
dium
ad-

sorp-
tion
ratio

0.3
.3
.2
.2
.2
.2

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

90
108
93
50
64
69

pH

7.2
7.2
8.2
7.1
7.3
7.5

SAN JOAQUIN RIVER BASIN Continued

11-3366. DELTA CROSS-CHANNEL NEAR WALNUT GROVE, CALIF.

LOCATION. Approximately 0.2 mile downstream from control gates, 0.5 mile north of Walnut Grove, Sacramento County, and 7.5 miles south of Courtland. RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. No discharge records available.

Chem

Date
of
collection

Jan. 11, I960.....

July 11...........

Sept. 5...........

Mean

discharge
(cfs)

Silica

(SiQ,)

21

22

Iron

(Fe)

0.04

Cal-

cium

(Ca)

11

17

ical analvses. in D:

Mag-
ne-

sium

(Mg)

6.2

8.9

Sodium

(Na)

13
12
13
12
12
9.9

4.3
10
8.2
12
12
19

Po-
tas-

sium

(K)

1.4

1.4

rts Der million, water year October 1959 to Sentember 1960

Bi-
car-

bon-

ate

(HCO,)

91
91
92
90
68
79

52
68
64
82
82
113

Car-
bon-
ate

(ccg

Sulfate

(SO,)

13

9.0

Chloride

(Cl)

8.5
9.5
16
8.5
10
9.5

3.8
7.2
8.5
10
8.8
15

FluO-

ride

(P)

0.0

.0

Ni-

trate

(Ncg

0.2

.5

Bo-

ron

(B)

0.0
.2
. 1
.0
.0
. 1

. 1
. 1
. 1
. 1
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

103

149

Tons

per
acre-

foot

0.14

.20

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

68
70
72
71
60
66

43
53
54
58
59
79

Non-
car-

bon-

ate

0
0
0
0
4
1

0
0
2
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.7
.6
. 7
.6
. 7
.5

.3
.6
. 5
. 7
. 7
.9

Specific
con-

duct-

ance

micro-

mhos at

25"C)

179
184
190
185
177
172

105
153
141
166
169
233

PH

7.3
7.5
7.5
7.3
7.3
7.4

7.3
7.6
7.5
7.9
7.7
7.7

SAN JOAQUIN RIVER BASIN Continued

11-3368. LITTLE POTATO SLOUGH NEAR TERMINOUS, CALIF.

LOCATION. At tidal gaging station at bridge on State Highway 12, approximately 0.2 mile from conflu mile north of Terminous, San Joaquin County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Tidal gaging station maintained and operated by State of California Department of Water Resources. Chemical analyses, in parts per million, water year October 1959 to September 1960

with South Fork Mokelumne River, and approximately 0.5

Date
of
collection

Sept. 5..... ......

Mean

discharge
(cfs)

Silica

(sicy

"

19

21

Iron

(Fe)

"

0.07

.07

Cal-

cium

(Ca)

- -

15

20

Mag-
ne-

sium

(Mg)

"

6.4

11

Sodium

(Na)

16
12
14
24
20

4.7
13
13
15
18
30

Po-
tas-

sium

(K)

::

1.3

1.9

Bi-
car-

bon-

ate

(HCOS)

93
97
90
92
82
88

48
68
78
85
88
112

Car-
bon-
ate

(COJ

Sulfate

(S04)

10

16

Chloride

(Cl)

15
24
9.0
48
50
39

5.8
21
17
21
26
36

Fluo-
ride

(F)

0.1

. 1

Ni-
trate

(NOj)

0.2

. 7

Bo-

ron

(B)

0.0

.1
. 3
. 1
.0
. 1

. 1
. 1
. 1
. 1
.0
. 0

Dissolved solids

(calculated)

Parts

per
million

120

192

Tons

per
acre-

foot

E

0.16

. 26

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

76
83
74
143
114
132

43
64
70
71
76
95

Non-
car-

bon-

ate

0
3
0
68
47
60

4
8
6
1
4
3

So-

dium
ad-

sorp-
tion
ratio

0.8
.6
. 7
.9
. 8

. 3
. 7
. 7
.8
.9
1.3

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

200
236
196
330
338
281

103
193
193
215
240
293

pH

7.2
7.6
7.5
7.2
7.3
7.4

7.2
7.4
7.4
7.6
7.6
7.6

SAN JOAQUIN RIVER BASIN Continued

11-3372. SAN JOAQUIN RIVER AT ANTIOCH, CALIF.

LOCATION. At tidal gaging station at Antioch, Contra Costa County, and 4.5 miles from mouth.
RECORDS AVAILABLE. Chemical analyses: October 1952 to September 1960.
REMARKS. Tidal gaging station maintained and operated by State of California Department of Water Resources.

Chemical analyses, in parts per million, water year C

Date
of
collection

Oct. 5, 1959... ...

Sept. 5...........

Mean

discharge
(eta)

Silica

(SiCU

15

11

Iron

(Fe)

0.04

.07

Cal-

cium

(Ca)

13

34

Mag-
ne-

sium

(Mg)

8.6

67

Sodium

(Na)

233
229
535
525
61
35

13
49
52
417
730
483

Po-
tas-

sium

(K)

3.1

15

Bi-
car-

bon-

ate

(HCOJ

105
99
94
100
96
76

60
62
81
86
88
94

Car-
bon-
ate

(CO,)

Sulfate

(S04)

22

128

Chloride

(CD

405
390
1,050
795
96
54

3.5
73
83
725
1,190
897

ctober 1959 to September 1960

Fluo-

ride

(F)

0.0

.4

Ni-

trate

(NOj)

0.2

.6

Bo-

ron

(B)

0.2
. 1
.3
.2
.2
. 1

. 1
.2
. 1
.3
.3
.3

Dissolved solids

(calculated)

Parts

per
million

215

1,680

Tons

per
acre-

foot

0.29

2.28

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

204
198
395
338
128
106

58
68
86
328
464
360

Non-
car-

bon-

ate

118
117
318
256
49
44

9
17
20
257
392
283

So-

dium
ad-

sorp-
tion
ratio

7.1
7.1
12
12
1.8
1.5

. 7
2.6
2.4
10
15
11

Specific
con-

duct-

ance

[micro-
mhos at

25"C)

1,590
1,570
3,410
2,910
573
383

180
375
455
2,910
4,240
3,210

PH

7.6
7.5
7.0
7.5
7.6
7.4

7.3
7.3
7.2
7.6
7.8
7.7

SACRAMENTO RIVER BASIN

11-3420. SACRAMENTO RIVER AT DELTA, CALIF.

LOCATION. At gaging station 0.2 mile downstream from Dog Creek, 0.6 mile southeast of Delta, Shasta County, and 2.8 miles south of La Moine. DRAINAGE AREA. 427 square miles.
RECORDS AVAILABLE. Chemical analyses: December 1953 to September 1960.
Water temperatures: June to September 1951, October 1953 to September 1957.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 12, 1959... ..

Mar. 7............

Sept. 6.... ....

Discharge
(cfs)

219
213
208
210
4,540
8,840

1,580
1,290
1,120
329
199
181

Silica

(S1Q.)

20

26

Iron

(Fe)

0.05

. 02

Cal-

cium

(Ca)

5.4

9.8

Mag-
ne-

sium

(Mg)

6.2

6.7

Sodium

(Na)

11
12
12
11
2.2
3.8

2.0
3.2
3.1
6.4
11
13

Po-
tas-

sium

(K)

0.7

.9

Bi-
car-

bon-

ate

(HCO,)

76
77
76
76
36
30

44
49
51
72
77
84

Car-
bon-

ate

(CO,)

Sulfate

(S0«)

4.4

3.0

Chloride

(Cl)

9.0
11
9.0
8.8
3.0
2.5

2.5
2.4
2.8
5.5
7.2
9.0

Fluo-
rlde

(F)

0.0

. 0

Ni-

trate

(NOJ

0.0

. 0

Bo-

ron

(B)

0.1
. 3
.2
.2
.0
.0

. 1
. 1
. 1
.0
.2
. 2

Dissolved solids

(calculated)

Parts

per
million

66

110

Tons

per
acre-

foot

0.09

. 15

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

58
53
61
54
31
26

36
39
42
62
53
52

Non-
car-

bon-

ate

0
0
0
0

i
i

0
0
0
3
0
0

So-

dium
ad-

sorp-
tion
ratio

0.6
. 7
. 7
.7
.2
. 3

.2
.2
.2
.4
.7
. 8

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

151
149
141
152
66
63

80
89
86
129
151
157

pH

7.9
8.0
7.9
7.9
7.3
7.0

7.7
7.5
7.8
7.9
7.8
7.8

SACRAMENTO RIVER BASIN Continued

11-3455. SOUTH FORK PIT RIVER NEAR LIKELY, CALIF.

LOCATION. At gaging station 1.3 miles downstream from West Valley Creek and 3.5 miles east of Likely, Modoc County. DRAINAGE AREA. 248 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 15, 1959.....

Mn v 11

Sept. 8.... ....

Discharge
(cfs)

26
ai6
alO
a20
24
11

47
104
144
50
159
72

Silica

(SiQg)

35
35
36

30

36

Iron

(Fe)

0.05

.07

.06

Cal-

cium

(Ca)

13
11
11

8.5

13

Mag-
ne-

sium

(Mg)

4.7
4.0
3.5

2.2

5.2

Sodium

(Na)

8.6
6.9
7.0
4.8
6.0
6.7

3.9
3.6
4.5
6.4
9.5
12

Po-
tas-

sium

(K)

3.1
2.1
4.4

1.9

4.5

Bi-
car-

bon-

ate

(HCO,)

75
71
63
52
60
64

51
46
58
74
86
88

Car-
bon-
ate

(ccg

SuLfate

(S04)

2.0
1.0
1.0

1.0

7.0

Chloride

(Cl)

7.5
.5
5.5
1.5
.8
2.0

1.9
1.0
3.0
.5
1.0
2.2

Fluo-
ride

(F)

0.2
.2
.0

.2

.0

Ni-

trate

(NO,)

0.0
.2
.4

.6

1.6

Bo-

ron

(B)

0.0
.0
.0
. 1
.1
.1

.0

.1
.0
.0
.1
.0

Dissolved solids

(calculated)

Parts

per
million

111
96
100

72

125

Tons

per
acre-

foot

0.15
. 13
. 14

. 10

. 17

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

52
44
42
37
52
48

37
30
38
47
56
54

Non-
car-

bon-

ate

0
0
0
0
3
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.5
.5
.5
.3
.4
.4

.3
.3
.3
.4
.5
. 7

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

127
111
105
96
127
127

88
83
100
122
149
150

PH

7.8
7.7
7.6
7.6
7.3
7.6

8.0
7.5
7.7
7.9
7.8
7 9

a Daily mean discharge.

SACRAMENTO RIVER BASIN Continued

11-3485. PIT RIVER NEAR CANBY, CALIF.

LOCATION.--At gaging station at lower end of Warm Spring Valley, 4 miles southwest of Canby, Modoc County. DRAINAGE AREA. 1,430 square miles, approximately, excluding Goose Lake basin.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Nov. 12...........

Jan. 6, 1960......
*>h. in.. ....

Sept. 8.. ....

Discharge
(cfs)

32
19
36
b30
i 4^n
522

164
232
61
13
31
20

Silica

(SiQ,)

32

28

Iron

(Fe)

0.00

Cal-

cium

(Ca)

»

17

20

Mag-
ne-

sium

(Mg)

»

6.8

11

Sodium

(Na)

31
47
39
32
14
19

15
19
26
25
22
22

Po-
tas-

sium

(K)

~

5.2

4.7

Bi-
car-

bon-

ate

(HCO,)

158
a!80
162
148
66
90

105
125
162
158
143
152

Car-
bon-
ate

(CO,)

Sulfate

(S04)

"

10

11

Chloride

(Cl)

12
20
14
9.5
4.0
6.5

5.4
4.6
9.0
7.0
5.0
6.0

Fluo-
ride

(F)

~

0.4

.3

Ni-

trate

(NO,)

0.5

.0

Bo-

ron

(B)

0.2
. 3
.2
. 1
.2
. 1

. 1
.2
. 1
. 1
. 2
.3

Dissolved solids

(calculated)

Parts

per
million

"

158

178

Tons

per
acre-

foot

0.21

. 24

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

95
98
88
84
44
64

62
71
84
91
87
96

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.4
2.1
1.8
1.5
.9
1.0

. 8
1.0
1.2
1.1
1.0
1.0

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

314
376
329
285
124
199

195
220
270
284
270
256

PH

7.6
8.4
7.8
8.1
7.7
7.3

7.9
7.8
8.1
8.0
8.0
7.9

a Includes equivalent of 6 ppm of carbonate (C03). b Daily mean discharge.

SACRAMENTO RIVER BASIN Continued

11-3520. PIT RIVER NEAR BIEBER, CALIF.

LOCATION. Approximately 200 feet upstream from gaging station, 2.2 miles upstream from Spring Gulch, and 7.4 miles south of Bieber, Lassen County. DRAINAGE AREA. 2,970 square miles, approximately, excluding Goose Lake basin.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 14, 1959.....

Sept. 8... ....

Discharge
(cfs)

a25
24
67
a65
3,600

306
364
45
20
. 8
.8

Silica

(SiQ,)

33
26
34

30

16

Iron

(Fe)

0.03

Cal-

cium

(Ca)

24
23
23

20

15

Mag-
ne-

sium

(Mg)

12
11
8.9

8.9

3.3

Sodium

(Na)

38
30
33
30
8.3

15
26
32
11
44
59

Po-
tas-

sium

(K)

6.5
5.2
7.3

6.2

6.5

Bi-
car-

bon-

ate

(HCO,)

173
170
172
159
42

105
161
171
218
78
84

Car-
bon-

ate

(COJ

0
0
0
0
0

4
0
10
0
39
47

Sulfate

(S04)

40
19
16

11

12

Chloride

(CD

7.0
12
14
8.8
2.2

5.8
5.6
10
6.0
7.5
14

Fluo-

ride

<F)

0.2
.5
. 2

.4

.4

Ni-

trate

(NOJ

0.6
. 3
. 3

. 5

.7

Bo-

ron

(B)

0.2
.2
. 1
. 2
. 1

.0
.2
. 1
. 2
.2
. 1

Dissolved solids

(calculated)

Parts

per
million

246
211
222

188

215

Tons

per
acre-

foot

0.33
.29
. 30

.26

.29

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

108
104
94
89
35

70
86
101
177
59
51

Non-
car-

bon-

ate

0
0
0
0

i

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.6
1.3
1.5
1.4
. 6

.8
1.2
1.4
.4
2.5
3.6

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

334
312
335
297
104

204
275
314
362
277
323

pH

7.9
8.2
7.6
8.2
6.7

8.5
7.8
8.5
7.9
9.2
9.6

a Daily mean discharge.

SACRAMENTO RIVER BASIN Continued

11-3650. PIT RIVER NEAR MONTGOMERY CREEK, CALIF.

LOCATION. At gaging station 1 mile upstream from Cow Canyon Creek and 3.5 miles west of Montgomery Creek, Shasta County. DRAINAGE AREA. 5,170 square miles, approximately; excluding Goose Lake basin.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
Water temperatures: June to September 1951, October 1953 to September 1957, October 1958 to August 1959.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Nov. 11,1959.... ..
Dec. 9...... ......

Feb. 10.. ....

Sept. 8...........

Discharge
(cfs)

4,080
4,030
3,130
11,710
9,980

2,080
1,780
4,360
4,090
4,080
1,250

Silica

(SiQ.)

30

29

Iron

(Fe)

0.01

.01

Cal-

cium

(Ca)

12

11

Mag-
ne-

sium

(Mg)

5.5

6.2

Sodium

(Na)

12
12
12
6.8
8.2

7.7
8.5
9.9
9.6
11
13

Po-
tas-

sium

(K)

1.9

2.0

Bi-
car-

bon-

ate

(HCOJ

90
90
93
66
76

77
83
89
93
90
91

Car-
bon-
ate

(cog

Sulfate

(S04)

3.0

3.0

Chloride

(CD

4.5
5.5
4.8
3.2
4.0

3.6
3.3
8.5
2.2
3.0
4.5

Fluo-
ride

(P)

0.1

. .1

Ni-

trate

(NO,)

0.0

. 0

Bo-

ron

(B)

.0
.2
. 1
. 1
. 1

.0
. 1
. 1
.0
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

106

114

Tons

per
acre-

foot

0.14

. 16

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

54
62
60
50
57

52
53
56
58
55
53

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.7
,7
. 7
.4
. 5

.5
.5
.6
. 6
. 6
. 8

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

157
169
163
127
142

137
143
149
154
152
151

PH

7.8
7.8
8.0
7.5
7.4

7.8
7.9
7.9
7.8
8.2
7.8

SACRAMENTO RIVER BASIN Continued

11-3680. MCCLOUD RIVER ABOVE SHASTA LAKE, CALIF.

LOCATION.--At gaging station upstream from Shasta Lake, Shasta County, 0.2 mile downstream from Big Bollibokka Creek, and 11.3 mile DRAINAGE AREA. 606 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
Water temperatures: June to September 1951, October 1953 to September 1959.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

east of La Moin

Date
of
collection

Oct. 12, 1959.....

Feb. 10... ....

Sept. 7 ....

Discharge
(cfs)

1,070
1,030
991
970
4,500
6,300

1,960
1,600
1,610
1,120
998
958

Silica

(SiQj)

31

36

Iron

(Fe)

0.02

. 00

Cal-

cium

(Ca)

10

9.2

Mag-
ne-

sium

(Mg)

4.1

2.7

Sodium

(Na)

8.6
5.3
5.5
4.7
2.0
2.0

3.2
3.6
4.0
4.1
5.2
6.0

Po-
tas-
sium

(K)

1.1

1.4

Bi-
car-

bon-

ate

(HCOj)

70
54
54
50
36
34

a5S
58
57
62
58
54

Car-
bon-
ate

(CO,)

Sulfate

(S04)

3.0

1.0

Chloride

(CD

4.8
1.0
1.2
2.0
1.2
2.0

.7
1.5
2.2
. 0
.0
1.8

Fluo-
ride

(P)

0.1

.0

Ni-

trate

(NO,)

0.2

.2

Bo-

ron

(B)

0.0
.0
.0
.0

. 1
. 0

.0

.1
.0
. 0
. 0
.0

Dissolved solids

(calculated)

Parts

per
million

84

85

Tons

per
acre-

foot

0.11

. 12

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

51
36
38
38
32
30

42
42
40
42
45
34

Non-
car-

bon -

ate

0
0
0
0
2
2

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.5
.4
.4
. 3
. 2
. 2

.2
.2
. 3
. 3
.3
.4

Specific
con-

duct-

ance

|micro-
mhos at

25°C)

129
93
95
96
72
67

97
93
98
97
97
94

pH

.6
.7
.6
.9
. 2
.4

.4
. 7
.4
. 7
. 6
.6

a Includes equivalent of 1 ppm of carbonate (CO3).

LOCATION (revised). At gaging station, 0.4 mile upstream
County, and 10 miles downstream from Shasta Dam.
DRAINAGE AREA. 6,710 square miles, approximately, excluding Goose Lake basin.
RECORDS AVAILABLE. Chemical analyses: December 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

SACRAMENTO RIVER BASIN Continued

11-3705. SACRAMENTO RIVER AT KESWICK, CALIF,

from Middle Creek, 0.8 mile downstream from Keswick Dam, 1.6 miles downstream from Keswick, Shasta

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 13, 1959.....

Jan. 4, 1960......

Sept. 5. ....

Mean

discharge
(cfs)

5,250
4,310
4,070
3,720
7,240
4,170

3,330
7,650
7,990
11 , 600
10,800
7,730

Silica

(sicg

23

21

Iron

(Fe)

0.06

Cal-

cium

(Ca)

10

9.8

Mag-
ne-

sium

(Mg)

5.1

5.2

Sodium

(Na)

3.9
8.5
8.4
8.7
7.3
6.4

5.8
6.1
6.5
6.2
6.3
6.8

Po-
tas-

sium

(K)

1.6

.8

Bi-
car-

bon-

ate

(HCOS)

62
73
76
72
63
50

62
64
65
65
63
62

Car-
bon-

ate

(COJ

Sulfate

(S04)

5.0

6.0

Chloride

(CD

3.0
4.0
3.0
4.2
7.0
4.2

5.5
3.5
5.5
5.0
2.8
2.8

Fluo-
ride

(F)

0.0

.0

Ni-

trate

(NO,)

0.4

.3

Bo-

ron

(B)

0.0
.0
. 1
.0
.0
.1

.0
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

87

84

Tons

per
acre-

foot

0.12

. 11

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

48
53
53
56
54
50

52
46
45
48
44
46

Non-
car-

bon-

ate

0
0
0
0
2
9

1
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.2
.5
. 5
. 5
.4
.4

.3
.4
.4
.4
.4
.4

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

114
130
134
137
133
126

131
120
117
119
113
113

PH

.3
. 1
.4
.8
.5
.0

.3
7.6
7.4
.8
.5
7.5

SACRAMENTO RIVER BASIN Continued

11-3720. CLEAR CREEK NEAR IGO, CALIF.

LOCATION. At gaging station at highway bridge on Redding-Igo road, 1.0 mile northeast of Igo, Shasta County, 8 miles southwest of Redding, and 11.1 miles upstream from mouth.
DRAINAGE AREA. 228 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Nov. 11...........

Jan. 14, I960.....

May 5...... ....

Sept. 5...........

Discharge
(cfs)

37
37
41
74
247
1,970

297
309
140
74
39
35

Silica

(sicg

18

14

Iron

(Fe)

0.08

.03

Cal-

cium

(Ca)

18

8.7

18

Mag-
ne-

sium

(Mg)

4.1

2.3

4.5

Sodium

(Na)

15
15
15
16
4.3
2.6

3.9
4.5
5.4
7.2
13
16

Po-
tas-

sium

(K)

0.9

1.3

Bi-
car-

bon-

ate

(HCO,)

65
65
68
53
26
24

34
40
44
54
75
a78

Car-
bon-

ate

(COJ

Sulfate

(S04)

6.6

11

Chloride

(CD

21
20
21
29
5.5
3.0

4.5
2.1
6.5
9.5
14
19

Fluo-
ride

(F)

0.0

.0

Ni-

trate

(NOJ

0.0

.0

Bo-

ron

(B)

0.0
.0
.0
. 1
.0
.0

.0
.0
.0
.0
.0

.1

Dissolved solids

(calculated)

Parts

per
million

63

122

Tons

per
acre-

foot

0.09

. 17

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

63
62
64
64
28
24

34
31
37
50
58
64

Non-
car-

bon-

ate

10
9
8
21
7
4

6
0
1
6
0
0

So-

dium
ad-

sorp-
tion
ratio

0.8
.8
.8
.9
.4
.2

.3
.4
.4
.4
.7
.9

Specific
con-

duct-

ance

micro-

mhos at

25°C)

192
191
195
204
80
58

87
89
101
125
173
197

PH

7.6
7.6
7.8
7.5
7.8
7.1

7.5
7.4
7.3
7.8
8.2
8.4

a Includes equivalent of 4 ppm of carbonate (CO3).

SACRAMENTO RIVER BASIN Continued

11-3740. COW CREEK NEAR MILLVILLE, CALIF.

LOCATION. At gaging station 4.2 miles southwest of Millville, Shasta County, and 4.3 miles downstream from Little Cow Creek. DRAINAGE AREA. 427 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 5.. ....

Discharge
(cfs)

28
55
80
217
286
7,260

318
308
70
13
1.5
al4

Silica

(SiQ,)

26

35

Iron

(Fe)

0.01

. 00

Cal-

cium

(Ca)

20

11

20

Mag-
ne-

sium

(Mg)

4.4

4.0

8.3

Sodium

(Na)

10
10
9.7
9.4
7.0
2.6

4.7
4.4
6.6
9.0
10
13

Po-
tas-

sium

(K)

0.9

2.2

Bi-
car-

bon-

ate

(HC03)

92
86
82
62
63
31

56
54
78
104
113
120

Car-
bon-

ate

(CO,)

Sulfate

(S04)

5.0

7.0

Chloride

(CD

9.8
8.0
9.5
14
8.0
1.4

4.8
3.5
5.0
5.8
5.5
9.0

Fluo-
ride

(F)

0.0

. 1

Ni-

trate

(NO,)

0.3

.3

Bo-

ron

(B)

0.0
. 0
.2
.0
. 1
. 1

. 1
. 1
.3
. 1
. 0
. 0

Dissolved solids

(calculated)

Parts

per
million

82

154

Tons

per
acre-

foot

0.11

. 21

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

69
68
63
60
67
26

44
44
66
74
79
84

Non-
car-

bon-

ate

0
0
0
9
15
1

0
0
2
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.5
. 5
. 5
.5
.4
.2

. 3
.3
.4
.5
. 5
. 6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

175
164
163
163
142
66

110
102
144
181
191
215

PH

7.6
7.5
7.5
7.5
7.6
7.4

7.4
7.8
7.8
8.1
7.4
7.5

Daily mean discharge.

SACRAMENTO RIVER BASIN Continued

11-3758. COTTONWOOD CREEK NEAR ONO, CALIF.

LOCATION. Approximately 1 mile downstream from North Fork, and approximately 8 miles southeast of Ono, Tehama County.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Discharge records for gaging stations at Middle Fork Cottonwood Creek near Ono and North Fork Cottonwood Creek near Igo are combined to give the flow at this station. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Dec. 2............

Feb. 2............

Sept. 5.. ....

Mean

discharge
(cfs)

27
18
20
78
1,348
2,500

270
207
126
64
16
13

Silica

(SlQs)

20

19

19

18

Iron

(Fe)

0.05

.00

Cal-

cium

(Ca)

26

28

21

27

Mag-
ne-

sium

(Mg)

12

13

11

14

Sodium

(Na)

10
14
12
13
6.6
4.5

3.9
6.8
4.9
6.0
9.1
12

Po-
tas-

sium

(K)

1.1

1.6

1.2

1.1

Bi-
car-

bon-

ate

(HCOS)

129
86
144
119
54
48

56
116
123
126
al27
b!50

Car-
bon-
ate

(ccg

Sulfate

(S04)

7.0

5.0

11

9.0

Chloride

(Cl)

18
15
21
20
9.0
3.5

4.0
4.5
6.0
7.0
10
16

Fluo-
ride

(F)

0.2

. 1

.0

.0

Ni-

trate

(NO,)

0.0

.0

.0

.0

Bo-

ron

(B)

0.0
.0
.0
.0
. 0
.0

.0
.0
. 0
.0
.0

.1

Dissolved solids

(calculated)

Parts

per
million

158

171

132

171

Tons

per
acre-

foot

0.21

.23

. 18

.23

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

114
72
124
113
64
46

48
98
98
106
106
125

Non-
car-

bon-

ate

8
1
6
15
20
7

2
3
0
3
2
2

So-

dium
ad-

sorp-
tion
ratio

0.4
. 7
.5
.5
.4
. 3

.2
.3
.2
.3
.4
.5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

256
194
287
271
154
105

110
211
207
212
244
281

pH

8.0
7.9
7.8
7.8
7.2
7.4

7.6
7.8
7.9
8.2
8.4
8.4

a Includes equivalent of 4 ppm of carbonate (CO3). b Includes equivalent of 9 ppm of carbonate (CO3).

SACRAMENTO RIVER BASIN Continued

11-3760. COTTONWOOD CREEK NEAR COTTONWOOD, CALIF.

LOCATION. At gaging station 2 miles east of Cottonwood, Shasta County, and 2.4 miles upstream from mouth. DRAINAGE AREA. 945 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

May 10............

Sept. 5...........

Discharge
(cfs)

80
82
82
123
3,690
5,140

567
360
230
97
56
61

Silica

(sicg

20

25

Iron

(Fe)

0.00

.05

Cal-

cium

(Ca)

22

16

Mag-
ne-

sium

(MB)

10

7.9

Sodium

(Na)

13
12
9.5
13
6.6
5.1

6.4
8.1
6.7
7.0
8.5
9.5

Po-
tas-

sium

(K)

1.2

1.3

Bi-
car-

bon-

ate

(HCO,)

108
106
104
117
73
66

110
118
117
112
105
102

Car-
bon-

ate

(COJ

Sulfate

(SO,)

9.0

7.0

Chloride

(CD

6.0
4.0
7.0
22
13
3.5

8.0
9.0
7.5
4.5
5.2
3.9

Fluo-

ride

(F)

0.1

.0

Ni-

trate

(NOJ

0.4

. 0

Bo-

ron

(B)

0.0
.0

.1
.0
.0

.1

.0
.0

.1
.0

.1
.1

Dissolved solids

(calculated)

Parts

per
million

138

121

Tons

per
acre-

foot

-

0.19

. 16

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

72
72
80
110
82
60

96
98
94
88
80
72

Non-
car-

bon-

ate

0
0
0
14
22
6

6
1
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.7
.6
.5
. 5
. 3
. 3

.3
.4
.3
. 3
.4
. 5

Specific
con-

duct-

ance

(micro-
mhos at

25"C)

184
187
192
270
176
140

212
216
203
196
192
175

PH

7.9
7.9
7.2
7.5
7.3
7.3

7.9
8.0
7.7
8.2
7.4
7.5

SACRAMENTO RIVER BASIN Contlnued

11-3765. BATTLE CREEK NEAR COTTONWOOD, CALIF.

LOCATION. At gaging station 6.3 miles upstream from mouth and 7.6 miles east of Cottonwood, Shasta County. DRAINAGE AREA. 362 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Feb. 24... ....
Mar 7

May 11..... ....

July 12...........

Discharge
(cfs)

212
189
214
289
273
3,040

363
401
287
176
163
150

Silica

(S1Q,)

38

49

Iron

(Fe)

0.01

.01

Cal-

cium

(Ca)

11

7.6

11

Mag-
ne-

sium

(Mg)

7.4

6.6

7.4

Sodium

(Na)

10
9.7
9.0
8.8
7.2
2.7

5.6
5.7

16
8.8
11

Po-
tas-

sium

(K)

2.1

2.4

Bl-
car-

bon-

ate

(HCOJ

92
90
90
88
77
37

66
66

88
94
95

Car-
bon-

ate

(CO,)

Sulfate

(S04)

3.0

4.0

Chloride

(Cl)

3.5
3.8
3.0
3.5
3.5
1.2

3.0
2.5
. 5
8.5
1.0
2.2

Fluo-
rlde

(F)

0.1

.0

Ni-

trate

(NO,)

0.7

.2

Bo-

ron

(B)

0.0
.0
.0
.0

.1
.1

.0
.0

.1
.1
.1
.0

Dissolved solids

(calculated)

Parts

per
million

99

134

Tons

per
acre-

foot

0.13

. 18

Tons

per

day

Hardness
as CaCOa

Cal-

cium,
Mag-
ne-

sium

58
58
58
57
57
26

48
46
48
54
58
58

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0

0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.6
.6
. 5
. 5
.4
.2

.3
.4
.3
1.0
.5
.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

149
149
147
147
123
68

117
108
116
142
149
149

pH

7.8
7.8
7.8
7.9
7.6
7.2

7.8
7.7

8.0
8.0
7.6

SACRAMENTO RIVER BASIN Continued

11-3775. PAYNES CREEK NEAR RED BLUFF, CALIF.

LOCATION.--At gaging station 0.4 mile upstream from mouth and 6.5 miles northeast of Red Bluff, Tehama County. DRAINAGE AREA. 92.5 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960 1

Date
of
collection

Feb. 24...........

Discharge
(cfs)

0.9
2.8
2.5
12
27

1,410
10
29
.6
.4

Silica

(SiQ.)

50
52

47

51

Iron

(Fe)

0.02

. 02

Cal-

cium

(Ca)

16
15

12

17

Mag-
ne-

sium

(Mg)

10
10

,10

9.8

Sodium

(Na)

24
22
20
20
14

4.5
16
13
17
23

Po-
tas-

sium

(K)

2.1
2.8

1.7

2.2

Bi-
car-

bon-

ate

(HCO,)

125
120
122
117
90

42
105
98
120
134

Car-
bon-

ate

(CO,)

Sulfate

(S04)

1.0
4.0

5.0

2.0

Chloride

(Cl)

20
19
18
16
13

5.6
11
9.5
12
20

FluO-

rlde

(F)

0.1
.0

.1

.1

Ni-

trate

(NO,)

0.2
.6

. 6

.4

Bo-

ron

(B)

0.5
. 5
.4
. 5
. 3

. 1
.4
. 3
. 2
. 5

Dissolved solids

(calculated)

Parts

per
million

186
185

147

192

Tons

per
acre-

foot

0.25
.25

. 20

.26

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

82
79
78
79
71

36
74
72
82
83

Non-
car-

bon-

ate

0
0
0
0
0

2
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.1
1.1
1.0
1.0
. 7

.3
.8
. 7
. 8
1.1

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

253
236
238
234
170

95
199
172
222
255

PH

7.5
7.8
7.5
7.6
7.4

8.0
7.6
7.7
7.6
8 0

SACRAMENTO RIVER BASIN Continued

11-3785. SACRAMENTO RIVER AT RED BLUFF, CALIF.

LOCATION. At U.S. Highway 99E bridge at Red Bluff, Tehama County, approximately 5 miles downstream from gaging station near Red Bluff.
DRAINAGE AREA. 9,300 square miles, approximately, excluding Goose Lake basin, upstream from gaging station.
RECORDS AVAILABLE. Water temperatures: October 1957 to September 1960.
Sediment records: October 1957 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 66°F June 1; minimum, 45°F Jan. 14.
Sediment concentrations: Maximum daily, 1,510 ppm Feb. 8; minimum daily, 4 ppm on many days.
Sediment loads: Maximum daily, 271,000 tons Feb. 8; minimum daily, 44 tons Dec. 4-6.
EXTREMES, 1957-60. Water temperatures: Maximum, 66°F June 1, 1960; minimum, 44°F Jan. 6, 1958.
Sediment concentrations: Maximum daily, 1,510 ppm Feb. 8, 1960; minimum daily, 4 ppm on many days 1959-60.
Sediment loads: Maximum daily, 271,000 tons Feb. 8, 1960; minimum daily, 44 tons Dec. 4-6, 1960.
REMARKS. No appreciable inflow between sampling point and gaging station except for heavy local runoff. Records of discharge for water year October 1959 to September 1960 given in WSP 1715 as Sacramento River near Red Bluff.

Temperature (°F) of water, water year October 1959 to September 1960

Month

October . ....
November ..
December

January .....
February ....
March ....

April ....
May ....
June .. ..

July...........
August ....
September ..

Day

1

60
5
55

46
50
50

56
54
66

57
58
60

2

_

55

__

49
48

59
55
65

__

_

3

62
57

46
48
48

60
55

60
58
60

4

_

53

_

48
48

62
54
64

__

59

5

62
58

47
49
50

62
57

59
58
60

6

_

53

__

50
51

60
57
60

__
_

~

7

61
59

47
51
53

60
58

59
60
61

8

__

52

__

52
51

62
59
60

_ .

_

9

64
59

48
49
53

60
59

58
60
60

10

52

_

48
51

60
59
50

_

11

64
59

48
48
50

59
59

57
59
62

12

__

46

46
48
50

59
59
60

__
__

13

65
58

46
49
52

59
57

58
59
61

14

__

50

45
50
53

59
57
61

_

__

61

15

64
56

46
50
53

56
59

_

58
60

16

51

47
50
54

56
58
62

__

17

65
56

47
49
57

55
56

_

60
61

18

54

46
49

58

56
55
58

_

19

62
55

47
50
60

57
58

_

59
61

20

52

49
50
59

57
57
57

59

21

59
56

47
51
60

55
55

_

59
60

22

61

48

47
50
59

52
53
58

59

- -

23

65
58

48
50
60

49
50

_

58
61

24

52

48
50
59

50
50
59

59

25

64
55

50
49
60

50
52

_

58
63

26

50

50
50
55

51
54
58

58

27

63

50
52
55

53
59

__

58
62

28

50

50
52
54

53
61
57

60

29

57
54

48
51
53

55
62

_

59
62

30

55
48

52

53

56
64

58

31

50

54

_

65

_

Aver-

age

48
50
54

57
57

__

SACRAMENTO RIVER BASIN Continued

11-3788. RED BANK CREEK NEAR RED BLUFF, CALIF.

LOCATION (revised). At gaging station on road bridge 0.1 mile downstream from unnamed tributary, 1.8 miles southeast of Red Bank, and approximately 13 miles west of Red Bluff, Tehama County.
RECORDS AVAILABLE.--Chemical analyses: October 1959 to September 1960.
REMARKS. Gaging station maintained and operated by State of California Department of Water Resources. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60. No flow during summer months.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

May 2.............

Mean

discharge
(cfs)

161
69
6.2
9.9

Silica

(SiQ.)

15
23
18
18

Iron

(Fe)

0.04

Cal-

cium

(Ca)

32
45
56
56

Mag-
ne-

sium

(Mg)

15
23
28
29

Sodium

(Na)

11
13
18
17

Po-
tas-
sium

(K)

0.9
. 7
1.7
1.2

Bl-
car-

bon-

ate

(HCO,)

131
210
a268
267

Car-
bon-
ate

(CO,)

Sulfate

(SO.)

40
50
59
60

Chloride

(Cl)

6.0
8.0
14
14

Fluo-
rlde

(F)

0.4
. 1
.2
.0

Ni-
trate

(NOJ

3.3
.2
.8
.4

Bo-

ron

(B)

0.0
.1
.1
.1

Dissolved solids

(calculated)

Parts

per
million

189
266
328
328

Tons

per
acre-

foot

0.26
.36
.45
.45

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

141
206
256
258

Non-
car-

bon-

ate

34
34
36
39

So-
dium
ad-

sorp-
tion
ratio

0.4
.4
.5
.5

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

316
421
518
514

pH

7.8
8.2
8.3
8.1

a Includes equivalent of 10 ppm of carbonate (CO3).

SACRAMENTO RIVER BASIN Continued

11-3790. ANTELOPE CREEK NEAR RED BLUFF, CALIF.

LOCATION. At gaging station in Rio De Los Berrendos Grant^ 1.8 miles upstream from diversion dam of Los Molinos Mutual Water Co., 6 Bluff, Tehama County, and 9.7 miles upstream from mouth.'
DRAINAGE AREA. 124 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No flow during August and September

Chemical analyses, In parts per million, water year October 1959 to September 1960

,5 miles east of Red

Date
of
collection

Mar 7

July 12....... ....

Discharge
(cfs)

38
39
82
3,060

107
104
81
45
34

Silica

(S1Q.)

41
41

32

Iron

(Fe)

0.01

Cal-

cium

(Ca)

12
13

8.0

Mag-
ne-

sium

(Mg)

7.8
6.7

5.4

Sodium

(Na)

12
11
10
2.5

3.7
5.1
5.7
8.7
15

Po-
tas-

sium

(K)

1.3
1.6

1.2

Bi-
car-

bon-

ate

(HCOJ

89
88
81
20

43
53
59
76
90

Car-
bon-

ate

(CO,)

Sulfate

(SO.)

1.0
. 0

.0

Chloride

(CD

9.5
11
9.0
2.0

3.8
2.5
5.5
6.5
12

Fluo-
ride

(F)

0.1
. 0

. 1

Ni-

trate

(NOJ

0.0
.0

.6

Bo-

ron

(B)

0.1
. 1
.2
.0

.0

.1
.1
.1
.2

Dissolved solids

(calculated)

Parts

per
million

129
127

88

Tons

per
acre-

foot

0.18
. 17

. 12

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

62
60
59
28

35
36
42
59
59

Non-
car-

bon-

ate

0
0
0
12

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.7
. 6
.6
.2

. 3
.4
.4
.5
.8

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

164
163
154
69

85
92
105
139
162

PH

7.9
7.7
7.3
6.2

7.9
7.5
7.7
7.7
8.0

SACRAMENTO RIVER BASIN Continued

11-3791. ANTELOPE CREEK NEAR MOUTH, NEAR LOS MOLINOS, CALIF.

LOCATION. At U.S. Highway 99E bridge 0.2 mile northwest of Lassen View Union School and approximately 6 miles north of Los Molinos, Tehama County. RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 11, I960.....

May 10. ....

Sept. 13..........

Mean

discharge
(cfs)

Silica

(S10J

41

41

31

40

Iron

(Fe)

0.03

.00

Cal-

cium

(Ca)

20

19

9.6

16

Mag-
ne-

sium

(Mg)

9.2

13

5.1

10

Sodium

(Na)

24
19
20
17
2.2
6.7

9.6
10
10
19
17
19

Po-
tas-

sium

(K)

5.0

4.2

2.3

6.7

Bi-
car-

bon-

ate

(HCOS)

93
80
139
76
22
63

52
50
92
82
122
100

Car-
bon-
ate

(CO,)

Sulfate

(S04)

21

7.0

15

19

Chloride

(CD

32
24
16
22
1.5
6.2

9.0
10
10
18
17
24

Fluo-
rlde

(F)

0.2

.2

.2

.0

Ni-

trate

(NO,)

0.0

.5

.7

.0

Bo-

ron

(B)

0.7
.6
.5
.6
.0
.2

.4
1.0
.3
.5
.5
.5

Dissolved solids

(calculated)

Parts

per
million

199

189

109

184

Tons

per
acre-

foot

0.27

.26

. 15

.25

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

88
67
99
66
26
52

46
45
86
69
95
81

Non-
car-

bon-

ate

12
1
0
4
8
0

3
4
11
2
0
0

So-

dium
ad-

sorp-
tion
ratio

1.1
1.0
.9
.9
.2
.4

.6
.6
. 5
1.0
.8
.9

Specific
con-

duct-

ance

(micro-
mhos at

25"C)

291
227
276
210
64
131

139
132
209
212
269
263

PH

7.0
7.5
7.4
6.8
6.4
8.0

7.3
7.3
7.6
7.1
7.9
7.6

SACRAMENTO RIVER BASIN Continued

11-3795. ELDER CREEK NEAR PASKENTA, CALIF.

LOCATION. At gaging station 2.5 miles downstream from South Fork, 8 miles northeast of Flournoy, and 11 miles north of Paskenta, Tehama County. DRAINAGE AREA. 95.8 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 12..........

Mean

discharge
(cfs)

3.0
3.2
3.8
12
199
356

63
44
13
4.5
1.8
. 8

Silica

(SIQJ

14

16

14

14

Iron

(Fe)

0.01

. 01

Cal-

cium

(Ca)

50

50

26

52

Mag-
ne-

sium

(Mg)

35

38

18

42

Sodium

(Na)

90
155
82
50
9.6
4.3

8.8
13
23
44
91
182

Po-
tas-

sium

(K)

2.0

1.9

1.0

1.0

Bl-

car-

bon-

ate

(HCO,)

218
194
244
206
101
90

135
150
158
122
128
138

Car-
bon-
ate

(CO,)

0
6
0
4
0
0

0
4
11
10
7
8

Sulfate

(SOJ

14

30

19

13

Chloride

(Cl)

188
294
168
92
18
4.5

17
9.0
42
101
206
386

Fluo-

rlde

(F)

0.0

. 0

.2

. 1

Ni-

trate

(NO,)

0.0

.0

.0

. 8

Bo-

ron

(B)

0.2
. 2
. 1
. 1
.0
. 1

.0
.0
. 1
. 1
. 1
.0

Dissolved solids

(calculated)

Parts

per
million

500

506

174

718

Tons

per
acre-

foot

0.68

.69

.24

.98

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

268
314
280
238
124
82

115
138
156
164
219
302

Non-
car-

bon-

ate

89
145
80
63
41
8

4
8
8
48
103
176

So-

dium
ad-

sorp-
tion
ratio

2.4
3.8
2.1
1.4
.4
.2

.4
. 5
.8
1.5
2.7
4.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

930
1,310
912
657
264
170

260
300
395
544
902
1,330

PH

8.2
8.3
8.2
8.3
7.9
7.7

8.1
8.4
8.4
8.4
8.3
8.4

SACRAMENTO RIVER BASIN Continued

11-3805. ELDER CREEK AT GERBER, CALIF.

LOCATION. In Saucos Grant at U.S. Highway 99W bridge, 1,200 feet upstream from gaging station, 1.2 miles west of Gerber, Tehama County, and 3.7 miles upstream from mouth.
DRAINAGE AREA. 142 square miles.
RECORDS AVAILABLE. Chemical analyses: January 1959 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No flow during summer months.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Apr 11

Discharge
(cfs)

242
264
61
a32
al.9

Silica

(SiQ,)

17
21
15
18
20

Iron

(Fe)

0.01

Cal-

cium

(Ca)

27
21
22
28
35

Mag-
ne-

sium

(Mg)

13
11
16
20
24

Sodium

(Na)

13
7.5
9.6
14
16

Po-
tas-
sium

<K)

1.2
.8
1.6
1.1
1.3

Bi-
car-

bon-

ate

(HCO,)

134
114
139
178
b221

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

12
13
13
11
15

Chloride

(Cl)

19
9.0
14
18
24

Flno-

ride

(F)

0.2
.2
.2
. 1
. 1

Ni-
trate

(NOJ

1.1
. 1
.9
.4
.0

Bo-

ron

(B)

0.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

170
140
160
199
244

Tons

per
acre-

foot

0.23
. 19
.22
.27
.33

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

120
99
122
152
188

Non-
car-

bon-

ate

10
6
8
6
7

So-

dium
ad-

sorp-
tion
ratio

0.5
.3
.4
.5
. 5

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

301
221
269
330
418

PH

7.4
7.8
8.1
8.2
8.4

a Daily Bean discharge.
b Includes equivalent of 6 ppm of carbonate (C03).

SACRAMENTO RIVER BASIN Continued

11-3816.2. MILL CREEK AT MOUTH, NEAR LOS MOLINOS, CALIF.

LOCATION. At bridge on U.S. Highway 99, 0.8 mile upstream from confluence with Sacramento River, 4.7 miles downstream from gaging station near Los Molinos, Tehama County.
DRAINAGE AREA. 134 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715 as Mill Creek near Los Molinos. Considerable diversion between gaging station and sampling point.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 13..........

Discharge
(cfs)

100
95
95
203
2,140
al,500

370
419
334
136
108
99

Silica

(S1Q.)

29

~

42

Iron

(Fe)

0.04

.00

Cal-

cium

(Ca)

8.0

19

Mag-
ne-

sium

(Mg)

4.9

13

Sodium

(Na)

20
19
19
21
5.4
5.0

8.4
8.5
7.3
17
15
16

Po-
tas-

sium

(K)

2.0

3.5

Bi-
car-

bon-

ate

(HCO,)

66
68
70
61
28
36

38
38
34
62
87
94

Car-
bon-

ate

(CO,)

Sulfate

(S0«)

~"

~

15

25

Chloride

(Cl)

28
24
23
27
7.0
4.5

9.8
10
5.0
22
15
26

Fluo-
ride

(F)

::

0.2

. 1

Ni-
trate

(NOJ

~

0.6

. 3

Bo-

ron

(B)

0.5
.8
. 7
. 8
. 1
. 1

.3
.3
.3
.4
. 5
.6

Dissolved solids

(calculated)

Parts

per
million

~

98

192

Tons

per
acre-

foot

- -

~

0.13

.26

Tons

per

day

Hardness
as CaCOa

Cal-

cium,
Mag-
ne-

sium

66
60
60
60
36
31

36
4O
41
57
74
99

Non-
c*r-
bon-

ate

12
4
3
10
13
1

5
9
13
6
3
22

So-

dium
ad-

sorp-
tion
ratio

1.1
1.1
1.1
1.2
.4
.4

. 6
.6
.5
1.0
. 8
. 7

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

234
209
212
220
100
84

116
115
118
186
224
251

pH

7.6
7.5
7.7
7.1
6.5
7.1

7.4
7.4
7.4
7.6
7.8
7.8

a Daily mean discharge.

SACRAMENTO RIVER BASIN Continued

11-3820. THOMES CREEK AT PASKENTA, CALIF.

LOCATION. At gaging station 0.25 mile upstream from Digger Creek and 0.3 mile upstream from highway bridge at Paskenta, Tehama County. DRAINAGE AREA. 188 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Dec. 2.. ....
Jan. 12, I960.....

May 9.............

Sept. 12. ....

Discharge
(cfs)

6.6
5.3
4.9
25
538
1,670

257
217
89
16
6.7
2.2

Silica

(SiQ.)

11

12

10

9.4

Iron

(Fe)

0.08

.03

Cal-

cium

(Ca)

46

52

22

40

Mag-
ne-

sium

(Mg)

13

17

3.2

12

Sodium

(Na)

19
21
20
15
3.4
2.1

2.8
2.9
4.3
8.0
13
19

Po-
tas-

sium

(K)

1.0

1.1

. 7

1.0

Bl-

car-

bon-

ate

(HCO,)

150
al62
188
130
61
54

69
72
86
130
108
bl!4

Car-
bon-
ate

(CO,)

Sulfate

(SO,)

40

34

11

49

Chloride

(Cl)

36
35
38
20
8.0
2.5

2.0
4.0
5.2
10
17
37

Fluo-

rlde

(F)

0.0

.0

.2

. 1

Ni-
trate

(NO,)

0.0

.0

.0

.0

Bo-

ron

(B)

0.3
. 1
.3
.2
.0
.0

.0
. 1
.0
. 1
.2
.2

Dissolved solids

(calculated)

Parts

per
million

240

267

89

224

Tons

per
acre-

foot

0.33

.36

. 12

.30

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

170
179
198
132
58
52

63
68
78
121
120
149

Non-
car-

bon-

ate

47
46
44
25
8
8

6
9
7
14
31
56

So-

dium
ad-

sorp-
tion
ratio

0.7
. 7
.6
.6
.2
. 1

.2
.2
.2
.3
. 5
.7

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

410
434
463
316
131
105

136
140
169
269
297
389

pH

8.2
8.4
8.1
7.9
7.5
7.5

7.7
7.9
8.0
8.2
8.2
8.3

a Includes equivalent of 6 ppm of carbonate (CO3). b Includes equivalent of 2 ppm of carbonate (CO3).

SACRAMENTO RIVER BASIN Continued

11-3821. THOMES CREEK NEAR MOUTH, NEAR CORNING, CALIF.

LOCATION. At U.S. Highway 99W bridge, 2.6 miles upstream from mouth and 3.5 miles north of Corning, Tehama County. RECORDS AVAILABLE. Chemical analyses: January 1959 to September 1960.
REMARKS. No discharge records available. Stream dry during summer months.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Aug. 3.. ....

Mean

discharge
(cfs)

Silica

(SiQ,)

11
24
13
11

14

Iron

(Fe)

0.01

Cal-

cium

(Ca)

16
19
22
27

31

Mag-
ne-

sium

(Mg)

3.3
3.0
4.1
6.0

8.3

Sodium

(Na)

3.4
3.2
3.1
3.7

4.5
4.8
5.5

Po-
tas-

sium

(K)

1.1
1.7
1.1
1.0

. 7

Bi-
car-

bon-

ate

(HCO,)

56
63
79
104

a 133
144
150

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

10
14
9.0
7.0

8.8

Chloride

(Cl)

1.6
3.0
3.0
4.0

1.6
2.4
3.9

Fluo-
ride

(F)

0.4
. 1
. 1
.2

.0

Ni-
trate

(NO,)

1.8
.0
1.1
.4

2.5

Bo-

ron

(B)

0.0
.1
.0
.1

.0
. 1
.0

Dissolved solids

(calculated)

Parts

per
million

77
99
96
111

137

Tons

per
acre-

foot

0.10
. 13
. 13
. 15

. 19

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

54
60
72
92

112
116
125

Non-
car-

bon-

ate

8
8
7
7

3
0
2

So-

dium
ad-

sorp-
tion
ratio

0.2
.2
.2
.2

.2
.2
.2

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

133
127
157
198

230
253
260

PH

7.1
7.5
7.9
8.0

8.3
7.7
[8.2

a Includes equivalent of 2 ppm of carbonate (C0 3).

SACRAMENTO RIVER BASIN Continued

11-3838. SACRAMENTO RIVER NEAR HAMILTON CITY, CALIF.

LOCATION. At gaging station on State Highway 32 bridge, 1.3 miles northeast of Hamilton City, Glenn County, and 2.4 miles upstream from Pine Creek. RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Gaging station maintained and operated by State of California Department of Water Resources. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60 as Sacramento River at Hamilton City.

Chemical analyses, in oarts Der million, water year October 1959 to September 1960

Date
of
collection

Oct. 13, 1959.....

Jan. 13, I960.....

June 15. ....

Sept. 12..........

Discharge
(cfs)

4,900
4,880
4,030
5,900
38,300
19 , 000

3,740
7,360
7,140
8,570
8,130
5,830

Silica

(SiQ.)

25

27

Iron

(Fe)

0.08

.02

Cal-

cium

(Ca)

11

9.2

Mag-
ne-

sium

(Mg)

6.9

5.8

Sodium

(Na)

7.3
9.5
9.4
9.5
3.8
4.5

6.6
6.6
6.5
6.2
7.0
7.7

Po-
tas-

sium

(K)

1.3

1.1

Bi-
car-

bon-

ate

(HCO,)

72
76
81
74
38
48

74
72
67
68
69
70

Car-
bon-
ate

(CO,)

Sulfate

(SO,)

9.0

5.0

Chloride

(CD

4.2
4.5
5.0
7.5
9.0
3.5

5.5
3.5
4.8
3.0
2.5
2.5

Fluo-
ride

(P)

0.1

.0

Ni-

trate

(NOj)

0.4

.0

Bo-

ron

(B)

0.0
.0

.1
.1
.0
.0

.1
.0
.0
.0
.0
.0

Dissolved solids

. (calculated)

Parts

per
million

99

92

Tons

per
acre-

foot

0.13

. 13

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

54
52
56
57
46
43

58
56
50
55
48
47

Non-
car-

bon-

ate

0
0
0
0
15
4

0
0
0
0
0
0

So-
dium
ad-

sorp-
tion
ratio

0.4
.6

".3

.4
.4
.4
.4
.4

Specific
con-

duct-

ance

micro-

mhos at

25°C)

130
141
148
153
94
105

147
131
126
121
120
123

PH

7.5
7.6
7.6
7.5
6.9
7.3

7.8
7.8
7.6
7.8
7.8
7.8

SACRAMENTO RIVER BASIN Continued

11-3840. BIG CHICO CREEK NEAR CHICO, CALIF.

LOCATION. At gaging station in Arroyo Chico Grant 1.8 miles upstream from golf clubhouse in Bidwell Park, 2.6 miles upstream from Lindo Channel, and 7 miles northeast of Chico, Butte County.
DRAINAGE AREA. 67.9 square miles.
RECORDS 'AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Date
of
collection

Jan. 11, I960.....

Mar. 9.. ....

Discharge
(cfs)

27
27
27
122
199
560

69
65
30
a22
21
24

Silica

(SlQj)

36

41

Iron

(Fe)

0.00

.03

Cnemii

Cal-

cium

(Ca)

12

18

al an:

Mag-
ne-

sium

(Mg)

8.0

8.8

Ivses, :

Sodium

(Na)

15
17
15
13
5.3
2.7

7.1
7.5
11
18
15
16

n pai

Po-
tas-

sium

(K)

0.9

1.3

Bi-
car-

bon-

ate

(HCO,)

113
14
112
78
40
38

74
80
101
115
114
118

Car-
bon-
ate

<ccg

Sulfate

(S0t)

5.0

.0

Chloride

(Cl)

18
16
10
12
5.0
3.6

6.5
5.5
8.0
14
10
16

Fluo-
ride

(F)

0.1

.0

Ni-
trate

(NO,)

0.0

.0

Bo-

ron

(B)

0.1
.2
.3
. 2
.0
. 1

.0
. 1
. 2
.2
.3
. 2

Dissolved solids

(calculated)

Parts

per
million

114

159

Tons

per
acre-

foot

0.16

. 22

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

92
81
79
64
36
29

56
63
70
75
78
81

Non-
car-

bon-

ate

0
0
0
0
3
0

0
0
0
0
0
0

So-
dium
ad-

sorp-
tion
ratio

0.7
.8
.7
. 7
.4
.2

.4
.4
.6
.9
.7
.8

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

212
223
215
181
91
74

140
142
186
207
210
217

PH

7.9
8.0
7.9
7.5
7.0
7.3

7.7
7.7
8.0
8.1
8.2
7.9

Daily mean discharge.

SACRAMENTO RIVER BASIN Continued

11-3842. BIG CHICO CREEK AT CHICO, CALIF.

LOCATION. At gaging station at intersection of Bidwell Way and Rose Avenue, approximately 1 mile west of Chico, Butte County.
RECORDS AVAILABLE. Chemical analyses: January 1959 to September 1960.
REMARKS. Gaging station maintained and operated by State of California Department of Water Resources. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 11, I960.....

May 9.............

Sept. 12..........

Discharge
(cfs)

8.2
6.0
8.7
60
31
558

40
41
12
4.2
1.0

Silica

(siQ,)

36
40
41
34

36

36

Iron

(Fe)

-

0.00

.01

Cal-

cium

(Ca)

17
19
17
14

12

20

Mag-
ne-

sium

(Mg)

8.6
7.9
8.4
6.8

6.1

7.5

Sodium

(Na)

17
17
17
11
4.8
2.6

7.3
8.1
12
18
16

Po-
tas-

sium

(K)

1.6
2.0
1.5
1.4

.9

1.3

Bi-
car-

bon-

ate

(HCO,)

112
115
113
81
36
32

72
78
102
114
120

Car-
bon-

ate

(COJ

Sulfate

(S0«)

7.0
5.0
4.0
6.0

4.0

.0

Chloride

(Cl)

13
12
14
12
5.5
2.5

8.8
6.0
8.5
16
14

Fluo-
ride

(F)

0.1
.0
. 1
.4

.0

. 1

Ni-

trate

(NOJ

0.3
.0
.0
. 0

.0

. 1

Bo-

ron

(B)

0.2
.2
.2
.2
.0
.0

.0
. 1
. 2
. 2
.2

Dissolved solids

(calculated)

Parts

per
million

156
160
159
126

111

154

Tons

per
acre-

foot

0.21
.22
.22
. 17

. 15

.21

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

78
80
77
63
36
27

54
55
71
77
81

Non-
car-

bon-

ate

0
0
0
0
6
1

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.8
.8
. 8
.6
.4
.2

.4
.5
.6
.9
.8

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

217
217
222
168
93
66

141
143
190
211
221

PH

7.6
7.7
7.7
7.5
6.8
8.0

7.8
7.8
7.8
8.0
8.0

SACRAMENTO RIVER BASIN Continued

11-3885. STONY CREEK NEAR HAMILTON CITY, CALIF.

LOCATION. At gaging station in Capay Grant, 2.3 miles southwest of Hamilton City, 6 miles upstream from mouth, and 8 miles east of Orland, Glenn County. DRAINAGE AREA. 764 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No flow during summer months.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

May 9. ....

Discharge
(cfs)

802
3,100
100
9.0

Silica
(SiQ,)

10

Iron

(Fe)

0.00

Cal-
cium

(Ca)

32

Mag-
rie-
Sium

(Mg)

15

Sodium
(Na)

21
10
12
14

Po-
tas-
sium

(K)

1.0

Bi-
car-

bon-
ate

(HCOJ

110
96
140
154

Car-
bon-
ate

(ccg

Sulfate
(SO,)

19

Chloride
(Cl)

44
16
16
20

Fluo-
ride

(F)

0.1

Ni-
trate

(NOJ

0.0

Bo-
ron

(B)

0.0
. 1
. 1
.2

Dissolved solids

(calculated)

Parts
per
million

187

Tons
per
acre-

foot

0.25

Tons
per

day

Hardness
as CaCO,

Cal-

cium,
Mag-
ne-

sium

140
88
116
142

Non-
car-

bon-
ate

50
9
1
16

So-
dium
ad-
sorp-
tion
ratio

0.8
.5
. 5
.5

Specific
con-

duct-

ance

(micro-
mhos at
25°C)

351
217
286
320

pH

7.8
7.7
8.0
7.8

SACRAMENTO RIVER BASIN Continued

11-3895. SACRAMENTO RIVER AT COLUSA, CALIF.

LOCATION. At gaging station at north end of Jimeno Grant, downstream from highway bridge at Colusa, Colusa County, at mile 89.4 upstrea RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

from Sacramento.

Date
of
collection

Oct. 5, 1959......

Jan. 13, I960.....

Mar. 9............

Sept. 13..........

Discharge
(cfs)

4,950
4,030
4,230
6,380
30,200
28,700

3,850
7,680
6,670
7,610
7,320
5,600

Silica

(SiQ.)

30

26

27

Iron

(Fe)

0.08

.02

Cal-

cium

(Ca)

14

12

11

Mag-
ne-

sium

(Mg)

6.6

5.2

6.2

Sodium

(Na)

7.7
10
11
9.6
4.5
4.2

8.1
7.3
7.3
6.2
7.0
8.5

Po-
tas-

sium

(K)

1.9

1.9

1.2

Bi-
car-

bon-

ate

(HCO,)

78
85
79
76
39
42

90
72
70
71
70
75

Car-
bon-

ate

(CO,)

Sulfate

(S04)

12

6.6

6.0

Chloride

(Cl)

4.7
6.0
8.0
8.5
10
3.5

5.4
3.6
4.2
2.5
3.0
3.0

Fluo-
ride

(F)

0.2

.0

.0

Ni-
trate

(NO,)

0.1

.0

.2

Bo-

ron

(B)

0.1

. 1
.1
.1
.0
. 0

.0
. 2
. 1
. 0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

123

98

100

Tons

per
acre-

foot

0.17

. 13

. 14

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

56
62
62
58
45
43

68
52
52
60
49
53

Non-
car-

bon-

ate

0
0
0
0
13
9

0
0
0
2
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.6
.6
. 6
. 3
. 3

.4
.4
.4
.3
.4
.5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

146
157
160
156
I 98
101

171
.* 139
*. 132
126
124
132

pH

7.6
7.6
7.1
7.5
7.0
7.2

7.5
7.3
7.6
7.8
7.8
7.7

SACRAMENTO RIVER BASIN Continued

11-3900. BUTTE CREEK NEAR CHICO, CALIF.

LOCATION. At gaging station 0.7 mile downstream from Little Butte Creek and 7.5 miles east of Chico, Butte County. DRAINAGE AREA. 148 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Discharge
(els)

128
76
107
192
340
1,300

410
a385
a210
132
121
118

Silica

(S1Q,)

22

24

Iron

(Fe)

0.00

.02

Cal-

cium

(Ca)

7.6

12

Mag-
ne-

sium

(Mg)

3.9

5.6

Sodium

(Na)

4.6
3.9
4.8
4.3
2.9
1.8

1.9
2.1
2.4
6.1
4.0
4.6

Po-
tas-

sium

(K)

0.6

.9

Bi-
car-

bon-

ate

(HCO,)

71
76
72
59
50
36

40
44
52
65
70
68

Car-
bon-
ate

(ccg

Sulfate

(S04)

3.0

6.0

Chloride

(Cl)

5.0
1.5
2.2
1.0
2.5
1.5

1.5
1.2
.0
3.0
.0
2.5

Fluo-
ride

(F)

__

0.1

.0

Ni-

trate

(NO,)

0.0

.0

Bo-

ron

(B)

0.1
.1
.0
.0
.0
.0

.0
.0
.0
.0
.1
.0

Dissolved solids

(calculated)

Parts

per
million

~

62

89

Tons

per
acre'-

foot

0.08

. 12

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

56
56
50
47
42
30

32
35
43
45
50
53

Non-
car-

bon-

ate

0
0
0
0
1
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.3
.2
.3
.3
.2
. 1

. 1
.2
.2
.4
.2
.3

Specific
con-

duct-

ance

micro-

mhos at

25°C)

115
124
119
113
95
68

76
76
90
103
106
108

PH

7.6
7.8
7.6
7.5
7.4
8.0

7.6
7.4
7.5
7.9
7.9
7.7

a Daily mean discharge.

SACRAMENTO RIVER BASIN Continued

11-3906. SACRAMENTO RIVER AT BOYER'S BEND NEAR DUNNINGAN, CALIF. Continued

Temperature (°F) of water. June to September 1960

October . ....
November ..
December ..

January .....
February ....
March ....

August ....
September ..

1

70

2

69

3

70

4

70

5

70

6

70

7

71

8

70

9

70

10

72

11

73

12

73

13

72

14

72

15

70

Day

16

70

17

70

18

70

19

70

20

70

21

70

22

69

23

69

24

70

25

70

26

69

27

70

28

70

29

69

30

69

31

Aver-
age

70

SACRAMENTO RIVER BASIN Continued

11-3907. COLUSA TROUGH NEAR COLUSA, CALIF.

LOCATION. At gaging station 3 miles west of Colusa, Colusa County, on State Highway 20 and 6 miles northeast of Williams.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Gaging station maintained and operated by State of California Department of Water Resources. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60 as Colusa Basin Drain at Highway 20. This water is the drainage from Colusa Basin passing down the Back Barrow Pit and entering the Sacramento River just above Knights Landing gaging station.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Apr. 13.. ....

Aug. 3............
Sept. 13. ....

Discharge
(cfs)

292
364
427
292
1,220
151

171
1,190
554
789
811
890

Silica

(S1Q,)

30

17

26

Iron

(Fe)

0.02

Cal-

cium

(Ca)

26

21

26

Mag-
ne-

sium

(Mg)

20

13

16

Sodium

(Na)

38
60
57
122
49
161

47
40
48
33
38
38

Po-
tas-

sium

(K)

3.0

3.0

2.6

Bl-

car-

bon-

ate

(HCO,)

174
200
186
270
130
353

146
142
186
186
186
188

Car-
bon-

ate

(COJ

Sulfate

(SOJ

60

50

19

Chloride

(Cl)

19
28
26
74
30
110

30
20
22
18
16
26

Fluo-

ride

(F)

0.1

.1.

.3

Ni-

trate

(NOj)

1.2

.8

.9

Bo-

ron

(B)

0.1
.2
. 1
.3
.0
.4

. 1
.2
.3
.2
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

283

235

248

Tons

per
acre-

foot

0.38

.32

.34

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

146
143
132
216
118
313

132
105
125
122
124
129

Non-
car-

bon-

ate

3
0
0
0
11
24

12
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.4
2.2
2.2
3.6
2.0
3.9

1.8
1.7
1.9
1.3
1.5
1.5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

408
506
474
904
455
1,240

467
369
440
382
386
418

PH

7.9
7.8
7.8
7.5
7.2
8,2

7.8
7.7
7.9
7.8
8.0
8.0

SACRAMENTO RIVER BASIN Continued

11-3911. SACRAMENTO SLOUGH NEAR KNIGHTS LANDING, CALIF.

LOCATION. At gaging station on levee near Reclamation District 1,500 pumping plant, 1 mile upstream from mouth, and 5.4 miles southeast of Knights Landing, Yolo (revised) County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Gaging station maintained and operated by State of California Department of Water Resources. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60 as Sacramento Slough at Sacramento River. This water is the entire outflow of the Sutter By-Pass area and the Reclamation District 1,500.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Dec. 4.. ....

Apr. 4............

Sept. 15. ....

Mean

discharge
(cfs)

158
94
172

401

530
595
725
711
671
740

Silica

(SlCfe)

34

21

29

Iron

(Fe)

0.02

.06

Cal-

cium

(Ca)

33

24

36

Mag-
ne-

sium

(Mg)

23

17

15

Sodium

(Na)

32
38
26
6.0
29

12
18
25
25
27
31

Po-
tas-

sium

(K)

2.0

2.2

1.7

Bl-

car-

bon-

ate

(HCOS)

216
233
190
58
221

119
168
202
228
246
232

Car-
bon-
ate

(cog

Sulfate

(S04)

17

13

8.8

Chloride

(CD

38
41
22
5.6
31

9.2
18
23
11
18
14

Fluo-
ride

(F)

0.1

.2

. 1

Ni-

trate

(NOJ

0.7

.9

.3

Bo-

ron

(B)

0.0
. 1
. 1
. 1
. 1

. 0
.0
. 1
.0
. 1
.1

Dissolved solids

(calculated)

Parts

per
million

286

197

250

Tons

per
acre-

foot

0.39

.27

. 34

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

178
180
140
52
170

89
130
143
160
169
152

Non-
car-

bon-

ate

1
0
0
4
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.0
1.2
1.0
.4
1.0

.6
. 7
.9
.9
.9
1.1

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

451
479
372
132
438

226
314
375
399
431
385

pH

8.1
7.8
8.2
7.0
7.7

7.6
7.8
7.8
8.2
8.0
8.0

SACRAMENTO RIVER BASIN Continued

11-4015. INDIAN CREEK NEAR CRESCENT MILLS, CALIF.

LOCATION. At gaging station 0.8 mile upstream from Dixie Creek and 1.5 miles south of town of Crescent Mills, Plumas County. DRAINAGE AREA. 746 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 7, 1960......

Mean

discharge
(cfs)

42
56
62
65
940
1,020

657
324
84
19
10
8.8

Silica

(SiQj)

20

22

Iron

(Fe)

0.01

Cal-

cium

(Ca)

9.2

26

Mag-
ne-

sium

(MB)

3.6

9.0

Sodium

(Na)

9.5
10
9.6
9.0
3.9
4.0

6.4
3.8
5.2
11
14
16

Po-
tas-

sium

(K)

0.9

1.1

Bi-
car-

bon-

ate

(HCOJ

105
100
102
97
44
46

54
55
80
139
150
152

Car-
bon-

ate

(CO,)

Sulfate

(S04)

0.2

10

Chloride

(CD

4.2
5.0
3.0
4.8
2.8
3.0

1.7
1.6
5.0
4.8
6.5
6.5

Fluo-
ride

<F)

0.1

.0

Ni-

trate

(NO,)

0.2

.0

Bo-

ron

(B)

0.0
. 2
.0
. 1
.0
. 1

.0
. 1
.0
. 1
. 2
. 1

Dissolved solids

(calculated)

Parts

per
million

-

67

166

Tons

per
acre-

foot

0.09

.23

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

83
76
75
78
40
40

34
38
58
97
103
102

Non-
car-

bon-

ate

0
0
0
0
4
2

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.5
.5
.5
.4
.3
.3

.5
.3
.3
. 5
. 6
. 7

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

183
183
178
178
89
94

92
94
135
232
255
256

pH

7.4
7.2
7.3
8.0

7.2

8.0
7.5
7.4
7.6
7.4
7.2

SACRAMENTO RIVER BASIN Continued

11-4070. FEATHER RIVER NEAR OROVILLE, CALIF.

LOCATION. At gaging station, 75 feet upstream from bridge on Feather River Highway, 1.9 miles downstream from North Fork, and 4 miles northeast of Oroville, Butte County.
DRAINAGE AREA. 3,611 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
Water temperatures: October 1953 to September 1954, November 1956 to September 1960.
Sediment records: November 1956 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 74°F July 20, 28-31, Aug. 14; minimum, 35°F Dec. 27.
Sediment concentrations: Maximum daily, 1,400 ppm Feb. 8; minimum daily, 2 ppm on many days.
Sediment loads: Maximum daily, 365,000 tons Feb. 8; minimum daily, 9 tons on several days.
EXTREMES, 1953-54, 1956-60. Water temperatures: Maximum, 81°F Sept. 10, 12, 1959; minimum, 35°F Dec, 27, 1959.
Sediment concentrations (1956-60): Maximum daily, 1,680 ppm Feb. 24, 1957; minimum daily, 2 ppm on many days in 1958-60.
Sediment loads (1956-60): Maximum daily, 365,000 tons Feb. 8, 1960; minimum daily, 8 tons Sept. 26, 27, 1959.
REMARKS. Measurements of suspended sediment made at bridge on Clark Road 5.2 miles downstream from gaging station. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No appreciable inflow between sampling point and gaging station except during periods of heavy rainfall.

Chemical an:

Date
of
collection

Oct. 15, 1959.....

Jan. 7, 1960......

Sept. 9...........

Discharge
(cfs)

1,920
1,620
1,390
1,650
a!4,100
7,860

6,560
5,270
3,610
2,680
2,440
1.630

Silica

(SiQ,)

~

12

13

Iron

(Fe)

"

0.01

.01

Cal-

cium

(Ca)

-

7.4

12

Mag-
ne-

sium

(Mg)

3.0

4.4

Ivses.

Sodium

(Na)

6.6
6.1
6.5
7.3
2.1
2.9

2.1
2.2
3.2
3.3
4.5
5.7

n oarts pei

Po-
tas-

sium

(K)

-

0.3

1.2

Bi-
car-

bon-

ate

(HCOj)

70
70
77
72
30
37

36
40
50
64
66
73

mill

Car-
bon-

ate

(cog

ion. water vear (

Sulfate

(S04)

0.2

2.0

Chloride

(Cl)

4.0
2.0
2.2
2.8
2.0
7.0

1.7
1.2
.8
1.0
1.7
1.5

October 1959 to September 1960

Fluo-
ride

(P)

~

0.0

.0

Ni-

trate

(NO,)

--

2.0

.0

Bo-

ron

(B)

0.0
.0
.0

.1
. 1
.0

.0
.1
.0
.0
.0
.2

Dissolved solids

(calculated)

Parts

per
million

"

48

76

Tons

per
acre-

foot

0.07

. 10

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

54
50
56
63
28
42

29
31
36
68
55
48

Non-
car-

bon-

ate

0
0
0
4
3
12

0
0
0
16
1
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
.4
.4
.2
.2

.2
.2
.2
.2
.3
.4

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

122
121
127
149
66
75

67
68
85
101
111
115

PH

7.5
7.7
7.6
7.6
7.0
7.2

7.5
7.7
7.7
7.7
7.7
7.4

a Daily mean discharge.

SACRAMENTO RIVER BASIN Continued

11-4196. YUBA RIVER NEAR SMARTVILLE, CALIF.

LOCATION. Approximately 0.5 mile downstream from State Highway 20 bridge, 2.3 miles northwest of Smartville, 4 miles downstream from Deer Creek, and 5 miles downstream from Englebright Dam, Yuba County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Discharge records for gaging stations at Englebright Dam and Deer Creek near Smartville are combined to give the flow at this station. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 14..........

Mean

discharge
(cfs)

4.4
4.9
7.4
8.5
4,423
437

3,904
1,977
2,887
9.4
1.4
2.6

Silica

(sicg

12

14

Iron

(Fe)

0.01

.04

Cal-

cium

(Ca)

7.1

15

Mag-
ne-

sium

(Mg)

2.6

4.1

Sodium

(Na)

3.8
4.6
3.9
4.0
1.0
1.5

1.3
1.8
1.3
1.5
2.8
3.9

Po-
tas-

sium

(K)

0.3

.6

Bi-
car-

bon-

ate

(HCO,)

66
66
58
64
21
30

33
36
31
43
60
63

Car-
bon-
ate

(cog

Sulfate

(S04)

1.4

~

12

Chloride

(Cl)

3.2
3.5
3.2
2.0
3.0
.0

.0
1.8
.9
1.0
2.0
1.5

Fluo-
ride

(F)

0.0

.0

Ni-

trate

(NO,)

0.0

.0

Bo-

ron

(B)

0.1
.1
.1
.0
.0
.0

.0
.0

.1
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

45

82

Tons

per
acre-

foot

"

0.06

. 11

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

63
57
52
60
21
27

25
28
25
34
61
55

Non-
car-

bon-

ate

9
3
4
8
4
2

0
0
0
0
12
3

So-

dium
ad-

sorp-
tion
ratio

0.2
.3
.2
.2
. 1
. 1

-.1

.2
. 1
. 1
.2
.2

Specific
con-

duct-

ance

|micro-
mhos at

25°C)

129
130
116
126
47
59

56
65
58
72
107
117

PH

7.7
7.5
7.6
7.8
6.6
7.0

7.5
7.6
7.4
7.6
7.5
7.9

SACRAMENTO RIVER BASIN Continued

11-4215. YUBA RIVER AT MARYSVILLE, CALIF.

LOCATION. On Simpson Lane Bridge in Marysvilie, Yuba County, 800 feet upstream from site of former gaging station, and approximately 2 miles upstream from mouth.
DRAINAGE AREA. 1,340 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water vear October 1959 to September 1960

Date
of
collection

Mean

discharge
(da)

Silica

(SiQ,)

15

16

Iron

(Fe)

0.08

.03

Cal-
cium

(Ca)

7.6

13

Mag-
ne-

sium

(Mg)

3.2

5.0

Sodium

(Na)

4.5
5.9
4.9
3.6
1.5
2.2

1.5
1.9
1.5
2.4
3.8
3.7

Po-
tas-

sium

(K)

0.3

. 6

Bi-
car-

bon-

ate

(HCOj)

72
96
81
69
22
32

38
38
34
63
72
64

Car-
bon-

ate

(CO,)

Sulfate

(S04)

3.0

8.8

Chloride

(Cl)

4.5
2.0
3.0
2.0
3.5
2.0

. 6
1.5
.8
3.0
. 0
1.5

Fluo-
ride

(F)

0.0

. 0

Ni-

trate

(NOJ

0.1

. 0

Bo-

ron

(B)

0.0
. 0
. 0

. 1
.2
.0

. 0
. 1
.0
.0
.0
. 0

Dissolved solids

(calculated)

Parts

per
million

52

81

Tons

per
acre-

foot

0.07

. 11

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

68
96
77
66
23
31

29
32
27
56
76
53

Non-
car-

bon-

ate

9
17
11
9
5
5

0
1
0
4
18
1

So-

dium
ad-

sorp-
tion
ratio

0.2
.3
.2
.2
.2
.2

. 1
.1
.1
.1
. 2
. 2

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

146
204
169
142
55
69

62
68
62
126
150
118

PH

7.7
7.6
7.5
7.9
6.7
7.1

8.1
7.4
7.2
7.7
7.4
7.8

SACRAMENTO RIVER BASIN Continued

11-4217. FEATHER RIVER BELOW SHANGHAI BEND, NEAR YUBA CITY, CALIF.

LOCATION. At gaging station north of Barry Road, approximately 3 mile's west of Olivehurst, and 5 miles south of Yuba City, Butter County.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Gaging station maintained and operated by State of California Department of Water Resources. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60.

Chemic

Date
of
collection

Oct. 14, 1959.....

Dec. 4. ....
Jan. 7, 1960......

Sept. 15.. ....

Discharge
(cfs)

1.280
1,160
1,420
1,450
22,300
3,570

12,300
6,270
5,720
870
734
1,180

Silica

(SiQ,)

15

13

Iron

(Fe)

0.00

. 03

Cal-

cium

(Ca)

8.0

12

ll analvses. in Darts per mill]

Mag-
ne-

sium

(MB)

3.6

6.7

Sodium

(Na)

6.0
6.1
6.3
6.0
2.0
3.6

2.1
2.1
2.0
4.1
5.1
6.5

Po-
tas-

sium

(K)

0.6

1.3

Bi-
car-

bon-

ate

(HCOS)

76
76
80
79
29
56

41
42
39
76
76
79

Car-
bon-
ate

(CO,)

on. water vear October 195

Sulfate

(S04)

3.0

6.8

Chloride

(CD

4.8
3.5
2.8
3.0
2.8
4.0

1.8
1.2
1.0
2.0
3.0
2.4

Fluo-
ride

(F)

0.1

. 0

Ni-

trate

(Ncg

0.0

. 3

3 to September 1960

Bo-

ron

(B)

0.1
. 0
. 1
. 1
.0

.1

. 0
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

55

88

Tons

per
acre-

foot

0.07

. 12

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

60
56
61
60
27
48

31
35
31
58
62
58

Non-
car-

bon-

ate

0
0
0
0
3
2

0
1
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.3
.4
. 3
.3
.2
.2

. 2
. 2
.2
.2
.3
.4

Specific
con-

duct-

ance

micro-

mhos at

25°C)

134
135
141
139
67
106

72
75
71
130
130
135

PH

7.6
7.5
7.2
7.9
6.7
7.4

7.6
7.4
7.3
7.7
7.4
7.5

SACRAMENTO RIVER BASIN Continued

11-4240. BEAR RIVER NEAR WHEATLAND, CALIF.

LOCATION. Near gaging station at bridge on U.S. Highway 99E, 1 mile southeast of Wheatland, Yuba County, and 6.5 miles downstream from Rock Creek. DRAINAGE AREA. 295 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in W8P 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 14..........

Discharge
(cfs)

8.6
6.5
5.8
19
1,080
15

395
52
45
2.3
1.5
4.2

Silica

(SlQs)

15

21

Iron

(Fe)

0.00

.02

Cal-

cium

(Ca)

13

32

Mag-
ne-

sium

(Mg)

6.3

20

Sodium

(Na)

11
9.0
10
9.0
2.2
5.3

2.3
2.8
3.1
6.5
7.6
8.8

Po-
tas-

sium

(K)

0.6

1.2

Bi-
car-

bon-

ate

(HCO,)

128
131
141
107
31
104

36
57
60
a 141
152
153

Car-
bon-
ate

(CO,)

Sulfate

(S04)

12

36

Chloride

(CD

15
12
12
16
4.0
6.5

4.5
3.5
5.5
16
12
16

Fluo-
ride

(F)

0.1

.0

Ni-

trate

(NO,)

0.0

.1

Bo-

ron

(B)

0.0
.0
.0
. 1
.0
.0

.0
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

81

210

Tons

per
acre-

foot

0.11

.29

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

144
142
154
140
41
126

41
59
60
136
152
161

Non-
car-

bon-

ate

39
35
38
52
16
41

11
12
11
20
27
36

So-

dium
ad-

sorp-
tion
ratio

0.4
.3
.4
.3
.2
.2

.2
.2
.2
.2
.3
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

303
305
339
316
98
278

93
126
140
288
322
319

PH

7.9
7.7
7.8
7.8
6.7
7.6

7.4
7.7
7.7
8.4
8.2
8 1

a Includes equivalent of 8 ppra of carbonate (CO3).

SACRAMENTO RIVER BASIN Continued

11-4249. BEAR RIVER NEAR MOUTH, NEAR RIO OSO, CALIF.

LOCATION. At bridge on Feather River Boulevard 0.3 mile northwest of Rio Oso, gutter County, and approximately 3 miles upstream from mouth. RECORDS AVAILABLE. Chemical analyses: November 1958 to September 1960.
REMARKS. No discharge records available. Stream dry during summer months.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Feb. 16, I960.....

Mean

discharge
(cfs)

Silica

(sicy

22
29
10
16

Iron

(Fe)

0.00

Cal-

cium

(Ca)

14
22
9.6
14

Mag-
ne-

sium

(Mg)

4.6
10
4.4
7.3

Sodium

(Na)

3.7
8.5
2.9
4.8
7.5

Po-
tas-
sium

(K)

1.1
1.6
1.3
1.0

Bl-

ear -

bon-

ate

(HCO,)

44
90
38
66
79

Car-
bon-
ate

(cog

Sulfate

(S04)

16
29
11
17

Chloride

(CD

6.0
10
4.0
6.2
10

Fluo-
ride

(F)

0.2
.0
.2
.0

Ni-

trate

(Ncg

0.6
.4
1.3
.0

Bo-

ron

(B)

0.0
.0
.0

.1
.1

Dissolved solids

(calculated)

Parts

per
million

90
154
64
99;

Tons

per
acre-

foot

0.12
.21
.09
. 13

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

54
98
42
65
73

Non-
car-

bon-

ate

18
24
11
11
8

So-
dium
ad-

sorp-
tion
ratio

0.2
.4
.2
.3
.4

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

126
232
99
152
184

PH

7.2
7.5
7.6
7.6
7.7

SACRAMENTO RIVER BASIN Continued

11-4250. FEATHER RIVER AT NICOLAUS, CALIF.

LOCATION. At gaging station at Nicolaus, gutter County, at highway bridge and 2.9 miles downstream from Bear River. DRAINAGE AREA. 5,920 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: March 1951 to September 1960.
Water temperatures: March 1951 to September 1958, November 1959 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 109 ppm Jan. 19-26; minimum, 49 ppm Mar. 27-31.
Hardness: Maximum, 64 ppm Jan. 19-26; minimum, 31 ppm Mar. 27-31.
Specific conductance: Maximum daily, 183 raicromhos Jan. 25; minimum daily, 57 raicromhos Feb. 9.
Water temperatures: Maximum, 87°F July 21, 22; minimum, 40°F Jan. 5.
EXTREMES, 1951-58, 1959-60. Dissolved solids (1951-55, 1956-58, 1959-60): Maximum, 165 ppm Oct. 8-14, 1957; minimum, 43 ppm May 19-31, 1958. Hardness (1951-55, 1956-58, 1959-60): Maximum, 114 ppm June 21, 1954; minimum, 22 ppm June 1-3, 8, 10, 1952.
Specific conductance (1951-55, 1956-58, 1959-60): Maximum daily, 291 micromhos July 26, 1958; minimum daily, 50 micromhos May 28, 1952.
Water temperatures: Maximum, 87°F July 21, 22, 1960; minimum, 37°F Jan. 27, 1957.
REMARKS. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses

Date
of
collection

Nov. 18-30, 1959..

Jan. 1-18, 1960...

Jan. 27-Feb. 7....

Feb. 13-29........

Mar. 5-26.. ....

Mar. 27-31........

Mean

discharge
(cfs)

1,676
1,493
1,645
2,524
3,342

6,852
61,500
7,864
4,402
18,870

15,940
13,990
10,150
6,303
5,269

5,785
4,732
4,563
2,199
1,313

Silica

(S1Q,)

Iron

(Fe)

Cal-

cium

(Ca)

13
13
13
22
24

18
11
17
11
7.2

7.6
9.6
8.8
11
10

10
10
8.6
9.6
11

Mag-
ne-

sium

(Mg)

7.2
6.7
6.7
.5
1.0

.5
1.8
.4
4.7
3.6

2.9
3.2
3.4
2.6
3.6

2.2
2.9
3.3
4.9
5.8

Sodium

(Na)

5.5
5.7
6.2
6.0
6.2

5.1
2.2
3.6
4.1
2.8

2.4
2.6
2.6
3.0
3.1

3.0
2.9
3.6
4.1
4.8

Po-
tas-

sium

(K)

in parts per million. November 1959 to September 1960

Bi-
car-

bon-

ate

(HCOS)

74
78
74
68
67

49
26
50
60
42

40
38
42
43
46

43
44
49
58
70

Car-
bon-

ate

(cog

Sulfate

(S04)

Chloride

(Cl)

Fluo-
rlde

(P)

Ni-

trate

(NO,)

Bo-

ron

(B)

Dissolved solids

(calculated) a

Parts

per
million

99
102
99
97
109

85
51
74
80
57

49
55
57
57
63

59
62
63
73
87

Tons

per
acre-

foot

0.13
. 14
. 13
. 13
.15

. 12
.07
. 10
. 11
.08

.07
.07
.08
.08
.09

.08
.08
.09
. 10
19

Tons

per

day

448
411
440
661
984

1,570
8,470
1,570
951
2,900

2,110
2,080
1,560
970
896

922
792
776
433
3O8

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

62
60
60
57
64

47
35
44
47
33

31
37
36
38
40

34
37
35
44
f>5>

Non-
car-

bon-

ate

0
0
0
1
9

7
14
3
0
0

0
6
2
3
2

0
1
0
0
n

So-

dium
ad-

sorp-
tion
ratio

0.3
.3
.3
.3
.3

.3
.2
.2
.3
.2

.2
.2
.2
.2
.2

.2
.2
.3
.3
3

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

142
145
142
139
156

121
73
106
114
81

70
79
81
82
90

84
88
90
104

PH

7.1
7.1
7.1
7.4
7.3

7.3
6.9
6.8
7.0
7.3

7.5
7.5
7.0
7.1
7.0

7.5
7.4
6.3
7.1
7 T

a Calculated from specific conductance.

SACRAMENTO RIVER BASIN Continued

11-4335. MIDDLE FORK AMERICAN RIVER NEAR AUBURN, CALIF.

LOCATION. At gaging station 0.5 mile upstream from Mountain Quarry Co. plant, 1.9 miles upstream from mouth, and 3.5 miles northeast of Auburn, Placer County. DRAINAGE AREA. 619 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Dec. 3..... ....

Feb. 15... ....

Sept. 14..........

Discharge
(cfs)

66
53
49
66
1,130
564

3,990
2,980
2,450
195
63
a50

Silica

(sicy

10

14

Iron

(Fe)

0.01

.00

Cal-

cium

(Ca)

2.0

9.6

Mag-
ne-

sium

(Mg)

__

1.3

2.9

Sodium

(Na)

3.4
3.8
3.9
3.6
1.5
1.9

.9
1.0
1.0
1.7
3.7
4.3

Po-
tas-

sium

(K)

0.2

.8

Bi-
car-

bon-

ate

(HCO,)

36
36
37
34
19
26

13
14
12
26
34
41

Car-
bon-
ate

(CO,)

Sulfate

(SO,,)

0.4

5.4

Chloride

(CD

6.2
5.5
5.2
6.2
4.4
2.0

1.5
.8
. 6
3.8
4.8
4.5

Fluo-

ride

(F)

0.0

. 0

Ni-
trate

(NO,)

0.1

. 1

Bo-

ron

(B)

0.0
.0

.1
. 0
.0
.0

.0
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per

-jmillion

23

62

Tons

per
acre-

foot

0.03

.08

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

36
37
37
40
20
22

12
10
9
22
30
36

Non-
car-

bon-

ate

6
7
7
12
4
1

1
0
0
1
2
2

So-

dium
ad-

sorp-
tion
ratio

0.3
.3
.3
.3
.2
.2

. 1
. 1
. 1
.2
.3
. 3

Specific
con-

duct-

ance

rnicro-

mhos at

25°C)

89
94
95
95
49
57

25
27
25
55
79
90

PH

7.3
7.3
7.3
7.4
6.9
7.0

6.6
7.1
6.8
7.4
7.3
7.6

a Daily mean discharge.

SACRAMENTO RIVER BASIN Continued

11-4455. SOUTH FORK AMERICAN RIVER NEAR LOTUS, CALIF.

LOCATION. At gaging station 0.4 mile downstream from Greenwood Creek, 2.4 miles northwest of Lotus, El Dorado County, and 3.3 miles northwest of Coloma. DRAINAGE AREA. 678 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
Water temperatures: December 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 85°F July 20; minimum, 34°F Jan. 2-6.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Mar. 3..... ....

July 7.... ....

Sept. 14..........

Discharge
(cfs)

152
98
a95
130
790
338

2,690
2,120
1,630
192
140
114

Silica

(SiQ,)

9.8

13

Iron

(Fe)

0.02

.05

Cal-

cium

(Ca)

1.8

2.0

Mag-
rie -

slum

(Mg)

0.9

4.6

Sodium

(Na)

2.8
4.1
3.9
3.9
2.1
2.5

1.0
1.3
1.0
2.2
3.5
4.3

Po-
tas-

sium

(K)

0.4

.8

Bi-
car-

bon-

ate

(HCO,)

21
26
30
28
19
26

14
13
11
24
24
30

Car-
bon-

ate

(CO,)

Sulfate

(S04)

0.4

4.6

Chloride

(Cl)

7.2
4.0
6.5
6.0
3.9
4.0

1.5
.4
.4
4.8
5.5
4.2

Fluo-
ride

(F)

0.0

.0

Ni-

trate

(NO,)

0.0

.2

Bo-

ron

(B)

0.0
.0
.5
.0
. 1
.0

. 1
.0
. 0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

21

49

Tons

per
acre-

foot

0.03

.07

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

20
22
28
30
19
25

13
8
8
18
20
24

Non-
car-

bon-

ate

3
1
3
7
3
4

1
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.3
.4
.3
.3
. 2
.2

. 1
.2
. 1
. 2
.3
.4

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

58
61
73
75
52
56

28
26
22
50
54
61

PH

6.9
7.2
7.3
7.5
6.7
7.0

6.7
7.2
6.7
7.3
7.1
7.3

a Daily mean discharge.

SACRAMENTO RIVER BASIN Continued

11-4464. AMERICAN RIVER AT NIMBUS DAM, CALIF.

LOCATION. At dam approximately 1.5 miles east of Fair Oaks, Sacramento County.
RECORDS AVAILABLE. Chemical analyses: November 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 furnished by U.S. Bureau of Reclamation.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Nov. 9............

Jan. 7, 1960......

July 8... ....

Sept. 9...........

Mean

discharge
(cfs)

684
628
604
573
4,210
5,060

3,630
2,100
4,380
3,540
2,510
1,520

Silica

(S1Q.)

8.6
8.5

12

12

Iron

(Fe)

0.04

.00

Cal-

cium

(Ca)

8.0
8.0

6.0

4.8

Mag-
ne-

sium

(Mg)

2.2
2.4

2.2

1.8

Sodium

(Na)

3.1
2.9
3.1
3.2
1.8
1.9

1.7
2.3
1.5
1.5
1.9
2.0

Po-
tas-

sium

(K)

0.5
.8

.6

. 7

Bi-
car-

bon-

ate

(HCOj)

35
33
35
32
24
32

28
28
25
24
24
27

Car-
bon-

ate

(CO,)

Sulfate

(SOJ

2.0
2.0

1.0

1.0

Chloride

(Cl)

4.5
4.8
7.2
3.8
4.8
4.0

3.5
4.5
1.0
2.2
2.5
1.0

Fluo-
ride

(F)

0.1
. 1

. 1

. 0

Ni-

trate

(NOJ

0.0
.4

.3

.2

Bo-

ron

(B)

0.0
. 0
. 0
.0

.1
.0

.1
. 1
.1
.1
.0
. 0

Dissolved solids

(calculated)

Parts

per
million

46
46

43

36

Tons

per
acre-

foot

0.06
.06

.06

. 05

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

29
30
37
36
25
34

28
24
21
20
28
20

Non-
car-

bon-

ate

0
3
8
10
5
8

5
1
1
0
8
0

So-

dium
ad-

sorp-
tion
ratio

0.2
,2
.2
.2
.2
. 1

. 1
.2
.2
. 2
.2
.2

Specific
con-

duct-

ance

[micro-
mhos at

25"C)

91
76
89
82
62
68

60
58
52
50
50
50

pH

7.1
7.2
7.2
7.3
6.6
7.0

7.0
7.2
7.0
7.2
6.9
7.4

SACRAMENTO RIVER BASIN Continued

11-4465. AMERICAN RIVER AT FAIR OAKS, CALIF.

LOCATION. At old highway bridge 2.2 miles downstream from gaging station, 1,500 feet upstream from new highway bridge at Fair Oaks, Sacramento County 2.6 miles downstream from Nimbus Dam, and 10 miles downstream from South Fork.
DRAINAGE AREA. 1,889 square miles.
RECORDS AVAILABLE. Chemical analyses: January to December 1906, March 1951 to September 1958, November 1959 to September 1960.
Water temperatures: March 1951 to September 1958, November 1959 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 54 ppm Jan. 16-31; minimum, 36 ppm July 12-Aug. 31.
Hardness: Maximum, 32 ppm Jan. 1-31, Feb. 1-12 minimum, 20 ppm July 1-11, 21-31, Sept. 1-31.
Specific conductance: Maximum daily, 82 micromhos Feb. 9; minimum daily, 49 micromhos Sept. 1.
Water temperatures: Maximum, 65°F on several days during September; minimum, 43"F Jan. 24.
EXTREMES, 1951-58, 1959-60. Dissolved solids: Maximum, 83 ppm Aug. 11-20, 1954; minimum, 27 ppm June 4-30, Aug. 2-31, 1958.
Hardness: Maximum, 41 ppm Aug. 1 to Sept. 10, 1951, Nov. 21-30, 1952, Aug. 11-20, 1954; minimum, 12 ppm May 24-31, 1958.
Specific conductance: Maximum daily, 112 micromhos Aug. 28, 1951; minimum daily, 29 micromhos June 3, 1952.
Water temperatures: Maximum, 81°F July 27, Aug. 3, 1954; minimum, freezing point Nov. 25, 26, 1957, Nov. 25-29, 1958.
REMARKS. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, November 1959 to September 1960

Date
of
collection

Dec. 16-31........
Jan. 1-15, 1960...

May 21-31.........

Mean

discharge
(cfs)

770
630
604
572
601

2,200
3,044
3,319
4,219
3,630

3,398
2,608
2,104
2,103
1,533

Silica

(S1Q,)

Iron

(Fe)

Cal-

cium

(Ca)

8.0
8.0
7.2
8.0
8.8

8.2
7.6
12
10
7.2

7.2
6.4
4.8
4.8
5.6

Mag-
ne-

sium

(Mg)

2.7
2.7
2.9
2.9
2.4

2.8
2.2
.0
.2
1.9

1.7
1.9
2.2
2.9
2.4

Sodium

(Na)

2.6
2.6
2.6
2.8
2.6

2.4
2.1
2.4
2.1
2.2

1.9
2.1
1.9
1.9
1.9

Po-
tas-

sium

(K)

1.1
. 7
.8

Bi-
car-

bon-

ate

(HCO,)

29
31
31
34
34

16
24
28
26
32

31
30
29
29
29

Car-
bon-

ate

(CO,)

Sulfate

(S04)

7.0
6.0
3.0

"

_

Chloride

(CD

4.2
4.0
4.8

Fluo-

ride

(F)

0.0
. 0
.0

::

Ni-

trate

(NO,)

1.6
.9
1.3

Bo-

ron

(B)

0.0
. 0
. 0

Dissolved solids

(calculated) a

Parts

per
million

52
51
52
55
54

53
44
48
44
45

41
42
41
39
38

Tons

per
acre-

foot

0.07
. 07
.07
.07
.07

. 06
. 06
.07
.06
.06

.06
.06
.06
.05
.05

Tons

per

day

108
86.8
84.8
84.9
87.6

315
362
430
501
441

376
296
233
221
157

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

31
31
30
32
32

32
28
30
26
26

25
24
21
24
24

Non-
car-

bon-

ate

7
6
5
4
4

19
8
7
5
0

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.2
.2
.2
. 2
. 2

.2
.2
.2
. 2
. 2

.2
.2
. 2
. 2
.2

Specific
con-

duct-

ance

micro-

mhos at

25°C)

74
73
74
78
77

76
63
69
63
64

59
60
58
56
54

pH

6.6
6.7
6.7
6.8
7.4

6.4
7.2
7.2
7.0
7.4

7.2
7.2
7.1
7.2
7.2

SACRAMENTO RIVER BASIN Continued

11-4470. AMERICAN RIVER AT SACRAMENTO, CALIF.

LOCATION (revised). At site of former gaging station at H Street Bridge, east of Sacramento, Sacramento County, and 6.5 miles upstream from mouth. RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715 as American River at Fair Oaks. No appreciable inflow between sampling point and gaging station.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Mean

discharge
(eta)

684
628
604
573
3,540
1,570

3,630
2,100
4,380
3,540
2,510
1,520

Slliea

(SiQ.)

12

12

Iron

(Fe)

0.05

.00

Cal-

cium

(Ca)

6.4

5.2

Mag-
ne-

sium

(Mg)

2.4

1.8

Sodium

(Na)

3.0
3.3
3.0
3.1
1.8
1.9

1.9
1.9
1.6
1.4
1.9
2.2

Po-
tas-

sium

(K)

0.5

. 7

Bi-
car-

bon-

ate

(HCOJ

32
30
33
32
24
30

30
30
25
27
25
28

Car-

bon-
ate

(CO,)

Sulfate

(SO.)

2.0

2.0

Chloride

(CD

5.8
4.5
3.5
3.5
4.0
2.0

3.0
3.0
2.4
1.5
2.0
1.2

Fluo-

ride

(F)

0.1

.0

Ni-
trate

(NO,)

0.2

. 3

Bo-

ron

(B)

0.0
.0
.0
.0
.0
. 0

. 1
.1
.1
. 0

.1
.0

Dissolved solids

(calculated)

Parts

per
million

44

39

Tons

per
acre-

foot

0.06

.05

Tons

per

day

Hardness

as CaCOj,

Cal-

cium,
Mag-
ne-

sium

31
31
32
36
24
30

30
26
22
22
26
20

Non-
car-

bon-

ate

5
6
5
10
4
5

5
1
2
0
6
0

So-

dium
ad-

sorp-
tion
ratio

0.2
.3

'.2

.2
.2
. 1

. 1
.2
. 1
. 1
. 2
.2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

71
77
73
77
60
67

61
56
54
50
52
53

PH

7.1
6.7
7.1
7.8
6.9
7.0

7.1
7.2
7.0
7.3
7.0
7.4

SACRAMENTO RIVER BASIN Continued

11-4475. SACRAMENTO RIVER AT SACRAMENTO, CALIF.

LOCATION. At Tower Bridge, 0.6 mile downstream from gaging station at Sacramento, Sacramento County, and approximately 1.3 miles downstream from confluence with American River.
RECORDS AVAILABLE. Chemical analyses: October 1952 to May 1960 (discontinued).
Water temperatures: May 1955 to September 1960.
Sediment records: October 1956 to September 1960.
EXTREMES 1959-60. Sediment concentrations: Maximum daily, 865 ppm Feb. 9; minimum daily, (est.) 11 ppm Nov. JO.
Sediment loads: Maximum daily, 147,000 tons Feb. 9; minimum daily, (est.) 200 tons Dec. 14.
EXTREMES, 1955-60. Dissolved solids: Maximum (1955-59), 164 ppm Apr. 12, 1959; minimum (1955-60), 41 ppm Feb. 26-28, 1957.
Hardness: Maximum (1955-59), 88 ppm Sept. 11-20, 1959; minimum (1955-60) 22 ppm Dec 22-31, 1955
Specific conductance: Maximum daily (1955-59), 277 micromhos Apr. 12, 1959; minimum daily (1955-60) 47 micromhos Dec. 26, 1955.
Water temperatures: Maximum (1955-59), 78°F June 21, 1957; minimum (1955-60), 39°F Jan. 30, 31, Feb. 1, 1957.
Sediment concentrations (1956-60): Maximum daily, 865 ppm Feb. 9, 1960; minimum daily, (est.) 11 ppm Nov. 30, 1959.
Sediment loads (1956-60): Maximum daily, 147,000 tons Feb. 9, 1960; minimum daily, (est.) 200 tons Dec. 14, 1959.
REMARKS. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No appreciable inflow between gaging station and sampling point except during periods of high local runoff.

Chemical analys in parts per million, October 1959 to May 1960

Date
of
collection

Oct. 1-10, 1959...

Jan. 1-10, 1960...

Jan. 27-31. ....

Mean

discharge
(cfs)

8,293
7,834
7,661
7,483
7,218
7,324

6,950
6,726
7,880
7,967
10,770
18.340

Silica

(S1Q,)

26
25
25
27
24
25

27
25
25

Iron

(Fe)

0.00
. 00
.00
.01
.00
.00

. 00
.00
.00
.03
. 06

Cal-

cium

(Ca)

17
16
15
15
16
13

14
14
15
14
12
11

Mag-
ne-

sium

(Mg)

7.7
7.3
8.4
8.9
8.5
7.5

7.7
8.0
7.4
7.3
9.4
6.4

Sodium

(Na)

13
11
12
12
13
11

11
12
13
13
12
9.9

Po-
tas-

sium

(K)

.8
. 7
.8
.8
.8
. 3

.4
.4
1.4
2.0
2.1
1.9

Bi-
car-

bon-

ate

(HCO,)

93
89
90
94
91
88

88
92
90
92
85
64

Car-
bon-

ate

(CO,)

Sulfate

(S04)

10
7.0
"8.0
7.0
9.0
8.0

11
9.0
11
12
14
10

Chloride

(Cl)

11
10
12
12
16
6.8

5.8
8.0
8.0
7.0
11
11

Fluo-
ride

(F)

0.1
. 1
. 1
. 1
. 1
. 0

.2
. 1
. 0
. 1
. 1
. 1

Ni-

trate

(NO,)

0.2
.0
.2
.2
.2
. 0

. 3
. 1
.6
. 5
. 8
1.3

Bo-

ron

(B)

0.0
.0

.1
.1
.0
.0

. 0
.0

.1
.1
.1
.1

Dissolved solids

(residue at 180°C)

Parts

per
million

128
119
119
128
129
107

122
125
134
129
126

Tons

per
acre-

foot

0.17
. 16
. 16
. 17
. 18
. 15

. 17
. 17
. 18
. 15
. 17

Tons

per

day

2,870
2,520
2,460
2,590
2,510
2,120

2,290
2,270
2,850
2,770
3,660

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

74
70
72
74
75
64

66
68
68
65
68
54

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
2

So-

dium
ad-

sorp-
tion
ratio

0.7
. 6

'.6

.6
.7
.6

. 6
.6
. 7
.7
.6
.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

192
179
182
178
181
180

193
190
198
195
196
146

PH

6.9
7.1
7.1
7.9
7.9
7.8

6.7
7.0
6.8
7.2
7.7
7 0

SACRAMENTO RIVER BASIN Continued

11-4500. CLEAR LAKE AT LAKEPORT, CALIF.

LOCATION. At foot of Third Street near municipal wharf in Lakeport, Lake County.
DRAINAGE AREA. 528 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of gage height for water year October 1959 to September 1960 given in TOP 1715.

Chemical an

Date
of
collection

Sept. 14..........

Mean

discharge
(eta)

Silica

(SiQs)

14

9.9

Iron

(Fe)

0.00

.01

Cal-

cium

(Ca)

20

22

Mag-
ne-

sium

(Mg)

i

13

15

ilvses. in ca

Sodium

(Na)

12
11
12
10
9.6
8.7

8.3
7.8
8.8
8.9
10
11

Po-
tas-

sium

(K)

2.2

1.7

fts oer million, water year (

Bi-
car-

bon-

ate

(HC03)

165
157
149
148
132
124

131
138
145
152
156
158

Car-
bon-

ate

(CO,)

Sulfate

(S04)

6.0

6.0

Chloride

(CD

7.5
5.8
6.5
8.0
10
6.0

5.0
4.8
7.8
6.0
8.0
6.8

October 19

Fluo-

rlde

(F)

0.1

. 1

Ni-

trate

(NO,)

__

0.9

4.6

59 to September 1960

Bo-

ron

(B)

0.8
.6
.8
.8
.6
.6

.8
1.2
.7
.8
.7
.8

Dissolved solids

(calculated)

Parts

per
million

138

156

Tons

per
acre-

foot

0.19

.21

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

121
119
123
118
112
98

104
103
109
113
118
118

Non-
car-

bon-

ate

0
0
1
0
4
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.5
.4
. 5
.4
.4
.4

.4
.3
.4
.4
.4
.4

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

289
274
263
262
243
222

232
235
243
252
263
276

PH

7.1
7.6
7.6
7.7
8.0
7.5

7.7
7.9
8.2
7.7
7.9
8.2

SACRAMENTO RIVER BASIN Continued

11-4510. CACHE CREEK NEAR LOWER LAKE, CALIF.

LOCATION. At gaging station 500 feet downstream from Clear Lake Dam, 1.9 miles downstream from Copsey Creek, and 2.5 miles northeast of Lower Lake, Lake County.
DRAINAGE AREA. 528 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 14, 1959.....

May 10. ....

Sept. 14..........

Discharge
(cfs)

30
1.6
a2.0
al.O
1.2
3.4

86
300
456
377
374
149

Silica

(SiQ,)

12

2.0

Iron

(Fe)

0.00

.02

Cal-

cium

(Ca)

22

23

Mag-
ne-

sium

(Mg)

18

16

Sodium

(Na)

12
13
13
13
12
9.9

11
9.6
9.9
9.4
11
12

Po-
tas-

sium

(K)

2.5

2.1

Bl-

car-

bon-

ate

(HCOS)

164
166
167
177
147
102

115
159
156
160
164
b!70

Car-
bon-
ate

(CO,)

Sulfate

(S04)

10

9.8

Chloride

(Cl)

11
6.2
6.5
9.0
14
6.0

6.5
5.8
5.0
6.0
10
5.8

Fluo-
ride

(F)

0.1

. 2

Ni-

trate

(NOJ

1.1

.6

Bo-

ron

(B)

1.0
1.0
.9
1.0
.8
.4

.4
.9
.8
.9
. 8
. 9

Dissolved solids

(calculated)

Parts

per
million

160

156

Tons

per
acre-

foot

0.22

.21

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

126
128
134
137
125
91

106
129
113
117
126
125

Non-
car-

bon-

ate

0
0
0
0
4
7

12
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.5
. 5
. 5
.5
. 5
. 5

. 5
.4
.4
.4
.4
. 5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

281
292
292
307
271
224

258
270
261
263
272
282

PH

7.7
7.9
7.8
7.9
8.0
7.1

7.3
7.7
7.9
7.9
8.0
8.3

a Daily mean discharge.
b Includes equivalent of 2 ppm of carbonate (CO3).

SACRAMENTO RIVER BASIN Continued

11-4515. NORTH FORK CACHE CREEK NEAR LOWER LAKE, CALIF.

LOCATION. At bridge on State Highway 20, 3 miles downstream from gaging station, 2 miles upstream from confluence with Cache Creek, and 6.5 miles northeast of Lower Lake, Lake County.
DRAINAGE AREA. 198 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Miscellaneous suspended-sediment samples collected at gaging station. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. Some inflow between gaging station and sampling point during rainy season.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Dec. 3.. ....
Jan. 13, I960.....

Sept. 14..........

Discharge
(cfs)

1.4
1.6
2.3
42
328
455

90
54
25
4.3
3.3
.8

Silica

(SiQs)

20

22

Iron

(Fe)

o.oo

.00

Cal-

cium

(Ca)

27

35

Mag-
ne-

sium

(Mg)

24

29

Sodium

(Na)

53
46
61
69
20
9.1

20
25
28
35
37
39

Po-
tas-

sium

(K)

1.7

2.3

Bi-
car-

bon-

ate

(HCO,)

210
260
229
262
139
113

200
217
203
205
230
241

Car-
bon-
ate

(CO,)

8
0
0
5
0
0

0
0
10
11
0
0

Sulfate

(S04)

16

.0

Chloride

(CD

84
90
85
132
28
7.0

21
23
31
48
50
66

FluO-
rlde

(F)

0.1

. 1

Ni-

trate

(NO,)

0.4

.0

Bo-

ron

(B)

5.6
4.0
6.2
6.6
1.7
.6

1.8
2.1
3.0
3.4
3.9
6.2

Dissolved solids

(calculated)

Parts

per
million

246

319

Tons

per
acre-

foot

::

0.33

.43

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

202
266
211
300
128
88

154
165
169
180
186
206

Non-
car-

bon-

ate

17
53
23
77
14
0

0
0
0
0
0
8

So-

dium
ad-

sorp-
tion
ratio

1.6
1.2
1.8
1.7
.8
.4

.7
.8
.9
1.1
1.2
1.2

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

610
694
636
862
313
209

378
408
441
487
515
558

PH

8.3
8.0
8.2
8 3

s!o
7.8

8.2
8.2
8.3
8.4
8.2
8.2

SACRAMENTO RIVER BASIN Continued

11-4517.6. CACHE CREEK ABOVE RUMSEY, CALIF.

LOCATION. At gaging station, 0.4 mile downstream from highway bridge, and 2.5 miles northwest of Rumsey, Yolo County. DRAINAGE AREA. 954 square miles.
RECORDS AVAILABLE. Water temperatures: January to September 1960.
Sediment records: January to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in State of California Bulletin No. 23-60.

Temperature (°F) of water. January to September 1960

Month

October . ....
November ..
December ..

January . ....
February ....
March ....

August ....
September ..

Day

1

50
45

55
61

74

2

45
45

5V

3

49
48

4

45
50

5

48
52

6

52
53

7

54
54

8

53
48

\

9

48
50

10

47
46

11

45
50

12

46
51

13

36
48
43

14

38
46
49

15

37
46
4d

16

35
47
51

17

35
45
55

18

40
47
55

19

39
45
54

20

41
46
56

21

43
45
55

22

45
45
56

23

45
45
57

24

47
43
58

25

49
45
59

26

48
45
57

27

48
44
57

28

50
44
52

29

48
43
52

30

49

56

31

46

53

-

Aver-

age

47
52

SACRAMENTO RIVER BASIN Continued

11-4520. CACHE CREEK NEAR CAPAY, CALIF.

LOCATION. At gaging station, 1.8 miles upstream from Clear Lake Water Company's diversion dam, 3.2 miles northwest of Capay, Yolo County, and 5.4 miles northwest of Esparto.
DRAINAGE AREA. 1,052 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1952 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, wate October 1955 to September 1960

Date
of
collection

July 14...........

Sept. 13..........

Discharge
(cfs)

33
6.1
6.5
57
31
670
1,110

112
339
488
324
387
130

SUlca

(sicg

18

14

10

Iron

(Fe)

"

0.00

.00

Cal-

cium

(Ca)

55

27

30

Mag-
ne-

sium

(Mg)

43

25

19

Sodium

(Na)

44
63
73
106
89
37
17

49
27
17
18
15
24

Po-
tas-

sium

(K)

3.7

3.0

2.6

Bi-
car-

bon-

ate

(HCOS)

238
286
a302

285
177
125

b260
210
181
182
3179
202

Car-
bon-

ate

(CO,)

Sulfate

(S04)

39

18

5.0

Chloride

(Cl)

55
84
92
200
160
57
19

62
28
13
18
9.0
24

FluO-

rlde

(P)

0.1

. 3

. 1

Ni-

trate

(NO,)

1.8

.4

.0

Bo-

ron

(B)

1.5
1.7
1.6
4.5
4.1
1.8
.8

2.1
1.5
1.3
1.2
1.4
1.5

Dissolved solids

(calculated)

Parts

per
million

554

247

216

Tons

per
acre-

foot

0.75

.34

.29

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

202
244
276
355
312
167
102

222
171
134
134
130
153

Non-
car-

bon-

ate

7
9
28

78
22
0

9
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.3
1.8
1.9
2.4
2.2
1.3
. 7

1.4
.9
. 6
. 7
.6
.8

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

546
718
761
1,140
959
481
274

621
420
323
319
306
371

PH

8.1
8.0
8.4

8.2
8.2
7.8

8.4
7.9
8.1
8.1
8.3
8.2

a Includes equivalent of 6 ppm of carbonate (CO3). b Includes equivalent of 8 ppm of carbonate (CO3)

SACRAMENTO RIVER BASIN Continued

11-4525. CACHE CREEK AT YOLO, CALIF.

LOCATION. At gaging station, 800 feet upstream from highway bridge, and 0.5 mile south of Yolo, Yolo County.
DRAINAGE AREA. 1,137 square miles.
RECORDS AVAILABLE. Water temperatures: October 1958 to September i960.
Sediment records: October 1958 to September 1960.
EXTREMES, 1959-60. Sediment concentrations: Maximum daily, 4,540 ppm Feb. 8; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 118,000 tons Feb 8; minimum daily, 0 ton on many days.
EXTREMES, 1958-60. Sediment concentrations: Maximum daily, 6,130 ppm Feb. 17, 1959; minimum daily, no flow on many days each year Sediment loads: Maximum daily, 184,000 tons Feb. 17, 1959; minimum daily, 0 ton on many days each year.
REMARKS. No flow October to December, July to September; tabulation omitted for that period. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Temperature (°F) of water, water year October 1959 to September 1960

February ....

1 2

54

3

49

4 5

50

6

57

7

56

8

59

9

54

10

55

11

56

12

53

13

56

14

57

15

57

Day

16

57

17

58

18

58

19

58

20

56

21

58

22

55

23

54

24

60

25

59

26

59

27 28 29 30

-

31

-

Aver-
age

56

SACRAMENTO RIVER BASIN Continued

11-4540. PUTAH CREEK NEAR WINTERS, CALIF.

LOCATION. At gaging station 1 mile downstream from Monticello Dam, 6 miles west of Winters, Yolo County, and 8 miles downstream from Capell Creek. DRAINAGE AREA. 577 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1952 to September 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September I960

Date
of
collection

Dec. 4.. ....

May 11. ....

Sept. 15.... ......

Discharge
(cfs)

14
64
12
11
14
73

118
155
329
344
352
148

Silica

(SiQ,)

_

17

20

Iron

(Fe)

0.00

.02

Cal-

cium

(Ca)

19

20

Mag-
ne-

sium

(Mg)

27

25

Sodium

(Na)

ll
10
13
14
25
10

8.2
7.7
7.5
8.2
8.5
8.5

Po-
tas-

sium

(K)

2.1

1.7

Bi-
car-

bon-

ate

(HCOS)

185
179
187
197
184
192

188
188
al86
184
b!83
186

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

17

9.0

Chloride

(Cl)

10
5.2
7.8
14
34
7.5

7.5
5.0
4.0
9.0
5.0
7.0

Fluo-
rlde

(F)

0.1

.2

Ni-

trate

(NOJ

0.4

1.0

Bo-

ron

(B)

0.2
. 1
.2
.3
.4
. 2

. 1
. 1
.2
. 2
. 2
. 1

Dissolved solids

(calculated)

Parts

per
million

188

185

Tons

per
acre-

foot

0.26

.25

Tons

per

day

Harduess

as CaCOj

Cal-

cium,
Mag-
ne-

sium

162
150
153
166
179
164

153
156
147
149
151
153

Non-
car-

bon-

ate

10
3
0
4
28
7

0
2
0
0
1
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
. 5
.5
.8
. 3

.3
.3
.3
. 3
. 3
.3

Specific
con-

duct-

ance

[micro-
mhos at

25"C)

318
303
318
364
416
334

323
313
303
306
307
305

pH

7.9
7.8
8.2
8.1
8.2
8.2

8.2
7.9
8.3
8.2
8.3
8.1

a Includes equivalent of 7 ppm of carbonate (CO3). b Includes equivalent of 5 ppm of carbonate (CO3).

SACRAMENTO RIVER BASIN Continued

11-4553. LINDSAY SLOUGH NEAR RIO VISTA, CALIF.

LOCATION. Near tidal gaging station, 6 miles north of Rio Vista, Solano County, and 1.1 miles upstream from confluence with Cache Slough. RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Tidal gaging station maintained and operated by State of California Department of Water Resources.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

July 11.......... .

Sept. 5.... ....

Mean

discharge
(eta)

Silica

(sicg

18

20

Iron

(Fe)

0.09

.01

Cal-

cium

(Ca)

13

15

Mag-
ne-

sium

(Mg)

7.4

8.6

Sodium

(Na)

17
14
14
15
15

11
12
16
12
13
19

Po-
tas-

sium

(K)

1.5

1.3

Bi-
car-

bon-

ate

(HCO,)

102
98
97
100
86

74
78
98
67
88
106

Car-
bon-

ate

(ccg

Sulfate

(S0«)

14

11

Chloride

(Cl)

14
13
9.8
10
14

10
10
13
9.5
9.4
11

Fluo-

rlde

(F)

0.1

.0

Ni-

trate

(NO,)

0.6

1.0

Bo-

ron

(B)

0.2
. 1
. 0
. 1
.0

. 1
. 1
. 2
. 1
. 0
.0

Dissolved solids

(calculated)

Parts

per
million

115

139

Tons

per
acre-

foot

0.16

. 19

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

81
74
71
74
74

61
63
76
65
65
73

Non-
car-

bon-

ate

0
0
0
0
3

0
0
0
10
0
0

So-

dium
ad-

sorp-
tion
ratio

0.8
. 7
. 7
.8
. 8

.6
. 7
.8
. 6
. 7
1.0

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

220
202
197
212
213

172
180
219
184
186
217

PH

7.4
7.5
7.5
7.1
7.4

7.5
7.4
7.8
7.8
7.9
7.5

SACRAMENTO RIVER BASIN Continued

11-4554. SACRAMENTO RIVER NEAR RIO VISTA, CALIF.

LOCATION. At pier, 1,500 feet upstream from tidal gaging station, 1 mile south of Rio Vista, Solano County, Steamboat Slough.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Tidal gaging station maintained and operated by State of California Department of Water Resources

and approximately 3.1 miles downstream from

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Mean

discharge
(cfs)

Silica

(SIQ,)

19

19

Iron

(Fe)

0.05

Cal-

cium

(Ca)

14

13

Mag-
ne-

sium

(Mg)

6.6

9.5

Sodium

(Na)

13
14
14
12
13

6.5
11
12
12
13
19

Po-
tas-

sium

(K)

1.2

1.0

Bi-
car-

bon-

ate

(HCO,)

92
90
92
68
86

57
71
78
81
78
107

Car-
bon-
ate

(CO,)

Sullate

(SO.)

14

12

Chloride

(Cl)

9.0
9.5
14
11
12

4.5
9.8
10
10
10
12

Fluo-
ride

(F)

0.1

.2

Ni-

trate

(NO,)

0.5

.0

Bo-

ron

(B)

0.0
.1
.0
.3
. 1

.0
.1
.1
.0
.1
.2

Dissolved solids

(calculated)

Parts

per
million

ill

139

Tons

per
acre-

foot

0.15

. 19

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

68
78
77
68
75

49
62
60
63
66
72

Non-
car-

bon-

ate

0
4
2
12
4

2
4
0
0
2
0

So-

dium
ad-

sorp-
tion
ratio

0.7
. 7
.7
.6
. 7

.4
.6
. 7
. 7
. 7
1.0

Specific
con-

duct-

ance

Imicro-

mhos at

25°C)

194
201
211
163
205

124
162
173
183
175
218

PH

7.6
7.6
7.5
7.1
7.5

7.2
7.5
7.6
7.8
7.8
8.1

NAPA RIVER BASIN

11-4560. NAPA RIVER NEAR ST. HELENA, CALIF.

LOCATION (revised). At gaging station, 0.2 mile upstream from highway bridge, 1.3 miles northeast of Zinfandel, and 2.5 miles east of St. Helena, Napa County. DRUNAGE AREA. 81.3 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
Water temperatures: October 1957 to September 1960.
Sediment records: December 1956 to September 1960.
EXTREMES, 1959-60. Sediment concentrations: Maximum daily, 2,310 ppm Feb. 8; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 39,600 tons Feb. 8; minimum daily, 0 ton on many days.
EXTREMES, 1956-60. Sediment concentrations: Maximum daily, 2,310 ppm Feb. 8, 1960; minimum daily, no flow on many days in 1957, 1959-60. Sediment loads: Maximum daily, 39,600 tons Feb. 8, 1960; minimum daily, 0 ton on many days in 1957, 1959-60.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

May 11 .

Discharge
(cfs)

0.8
.6
1.0
9.8
151
158

29
16
3.2
.6
.4
.4

Silica

(sicg

44

33

Iron

(Fe)

"

0.00

.00

Cal-

cium

(Ca)

20

34

Mag-
ne-

sium

(Mg)

11

18

Sodium

(Na)

21
21
22
36
9.9
9.6

16
19
20
18
19
20

Po-
tas-

sium

(K)

3.8

2.9

Bl-

car-

bon-

ate

(HC03)

187
196
177
120
70
64

107
122
156
186
192
203

Car-
bon-
ate

(CO,)

Sulfate

(S04)

18

9.0

Chloride

(CD

28
16
34
47
13
7.8

14
19
17
14
14
17

Fluo-
ride

(P)

0.1

.2

Ni-
trate

(NO,)

2.5

.8

Bo-

ron

(B)

0.5
.4
.6
1.5
.2
.2

.5
.7
.6
.4
.4
.4

Dissolved solids

(calculated)

Parts

per
million

198

235

Tons

per
acre-

foot

I
0.27

.32

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

153
153
158
111
60
56

89
96
128
144
148
157

Non-
car-

bon-

ate

0
0
13
13
3
4

1
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.7
. 7
.8
1.5
.6
.6

.7
.8
.8
.6
. 7
.7

Specific
con-

duct-

ance

Imlcro-

mhos at

25°C)

379
381
395
399
163
161

244
289
339
348
361
367

PH

7.8
7.8
8.0
7.1
7.5
7.2

7.5
7.6
7.6
7.8
7.8
7.7

RUSSIAN RIVER BASIN

11-4625. RUSSIAN RIVER NEAR HQPLAND, CALIF.

LOCATION. At gaging station in Eancho de Sanel Grant, 0.2 mile downstream from McNab Creek, 4 miles north of Hopland, Mendocino County, and 17 miles upstream fron Sulfur Creek.
DRAINAGE AREA. 362 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 14..........

Discharge
(cfs)

322
315
318
al96
776
1,560

716
349
180
227
217
193

Silica

(S1Q.)

12

14

Iron

(Fe)

0.06

.00

Cal-

cium

(Ca)

18

17

Mag-
ne-

sium

(Mg)

7.5

9.6

Sodium

" (Na)

4.3
7.0
7.6
12
6.6
5.6

5.1
5.7
6.0
5.4
14
8.0

Po-
tas-

sium

(K)

1.2

1.0

Bi-
car-

bon-

ate

(HCO,)

99
101
110
118
68
78

82
93
97
92
96
104

Car-
bon-
ate

(CO,)

Sulfate

(S04)

9.0

8.0

Chloride

(Cl)

5.2
3.2
4.0
10
9.0
6.2

4.8
4.5
7.0
6.0
4.5
4.0

Fluo-
rlde

(F)

0.0

.0

Ni-

trate

(NO,)

1.3

.6

Bo-

ron

(B)

0.2
.3
. 5
. 7
. 1
.2

. 2
. 3
. 3
. 1
.3
. 3

Dissolved solids

(calculated)

Parts

per
million

106

114

Tons

per
acre-

foot

0.14

. 16

Tons

per

day

Harduess

as CaCO,

Cal-

cium,
Mag-
ne-

sium

81
80
88
97
66
70

71
76
79
81
60
82

Non-
car-

bon-

ate

0
0
0
0
10
6

4
0
0
6
0
0

So-

dium
ad-

sorp-
tion
ratio

0.2
- 3
.4
. 5
.4
.3

. 3
. 3
.3
.3
.8
.4

Specific
con-

duct-

ance

[micro-
mhos at

25'C)

179
183
192
223
145
162

162
168
180
170
172
183

PH

7.7
7.9
7.5
7.4
7.2
7.4

7.5
7.9
7.8
7.7

7.8

a Daily mean discharge.

RUSSIAN RIVER BASIN Continued

11-4640. RUSSIAN RIVER NEAR HEALDSBURG, CALIF.

LOCATION. At gaging station in Sotoyome Grant, 2 miles east of Healdsburg, Sonoma County, and 3.5 miles upstream from Dry Creek. DRAINAGE AREA. 791 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 15, 1959.....

Discharge
(cfs)

313
313
337
300
2,440
4,580

1,030
630
a205
a200
a210
a!55

Silica

(SiQ,)

_

15

17

Iron

(Fe)

0.02

.00

Cal-

cium

(Ca)

23

23

Mag-
ne-

sium

(Mg)

,13

13

Sodium

(Na)

7.2
19
7.7
8.7
6.4
5.3

6.1
7.3
7.5
7.4
8.0
9.8

Po-
tas-

sium

(K)

1.3

1.0

Bi-
car-

bon-

ate

(HCO,)

128
179
128
130
91
92

116
135
149
146
134
143

Car-
bon-

ate

(CO,)

Sulfate

(S0«)

-

11

9.0

Chloride

(CD

6.0
14
5.2
6.0
8.0
5.5

6.0
5.0
6.8
4.0
4.8
4.8

Fluo-

ride

(F)

0.0

.1

Ni-

trate

(NO,)

_

i.l

. 0

Bo-

ron

(B)

0.4
.4
. 5
.4
. 1
.2

. 3
. 3
. 5
.4
.3
.5

Dissolved solids

(calculated)

Parts

per
million

_

144

148

Tons

per
acre-

foot

0.20

. 20

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

103
142
105
120
83
80

98
109
122
118
103
113

Non-
car-

bon-

ate

0
0
0
13
8
5

3
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.3

.3
. 3
.3
.3

.3
. 3
. 3
. 3
'.4

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

224
344
227
253
180
182

214
233
257
246
234
248

pH

7.9
8.0
7.8
7.6
7.5
7.6

8.0
8.1
7.9
8.2
8.1
8.2

a Daily mean discharge.

RUSSIAN RIVER BASIN Continued

11-4670. RUSSIAN RIVER AT GUERNEVILLE, CALIF.

LOCATION. At bridge on State Highway 12 in Guerneyville, Sonoma County, 5.3 miles downstream
DRAINAGE AREA. 1,342 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715 as Russian River near Guernevill

gaging station, and 6.5 miles upstream from Austin Creek.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Dec. 8............

Aug. 1............
Sept. 15. ....

Discharge
(cfs)

207
328
285
420
49,600
16,100

1,700
660
386
202
b!75
165

Silica

(S1Q,)

16

18

Iron

(Fe)

0.02

. 00

Cal-

cium

(Ca)

23

24

Mag-
ne-

sium

(Mg)

14

15

Sodium

(Na)

10
8.1
9.6
15
2.9
4.9

7.1
8.7
8.4
6.8
8.9
10

Po-
tas-

sium

(K)

1.5

1.1

Bi-
car-

bon-

ate

(HCO,)

165
137
144
132
41
64

124
144
150
al56
146
153

bon-

ate

(CO,)

Sulfate

(S04)

13

11

Chloride

(Cl)

7.0
5.1
10
13
5.0
6.2

7.5
6.2
8.0
5.5
6.0
5.0

Fluo-
ride

(F)

0.0

.0

Ni-
trate

(NO,)

1.0

.0

Bo-

ron

(B)

0.5
.4
.3
.4
. 0
. 1

.3
.4
.4
. 3
.4
.4

Dissolved solids

(calculated)

Parts

per
million

155

160

Tons

per
acre-

foot

0.21

.22

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

132
108
118
113
40
58

107
116
119
122
116
121

Non-
car-

bon-

ate

0
0
0
5
6
6

5
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.3
.4
. 6
. 2
.3

.3
.4
. 3
. 3
.4
.4

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

285
238
256
268
86
139

228
253
259
264
262
263

pH

8.1
8.0
8.2
7.3
7.8
7.2

7.9
7.8
7.8
8.3
8.0
8.1

a Includes equivalent of 6 ppm of carbonate (CO3). b Daily mean discharge.

GUALALA RIVER BASIN

11-4675. SOUTH FORK GUALALA RIVER NEAR ANNAPOLIS, CALIF.

LOCATION. Approximately 40O feet downstream from gaging station, 1,400 feet downstream from Wheatfield Fork Gualala River, and 4.8 miles west of Annapolis, Sonoma County.
DRAINAGE AREA. 161 square miles.
RECORDS AVAILABLE. Chemical analyses: January 1959 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September I960

Date
of
collection

Nov. 2............

Mar. 7.. ....

Apr. 4............

Sept. 12..........

Discharge
(cfs)

13
7.0
6.6
218
19,800
9,600

317
71
41
17
7.5
6.2

Silica

(sicg

16
14
16

14

15

Iron

(Fe)

0.02

.00

Cal-

cium

(Ca)

32
28
30

24

26

Mag-
ne-

sium

(Mg)

15
14
13

9.7

14

Sodium

(Na)

17
15
17
13
3.6
4.2

7.5
9.8
12
12
14
13

Po-
tas-
sium

<K)

1.8
1.4
3.0

1.3

1.4

Bi-
car-

bon-

ate

(HCO,)

170
158
165
114
36
36

94
126
146
a!54
152
b!65

Car-
bon-
ate

(CO,)

Sulfate

(S04)

19
13
12

9.0

7.0

Chloride

(Cl)

14
8.5
14
9.0
7.0
5.8

8.0
9.5
11
9.5
9.0
7.8

Fluo-
ride

(F)

0.1
. 1
.0

.0

.0

Ni-
trate

(NOJ

0.0
.0
.0

.3

.2

Bo-

ron

(B)

0.1
. 1
. 1
. 1
.0
.0

.0
.2
. 1
.0
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

199
172
186

140

166

Tons

per
acre-

ioot

0.27
.23
.25

. 19

.23

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

140
126
130
99
31
36

81
100
110
116
111
121

Non-
car-

bon-

ate

1
0
0
6
1
6

4
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.6
.6
.6
.6
.3
.3

.4
.4
. 5
. 5
.6
.5

Specific
con-

duct-

ance

(micro-
mhos at

25"C)

300
293
298
233
77
91

192
234
258
267
275
282

PH

8.1
7.3
8.1
7.6
6.8
7.1

7.8
8.1
7.8
8.3
8.1
8.3

a Includes equivalent ef 4 ppm of carbonate (CO3). b Includes equivalent of 3 ppm of carbonate (CO3).

NAVAERO RIVER BASIN

11-4680. NAVARRO RIVER NEAR NAVARRO, CALIF.

LOCATION. At gaging station, 2.7 miles downstream from North Fork, 5.4 miles upstream from mouth, and 6.6 miles west of Navarro, Mendocino County. DRAINAGE AREA. 304 square miles.
RECORDS AVAILABLE. Chemical analyses: January 1959 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 12..........

Discharge
. (cfs)

14
15
119
a!8,000
4,750

393
112
76
32
18
6.5

Silica

(S1Q.)

17
18

19

20

Iron

(Fe)

0.02

.00

Cal-

cium

(Ca)

30
29

25

26

Mag-
ne-

sium

(Mft)

12
11

9.6

11

Sodium

(Na)

15
15
13
4.9
4.9

8.7
12
12
13
6.2
12

Po-
tas-

sium

(K)

2.0
1.2

1.6

1.5

Bl-

car-

bon-

ate

(HCO,)

150
155
132
38
38

96
129
141
b!50
144
151

Car-
bon-

ate

(CO,)

Sulfate

(S04)

25
. 7.0

13

5.0

Chloride

(CD

8.5
8.5
11
9.0

e.&

9.8
8.2
10
8.0
9.0
7.5

Fluo-
ride

(F)

0.1
.2

.0

.0

Ni-
trate

(NO,)

0.7
.3

.3

.2

Bo-

ron

(B)

0.3
.2
.2
.0
,1

.3
.2
.2
. 1
.2
.2

Dissolved solids

(calculated)

Parts

per
million

185
166

153

157

Tons

per
acre-

foot

0.25
.23

.21

.21

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

126
118
116
42
38

81
102
103
109
120
110

Non-
car-

bon-

ate

3
0
8
11
7

2
0
0
0
2
O

So-

dium
ad-

sorp-
tion
ratio

0.6
.6
. 5
.3
.3

.4
.5
.5
. 5
.2
.5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

274
279
259
85
98

196
235
248
258
263
266

pH

8.2
7.7
7.6
7.0
7.0

7.7
8.0
7.8
8.4
7.9
8.1

a Dally mean discharge.
b Includes equivalent of 7 ppm of carbonate (CO3).

BIG RIVER BASIN

11-4681. BIG RIVER NEAR MOUTH, NEAR MENDOCINO, CALIF.

LOCATION. Approximately 200 feet upstream from Little North Fork Big River, and approximately 5.5 miles east of Mendocino County. RECORDS AVAILABLE. Chemical analyses: January 1959 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Aug. 1............
Sept. 12..........

Mean

discharge
(cfs)

Silica

(sicg

18
18
17

19

14

Iron

(Fe)

0.08

. 00

Cal-

cium

(Ca)

30
24
25

15

21

Mag-
ne-

sium

(Mg)

3.6
8.8
8.1

6.2

8.1

Sodium

(Na)

14
16
14
5.2
4.5

7.3
9.1
10
12
13
12

Po-
tas-
sium

(K)

2.0
2.4
2.8

1.3

1.3

Bi-
car-

bon-

ate

(HCOj)

122
126
127
36
34

74
84
111
119
118
125

Car-
bon-

ate

(CO,)

Sulfate

(SO.)

1.0
14
8.0

7.0

1.0

Chloride

(CD

16

8 5 14'

11
6.5

7.5
7.5
11
6.0
8.5
7.0

Fluo-
ride

(F)

0.1
. 0
.0

. 0

. 0

Ni-
trate

(NOJ

0.3
. 0
.0

. 2

. 1

Bo-

ron

(B)

0.4
. 5
.4
.0
.0

. 0
. 2
.2
1.0
.4
. 5

Dissolved solids

(calculated)

Parts

per
million

145
154
152

107

127

Tons

per
acre-

foot

0.20
.21
. 21

. 15

. 17

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

90
96
96
43
32

58
63
78
89
83
86

Non-
car-

bon-

ate

0
0
0
13
4

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.6
. 7

'.6

.4
.4

.4
. 5
. 5
.6
.6
.6

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

226
233
235
91
86

147
164
200
216
219
220

PH

8.0
7.3
7.9
7.0
7.1

7.6
7.7
7.7
8.1
7.8
7.8

LOCATION. At gaging station, 0.7 mile downstr
DRAINAGE AREA. 105 square miles.
RECORDS AVAILABLE. Chemical analyses: Ja
REMARKS. Records of discharge for water year

NOYO RIVER BASIN

11-4685. NOYO RIVER NEAR FORT BRAGG, CALIF.

>am from South Fork and 3.5 miles east of Fort Bragg, Mendocino County.

,ry 1959 to September 1960.
October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 12..........

Discharge
(cfs)

4.8
4.5
6.3
82
3,380
1,940

253
50
47
13
9.2
4.8

Silica

(S1Q,)

22
18

17

18

Iron

(Fe)

0.01

.02

Cal-

cium

(Ca)

14
16

14

14

Mag-
ne-

sium

(Mg)

11
5.4

6.1

6.1

Sodium

(Na)

31
13
11
11
4.7
4.7

6.2
8*3
10
9.6
11
10

Po-
tas-
sium

(K)

2.9
.9

1.1

1.3

Bi-
car-

bon-

ate

(HCO,)

86
85
86
68
30
32

52
70
77
84
80
86

Car-
bon-

ate

(CO,)

Sulfate

(SO.)

14
5.0

9.0

1.0

Chloride

(Cl)

48
11
8.0
12
10
7.2

8.0
8.5
11
8.5
9.0
8.5

Fluo-
ride

(F)

0.1
.2

. 2

. 1

Ni-

trate

(NO,)

0.2
.3

.0

. 2

Bo-

ron

(B)

0.1
. 1
. 3
. 3
.0
.0

.0
. 0
. 1
.0
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

185
112

98

101

Tons

per
acre-

foot

0.25
. 15

. 13

. 14

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

82
62
67
58
30
32

46
60
56
65
58
60

Non-
car-

bon-

ate

11
0
0
2
5
6

3
3
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.5
..7
.6
. 6
.4
.4

.4
. 5
.6
. 5
.6
.6

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

306
174
165
163
78
86

117
144
148
161
161
168

pH

7.9
7.4
7.8
7.3
6.8
7.1

7.4
7.6
7.6
7.9
7.9
7.8

MATTOLE RIVER BASIN

11-4690. MATTOLE RIVER NEAR PETROLIA, CALIF.

LOCATION. At gaging station 0.2 mile downstream from Clear Creek, 1.2 miles southeast of Petrolia, Humboldt County, and 1.3 miles upstream from North Fork. DRAINAGE AREA. 242 square miles.
RECORDS AVAILABLE. Chemical analyses: January 1959 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year C

Date
of
collection

Oct. 6, 1959......

Jan. 12, 1960... ..

Sept. 14..........

Discharge
(cfs)

51
45
1,290
5,910
4,040

1,510
990
740
134
81
46

Silica

(SiQ.)

12
5.8

14

18

Iron

(Fe)

0.07

.00

Cal-

cium

(Ca)

42
40

18

36

Mag-
ne-

sium

(Mg)

7.1
6.3

4.1

5.6

Sodium

(Na)

9.6
10
6.4
4.6
4.1

4.5
5.7
6.1
7.1
8.4
7.7

Po-
tas-
sium

(K)

1.8
1.3

.9

1.1

Bi-
car-

bon-

ate

(HCOj)

130
130
58
45
46

58
70
76
alOl
124
132

Car-
bon-
ate

(ccg

Sulfate

(S0«)

40
31

12

13

Chloride

(Cl)

7.0
4.8
6.0
9.0
6.5

6.0
4.5
8.0
5.0
5.0
3.8

ctober 1959 to September 1960

Fluo-
rlde

(F)

0.1
.2

.0

.0

Ni-
trate

(Ncg

0.3
.0

.2

.0

Bo-

ron

(B)

0.1
.1
. 1
.0
.0

.1
. 1
.0
.0
.1
.1

Dissolved solids

(calculated)

Parts

per
million

184
164

94

150

Tons

per
acre-

foot

0.25
.22

. 13

.20

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

134
126
72
40
44

57
62
64
91
103
113

Non-
car-

bon-

ate

27
19
24
3
6

9
5
2
8
1
5

So-

dium
ad-

sorp-
tion
ratio

0.4
,4
.3
.3
.3

.3
.3
.3
.3
.4
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

280
276
156
98
108

135
144
154
201
238
261

pH

8.0
8.0
7.5
7.2
7.3

7.5
7.7
7.7
8.3
7.8
8.2

a Includes equivalent of 2 ppm of carbonate (CO3).

EEL RIVER BASIN

11-4710. POTTER VALLEY POWERHOUSE TAILRACE NEAR POTTER VALLEY, CALIF. (Formerly published as East Fork Russian River at Potter Valley powerhouse, Calif.)

LOCATION. At gaging station, 100 feet downstream from powerhouse of Pacific Gas and Electric Company and 3 miles northwest of Potter Valley, Mendocino County.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Apr. 4............

Sept. 14..........

Discharge
(cfs)

16
43
299
300
300

200
134
298
79
103

Silica

(SiQJ

13

14

Iron

(Fe)

0.08

.01

Cal-

cium

(Ca)

17

17

Mag-
ne-

sium

(Mg)

5.0

6.0

Sodium

(Na)

7.4
12
4.5
2.7
3.4

6.0
4.2
3.6
4.7
5.7

Po-
tas-

sium

(K)

0.9

.6

Bi-
car-

bon-

ate

(HCO,)

116
115
65
46
64

78
80
78
77
86

Car-
bon-
ate

(CO,)

Sulfate

(S0«)

8.0

6.0

Chloride

(Cl)

5.2
9.0
8.0
3.2
3.0

3.5
4.8
4.5
3.2
3.0

Fluo-

rlde

(F)

~

0.0

. 1

Ni-

trate

(NO,)

0.2

.0

Bo-

ron

(B)

0.7
1.4
.3
.2
.3

.3
.3
. 1
.3
.3

Dissolved solids

(calculated)

Parts

per
million

92

95

Tons

per
acre-

foot

"

0.13

. 13

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

94
97
64
44
54

63
66
65
62
67

Non-
car-

bon-

ate

0
3
11
6
2

0
0
1
0
0

So-

dium
ad-

sorp-
tion
ratio

0.3
..5
.2
.2
.2

.3
.2
.2
.3
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

208
232
129
101
125

139
146
136
141
149

pH

7.7
7.6
7.4
7.3
7.6

7.7
7.7
8.2
7.9
7.9

EEL RIVER BASIN Continued

11-4721.5. EEL RIVER NEAR DOS RIOS, CALIF.

LOCATION. At bridge upstream from Outlet Creek and approximately 6.2 miles south of Dos Rios, Mendocino County. RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Discharge used is difference between gaging stations at Eel River above Dos Rios and Outlet Creek near Longvale inflow between stations. Records of discharge for water year October 1959 to September 1960 given in W8P 1715.

No correction made for

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

A no- 9

Sept. 13..........

Discharge
(cfs)

18
12
9.6
443
35,500
14,880

1,330
207
a90
a20
a6.9
a4.3

Silica

(SiQs)

12

8.5

Iron

(Fe)

0.03

.00

Cal-

cium

(Ca)

19

24

Mag-
ne-

sium

(Mg)

6.9

8.0

Sodium

(Na)

11
10
12
8.5
2.8
2.7

4.0
5.3
4.4
7.7
9.5
10

Po-
tas-

sium

(K)

l.l

1.5

Bi-
car-

bon-

ate

(HCO,)

145
141
146
82
40
48

72
94
104
129
122
114

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

10

18

Chloride

(Cl)

6.0
7.5
9.0
7.0
4.5
3.0

2.5
3.5
5.8
10
9.0
5.5

Fluo-

ride

(F)

0.0

. 1

Ni-

trate

(NO,)

0.2

. 1

Bo-

ron

(B)

0.8
.8
1.1
.4
. 1
. 1

. 1
.2
.2
.3
.4
.5

Dissolved solids

(calculated)

Parts

per
million

104

132

Tons

per
acre-

foot

0.14

. 18

Tons

per

day

Hardness
as CaCO,

Cal-

cium,
Mag-
ne-

sium

119
118
136
84
42
46

66
76
85
105
100
93

Non-
car-

bon-
ate

0
2
16
17
9
7

7
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
.4
.4
.2
.2

.2
.3
.2
.3
.4
. 5

Specific
con-

duct-

ance

micro-

mhos at

25°C)

263
257
280
189
88
105

135
169
189
229
232
228

PH

8.1
7.7
8.2
7.7
7.1
7.5

7.7
7.9
8.1
8.2
8.0
8.2

a Daily mean discharge

EEL RIVER BASIN Continued

11-4722. OUTLET CREEK NEAR LONGVALE, CALIF.

LOCATION. At railroad bridge approximately 0.9 mile downstream from gaging station, approximately 600 feet upstream from Eel River, and 6.5 miles northeast of Longvale, Mendocino County.
DRAINAGE AREA. 159 square miles upstream from gaging station.
RECOKDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No appreciable inflow between sampling point and gaging station.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Feb. 9, 1960......
Mar. 8...... ......

Sept. 13... ....

Discharge
(cfs)

1.2
2.6
3.4
11,700
2,720

261
103
68
5.8
2.6
1.2

Silica

(SiOj

15

12

Iron

(Fe)

0.02

.00

Cal-

cium

(Ca)

15

29

Mag-
ne-

sium

(Mg)

7.4

11

Sodium

(Na)

16
21
24
3.1
2.8

4.9
6.4
6.1
10
13
14

Po-
tas-
sium

(K)

1.0

1.6

Bi-
car-

bon-

ate

(HCO,)

158
178
186
18
30

67
82
94
140
144
al46

Car-
bon-
ate

(CO,)

Sulfate

(S04)

9.0

1.0

Chloride

(CD

22
32
31
7.2
4.5

5.2
6.2
4.8
9.8
16
22

Fluo-
ride

(F)

0.1

. 1

Ni-

trate

(NO,)

0.0

.0

Bo-

ron

(B)

1.6
3.4
3.2
.0
.0

.2
.2
.4
1.1
1.1
1.8

Dissolved solids

(calculated)

Parts

per
million

100

164

Tons

per
acre-

foot

0.14

.22

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

133
156
164
38
33

59
68
74
106
110
119

Non-
car-

bon-

ate

3
10

11
23
8

4
1
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.6
. 1
.8
.2
. 2

.3
.3
.3
.4
. 5
. 6

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

326
382
390
90
75

130
154
174
245
265
282

PH

8.1
7.9
8.1
6.8
7.0

7.6
7.8
7.9
8.2
8.0
8.4

a Includes equivalent of 4 ppm of carbonate (CO3).

QUALITY OF SURFACE WATERS, 1960

EEL RIVER BASIN Continued

11-4725. EEL RIVER ABOVE DOS RIOS, CALIF.

LOCATION. At gaging station, 1.8 miles upstream from Middle Fork, and 2.1 miles south of Dos Rios, Mendocino County.
DRAINAGE AREA. 703 square miles.
RECORDS AVAILABLE. Water temperatures: October 1957 to September 1959.
Sediment records: October 1957 to September 1960.
EXTREMES, 1959-60. Sediment concentrations: Maximum daily, 4,410 ppm Feb. 8; minimum daily, 1 ppm on many days.
Sediment loads: Maximum daily, 796,000 tons Feb. 8; minimum daily, less than 0.50 ton on many days. EXTREMES, 1957-60. Sediment concentrations: Maximum daily, 4,410 ppm Feb. 8, 1960; minimum daily, 1 ppm on many days during 1957-60.
Sediment loads: Maximum daily, 796,000 tons Feb. 8, 1960; minimum daily, less than 0.50 ton on many days during 1957-60.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. Suspended sediment, water year October 1959 to September I960
(Where no concentrations are reported, loads are estimated)

OCTOBER ; NOVEMBER l DECEMBER

Suspen

dis-

charge
(cfs)

20
19
19
19
19

19
19
19
21
22

23
21
20
20
20

19
19
19
19
19

20
20
21

Mean

tration

(ppm)

1

2

-

1

2

21
20 I

20
20
20
19 1
20
20

ded sediment
Mean

Tons di»-
per , charge
day (cfs)

1 20
20
19
16
15

16
16
1*
1*
13

Suspen

Mean

tration

(ppm)

1

__

~

13
13
13
1*
15

.

1

1*
13
13
13 .
13

13
13
13

1

13
i 13

13
13
13
13
13 1

ded sediment 1
1 Mean
Tons dia-

per charge

day (cf«)

T 13
13
13
13
13

13
13
13
13
1*

14
1*
20
23
23

18
16
15
14
15

15
15
24
150
288

156
84
59
46
38
32

Suspended sediment

. - - -

Mean 1 TOH»

tration

(ppm)

__

1

_

1
.

_

4

per

day

T

2

_

~

_

8

157

_

22

_

S 8
11

2

S Computed by subdividing day.
T Less than 0.50 ton.

EEL RIVER BASIN -Continued

11-4739. MIDDLE FORK EEL RIVER AT DOS RIOS, CALIF.

LOCATION. At bridge on county road, 0.4 mile upstream from mouth, and 0.5 mile southeast of Dos Rlos, Mendocino County. RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
Water temperatures: October 1957 to September 1960.
Sediment records: October 1957 to September 1960.
REMARKS. Water discharge used is difference between discharge of Eel River above Dos Rios and Eel R
between stations. Records of discharge for water year October 1959 to September 1960 given in WS

below Dos
P 1715.

Rios. No correction made for inflow

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Dec. 9..... ....

Sept. 13..........

Discharge
(cfs)

a 30
25
21
320
18,000

1,980
875
579
72
26
12

Silica

(SiQ.)

11

10

Iron

(Fe)

0.05

.01

Cal-

cium

(Ca)

18

38

Mag-
ne-

sium

(Mg)

6.1

11

Sodium

(Na)

14
14
18
7.0
2.2

2.2
2.9
2.0
6.4
9.9
13

Po-
tas-

sium

(K)

0.7

1.3

Bi-
car-

bon-

ate

(HCO,)

128
135
154
90
48

63
78
78
128
136
124

Car-
bon-

ate

(COJ

Sulfate

(SO.)

12

30

Chloride

(Cl)

16
22
25
10
2.5

3.0
2.5
3.4
12
14
28

Fluo-
ride

(F)

0.2

. 1

Ni-

trate

(NOJ

0.0

.1

Bo-

ron

(B)

0.2
.2
.3
. 2
. 0

.0
. 1
. 1
. 2
. 2
.3

Dissolved solids

(calculated)

Parts

per
million

92

193

Tons

per
acre-

foot

0.13

.26

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

137
146
160
96
49

59
70
67
114
127
142

Non-
car-

bon-

ate

32
35
34
22
10

7
6
3
9
15
40

So-

dium
ad-

sorp-
tion
ratio

0.5
.5
.6
.3
. 1

.1
.2
. 1
.3
.4
.5

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

317
343
374
206
103

119
145
147
247
291
331

PH

8.0
7.8
8.1
7.6
7.6

7,7
7.8
7.7
8.2
8.1
8.2

a Daily mean discharge.

EEL RIVER BASIN Continued

11-4752.5. EEL RIVER AT MCCANN, CALIF.

LOCATION. Downstream from Summer Bridge, approximately 0.5 mile northwest of McCann, Humboldt County, and 6.5 miles upstre'a RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1950.
REMARKS. No discharge records available.

from confluence with the South Fork.

Date
of
collection

Sept . 13 ....

Mean

discharge
(cfs)

Silica

(S1Q,)

__

12

12

Iron

(Fe)

0.05

.00

Cal-

cium

(Ca)

21

39

Mag-
ne-

sium

(Mg)

6.2

8.4

Sodium

(Na)

11
10
8.4
5.8
2.9
2.8

3.4
4.0
3.1
6.0
8.0
9.7

Po-
tas-

sium

(K)

0.9

1.4

Bl-

car-

bon-

ate

(HCO,)

134
140
230
74
54
54

75
91
92
136
151
148

Car-
boii-

ate

(cog

Sulfate

(S04)

11

22

Chloride

(CD

13
8.8
7.0
6.0
4.5
3.5

3.0
3.0
3.0
8.0
8.5
8.5

Fluo-
rlde

(P)

0.1

.1

Ni-

trate

(Ncg

0.0

. 2

Bo-

ron

(B)

0.3
.3
.3
. 2
. 0
.0

. 1
. 0
. 0
. 1
.2
.2

Dissolved solids

(calculated)

Parts

per
million

103

174

Tons

per
acre-

foot

0.14

.24

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

135
135
204
84
52
52

69
78
80
114
126
132

Non-
car-

bon-

ate

25
20
15
23
8
8

7
3
5
2
2
11

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
.3
.3
.2
. 2

.2
.2
. 1
. 2
.3
.4

Specific
con-

duct-

ance

micro-

mhos at

25°C)

303
298
399
174
111
108

143
168
167
247
272
278

PH

8.1
8.0
7.9
7.5
7.5
7.8

7.7
7.8
8.0
8.1
8.1
8.2

EEL RIVER BASIN Continued

11-4765. SOUTH FORK EEL RIVER NEAR MIRANDA, CALIF.

LOCATION. At gaging station at Sylvandale Campgrounds on U.S. Highway 101, 0.5 mile upstream from Rocky Gle Hvunboldt County, and 20 miles upstream from mouth.
DRAINAGE AREA. 537 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Creek, 4.3 miles southeast of Miranda,

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 12, I960.....

Mar. 8............

Sept. 13..........

Discharge
(cfs)

54
48
44
1,740
21,100
9,800

2,070
670
890
191
108
52

Silica

(SiQ,)

16

13

Iron

(Fe)

0.03

.00

Cal-

cium

(Ca)

18

27

Mag-
ne-

sium

(Mg)

5.6

10

Sodium

(Na)

10
11
9.6
6.5
3.7
3.6

4.5
6.0
6.1
7.2
8.8
8.6

Po-
tas-

sium

(K)

- -

1.0

1.4

Bi-
car-

bon-

ate

(Hccg

142
142
138
64
36
40

64
84
84
ai!3
129
142

Car-
bon-

ate

(cog

Sulfate

(S04)

8.0

9.0

Chloride

(CD

7.8
8.5
10
7.0
5.2
5.8

5.8
5.0
8.0
6.0
4.8
5.8

Fluo-
ride

(F)

0.0

.0

Ni-
trate

(NO,)

- -

0.3

. 1

Bo-

ron

(B)

0.2
. 1
.5
. 1
.0
.0

.0
. 1
.0
. 1
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

-

101

145

Tons

per
acre-

foot

0.14

.20

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

117
114
124
66
38
39

55
68
67
90
99
110

Non-
car-

bon-

ate

1
0
11
14
8
6

3
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
.4
.3
.3
.3

.3
.3
.3
.3
.4
.4

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

264
266
262
142
93
97

129
154
152
198
227
251

pH

8.0
8.1
7.6
7.4
7.2
7.2

7.6
7.6
7.9
8.4
8.2
8.2

a Includes equivalent of 4 ppm of carbonate (C0 3).

EEL RIVER BASIN Continued

11-4770. EEL RIVER AT SCOTIA, CALIF.

LOCATION. At gaging station at bridge on U.S. Highway 101, 0.5 mile north of Scotia, Humboldt County, and 6 miles upstream from Van Duzen River. DRAINAGE AREA. 3,113 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
Water temperatures: October 1957 to September 1960.
Sediment records: October 1957 to September 1960.
EXTREMES, 1959-60. Water temperatures: Minimum, 41"F Jan. 2.
Sediment concentrations: Maximum daily, 7,340 ppm Feb. 8; minimum daily, 1 ppm on many days.
Sediment loads: Maximum daily, 5,380,000 tons Feb. 8; minimum daily, 0.3 ton on several days.
EXTREMES, 1957-60. Water temperatures: Minimum, 41°F Jan. 2, 1960.
Sediment concentrations: Maximum daily, 7,340 ppm Feb. 8, 1960; minimum daily, 1 ppm on many days in 1958-60. Sediment loads: Maximum daily, 5,380,000 tons Feb. 8, 1960; minimum daily, 0.3 ton on many days in 1958-60. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 12, I960.....

June 7.. ....

A up- 9

Discharge
(cfs)

180
174
126
3.810
97,100
42,100

8,930
3,330
2,990
500
287
125

Silica

(SiQ.)

13

9 2

Iron

(Fe)

0.04

.00

Cal-
cium

(Ca)

22

36

Mag-
ne-

sium

(Mg)

6.3

12

Sodium

(Na)

11
11
11
8.5
3.8
3.6

4.5
5.3
4.0
6.8
9.1
9.2

Po-
tas-

sium

(K)

1.0

1.4

Bi-
car-

bon-

ate

(HCO,)

161
180
168
82
74
64

78
96
96
137
166
172

Car-
bon-

ate

(CO,)

Sulfate

(S04)

10

16

Chloride

(Cl)

8.4
10
8.0
9.0
6.2
10

6.0
4.5
5.0
9.0
10
5.8

Fluo-
ride

(F)

0.0

.0

Ni-
trate

(NO,)

0.2

. 1

Bo-

ron

(B)

0.2
. 1
.2
.2
.0
. 1

. 1
. 1
.0
. 1
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

109

175

Tons

per
acre-

foot

0.15

.24

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

144
159
150
84
80
64

71
81
80
110
131
138

Non-
car-

bon-

ate

12
11
12
17
19
12

7
2
1
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
-.4
.4
.4
.2
.2

.2
.3
.2
.3
.3
.3

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

312
341
318
194
171
137

161
176
176
239
287
298

PH

8.1
8.1
8.2
7.5
7.3
7.6

7.5
8.0
7.9
8.2
8.0
8.2

EEL RIVER BASIN Continued

11-4785. VAN DUZEN RIVER NEAR BRIDGEVILLE, CALIF.

LOCATION. At gaging station at bridge on State Highway 36, 0.3 mile downstream from Pip Creek, 0.5 mile upstream from Rogers Creek, and 4 miles west of Bridgeville, Humboldt County.
DRAINAGE AREA. 214 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Nov. 4..... ....

Jan. 13, I960.....

Aug. 3............
Sept. 14. ....

Discharge
(cfs)

15
20
14
304
5,670
3,340

764
350
326
45
23
10

Silica

(S1Q.)

10

11

12

Iron

(Fe)

0.06

.00

Cal-

cium

(Ca)

34

16

34

Mag-
ne-

sium

(Mg)

10

5.8

8.5

Sodium

(Na)

7.7
9.7
11
4.7
2.4
2.2

2.6
3.1
2.2
4.8
6.9
7.5

Po-
tas-

sium

(K)

1.5

.6

1.2

Bi-
car-

bon-

ate

(HCO,)

126
126
166
74
44
44

64
73
82
109
129
a!38

Car-
bon-

ate

(CO,)

Sulfate

(S04)

35

9.0

15

Chloride

(Cl)

4.0
4.4
8.0
4.0
3.5
2.5

1.8
2.2
3.4
4.5
7.0
5.2

Fluo-
ride

(F)

0.1

. 1

.0

Ni-

trate

(NO,)

0.0

.0

.0

Bo-

ron

(B)

0.1
.0
.0
.1
.0
.0

.0
.0
.0
.0
.2
.2

Dissolved solids

(calculated)

Parts

per
million

164

84

152

Tons

per
acre-

foot

0.22

. 11

.21

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

128
101
152
80
44
44

59
64
68
92
106
120

Non-
car-

bon-
ate

25
0
16
19
8
8

7
4
1
3
0
7

So-
dium
ad-

sorp-
tion
ratio

0.3
.4
3.9
.2
.2
.2

. 1
.2
. 1
.2
.3
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

242
239
319
166
98
98

120
134
143
199
233
254

PH

8.1
7.8
8.1
7.7
7.5
7.6

7.5
7.8
7.9
8.1
7.9
8.4

a Includes equivalent of 4 ppm of carbonate (CO3).

HAD RIVER BASIN

11-4810. MAD RIVER NEAR ARCATA, CALIF.

LOCATION. At gaging station, 100 feet upstream from bridge on U.S. Highway 299, 1.0 mile downstream from Warren Creek, and 2.8 miles northeast of Arcata, Humboldt County.
DRAINAGE AREA. 485 square miles.
RECORDS AVAILABLE. Chemical analyses: November 1958 to September 1960.
Water temperatures: December 1957 to September 1960.
Sediment records: December 1957 to September 1960.
EXTREMES, 1959-60. Water temperatures: Minimum, 41°F Jan. 2, 15, 16.
Sediment concentrations: Maximum daily, 4,560 ppm Feb. 8; minimum daily, 2 ppm on many days.
Sediment loads: Maximum daily, 489,000 tons Feb. 8; minimum daily, 0.1 ton on several days.
EXTREMES, 1957-60.--Water temperatures: Minimum, 40°F Jan. 4, 1959.
Sediment concentrations: Maximum daily, 4,560 ppm Feb. 8, 1960; minimum daily, 1 ppm on several days in 1958-59. Sediment loads: Maximum daily, 489,000 tons Feb. 8, 1960; minimum daily (revised), 0.1 ton on many days in 1958-60. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
at
collection

Oct. 7, 1959......

Sept. 15..........

Discharge
(cfs)

25
35
31
846
6,820
3,780

1,240
828
612
87
44
24

Silica

(S1Q.)

13

"-

9.6

14

Iron

(Fe)

~

::

0.06

. 00

Cal-

cium

(Ca)

41

18

36

Mag-
ne-

sium

(Mg)

8.1

3.4

6.8

Sodium

(Na)

7.7
6.9
6.3
4.7
2.9
2.6

2.6
3.2
3.6
4.6
6.0
5.8

Po-
tas-

slum

(K)

1.2

. 8

1.2

Bi-
car-

bon-

ate

(HCO,)

146
131
146
60
42
42

58
70
78
124
136
143

Car-
bon-

ate

(CO,)

Sulfate

(S04)

23

"

4.0

12

Chloride

(Cl)

6.5
5.6
6.0
7.0
6.2
4.8

4.8
3.5
7.5
2.5
3.8
4.8

Fluo-

rlde

(F)

0.1

. 0

.0

Ni-

trate

(NO,)

0.4

.4

.0

Bo-

ron

(B)

0.1
. 1
.2
. 1
. 1
.0

.0
. 1
. 0
.0
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

173

77

151

Tons

per
acre-

foot

0.24

. 10

.21

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

136
107
132
66
44
41

57
59
72
106
110
118

Non-
car-

bon-

ate

16
0
12
17
10
7

9
2
8
4
0
1

So-

dium
ad-

sorp-
tion
ratio

0.3
. 3
.2
.2
.2
. 2

.1
.2
. 2
. 2
.2
.2

Specific
con-

duct-

ance

micro-

mhos at

25°C)

261
283
273
146
98
95

120
129
142
219
242
254

pH

8.0
7.4
7.9
7.4
7.2
7.4

7.5
7.7
7.9
7.9
7.8
8.2

REDWOOD CREEK BASIN

11-4825. REDWOOD CREEK AT ORICK, CALIF.

LOCATION. At gaging station on U.S. Highway 101 bridge at Orick, Humboldt County, 0.9 mile downstream from Prairie Creek. DRAINAGE AREA. 278 square miles.
RECORDS AVAILABLE. Chemical analyses: November 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 7, 1959......

Sept. 14..........

Discharge
(cfs)

23
60
31
644
4,890
3,840

1,460
610
692
126
76
28

Silica

(SiQ,)

10

11

13

Iron

(Fe)

0.09

Cal-
cium

(Ca)

22

12

24

Mag-
ne-

sium

(Mg)

2.7

2.7

1.0

Sodium

(Na)

6.7
7.3
6.9
3.7
2.6
2.7

2.7
3.1
2.3
3.5
5.2
5.1

Po-
tas-

sium

(K)

0.3

.4

.6

Bi-
car-

bon-

ate

(HCO,)

62
54
64
40
22
24

35
42
40
61
66
71

Car-
bon-

ate

(ccg

Sulfate

(SOJ

13

8.0

5.0

Chloride

(Cl)

10
6.8
7.0
7.0
6.8
6.5

4.5
4.2
5.4
10
10
10

Fluo-
ride

(F)

0.1

.0

. 1

Ni-
trate

(NO,)

0.2

.0

.2

Bo-

ron

(B)

0.0
.1
.0
.0
.0
.0

.0
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

96

62

94

Tons

per
acre-

foot

0.13

.08

. 13

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

66
60
61
46
28
28

36
41
37
56
60
64

Non-
car-

bon-

ate

15
16
9
13
10
8

7
7
4
6
6
6

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
.4
.2
.2
.2

.2
.2
.2
.2
.3
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

132
151
144
104
69
74

83
92
91
128
139
148

pH

7.6
7.1
7.6
7.4
7.0
7.0

7.1
7.5
7.4
7.6
7.7
7.9

LOWER KLAMATH LAKE BASIN

11-4895. ANTELOPE CREEK NEAR TENNANT, CALIF.

LOCATION. At gaging station 2.5 miles south of Tennant, Siskiyou County, 4 miles downstream from Frog Lake, and 17 miles southeast of Mount Hebron. DRAINAGE AREA. 18.8 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1959 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 7...........

Discharge
(cfs)

14
14
81
as. 6
as 6
a32

51
44
73
22
12
10

Silica

(SiQa)

34
33
33
36
19

25

29

Iron

(Fe)

0.05

.03

Cal-

cium

(Ca)

8.8
6.0
7.2
7.6
2.4

4.4

5.6

Mag-
ne-

sium

(Mg)

3.4
1.7
1.7
1.5
1.9

1.8

2.7

Sodium

(Na)

5.9
3.7
4.6
4.4
1.7
2.5

1.9
2.2
1.0
2.2
4.7
3.6

Po-
tas-

sium

(K)

1.6
1.1
2.6
1.2
. 7

1.4

.8

Bi-
car-

bon-

ate

(HCOJ

47
35
35
38
19
28

28
28
22
33
45
40

Car-
bon-
ate

(CO,)

SuUate

(S04)

7.0
1.0
1.0
.0
.4

2.0

.0

Chloride

(CD

4.0
.5
6.0
3.0
.8
1.5

1.0
.0
. 5
1.0
.5
.8

Fluo-
rlde

(F)

0.3
.3
.0
. 1
.3

.0

.0

Ni-
trate

(NO,)

0.0
.2
. 1
.0
1.5

.2

.0

Bo-

ron

(B)

0.0
.0
.0
.0
. 1
.0

.0
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

88
64
73
73
38

51

63

Tons

per
acre-

foot

0.12
.09
. 10
. 10
.05

.07

.09

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

36
22
25
25
14
24

22
19
6
23
27
25

Non-
car-

bon-

ate

0
0
0
0
0
1

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.3
.4
.4
.2
.2

.2
.2
. 1
.2
.4
.3

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

79
61
62
66
38
54

47
48
39
56
73
63

pH

7.5
7.4
7.4
7.1
6.4
7.1

7.1
7.2
7.0
7.6
7.5
7.5

a Daily mean discharge.

LOWER KLAMATH LAKE BASIN Continued

11-4905. BUTTE CREEK NEAR MACDOEL, CALIF.

LOCATION. At gaging station, 7 miles south of Macdoel, Siskiyou County, and 7.5 miles downstream from Little Antelope Creek. DRAINAGE AREA. 178 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1959 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. Gaging station discontinued.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 14, 1959.....
Nov. 11. ....
Dec. 8.. ....
Jan. 5, 1960......
Feb. 8... ....

Sept. 7.... ....

Discharge
(cfs)

6.7
8.1
a8. 5
a5.5
a 26
26

25
18
22
1.8
.8
1.8

Silica

(SiQ,)

35
31
35
38
25

26

17

Iron

(Fe)

0.03

Cal-

cium

(Ca)

8.0
7.6
8.0
10
5.5

6.6

7.6

Mag-
ne-

sium

(Mg)

2.4
1.5
2.7
1.9
1.8

2.3

3.2

Sodium

(Na)

4.1
4.3
5.3
5.0
3.2
2.6

3.1
3.4
3.0
3.6
3.1
5.2

Po-
tas-

sium

(K)

1.4
1.7
2.9
1.9
1.8

2.4

1.3

Bl-

car-

bon-

ate

(HCOS)

42
41
46
48
34
30

40
40
38
45
37
50

Car-
bon-
ate

(CO,)

Sulfate

(S04)

2.0
1.0
.0
.0
1.0

2.8

1.0

Chloride

(Cl)

2.0
.8
6.0
6.0
.5
1.8

.8
. 6
1.2
1.0
2.2
2.2

Fluo-

ride

(F)

0.2
. 1
. 1
.0
.4

. 1

.3

Ni-

trate

(NO,)

0.0
. 1
. 1
. 0
1.1

. 3

.0

Bo-

ron

(B)

0.0
.0
.0
.0
.0
.0

.1
. 2
.0
.0
.0
. 1

Dissolved solids

(calculated)

Parts

per
million

76
68
83
87
57

65

63

Tons

per
acre-

foot

0.10
.09
. 11
. 12
.08

. 09

.09

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

30
25
31
33
20
25

32
26
25
31
26
32

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.3
.4
.4
.4
. 3
. 2

.2
.3
. 3
. 3
. 3
.4

Specific
con-

duct-

ance

imicro-

mhos at

25°C)

72
73
80
82
60
60

66
71
64
74
62
83

pH

7.2
7.2
7.6
7.4
7.1
7.0

7.3
7.3
7.4
7.5
7.7
7.4

a Daily mean discharge.

LOCATION. At gaging station, 500 f<
south of Copco, Siskiyou County,
DRAINAGE AREA. 4,370 square miles
RECORDS AVAILABLE. Chemical analyi
REMARKS. Records of discharge for

KLAMATH RIVER BASIN

11-5125. KLAMATH RIVER BELOW FALL CREEK, NEAR COPCO, CALIF.

!et downstream from Fall Creek, 0.5 mile downstream from Copco No. 2 plant of The California Oregon Power Co., and 1 mile

approximately.
;es: October 1953 to September 1960.
water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Feb. 3............

July 6............

Sept. 7... ....

Discharge
(cfs)

2,550
2,550
2,350
2,380
2,550
2,550

3,040
3,010
1,420
1,300
ai,180
1,540

Silica

(SiQ,)

41

22

43

Iron

(Fe)

0.04

.05

Cal-

cium

(Ca)

10

17

8.8

Mag-
ne-

sium

(Mg)

7.5

9.8

7.5

Sodium

(Na)

17
14
14
13
12
16

21
25
12
12
12
16

Po-
tas-
sium

(K)

2.9

4.1

2.7

Bi-
car-

bon-

ate

(HCO,)

86
74
72
72
68
82

97
91
90
79
84
87

Car-
bon-
ate

(ccg

Sulfate

(S04)

14

53

6.0
7.6
9.0

Chloride

(Cl)

5.2
4.8
5.0
3.0
4.0
4.5

5.0
7.0
5.5
6.2
.8
4.5

Fluo-

ride

(P)

0.2

. 2

. 3

Ni-
trate

(NOJ

1.5

1.2

2.5

Bo-

ron

(B)

0.1
. 1
. 1
. 1
.0

.1

.2
. 2
.0
. 1
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

141

185

137

Tons

per
acre-

foot

0.19

. 25

. 19

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

56
49
52
48
51
66

96
83
63
53
55
53

Non-
car-

bon-

ate

0
0
0
0
0
0

16
8
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.0
..9
.8
.8
. 7
.9

.9
1.2
. 7
. 7
.7
1.0

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

181
153
145
141
153
174

286
274
169
154
158
168

pH

7.2
7.0
7.0
6.8
6.8
7.2

7.2
7.5
7.2
7.2
7.3
7.4

a Daily mean discharge.

KLAMATH RIVER BASIN Continued

11-5175. SHASTA RIVER NEAR YREKA, CALIF.

LOCATION. At gaging station,0.5 mile upstream from mouth and 7 miles north of Yreka, Siskiyou County. DRAINAGE AREA. 796 square miles.
RECORDS AVAILABLE. Chemical analyses: December 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 13, 1959.....

Sept. 6...........

Discharge
(cfs)

108
174
160
157
1,720
444

112
120
54
9.5
18
34

Silica

(S1Q,)

55
62
58

49

57

Iron

(Fe)

0.04

.03

Cal-

cium

(Ca)

38
28
27

34

41

Mag-
ne-

sium

(Mg)

28
29
28

36

43

Sodium

(Na)

46
40
38
37
40
32

46
46
47
56
59
63

Po-
tas-

sium

(K)

4.1
3.3
3.8

5.5

4.6

Bi-
car-

bon-

ate

(HCO,)

310
284
272
268
242
244

303
321
351
337
396
376

Car-
bon-

ate

(CO,)

4
0
0
0
0
0

20
13
12
42
25
27

Sulfate

(S04)

17
6.0
6.0

12

12

Chloride

(CD

29
21
26
23
14
18

23
28
17
44
22
45

Fluo-
rlde

(F)

0.1
.4
. 1

.4

.3

Ni-
trate

(NO,)

0.0
. 3
.3

.3

.8

Bo-

ron

(B)

0.6
.4
.4
.5
.5
. 6

.6
.6
.7
. 7
.9
.8

Dissolved solids

(calculated)

Parts

per
million

375
330
322

383

480

Tons

per
acre-

foot

0.51
.45
.44

.52

.65

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

211
188
184
179
164
159

230
232
234
290
275
280

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0

s

So-

dium
ad-

sorp-
tion
ratio

.4
. 3
. 2
.2
.4
. 1

.3
.3
.3
.4
. 5
1.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

533
487
463
464
474
423

559
587
603
673
717
708

pH

8.3
8.2
8.2
8.2
7.6
8.1

8.5
8.4
8.4
8.7
8.6
8.6

KLAMATH RIVER BASIN Continued

11-5178.2. KLAMATH RIVER AT KLAMATH RIVER SCHOOL, NEAR HAMBURG, CALIF.

LOCATION. At bridge on State Highway 96, 0.9 mile downstream from Klamath school, 1.8 miles upstream from Horse Creek and, and approximately 5.5 miles northeast of Hamburg, Siskiyou County.
RECORDS AVAILABLE. Chemical analyses: December 1958 to September 1960.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 6...........

Mean

discharge
(cfs)

Silica

(SiQs)

38
42
34

24

39

Iron

(Fe)

0.06

.04

Cal-

cium

(Ca)

13
13
12

19

13

Mag-
ne-

sium

(Mg)

7.7
6.9
6.6

11

8.9

Sodium

(Na)

17
16
15
14
14
16

21
22
11
12
13
17

Po-
tas-

sium

(K)

2.8
2.5
3.4

4.9

2.5

Bi-
car-

bon-

ate

(HCOJ

88
93
87
86
106
108

111
104
93
a 95
88
109

Car-
bon-
ate

(CO,)

Sulfate

(S04)

17
7.0
5.0

45

9.0

Chloride

(CD

7.0
7.0
12
5.8
7.8
6.0

6.5
7.3
5.2
8.0
10
6.2

Fluo-
ride

(F)

0.1
. 1
.2

.2

. 1

Ni-
trate

(NOJ

1.8
2.2
1.9

.5

1.0

Bo-

ron

(B)

0.1
. 1
. 1
. 1
. 1
.2

.2
.2
. 1
.2
. 1
. 1

Dissolved solids

(calculated)

Parts

per
million

148
143
133

185

151

Tons

per
acre-

foot

0.20
. 19
. 18

.25

.21

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

64
61
57
57
88
84

107
93
63
62
58
69

Non-
car-

bon-

ate

0
0
0
0
i
0

16
8
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.9
,9
.9
.8
. 7
.8

.9
1.0
.6
. 7
. 7
.9

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

190
181
170
167
221
220

289
283
171
174
166
200

PH

7.4
7.5
7.4
7.7
7.4
7.6

7.7
7.8
7.9
8.3
7.7
7.9

a Includes equivalent of 2 ppm of carbonate (C0 3).

KLAMATH RIVER BASIN Continued

11-5195. SCOTT RIVER NEAR FORT JONES, CALIF.

LOCATION. At gaging station, 1.7 miles upstream from Snow Creek and 10.8 miles downstream from Fort Jones, Siskiyou County. DRAINAGE AREA. 662 square miles.
RECORDS AVAILABLE. Chemical analyses: November 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Mar. 8.. ....

Aug. 9............
Sept. 6. ....

Discharge
(cfs)

51
58
58
65
5,490
2,150

938
456
1,110
148
66
50

Silica

(sicy

17
20
21

17

21

Iron

(Fe)

0.08

.01

Cal-

cium

(Ca)

31
30
30

14

28

Mag-
ne-

sium

(Mg)

17
17
16

11

15

Sodium

(Na)

5.4
5.2
5.9
4.5
2.1
1.9

1.6
2.6
1.5
3.6
5.0
6.0

Po-
tas-

sium

(K)

1.7
.6
2.2

1.2

.6

Bi-
car-

bon-

ate

(HCOJ

170
170
171
160
52
72

73
95
58
153
175
168

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

10
5.0
6.0

5.8

6.0

Chloride

(Cl)

6.0
3.5
9.0
4.0
8.0
1.5

1.8
.8
1.8
5.5
3.2
2.5

Fluo-
rlde

(F)

0.1
. 1
.0

. 0

.0

Ni-

trate

(NO,)

1.0
1.2
1.6

.7

1.3

Bo-

ron

(B)

0.1
.0
.0
. 0
. 0
.0

.0
. 0
. 0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

172
167
176

100

163

Tons

per
acre-

foot

0.23
.23
.24

. 14

.22

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

147
143
142
138
53
65

62
79
46
125
135
132

Non-
car-

bon-

ate

8
4
2
7
10
6

2
1
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.2
..2
.2
.2
. 1
. 1

. 1
. 1
. 1
. 1
.2
.2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

273
273
272
267
111
129

122
162
99
241
269
270

pH

8.1
8.0
8.0
8.0
6.9
7.7

7.6
7.6
7.5
8.0
8.1
8.1

KLAMATH RIVER BASIN Continued

11-5205. KLAMATH RIVER NEAR SEIAD VALLEY, CALIF.

LOCATION. At gaging station, 0.4 mile upstream from Bittenbender Creek, 1.4 miles downstream from Grider Creek, and 2.2 miles west of Seiad Valley, Siskiyou County.
DRAINAGE AREA. 6,980 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: December 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 5, 1960......

Sept. 6. ....

Discharge
(cfs)

2,400
2,550
2,640
2,710
15,800
7,910

4,950
3,430
3,980
1,180
1,550
890

Silica

(SiOJ

38
40
34

22

31

Iron

(Fe)

0.06

. 02

Cal-

cium

(Ca)

14
13
12

19

14

Mag-
ne-

sium

(Mg)

6.1
6.7
6.8

8.0

9.0

Sodium

(Na)

17
16
15
14
7.5
8.2

13
17
6.6
9.6
13
16

Po-
tas-

sium

(K)

3.0
2.2
3.8

4.1

2.1

Bi-
car-

bon-

ate

(HCO,)

88
93
87
86
74
86

98
96
83
102
100
114

Car-
bon-

ate

(cog

Sulfate

(S04)

13
7.0
6.0

36

8.0

Chloride

(Cl)

10
6.5
9.0
6.8
5.2
4.5

4.8
4.8
3.5
7.2
4.8
6.7

Fluo-

rlde

(F)

0.1
.2
. 1

. 1

.3

Ni-

trate

(NO,)

1.7
2.6
1.6

.3

.0

Bo-

ron

(B)

0.2
.0
. 1
. 1
. 1
.0

.2
. 1
. 1
. 1
. 1
.3

Dissolved solids

(calculated)

Parts

per
million

146
140
131

158

143

Tons

per
acre-

foot

0.20
. 19
. 18

.22

. 19

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

60
60
58
62
68
70

90
79
61
74
65
72

Non-
car-

bon-

ate

0
0
0
0
7
0

10
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.0
.9
.9
. 8
.4
.4

.6
.8
.4
.5
.7
.8

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

189
181
172
168
150
147

232
249
147
184
185
203

pH

7.4
7.6
7.3
7.6
7.3
7.7

7.6
7.6
7.6
8.0
7.6
8.0

KLAMATH RIVER BASIN Continued

11-5225. SALMON RIVER AT SOMESBAR, CALIF.

LOCATION. At gaging station, 0.5 mile east of Somesbar Post Office, Siskiyou County, and 1.5 miles upstream from mouth. DRAINAGE AREA. 746 square miles.
RECORDS AVAILABLE. Chemical analyses: November 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Sept. 15. ....

Discharge
(cfs)

226
168
270
2,400
3,140

4,270
1,700
2,620
456
258
157

Silica

(SiQs)

17

17

17

Iron

(Fe)

0.00

.00

Cal-

cium

(Ca)

18

11

20

Mag-
ne-

sium

(Mg)

5.6

3.5

3.4

Sodium

(Na)

5.3
3.5
3.0
1.8
1.4

1.2
1.3
.4
3.0
2.9
3.3

Po-
tas-

sium

(K)

0.8

. 7

.8

Bl-

car-

bon-

ate

(HCO,)

74
75
66
46
44

40
51
35
62
72

agO

Car-
bon-
ate

(ccg

Sulfate

(S04)

13

4.0

.0

Chloride

(Cl)

3.5
3.0
3.0
1.8
2.0

.8
.8
2.1
4.2
2.5
5.0

Fluo-
rlde

(F)

0.1

. 1

. 1

Ni-
trate

(NO,)

0.2

.0

. 1

Bo-

ron

(B)

0.0
.0
.0
. 0
. 0

.0
.0
.0
.0

.1
.0

Dissolved solids

(calculated)

Parts

per
million

100

63

89

Tons

per
acre-

foot

0.14

.09

. 12

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

68
63
62
44
42

33
42
31
51
57
64

Non-
car-

bon-

ate

7
1
8
6
6

0
0
2
0
0
o

So-

dium
ad-

sorp-
tion
ratio

0.3
. 2
.2
. 1
. 1

. 1
. 1
. 0
. 2
.2
.2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

130
138
124
95
89

69
85
63
104
121
138

PH

8.0
7.8
7.7
7.5
7.5

7.3
7.6
7.7
8.1
8.1
8.4

a Includes equivalent of 3 ppm of carbonate (CO3).

KLAMATH RIVER BASIN Continued

11-5230. KLAMATH RIVER AT SOMESBAR, CALIF.

LOCATION. At gaging station, 300 feet downstream from Salmon River, and 1 mile west of Somesbar Post Office, Siskiyou County. DRAINAGE AREA. 8,480 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 8, 1959......

Jan. 14, I960.....

A lie- 4
Sept. 15..........

Discharge
(cfs)

3,510
2,370
3,950
13,380
15,220

16,650
5,740
7,790
2,150
1,800
1,630

Silica

(S1Q,)

19

33

Iron

(Fe)

0.01

.01

Cal-

cium

(Ca)

13

16

Mag-
ne-

sium

(Mg)

6.9

7.3

Sodium

(Na)

15
14
11
5.0
4.1

4.2
5.7
1.9
6.4
9.1
12

Po-
tas-

sium

(K)

1.3

2.1

Bl-

car-

bon-

ate

(HCOJ

94
90
92
72
64

40
76
50
84
94
96

Car-
bon-
ate

(cog

Sulfate

(S0<)

9.0

9.0

Chloride

(Cl)

5.5
6.2
6.0
3.8
2.5

2.8
3.0
1.6
5.5
4.0
7.5

Fluo-

ride

(F)

0.1

. 2

Ni-

trate

(NOJ

0.0

1.1

Bo-

ron

(B)

0.1
.0

.1
.0

.1

. 0
.0
.0
.0

.1
. 2

Dissolved solids

(calculated)

Parts

per
million

95

135

Tons

per
acre-

foot

0.13

. 18

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

65
66
70
60
56

53
61
39
63
66
70

Non-
car-

bon-

ate

0
0
0

1
4

20
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.8
.8
. 6
.3
.2

.2
. 3
. 1
.4
. 5
.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

187
188
174
138
127

119
148
90
148
168
181

pH

7.8
. 5
. 6
.6
.6

.4
.8
. 6
.0
.9
.8

KLAMATH RIVER BASIN Continued

11-5255. TRINITY RIVER AT LEWISTON, CALIF.

LOCATION. At old highway bridge in Lewiston, Trinity County, 0.3 mile downstream from gaging station, and 0.8 mile downstream from Deadwood Creek. DRAINAGE AREA (revised). 726 square miles.
RECORDS AVAILABLE. Chemical analyses: December 1953 to September 1960.
Water temperatures: September 1951 to September 1955, October 1957 to September 1958, July 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 79°F July 20, 21, 28, 29; minimum, 35°F Jan. 4-6.
EXTREMES, 1951-55, 1957-58, 1959-60. Water temperatures: Maximum, 79°F July 20, 21, 28, 29, 1960; minimum, 33°F on several days in January 1952. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in pai

Date
of
collection

Oct. 9, 1959......

Sept. 16..........

Mean

discharge
(cfs)

186
167
156
244
2,800
2,910

4,320
2,020
2,810
435
224
120

Silica

(sicg

17

17

Iron

(Fe)

~

0.02

.00

Cal-

cium

(Ca)

5.6

14

Mag-
ne-

sium

(Mg)

7.8

11

Sodium

(Na)

9.3
9.1
10
7.1
2.9
2.0

1.2
1.7
. 7
5.0
4.2
7.5

Po-
tas-

sium

(K)

0.3

.8

-ts per million, water vear October 1959 to September 1960

Bi-
car-

bon-

ate

(HCO,)

88
85
94
82
46
48

44
57
38
70
82
97

Car-
bon-

ate

(CO,)

Sulfate

(S04)

1.0

7.0

Chloride

(CD

9.0
8.6
14
8.0
3.0
3.0

.8
1.8
2.6
5.0
5.5
10

Fluo-

ride

(F)

0.1

.0

Ni-

trate

(NO,)

0.0

.1

Bo-

ron

(B)

0.0
.0

.1
.1
.0
.0

.0
.0
.0
.0
.1
. 1

Dissolved solids

(calculated)

Parts

per
million

63

116

Tons

per
acre-

foot

0.09

. 16

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

76
75
84
76
46
44

38
46
32
53
66
82

Non-
car-

bon-

ate

4
5
7
9
8
5

2
0
1
0
0
2

So-

dium
ad-

sorp-
tion
ratio

0.5
.5
.5
.4
.2
. 1

. 1
. 1
. 1
.3
.2
.4

Specific
con-

duct-

ance

(micro-
mhos at

25"C)

172
180
198
165
95
90

75
94
69
116
140
171

pH

7.8
7.7
7.9
7.9
7.4
7.6

7.3
7.5
7.6
7.9
7.9
8.1

KLAMATH RIVER BASIN Continued

11-5270. TRINITY RIVER NEAR BURNT RANCH, CALIF.

LOCATION. At gaging station, 500 feet upstream from Cedar Flat Creek, 700 feet upstream from highway bridge at Cedar Flat, and 2.3 Burnt Ranch, Trinity County.
DRAINAGE AREA. 1.438 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

ailes southeast of

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 8, 1959......

Dec. 10.... ....

Feb. 12. ....

May 2.......... ...

July 14... ....

Sept. 15. ....

Discharge
(cfs)

309
300
281
550
5,610
6,920

6,820
2,970
4,260
749
377
201

Silica

(SiO*)

10

17

17

Iron

(Fe)

0.04

.00

Cal-

cium

(Ca)

20

10

22

Mag-
ne-

sium

(Mg)

12

7.1

9.7

Sodium

(Na)

12
8.4
8.7
7.1
2.6
2.1

1.6
2.1
. 7
3.3
4.9
6.3

Po-
tas-
sium

(K)

1.3

.4

.8

Bi-
car-

bon-

ate

(HCOj)

106
108
108
96
60
62

51
66
44
a75
92
113

Car-
bon-
ate

(CO,)

Sulfate

(S04)

23

2.0

.0

Chloride

(Cl)

12
10
11
11
3.0
2.5

1.5
2.0
2.2
5.8
5.0
12

Fluo-

ride

(F)

0.1

. 1

.0

Ni-
trate

(NO,)

0.3

.0

.2

Bo-

ron

(B)

0.0
.0
.1
.0
.0
.1

.0
.0
.0
.0
.0
.1

Dissolved solids

(calculated)

Parts

per
million

143

74

124

Tons

per
acre-

foot

0.19

. 10

. 17

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

100
92
100
90
54
55

42
54
38
61
76
95

Non-
car-

bon-
ate

13
3
11
11
5
4

0
0
2
0
1
2

So-

dium
ad-

sorp-
tion
ratio

0.5
.4
.4
.3
. 1
. 1

. 1
. 1
.0
.2
.2
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

205
210
214
193
115
111

88
109
79
132
169
210

pH

8.1
8.0
.9
.8
.4

.4
.8
.5
8.5
7.9
8.2

a Includes equivalent of 4 ppm of carbonate (CO3).

KLAMATH RIVER BASIN Continued

11-5290. SOUTH FORK TRINITY RIVER NEAR SALYER, CALIF.

LOCATION. At gaging station, 4 miles south of Salyer, Humboldt County, and 8 miles upstream from mouth.
DRAINAGE AREA. 899 square miles.
RECORDS AVAILABLE. Water temperatures: November 1956 to September 1960.
Sediment records: November 1956 to September 1960.
EXTREMES, 1959-60. Sediment concentrations: Maximum daily, 2,610 ppm Feb. 8; minimum daily, 1 ppm on many days. Sediment loads: Maximum daily, 193,000 tons Feb. 8; minimum daily, 0.2 ton on several days.
EXTREMES, 1956-60. Sediment concentrations: Maximum daily, 4,190 ppm Jan. 29, 1958; minimum daily, 1 ppm on many days. Sediment loads: Maximum daily, 255,000 tons Feb. 19, 1958; minimum daily, 0.2 ton on many days during 1957 and 1960. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.
REVISIONS. Revised figures of water discharge, in cubic feet per second, and sediment loads, in tons, superseding those pub-lished in WSP 1523, are given herewith:

Date

Feb. 24
Feb. 25
Feb. 26

Total
Total
to

, 1957 ....

, February 1957..
, November 1956
September 1957 . . ,

Mean

discharge
(cfs)

15,800
14,800
12,300

80 , 1S7

404,644

Suspended sediment

Mean
concentration

(ppm)
2,480
1,500
2,270

Tons

per day

S 116,000
S 57,700
S 77 , 100

301,771

425,001.3

S Computed by subdividing day.

Revised water discharge for particle-size analyses. 1957: Feb. 24 (1:00 p.m.), 18,300 cfs; Feb. 25 (1:00 p.m.). 14,000 cfs

Month

October .....
November ..
December ..

January .....
February ....

July...........
August ....
September ..

Day

1

46

48

64

68

2

44

52

3

44
43

55

62

4

43
44

56

5

47
48

55

6

46
49

54

60

7

47
47

54

~

8

42
42
47

-

9

42
45
44

62

10

43
45
45

11

42
45
45

~

12

42
45
44

13

39
45
45

63

14

39
46
46

~

15

45
43

68

16

47
48

17

45
49

58

18

43
52

19

44
51

20

43
50

62

21

56

43
50

22

60

45
54

23

43
52

57

24

43
54

25

42
54

48

26

43
51

49

64

27

41
51

53

- -

28

43
48

55

29

47

59

30

46

60

62

31

47

59

Aver-

age

44
48

KLAMATH RIVER BASIN Continued

11-5300. TRINITY RIVER NEAR HOOPA, CALIF.

LOCATION. At gaging station in Hoopa Indian Reservation, 0.7 mile downstream from Campbell Creek, and 1.8 miles southeast of Hoopa, Humboldt County. DRAINAGE AREA (revised). 2,848 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
Water temperatures: November 1956 to September 1960.
Sediment records: November 1956 to September 1960.
EXTREMES, 1959-60. Sediment concentrations: Maximum daily, 2,810 ppm Feb. 8; minimum daily, 1 ppm on many days.
Sediment loads: Maximum daily, 540,000 tons Feb. 8; minimum daily, 1 ton on many days.
EXTREMES, 1956-60. Sediment concentrations: Maximum daily, 3,360 ppm Jan. 12, 1959; minimum daily, 1 ppm on many days in 1957-60.
Sediment loads: Maximum daily, 967,000 tons Feb. 19, 1958; minimum daily, 1 ton on many days in 1957-60.
REMARKS. Measurement of suspended sediment made at bridge on State Highway 96, 3.5 miles downstream from gaging station. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. No appreciable inflow between sampling point and gaging station except during periods of heavy runoff. Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Jan. 14, I960.....

Sept. 15..........

Discharge
(cfs)

562
545
503
1,140
15,200
15,400

10,600
4,800
6,610

700
388

Silica

(SiQg)

19

17

Iron

(Fe)

~

0.05

.00

Cal-

cium

(Ca)

14

27

Mag-
ne-

sium

(Mg)

7.3

9.1

Sodium

(Na)

6.8
7.1
8.4
5.6
2.4
2.0

3.9
2.2
1.3
3.1
4.6
5.4

Po-
tas-

sium

(K)

0.4

. 8

Bi-
car-

bon-

ate

(HCOJ

117
115
126
102
64
66

62
77
58
89
108
123

Car-
bon-

ate

(CO,)

Sulfate

(S04)

6.0

6.0

Chloride

(Cl)

8.8
8.8
12
9.0
3.8
3.0

3.0
2.0
3.3
5.8
6.0
8.2

Fluo-
ride

(F)

0.2

. 0

Ni-

trate

(NO,)

0.0

. 0

Bo-

ron

(B)

0.1
. 0
.1
. 1
.0
.0

. 1
.0
.0
.0
. 1
. 0

Dissolved solids

(calculated)

Parts

per
million

89

134

Tons

per
acre-

foot

0.12

. 18

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

102
103
120
98
62
58

52
65
50
74
89
105

Non-
car-

bon-

ate

6
9
17
14
10
4

1
2
2
1
0
4

So-

dium
ad-

sorp-
tion
ratio

0.3
. 3
.3
.2
. 1
. 1

.2
. 1
. 1
. 2
. 2
.2

Specific
con-

duct-

ance

micro-

mhos at

25°C)

222
229
243
198
124
117

112
130
100
156
187
217

PH

.9
. 7
.0
.9
. 7
. 8

.5
.8
7.7
8.1
8.0
8.2

KLAMATH RIVER BASIN Continued

11-5305. KLAMATH RIVER NEAR KLAMATH, CALIF.

LOCATION. At gaging station, 2.8 miles upstream from Turwar Creek and 3.3 miles east of Klamath, Del Norte County. DRAINAGE AREA. 12,100 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 7, 1959......

Sept. 14..........

Discharge
(cfs)

3,920
4,180
4,000
6,720
60 , 500
44,300

33 , 000
14,400
19,800
5,150
3,720
3,080

Silica

(S1Q,)

18

25

Iron

(Fe)

_

0.03

.00

Cal-

cium

(Ca)

13

20

Mag-
ne-

sium

(Mg)

7.2

6.6

Sodium

(Na)

12
11
12
6.4
2.7
2.6

2.6
3.8
1.6
4.3
6.3
8.9

Po-
tas-

sium

(K)

0.7

1.3

Bi-
car-

bon-

ate

(HCO,)

101
105
98
78
60
58

59
73
54
82
94
101

Car-
bon-
ate

(ccg

Sulfate

(S0«)

8.0

1.0

Chloride

(CD

5.4
6.5
6.5
6.0
3.5
3.5

1.8
2.5
2.8
4.8
6.5
9.2

Fluo-

ride

(F)

_

0.1

. 1

Ni-

trate

(NO,)

0.0

.5

Bo-

ron

(B)

0.1
. 1
. 1
. 1
. 0
.0

.0
.0
.0
.0
.0
.0

Dissolved solids

(calculated)

Parts

per
million

_

89

123

Tons

per
acre-

foot

_

0.12

. 17

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

78
80
85
70
50
52

51
62
45
64
73
77

Non-
car-

bon-

ate

0
0
5
6
1
4

3
2
1
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.6
.5
. 6
.3
.2
.2

. 2
. 2
. 1
.2
.3
.4

Specific
con-

duct-

ance

micro-

mhos at

25°C)

197
202
188
153
115
109

108
134
97
146
168
188

PH

7.9
7.6
7.4
7.6
7.5
7.5

7.7
7.7
7.6
8.1
7.9
7.9

SMITH RIVER BASIN

11-5325. SMITH RIVER NEAR CRESCENT CITY, CALIF.

LOCATION. At gaging station,0.5 mile downstream from South Fork and 8 miles east of Crescent City, Del Norte County. DRAINAGE AREA. 613 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1953 to September 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1715.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Discharge
(cfs)

253
385
298
2,850
27,900
12,800

5,020
2,500
2,080
580
332
265

Silica

(S1Q.)

"

IS

16

Iron

(Fe)

0.01

. 00

Cal-

cium

(Ca)

"

4.4

9.2

Mag-
ne-

sium

(Mg)

8.3

12

Sodium

(Na)

2.7
2.6
3.5
2.0
.4
. 5

.3
.4
.3
.9
2.5
2.4

Po-
tas-

sium

(K)

- -

0.3

.4

Bi-
car-

bon-

ate

(HCO,)

78
71
76
60
36
38

44
56
54
71
76
83

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

1.0

.0

Chloride

(Cl)

3.4
3.6
4.8
3.0
4.5
4.0

2.5
2.0
2.7
4.5
4.5
7.5

FluO-

rlde

(P)

0.1

.0

Ni-

trate

(NO,)

"

0.0

.2

Bo-

ron

(B)

0.0
.0
.0
. 0
.0
.0

.0
.0
.0
.0

.1
.0

Dissolved solids

(calculated)

Parts

per
million

"

64

89

Tons

per
acre-

foot

__

0.09

. 12

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

66
66
73
54
38
40

37
45
46
60
66
71

Non-
car-

bon-

ate

2
8
11
5
8
9

1
0
2
2
4
3

So-
dium
ad-

sorp-
tion
ratio

0.1
. 1
.2
. 1
. 1
. 1

. 1
. 1
. 1
. 1
. 1
. 1

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

136
137
133
104
77
78

78
91
94
117
128
138

pH

7.8
7.4
7.8
7.5
7.4
7.5

7.1
7.6
7.6
8.0
7.9
8.2

PART 12. PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

WILLAPA RIVER BASIN

12-115. WILLAPA RIVER AT LEBAM, WASH.

LOCATION. At bridge on State Highway 12, 0.1 mile upstream from gaging station, 0.4 mile west of Lebam, Pacific County, and 1.1 miles upstream from Walker Creek.
DRAINAGE AREA. 41.4 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
Water temperatures: March 1952 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 69°F Aug. 9; minimum, 34°F Mar. 3.
EXTREMES, 1952-60. Water temperatures: Maximum, 72°F July 19, 20, 1956; minimum, freezing point Jan. 28-30, 1957.
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively.

Chemical analyses, in parts per million. July 1959 to July 1960

Date
of
collection

July 8............

Mean

discharge
(cfs)

32
10.5
63
118
156
186

65
330
363
644
278
41
17.5

Silica

(SiQ,)

15
14
14
16
15
16

16
15
14
14
16
14
14

Iron

(Fe)

Cal-

cium

(Ca)

5.5
5.0
4.5
4.0
4.0
4.5

4.0
4.0
4.0
3.5
3.5
4.5
5.0

Mag-
ne-

sium

(Mg)

0.7
1.0
1.0
1.4
1.0
1.0

1.3
.6
.9
. 6
1.2
1.3
1.1

Sodium

(Na)

5.0
4.2
4.8
5.0
4.8
4.5

4.6
4.1
4.3
4.2
4.9
4.9
5.2

Po-
tas-

sium

(K)

0.5
.9
. 7
1.0
. 7
. 6

.6
.6
.4
. 6
. 5
.5
.8

Bi-
ear-

bon-

ate

(HCO,)

26
27
21
21
17
17

19
15
14
14
18
25
27

Car-
bon-
ate

(ccg

Sulfate

(S04)

2.9
1.9
3.4
4.7
4.2
3.5

4.8
1.5
3.5
3.2
3.8
2.6
2.6

Chloride

(Cl)

4.0
3.5
3.8
4.0
3.5
4.2

3.8
3.5
4.0
3.8
3.8
3.8
3.5

Fluo-

ride

(F)

0.2
.2
.2
.2
. 1
. 1

. 1
. 1
. 1
. 1
.0
. 1
.0

Ni-
trate

(NO,)

0.4
. 5
.9
1.5
2.1
2.2

1.9
2.2
2.1
2.3
1.8
.6
.4

Phos-

phate
(P0 4)

0.03
.00
.01
.01
. 01
.05

.05
.06
.00
.00
.04
.04
.06

Dissolved solids

(residue at 180°C)

Parts

per
million

45
48
45
53
47
45

46
44
45
42
42
46
50

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

16
17
15
16
14
15

15
12
14
11
14
16
17

Non-
car-

bon-

ate

0
0
0
0
0

1

0
0
2
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

61
59
57
61
56
56

61
52
50
48
55
59
63

pH

6.8
7.2
6.9
6.8
6.6
7.0

7.1
6.8
6.9
6.7
6.9
7.0
7.2

CHEHALIS RIVER BASIN

12-200. CHEHALIS RIVER AT DRYAD, WASH.

LOCATION. At county bridge at Dryad, Lewis County, 0.6 mile downstream from Dunn Creek and 3.5 miles downstream from gaging station near Doty. DRAINAGE AREA. 113 square miles upstream from gaging station,
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, repsectively. Some inflow between sampling point and gaging station.

Chemical analyses, in parts per million, July 1959 to July 1960

Date
of
collection

July 11...........

Mean

discharge
(cfs)

124
35
336
380
470
550

195
958
1,380
2,350
720
149
66

Silica

(SiQa)

16
17
15
16
16
18

16
15
14
14
14
14
16

Iron

(Fe)

Cal-

cium

(Ca)

7.0
6.5
5.5
5.5
5.0
5.0

5.5
4.5
4.5
4.0
5.0
6.0
7.0

Mag-
ne-

sium

(Mg)

1.2
1.8
1.4
1.3
1.0
1.3

1.1
1.3
.8
1.0
. 8
1.6
1.3

Sodium

(Na)

4.6
5.5
3.8
4.0
4.3
4.0

4.6
3.5
3.8
3.5
4.0
4.8
5.6

Po-
tas-

sium

(K)

0.5
. 7
.4
.6
.3
.4

. 5
.3
.2
. 2
. 3
.4
.5

Bi-
car-

bon-

ate

(HCO,)

30
34
26
25
22
22

23
20
20
19
22
30
32

Car-
bon-

ate

(CO,)

Sulfate

(S04)

2.7
2.3
2.6
4.4
3.0
2.8

3.0
2.5
2.6
2.6
3.8
3.8
2.4

Chloride

(Cl)

4.5
5.0
3.5
4.0
4.5
4.2

4.5
2.5
3.0
3.2
3.5
4.2
4.8

FluO-

ride

(F)

0.3
.3
.2
.2
. 2
. 1

. 0
. 1
. 1
. 1
. 0
. 1
.0

Ni-

trate

(NO,)

0.4
.3
.9
. 7
.8
1.1

. 8
1.1
1.1
.8
. 7
. 3
.2

Phos-

phate
(P04)

0.03
. 00
.03
.01
. 10
.03

.00
.03
.04
.00
.04
. 04
.05

Dissolved solids

(residue at 180°C)

Parts

per
million

55
60
47
50
47
48

53
42
43
39
45
50
56

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

22
24
19
19
17
18

18
16
14
14
16
22
23

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

67
77
59
59
60
62

63
50
53
49
56
65
75

PH

6.8
7.4
6.9
7.0
7.1
7.4

7.3
7.2
7.2
7.1
7.6
7.1
7.5

CHEHALIS RIVER BASIN Continued

12-260. SKOOKUMCHUCK RIVER NEAR CENTRALIA, WASH.

LOCATION.--At county bridge, 0.1 mile downstream from Thompson Creek, 4.4 miles downstream from gaging station, and 11 miles northeast of Centralia, Lewis County.
DRAINAGE AREA (revised). 61.7 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to June 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. Some inflow between sampling point and gaging station.

Chemical analyses, in parts per million, July 1959 to June 1960

Date
of
collection

June 7............

Mean

discharge
(cfs)

200
434
203

520
238
388
720
219
114

Silica

(SiOj

16
16
14
14
15
16

14
16
14
14
15
16

Iron

(Fe)

Cal-

cium

(Ca)

6.5
7.5
6.0
5.0
4.5
5.0

5.0
5.5
5.0
5.0
5.5
6.0

Mag-
ne-

sium

(Mg)

1.4
.9
1.1
1.2
.9
1.0

.3
. 7
.3
.3
1.0
1.3

Sodium

(Na)

3.6
4.3
3.3
2.8
2.9
3.0

2.6
3.1
2.6
3.1
3.3
3.6

Po-
tas-

sium

(K)

0.3
.6
.4
.6
.3
.3

.3
.6
.0
.2
.2
.2

Bi-
car-

bon-

ate

(HCO,)

32
36
29
26
21
25

19
25
22
20
27
30

Car-
bon-
ate

(CO,)

Sulfate

(S04)

1.4
1.8
1.6
1.9
1.9
1.6

1.2
1.6
1.2
2.0
2.2
1.4

Chloride

(Cl)

2.2
3.0
1.5
1.8
2.0
1.8

1.5
2.2
1.2
2.0
1.5
2.2

Fluo-

rlde

(F)

0.1
. 1
.2
. 1
. 1
. 1

.0
. 1
. 1
.0
.0
. 1

Ni-

trate

(NO,)

0.2
.3
. 1
. 1
.9
.3

.5
.5
.2
1.3
.2
. 1

Phos-

phate
(P04)

0.04
.02
.03
.01
.07
.07

.05
.07
.03
.01
.05
.04

Dissolved solids

(residue at 180°C)

Parts

per
million

48
55
43
43
44
44

43
47
34
49
44
47

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

22
22
20
18
14
17

14
16
14
14
18
20

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

61
70
55
50
46
51

44
52
42
45
51
59

pH

7.3
6.7
7.4
6.9
6.8
7.5

7.1
7.2
7.1
7.0
7.0
7.3

CHEHALIS RIVER BASIN Continued

12-310. CHEHALIS RIVER AT PORTER, WASH.

LOCATION. At gaging station at County Highway bridge in Porter, Grays Harbor County, immediately upstream from mouth of Porter Creek. DRAINAGE AREA (revised) . 1,294 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
Water temperatures: July 1959 to September 1960 (discontinued).
EXTREMES, 1959-60. Dissolved solids: Maximum, 75 ppm July 14 to Aug. 12; minimum, 45 ppm Dec. 13-20.
Hardness: Maximum, 32 ppm July 14 to Aug. 12; minimum, 14 ppm Nov. 20-27, Dec. 13-20, Mar. 30 to Apr. 4.
Specific conductance: Maximum daily, 103 micromhos Aug. 27; minimum daily, 45 micromhos Dec. 16.
Water temperatures: Maximum, 75°F July 17; minimum, 34°F Dec. 30.
EXTREMES, July 1959 to September I960. Dissolved solids: Maximum, 75 ppm July 14 to Aug. 12, 1960; minimum, 45 ppm Dec. 13-20, 1959.
Hardness: Maximum, 32 ppm July 14 to Aug. 12, 1960; minimum, 14 ppm Nov. 20-27, Dec. 13-20, 1959, Mar. 30 to Apr. 4, 1960.
Specific conductance: Maximum daily, 103 micromhos Aug. 27, 1960; minimum daily, 45 micromhos Dec. 16, 1959.
Water temperatures: Maximum, 77°F July 21, 1959; minimum, 34°F Dec. 30, 1959.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively.

Chemical analyses, in parts per million, July to September 1959

Date
of
collection

July 6-15, 1959...
July 16-31........

Aug. 16-31........

Sept. 8-20........

Mean

discharge
(cfs)

766
470
341
336
778
798
1,870

Silica

(SiQ,)

19
19
18
18
18
17
16

Iron

(Fe)

Cal-

cium

(Ca)

8.'o
8.0
8.5
7.5
7.5
6.0

Mag-
ne-

sium

(Mg)

2.0
2.4
2.5
2.3
2.8
1.6
1.6

Sodium

(Na)

5.7
6.3
6.4
6.9
6.8
5.3
4.5

Po-
tas-

sium

(K)

0.5
.8
. 7
1.1
1.1
1.1
. 9

Bi-
car-

bon-

ate

(HC03)

39
41
43
43
40
33
28

Car-
bon-

ate

(CO,)

Sulfate

(S04)

2.8
2.5
2.4
2.6
2.8
2.9
2.8

Chloride

(Cl)

4.5
5.5
5.8
6.2
6.5
4.5

Fluo-
ride

(F)

0.2
.2

!l
. 1

Ni-

trate

(NOJ

0.3
.4
.3
.3
.5
. 7
1.0

Phos-

phate
(P04)

0.08
.05
.07
.00
.01
.01
.01

Dissolved solids

(residue at 180°C)

Parts

per
million

64
68
70
70
67
57
53

Tons

per
acre-

foot

0.09
.09
. 10
. 10
.09
. 08
. 07

Tons

per

day

132
86.3
64.4
63.5
141
123
268

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

28
30
30
30
30
25
22

Non-
car-

bon-
ate

0
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

83
92
94
97
94
78
67

pH

7.0
7.2
7.4
7.3
7.2
6.9
6 9

CHEHALIS RIVER BASIN Continued

12-374. WYNOOCHEE RIVER NEAR MONTESANO, WASH.

LOCATION. At county bridge, 5 miles upstream from Wedekind Creek, 7 miles upstream from gaging station, 8 miles northwest of Montesano, Grays Harbor County and 9 miles northeast of Aberdeen.
DRAINAGE AREA. 179 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. Some inflow between sampling point and gaging station.

Chemical analyses, in parts per million, July 1959 to July 1960

Date
of
collection

July 19... ....

Mean

discharge
(cfs)

403
80
2,580
1,420
2,310
1,020

4,320
1,340
1,130
1,880
1,480
728
138

Silica

(SiQ.)

11
11
9.2
10
9.9
10

7.6
9.9
9.6
8.8
7.9
9.0
11

Iron

(Fe)

Cal-

cium

(Ca)

8.5
8.0
7.0
7.0
6.0
6.5

5.0
6.0
6.5
6.0
6.5
7.5
8.0

Mag-
ne-

sium

(Mg)

0.9
1.5
. 7
1.3
.9
1.3

.9
1.2
1.1
.9
.9
1.0
1.9

Sodium

(Na)

2.3
2.4
2.2
1.9
1.9
1.9

1.6
1.7
1.7
1.8
1.7
2.2
2.5

Po-
tas-

sium

(K)

0.3
. 5
.6
.5
.3
.6

. 2
.2
.0
.0
. 1
. 3
.4

Bi-
car-

bon-

ate

(HCO,)

33
36
25
28
24
27

21
25
27
23
25
30
35

Car-
bon-
ate

(CO,)

Sulfate

(S04)

2.5
3.0
2.8
3.3
3.0
2.4

2.5
2.5
2.2
1.8
1.0
2.4
2.4

Chloride

(Cl)

1.5
2.5
1.2
1.2
1.0
1.8

1.0
1.5
1.8
2.5
2.2
2.0
1.8

Fluo-

ride

(F)

0.1
. 1
.3
.0
. 1
.0

. 0
.0
.0
.0
. 0
.0
. 1

Ni-

trate

(NO,)

0.2
. 2
.8
.5
.5
.3

. 5
1.3
.3
.3
. 1
. 1
.0

Phos-

phate
(P0 4)

0.00
.00
. 01
.03
.01
.00

.03
.00
.00
.00
.01
.01
. 00

Dissolved solids

(residue at 180°C)

Parts

per
million

38
46
38
41
39
37

31
36
35
36
32
39
42

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

25
26
20
23
18
21

16
20
20
19
20
23
28

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

64
70
54
57
51
58

44
52
53
51
50
58
68

pH

6.9
7.2
7.3
7.2
7.0
7.1

7.2
7.4
7.4
7.0
7.4
7.4
7.3

HUMPTULIPS RIVER BASIN

12-390. HUMPTULIPS RIVER NEAR HUMPTULIPS, WASH.

LOCATION. At bridge on U.S. Highway 101, 0.2 mile south of Humptulips, Grays Harbor County, 1.1 miles upstream from Stevens Creek, and 1.4 miles downstream from gaging station.
DRAINAGE AREA. 130 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses.

Date
of
collection

Feb. 22...........
Mar 22 .

July 19...........

Sept. 7...........

Mean

discharge
(cfs)

385
169
2,540
1,510
2,120

974
4,170
1,410
1,060
1,830

1,460
705
197
169
296

SUlca

(SlQs)

11
12
9.6
11
11

11
9.0
11
9.8
9.2

9.1
12
12
11
10

Iron

(Fe)

Cal-

cium

(Ca)

7.0
8.0
5.5
6.0
5.0

5.5
4.5
5.0
5.5
4.0

5.5
6.0
7.5
8.0
7.0

Mag-
ne-

sium

(Mg)

1.0

1.1
1.1
1.3
1.3

1.3
.9
1.7
1.1
1.7

1.0
1.5
1.8
1.4
1.6

Sodium

(Na)

2.6
3.2
2.3
2.7
2.2

2.5
2.1
2.3
2.3
2 2

2.3
2.9
3.3
3.4
3.0

Po-
tas-

sium

(K)

0.2
.3
.3
.4
. 1

. 1
.3
.2
. 1
.2

.0
.3
.2
.3
.0

in parts per million. July 1959 to September 1960

Bl-

car-

bon-

ate

(HCOJ

31
34
23
26
23

25
20
25
24
21

23
28
33
34
32

Car-
bon-

ate

(CO,)

Sulfate

(S04)

2.5
3.3
2.6
2.9
3.0

2.2
1.9
1.9
2.3
2.0

1.0
2 2
2.0
2.4
3.0

Chloride

(Cl)

2.5
3.0
1.5
1.8
2.2

2.2
2.0
2.0
2.0
2.8

2.5
3.0
2.5
2.8
2.2

Fluo-
rlde

(F)

0.1
.2
.3
. 1
. 1

. 1
.0
.0

. 1
.1

.0
.0

. 1
.0
.0

Ni-

trate

(Ncg

0.2
.2
.6
.5
2.2

.4
.3
.8
.2
. 1

.0
.0
. 1
.0
.3

Phos-

phate
(P04)

0.00
.02
.08
.00
.04

.02
.03
.02
.01
.00

.01
.00
.03
.00
.01

Dissolved solids

(residue at 180°C)

Parts

per
million

39
45
37
40
36

40
36
36
37
34

36
39
51
48
45

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

22
24
18
20
18

19
14
20
18
17

18
21
26
26
24

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

imicro-

mhos at

25°C)

60
70
51
55
50

56
44
51
51
50

49
56
68
70
65

pH

6.9
7.1
7.2
6.9
6.9

7.3
7.2
7.5
7.5
7.1

7.2
7.5
7.2
7.5
7.4

QUINAULT RIVER BASIN

12-395. QUINAULT RIVER AT QUINAULT LAKE, WASH.

LOCATION. At bridge on U.S. Highway 101, 50 feet upstream from gaging station, 0.2 mile downstream from Quinault Lake, Grays Harbor County, and 5.5 miles upstream from Prairie Creek.
DRAINAGE AREA. 264 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to June 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively.

Chemical analyses, in parts per million, July 1959 to June 1960

Date
of
collection

Mean

discharge
(cfs)

2,230
850
6,120
3,500
5,800
2,350

6,640
2,650
2,480
4,020
4,350
3,400

Silica

(sicg

3.0
4.9
4.9
4.4
4.7
4.3

5.0
4.4
4.9
5.2
4.8
4.7

Iron

(Fe)

Cal-

cium

(Ca)

9.5
10
9.5
9.0
8.0
8.5

9.0
8.0
8.0
8.5
8.5
8.5

Mag-
ne-

sium

(Mg)

0.5
. 1
.2
.8
.4
. 3

. 2
.4
. 5
.4
. 7
. 8

Sodium

(Na)

. 3
.3
.5
.4
. 3
. 3

. 9
.3
.4
.4
. 6
. 7

Po-
tas-

sium

(K)

0.1
. 3
.4
.4
.2
. 1

. 2
. 1
.0
.2
. 1
. 1

Bi-
car-

bon-

ate

(HCOS)

27
28
27
28
24
22

25
23
24
24
25
26

Car-
bon-
ate

(COJ

Sulfate

(S04)

5.8
6.6
5.6
5.8
5.4
5.4

5.3
5.1
5.1
5.4
6.8
6.6

Chloride

(CD

0.8
1.2
1.0
1.2
. 5
1.0

1.0
1.0
1.2
1.0
1.5
1.2

Fluo-
ride

(F)

0.1
. 2

.0
. 1
.0
. 0

Ni-

trate

(NO,)

0.2
. 0
.2
.2
. 3
. 2

. 2
.2
.2
. 1
. 0
. 0

Phos-

pbate
(P04)

0.00
. 00
. 00
.00
.00
.03

. 03
. 06
.01
.00
.01
. 02

Dissolved solids

(residue at 180°C)

Parts

per
million

36
34
39
42
36
38

38
32
32
34
35
35

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

26
25
24
26
22
22

23
22
22
22
24
24

Non-
car-

bon-

ate

4
2
2
2
2
4

2
3
2
3
4
2

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

micro-

mhos at

25°C)

59
64
61
61
55
57

59
54
56
58
61
60

pH

7.4
7.2
7.1
7.2
6.8
7.0

7.0
6.9
7.3
7.0
7.0
7.0

ELWHA RIVER BASIN

12-455. ELWHA RIVER NEAR PORT ANGELES, WASH.

LOCATION. At bridge on U.S. Highway 101, 0.2 mile upstream from gaging station, 0.7 mile upstream from Little River, 5.3 miles southwest of Port Angeles, Clallam County, and 7.2 miles upstream from mouth.
DRAINAGE AREA. 269 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively.

Chemical analyses, in parts per million, July 1959 to July 1960

Date
of
collection

July 18...........

Mean

discharge
(cfs)

1,700
704
1,280
616
6,500
4,910

627
1,940
1,060
1,900
1,770
2,330
1,510

Silica

(S1Q.)

3.0
6.3
5.9
5.9
5.4
6.0

7.4
7.7
7.8
6.7
6.9
5.6
5.0

Iron

(Fe)

Cal-

cium

(Ca)

12
14
14
15
13
10

16
13
16
14
14
11
12

Mag-
ne-

sium

(Mg)

1.0
. 1
.6
.5
1.0
.9

.6
.5
.2
.9
.2
.0
.8

Sodium

(Na)

.2
.4
.8
.9
.5
.4

. 1
.7
.2
.8
.9
.6
.6

Po-
tas-

sium

(K)

0.1
.4
.4
.6
.4
.4

.4
. 1
.2
.2
. 1
. 1
.2

Bl-

car-

bon-

ate

(HCO,)

36
41
43
42
42
33

50
45
51
43
44
35
36

Car-
bon-

ate

(CO,)

Sulfate

(S04)

6.5
7.2
8.2
8.0
4.9
6.4

9.0
6.8
8.7
7.0
8.2
5.8
6.4

Chloride

(CD

0.5
.8
.8
.8
.0
.0

1.0

*5
.2
1.0
.5
.2

Fluo-
rlde

(F)

0.1
.0
.0
.0
.3
. 1

. 1
. 1
. 1
. 1
. 1
. 1
.0

Ni-

trate

(NO,)

0.1
.3
.2
.0
. 1
.2

.0
.3
. 1
.0
.0
.0
.0

Phos-

phate
(P04)

0.00
.00
.00
.02
.05
. 11

.00
.01
.02
.00
.00
.01
.00

Dissolved solids

(residue at 180°C)

Parts

per
million

44
54
55
55
55
46

66
54
65
52
54
42
47

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

34
35
38
40
36
30

46
39
45
38
40
32
33

Non-
car-

bon-

ate

4
2
2
5
2
2

6
2
3
4
4
3
4

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

75
85
90
90
80
71

106
90
103
89
91
70
76

PH

7.4
7.6
7.5
7.4
6.4
7.3

7.7
8.0
7.8
7.6
7.8
7.8
7.6

DUNGENESS RIVER BASIN

12-480. DUNGENESS RIVER NEAR SEQUIM, WASH.

»ing station and 6.3 miles upstream from mouth. LOCATION. At bridge on U.S. Highway 101, 1.8 miles west of Sequim, Clallam County, 5.4 miles downstream from DRAINAGE AREA.--156 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. Some inflow between sampling point and gaging station.

Chemical analyses, in parts per million, July 1959 to Julj

Date
of
collection

May 9. ....

July 18...........

Mean

discharge
(cfs)

504
257
303
150
826
1,300

150
440
205
445
532
732
420

Silica

(S1Q,)

3.0
6.7
6.3
6.8
5.5
7.1

7.0
8.4
8.7
7.2
6.8
5.3
4.9

Iron

(Fe)

Cal-

cium

(Ca)

16
18
16
20
13
12

21
19
23
18
16
14
14

Mag-
ne-

sium

(Mg)

2.0
2.1
2.1
2.5
1.6
1.7

3.6
2.8
2.7
1.7
2.7
1.6
1.6

Sodium

(Na)

1.9
2.8
2.5
3.2
1.8
1.9

3.5
3.2
4.1
2.5
2.5
1.9
1.9

Po-
tas-

sium

(K)

0.1
.6
.4
. 5
.3
.3

.4
.3
.3
.2
. 1
.3
.3

Bi-
car-

bon-

ate

(HCOJ

54
65
58
72
44
45

76
68
79
62
59
50
48

Car-
bon-

ate

(COJ

Sulfate

(S0«)

5.7
7.0
6.6
9.0
5.6
5.1

9.6
8.0
10
7.4
7.0
4.4
5.2

Chloride

(Cl)

0.5
.8
1.0
1.5
.8
. 5

1.8
1.2
2.2
.8
1.0
1.0
1.0

Fluo-
ride

(P)

0.0
. 1
. 1
.1
.1
.1

.0
.0
. 1
. 1
.0
. 1
.0

Ni-
trate

(NOj)

0.1
.4
.2
.2
.6
.3

.0
.2
. 1
.0
.0
.0
.0

Phos-

phate
(P04)

0.00
.00
.00
.00
.00
.06

.00
.05
.02
.00
.01
.01
.01

1960

Dissolved solids

(residue at 180°C)

Parts

per
million

59
72
67
84
55
53

91
77
94
69
63
54
54

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

48
54
49
60
39
38

68
59
68
52
51
42
42

Non-
car-

bon-

ate

4
0
2
1
3
1

5
4
4
1
2
0
2

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

micro-

mhos at

25°C)

101
125
113
137
89
94

150
130
152
117
112
93
92

pH

7.6
7.5
7.6
7.8
6.3
7.2

7.9
7.9
7.9
7.9
7.7
7.8
7.7

DESCHUTES RIVER BASIN

12-790. DESCHUTES RIVER NEAR RAINIER, WASH.

LOCATION. At bridge on State Highway 5H, 1.7 miles southwest of Rainier, Thurston County and 4 miles downstream from gaging station.
DRAINAGE AREA. 89.8 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
REMARKS.--Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. Slight inflow between sampling point and gaging station.

Chemical analyses, in parts per million, July 1959 to Jul\

Date
of
collection

July 7, 1959......

July 8 ....

Mean

discharge
(cfs)

66
36
84
170
395
172

484
279
456
744
232
115
59

Silica

(sicg

22
22
18
17
18
20

16
19
16
16
19
20
23

Iron

(Fe)

Cal-

cium

(Ca)

12
12
8.0
7.5
7.0
8.0

6.0
7.5
6.5
5.5
9.0
9.5
12

Mag-
ne-

sium

(Mg)

2.0
3.1
3.1
2.0
1.5
1.8

1.4
1.9
1.0
1.4
1.4
2.2
2.2

Sodium

(Na)

6.2
7.4
5.0
3.8
3.6
4.6

3.1
4.3
3.4
3.1
4.4
5.6
7.1

Po-
tas-

sium

(K)

0.7
.9
. 5
. 7
.3
.2

.2
.4
.2
.4
.4
.5
.7

Bi-
car-

bon-

ate

(HCOS)

48
52
42
35
31
36

28
34
29
27
39
42
51

Car-
bon-

ate

(ccg

Sulfate

(SO,)

2.1
2.4
1.6
1.9
2.1
2.1

1.7
1.7
1.6
1.0
1.8
2.2
1.6

Chloride

(Cl)

7.5
12
6.2
4.0
2.0
4.2

2.5
3.5
2.5
2.2
4.2
6.2
8.8

Fluo-
ride

(F)

0.1
. 1
. 1
. 1
. 1
. 1

.0
.0
.1
. 1
.1
.0
. 1

Ni-

trate

(NO,)

0.2
.3
.3
.4
. 7
. 5

.5
.7
.2
.4
.3
. 1
.2

Phos-

phate
(P04)

0.06
.00
. 11
.02
.02
.06

.05
.07
.03
.01
.05
.03
.07

1960

Dissolved solids

(residue at 180°C)

Parts

per
million

79
86
66
58
58
62

48
62
46
54
63
69
79

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

38
43
32
26
24
27

20
26
20
19
28
32
39

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

106
131
92
72
67
81

58
75
60
55
79
92
114

pH

7.2
7.4
7.4
7.2
6.9
7.3

7.1
7.3
7.4
7.0
7.4
7.7
7.6

PUYALLUP RIVER BASIN Continued

12-1015. PUYALLUP RIVER AT PUYALLUP, WASH.

LOCATION. At bridge, 0.8 mile downstream from gaging station, 1.8 miles northwest of Puyallup, Pierce County, and 6.2 miles upstream from mouth. DRAINAGE AREA. 948 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
Water temperatures: July 1959 to September 1960 (discontinued).
EXTREMES, 1959-60. Dissolved solids: Maximum, 66 ppm Jan. 9-23; minimum, 40 ppm June 2-July 1.
Hardness: Maximum, 32 ppm Jan. 9-23; minimum, 17 ppm Oct. 23-31.
Specific conductance: Maximum daily, 102 micromhos Jan. 20; minimum daily, 43 micromhos Oct. 12.
Water temperatures: Maximum, 69°F July 28; minimum, 35°F Jan. 19.
EXTREMES, July 1959 to September 1960. Dissolved solids: Maximum, 66 ppm Jan. 9-23, I960; i
Hardness: Maximum, 32 ppm Jan. 9-23, 1960; minimum, 17 ppm Sept. 26-30, Oct. 23-31, 1959.
Specific conductance: Maximum daily, 102 micromhos Jan. 20, 1960; minimum daily, 43 micromhos Oct. 12, 1959.
Water temperatures: Maximum, 69°F July 28, 1960; minimum, 35°F Jan. 19, 1960.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively.

Chemical analyses, in parts per million, July to September 1959

40 ppm July 8-21, 1959, June 2 to July 1, 1960.

Date
of
collection

July 8-21, 1959...

Sept. 26-30.......

Mean

discharge
(eta)

3,258
2,291
1,901
1,669
1,432

1,973
2,892
2,622
6.672

Silica

(SlQj)

12
13
13
13
14

14
13
14
12

Iron

(Fe)

Cal-

cium

(Ca)

5.5
6.0
6.0
7.0
7.5

7.5
6.5
7.0
5.0

Mag-
ne-

sium

(Mg)

1.0
1.3
1.3
1.5
1.6

.8
.9
1.2
1.1

Sodium

(Na)

2.8
3.0
3.1
3.5
3.4

3.4
3.0
3.3
2.6

Po-
tas-

sium

(K)

0.9
1.0
1.2
1.3
1.0

1.0
.9
.9
.8

Bi-
car-

bonr
ateN

(HC03)

24
26
28
32
31

29
25
28
21

Car-
bon-

ate

tco,)

Sulfate

(S0«)

4.4
4.8
5.0
5.8
6.3

6.7
5.0
5.2
4.6

Chloride

(Cl)

1.2
1.5
1.2
1.8
1.5

2.0
1.0
2.0
1.0

Fluo-

rlde

(F)

0.3
.2
.2
.3
.4

.2
.3
.3
.4

Ni-
trate

(NO,)

0.2
.2
.2
.2
.4

.3
.2
.2
.8

Phos-

phate
(P0 4)

0.07
.09
.03
.09
.02

.08
.07
.05
.04

Dissolved solids

(residue at 180°C)

Parts

per
million

40
43
42
50
54

55
48
51
44

Tons

per
acre-

foot

0.05
.06
.06
.07
.07

.07
.07
.07
.06

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

18
20
20
24
25

22
20
22
17

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

53
59
60
69
69

66
58
64
51

PH

7.1
7.0
7.3
7.2
6.8

7.2
7.2
7.2
7 ?

DUWAMISH RIVER BASIN

12-1065. GREEN RIVER AT PALMER, WASH.

LOCATION. At county bridge at Palmer, King County, 4.5 miles downstream from gaging station and 7 miles downstream from North Fork.
DRAINAGE AREA. 230 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
Water temperatures: August 1950 to September 1956.
Sediment records: August 1950 to September 1956.
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical anal

Date
of
collection

Jan. 27, I960.....

July 21...........

Mean

discharge
(cfs)

554
205
802
1,450
1,740
736

788
1,090
2,350
1,660
1,970
866
268

Silica

(SiQs)

13
14
14
14
14
14

13
14
13
13
12
13
14

Iron

(Fe)

Cal-

cium

(Ca)

5.5
6.0
5.5
5.0
5.0
5.5

5.0
4.0
3.5
4.5
4.0
5.0
6.0

Mag-
ne-

sium

(Mg)

0.5
.8
.3
.5
.2
.4

.3
.9
.5
. 1
.4
.5
.8

Sodium

(Na)

2.4
2.6
2.5
2.4
2.1
2.3

2.1
2.1
2.0
2.0
2.0
2.5
3.3

Po-
tas-

sium

(K)

0.1
.5
.4
.4
.2
.0

.4
. 1
. 1
.2
.0
.2
.3

yses, in parts per million, July 1959 to July 1960

Bi-
car-

bon-

ate

(HCO,)

22
27
22
22
20
22

20
20
17
18
18
21
28

Car-
bon-
ate

(ccg

Sulfate

(S04)

1.6
2.3
2.1
1.9
1.6
2.2

2.3
1.9
2.3
2.0
1.8
1.6
3.0

Chloride

(Cl)

1.2
1.2
1.0
1.0
1.0
.8

1.0
.8
.8
1.0
.8
1.0
1.5

Fluo-
ride

(F>

0.1
. 1
.2
. 1
. 1
. 1

.0
. 1
. 1
.0
. 1
.0
.0

Ni-

trate

(NO,)

0.4
.3
.2
. 1
.2
.3

. 1
.2
. 1
. 1
. 1
.0
.0

Phos-

phate
(POJ

0.02
.00
.03
.00
.01
.03

.06
.03
.03
.00
.02
.02
.02

Dissolved solids

(residue at 180°C)

Parts

per
million

36
38
38
36
38
36

36
30
32
31
28
35
45

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

16
18
15
14
13
15

14
14
11
12
12
14
18

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

Imicro-

mhos at

25°C)

44
54
45
43
40
45

43
41
34
36
35
41
53

PH

7.3
7.4
7.2
7.0
7.3
7.4

6.9
7.0
7.3
7.3
7.0
7.5
7.5

DUWAMISH RIVER BASIN Continued

12-1130. GREEN RIVER NEAR AUBURN, WASH.

LOCATION. At bridge on State Highway 5B, 0.1 mile upstream from Big Soos Creek, 1.8 miles east of Auburn, King County, and 2.1 miles upstream from gaging station.
DRAINAGE AREA. 382 square miles, excluding 4 square miles in the vicinity of Youngs Lake.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
Water temperatures: March 1952 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 71°F July 6, 27-29; minimum, 38°F Nov. 16-18, Mar. 3, 4.
EXTREMES, 1952-60. Water temperatures: Maximum, 75°F July 28, 1958; minimum, 33°F Feb. 16, 17, 1956.
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses

Date
of
collection

Oct. 16. ....

Mean

discharge
(cfs)

740
255
952
1,630
2,610

1,370
1,430
1,670
2,530
1,980

2,280
1,120
359
281
368

Silica

(S1Q.)

14
14
14
14
14

14
14
14
13
13

13
14
14
14
14

Iron

(Fe)

Cal-

cium

(Ca)

7.0
10
7.0
6.0
5.5

7.0
7.0
6.5
5.0
5.0

5.0
6.0
9.0
9.5
8.0

Mag-
ne-

sium

(Mg)

1.4
1.7
. 7
.9
1.6

1.5
1.2
1.2
.5
.8

.8
1.3
2.1
2.5
2.2

Sodium

(Na)

3.2
4.5
3.1
2.9
2.9

3.4
3.0
3.0
2.5
2.6

2.6
3.1
4.3
4.6
4.3

Po-
tas-

sium

(K)

0.5
.8
.4
.6
.4

.2
.4
.2
.2
.3

.3
.2
.4
.8
.4

in parts per million. Julv 1959 to September 1960

Bi-
car-

bon-

ate

(HCOS)

31
45
28
27
29

32
29
28
22
23

22
29
42
45
40

Car-
bon-

ate

(CO,)

Sulfate

(S04)

3.5
4.6
3.1
2.6
2.8

4.4
4.4
3.2
2.5
2.6

2.8
2.2
4.4
3.8
3.6

Chloride

(Cl)

1.5
2.8
1.2
1.8
.0

1.5
1.8
1.2
.8
1.0

1.0
1.5
1.8
2.5
2.2

Fluo-
rlde

(F)

0.

!o

.0

. 1
.0
.2
. 1

Ni-

trate

(NO,)

0.4
.5
.3
.0
. 1

.8
.8
.5
.2
.2

.2
. 1
.3
.3
.6

Phos-

phate
(P04)

0.01
.00
.02
.04
.04

.04
.00
.05
.03
.00

.03
.02
.06
.04
.02

Dissolved solids

(residue at 180°C)

Parts

per
million

48
65
44
40
47

49
50
42
38
43

41
42
60
66
57

Tons

per
acre-

foot

Tons

per

day

Harduess

as CaCO,

Cal-

cium,
Mag-
ne-

sium

23
32
20
18
20

24
22
21
14
16

16
20
31
34
29

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

So-

dlum
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

62
91
57
53
55

68
67
58
44
46

45
55
86
90
102

PH

6.9
7.4
7.3
7.1
6.2

7.5
7.1
7.0
7.5
7.4

7.1
7.9
7.0
7.4
7,3

DCWAMISH RIVER BASIN Continued

12-1134. DUWAMISH RIVER AT TUKWILA, WASH.

LOCATION. At county bridge at Tukwila, King County, 1.7 miles west of Renton and 10 miles upstream from mouth. RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
Water temperatures: July 1959 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 187 ppm Sept. 23; minimum, 38 ppm Oct. 22-26.
Hardness: Maximum, 65 ppm Sept. 23; minimum, 15 ppm Nov. 21-26.
Specific conductance: Maximum daily, 331 micromhos Sept. 23; minimum daily, 40 micromhos Oct. 22.
Water temperatures: Minimum, 38°F Nov. Ifi. Jan. 19.
EXTREMES, July 1959 to September 1960. Dissolved solids: Maximum, 464 ppm Sept. 3, 1959; minimum, 38 ppm Oct. 22-26, 1959. Hardness: Maximum, 145 ppm Sept. 3, 1959; minimum, 15 ppm Sept. 27-30, Nov. 21-26, 1959.
Specific conductance: Maximum daily, 813 micromhos Sept. 3, 1959; minimum daily, 38 micromhos Sept. 27, 1959.
Water temperatures: Maximum, 72°F July 18, 19, 1959; minimum, 38°F Nov. 16, 1959, Jan. 19, 1960.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. No discharge records

Chemical analyses, in parts per million, July to September 1959

Date
of
collection

July 8-11, 1959.. .

July 23-Aug. 6. ...

Sept. 3.. ....

Sept. 27-30.......

Mean

discharge
<cfs)

Silica

(SiQ,)

17
17
17
18
18

18
18
17
15
13

Iron

(Fe)

Cal-

cium

(Ca)

10
10
12
12
13

13
18
12
7.5
5.0

Mag-
ne-

sium

(Mg)

2.5
3.1
3.6
4.5
4.6

5.5
24
3.8
1.3
.6

Sodium

(Na)

9.5
10
12
14
15

25
117
10
4.2
3.0

Po-
tas-

sium

(K)

1.0
.9
1.4
1.7
1.5

1.8
5.5
1.3
. 7
.9

Bi-
car-

bon-

ate

(HC03)

48
49
58
63
62

59
57
56
32
20

Car-
bon-

ate

(CO,)

Sulfate

(S04)

5.4
5.1
6.2
6.4
6.8

19
46
8.2
4.1
3.1

Chloride

(Cl)

10
11
15
17
18

36
215
11
3.0
1.2

Fluo-

ride

(F)

0.1
. 1
.2
. 1
.2

. 1

. 1
. 1
.3

Ni-
trate

(NO,)

0.5
.8
.2
.0
. 5

.4
. 7
.2
.8
1.1

Phos-

phate
(P04)

0.13
. 16
. 14
.20
.00

. 17
.23
. 15
.08
.00

Dissolved solids

(residue at 180°C)

Parts

per
million

81
83
97
104
111

146
464
95
55
49

Tons

per
acre-

foot

0.11
. 11
.13
. 14

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

36
38
44
48
52

55
145
46
24
15

Non-
car-

bon-

ate

0
0
0
0
0

6
98
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

118
128
156
172
179

235
813
146
72
45

PH

7.2
6.9
7.5
7.4
7.0

7.2
7.3
7.4
7.3
6.9

LAKE WASHINGTON BASIN

12-1175. CEDAR RIVER NEAR LANDSBURG, WASH.

LOCATION. At county bridge at Landsburg, King County, 2 miles downstream from gaging station, 2.3 miles downstream from Rock Creek, and 10 miles east of Kent.
DRAINAGE AREA. 125 square miles upstream from gaging station, excluding that of Rock Creek.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
Water temperatures: August 1953 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 67°F July 27, 28; minimum, 36°F Jan. 18, 19.
EXTREMES, 1953-60. Water temperatures: Maximum, 67°F July 27, 28, 1960; minimum, 36°F several days during January and February 1956, 1957, and 1960. REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. Slight inflow between gaging station and sampling point.

c

Date
of
collection

Aug. 12. ....

Mar. 22...........

July 21...........

Mean

discharge
(cfs)

485
345
876
1,190
1,800
1,000

620
944
822
1,090
1,030
774
510

Silica

(SiQ,)

11
12

11
9.7
9.3
10

12
11
11
9.4
9.6
9.7
11

Iron

(Fe)

Cal-

cium

(Ca)

ll
10
7.0
5.5
5.5
5.5

8.0
8.0
7.0
6.0
5.5
6.0
9.5

Mag-
ne-

sium

(Mg)

0.0
1.2
1.1
.3
.0
. 6

.9
1.3
.5
.0
. 5
.9
1.4

Sodium

(Na)

. 6
. 8
.7
.6
.3
. 5

.8
. 7
.6
. 6
. 5
. 8
.9

Po-
tas-

sium

(K)

0.3
.4
.3
.5
.3
.4

.4
.2
.0
.4
. 1
.2
.3

Bi-
car-

bon-

ate

(HCOj)

32
39
28
20
18
22

30
32
26
21
22
25
36

i parts oer million. Jv

Car-
bon-

ate

(CO,)

Sulfate

(S04)

. 7
.4
.2
.8
.4
.9

'.9

.7
.4
. 2
.4
3.0

Chloride

(ci)

2.0
1.0
.5
1.0
.5
. 5

1.0
.8
.8
. 8
1.0
1.0
2.2

ilv 1959 t

Fluo-

rlde

(P)

0.2
. 1
. 1
.0
.0
. 1

.0
.0
. 1
.0
. 0
.0
.0

Ni-
trate

(Ncg

0.3
.4
. 1
.0
.2
. 3

.5
.6
.2
. 0
. 1
.0
. 1

D Juli

Phos-

phate
(P04)

0.00
.01
.01
.02
.00
. 01

.02
.01
.02
.00
.01
.00
.01

1960

Dissolved solids

(residue at 180°C)

Parts

per
million

43
49
39
29
31
33

44
42
37
31
27
34
51

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

28
30
22
14
14
16

24
25
20
15
16
19
30

Non-
car-

bon-

ate

2
0
0
0
0
0

0
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

60
73
53
40
37
43

60
61
51
41
41
46
68

pH

7.2
7.4
7.4
7.0
7.2
7.4

7.5
7.5
7.6
7.5
7.3
7.6
7.7

LAKE WASHINGTON BASIN Continued

12-1190. CEDAR RIVER AT RENTON, WASH.

LOCATION. At bridge on State Highway 5, 1.8 miles south of Renton, King County, 2.8 miles upstream from gaging station, and 4.8 miles upstream irom moutn. DRAINAGE AREA. 197 square miles upstream from gaging station, including 4 square miles in vicinity of Youngs Lake.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. Slight inflow between sampling point and gaging station.

Chemical analyses, in parts per million, July 1959 to September 1960

Date
of
collection

Sept . 7 ....

Mean

discharge
(cfs)

325
80
740
972
1,920

966
794
1,030
820
1,140

1,130
664
310
258
310

Silica

(S10J

12
15
11
11
10

12
12
11
11
10

11
11
12
11
12

Iron

(Fe)

Cal-

cium

(Ca)

10
10
5.5
6.0
5.0

6.0
6.5
6.5
7.0
6.0

6.0
7.0
8.0
7.5
8.0

Mag-
ne-

sium

(Mg)

0.9
2.7
1.7
1.1
1.0

1.4
1.4
1.2
.9
.6

1.0
1.0
1.8
1.8
1.7

Sodium

(Na)

2.5
3.7
2.1
1.8
1.8

2.1
2.2
2.1
3.0
1.9

2.0
2.2
2.8
2.5
2.9

Po-
tas-

sium

(K)

0.5
.7
.3
.5
.2

.4
.3
.2
.3
.2

.3
.3
.3
.6
.3

Bi-
car-

bon-

ate

(HCOS)

36
48
27
25
22

26
28
27
29
24

26
29
36
34
36

Car-
bon-

ate

(CO,)

Sulfate

(S04)

3.2
4.4
2.7
2.3
2.6

2.8
3.5
3.0
3.2
2.4

2.8
3.2
2.4
2.8
1.6

Chloride

(CD

2.2
2.0
1.0
.8
1.2

1.8
.8
1.0
1.0
1.0

1.0
1.0
1.0
1.2
1.5

Fluo-

rlde

(F)

0.0
.1
. 1
.1
.1

.1
.0
. 1
. 1
.0

.0
.0
.1
. 1
.0

Ni-

trate

(NO,)

0.4
. 1
.0
.3
1.0

.5
.7
.5
.4
. 1

.3
.0
. 1
. 1
.3

Phos-

phate
(PO4)

0.05
.00
.02
.00
.05

.02
.02
.02
.01
.00

.02
.01
.01
.03
.01

Dissolved solids

(residue at 180°C)

Parts

per
million

49
66
39
36
35

40
39
37
42
34

40
40
46
48
47

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

28
36
20
20
16

21
22
21
21
18

19
22
27
26
27

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

micro-

mhos at

25°C)

69
93
53
50
46

55
59
56
57
47

51
54
67
80
68

pH

7.0
7.0
7.3
7.1
6.9

7.2
7.2
7.1
7.5
7.3

7.5
7.6
7.4
7.4
7.4

SNOHOMISH RIVER BASIN

12-1345. SKYKOMISH RIVER NEAR GOLD BAR, WASH.

LOCATION. At bridge on U.S. Highway 2, 1.8 miles southeast of Gold Bar, Snohomish County, 0.3 mile upstream from gaging station and 5.3 miles upstream from Wallace River.
DRAINAGE AREA. 535 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. No inflow between sampling point and gaging station except during periods of heavy local runoff.

Date
of
collection

July 15, 1959.....

Jan. 20, I960.....
Feb. 17...........

July 20. ....

Mean

discharge
(eta)

5,240
1,130
5,930
6,300
9,450
3,550

966
3,230
1,640
2,800
10,500
4,410
2,080

Silica

(S1Q.)

4.2
5.9
6.0
5.4
5.2
6.7

7.6
6.7
7.0
6.7
4.8
4.9
4.9

Iron

(Fe)

Cal-

cium

(Ca)

2.5
5.0
4.0
3.5
3.0
3.5

5.0
4.5
5.0
4.0
3.0
3.0
3.0

Mag-
ne-

sium

(Mg)

0.3
. 1
. 1
.3
.3
. 5

.7
.2
.2
. 5
.3
.4
. 7

emi cal f

Sodium

(Na)

0.6
.7
.0
.0
.9
.2

.9
.4
.7
.6
.0
.2
.3

Po-
tas-
sium

(K)

0.6
. 7
.3
.6
.6
.4

.6
.6
.4
.5
.2
.3
.4

Bi-
car-

bon-

ate

(HCOS)

12
18
14
12
11
15

20
15
18
16
12
13
16

Car-
bon-
ate

(ccg

Sulfate

(SO,)

1.3
2.1
1.9
1.7
1.7
2.4

2.5
2.1
2.4
1.4
2.2
2.0
1.2

Chloride

(CD

0.5
1.8
.5
.5
.2
.8

1.8
1.0
1.5
1.2
.5
.8
.8

Fluo-

rlde

(F)

0.2
. 1
.2
. 1
.2
. 1

.0
.0
. 1
.0
.0
.0
.0

Ni-
trate

(Ncg

0.0
.1
.2
.6
.3
.3

. 1
.2
.4
.0
. 1
.0
.0

Phos-

phate
(P0 4)

0.00
.00
.00
.00
.01
.01

.02
.03
.01
.00
.01
.04
.01

Dissolved solids

(residue at 180 °C>

Parts

per
million

13
24
20
22
23
27

28
23
32
26
17
17
22

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

7
13
10
10
9
11

16
12
14
12
9
9
10

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

Imicro-

mhos at

25°C)

22
36
29
27
25
32

46
35
41
37
24
26
30

pH

6.7
7.3
7.1
7.0
6.7
7.3

7.3
7.3
7.4
7.2
7.0
7.0
7.2

SNOHOMISH RIVER BASIN Continued

12-1555. SNOHOMISH RIVER AT SNOHOMISH, WASH.

LOCATION. At gaging station at bridge on State Highway 1A at Snohomish, Snohomish County and 0.8 mile downstream from Pilchuck River. DRAINAGE AREA. 1,720 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
Water temperatures: July 1959 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 80 ppm Dec. 23; minimum, 25 ppm June 9-July 8.
Hardness: Maximum, 33 ppm Dec. 23; minimum, 8 ppm Nov. 18-24.
Specific conductance: Maximum daily, 104 micromhos Dec. 23; minimum daily, 22 micromhos Dec. 15.
Water temperatures: Maximum, 73°F Aug. 9; minimum, 34°F Jan. 3.
EXTREMES, July 1959 to September 1960. Dissolved solids: Maximum, 80 ppm Dec. 23, 1959; minimum, 21 ppm Sept. 6-11, 1959.
Hardness: Maximum, 33 ppm Dec. 23, 1959; minimum, 8 ppm Nov. 18-24, 1959.
Specific conductance: Maximum daily, 104 micromhos Dec. 23, 1959; minimum daily, 22 micromhos Sept. 7, Dec. 15, 1959.
Water temperatures: Maximum, 73°F Aug. 9, 1960; minimum, 34°F Jan. 3, 1960.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Discharge below 10,000 cfs not determined. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. Chemical analyses, in parts per million. July to September 1959

Date
of
collection

July 15-27, 1959..
July 28-Aug. 14. ..

Aug. 27-31........

Sept. 20-30. ......

Mean

discharge
(cfs)

Silica

(SiQ.)

5.4
7.1
7.3
6.7

6.0
5.0
6.9
5.7

Iron

(Fe)

Cal-

cium

(Ca)

4.0
5.5
6.0
5.5

5.0
3.0
4.5
4.0

Mag-
ne-

sium

(Mg)

0.2
. 5
.8
. 2

. 5
.4
. 7
. 1

Sodium

(Na)

1.6
2.5
2.4
1.8

1.8
1.3
1.8
1.4

Po-
tas-

sium

(K)

0.9
1.0
.9
. 7

1.1
.6
1.0
.8

Bl-
car-

bon-

ate

(HCOJ

16
24
25
20

20
11
18
13

Car-
bon-

ate

(CO,)

Sulfate

(SO.)

2.1
2.4
2.7
1.6

2.6
1.0
2.4
2.1

Chloride

(CD

1.5
1.8
2.0
1.5

1.0
.2
1.5
1.0

Fluo-
rlde

(F)

0.1
. 1
. 1
. 2

. 1
.2
.2
.3

Ni-

trate

(NO,)

0.3
. 2
. 7
. 6

.4
.6
. 7
.8

Phos-

phate
(P04)

0.04
.02
.02
. 00

.01
.01
.00
. 01

Dissolved solids

(residue at 180°C)

Parts

per
million

26
32
37
37

28
21
33
29

Tons

per
acre-

foot

0.04
.04
.04
. 05

.04
.03
.04
. 04

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

11
16
18
14

14
9
14
10

Non-
car-

bon-

ate

0
0
0
0

0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

34
48
53
43

43
27
42
29

PH

6.9
7.0
6.9
7.1

7.1
7.0
7.0
6 8

STILLAGUAMISH RIVER BASIN

12-1610. SOUTH FORK STILLAGUAMISH RIVER NEAR GRANITE FALLS, WASH.

LOCATION. At county road bridge 0.2 mile downstream from gaging station, 1.2 miles upstream from Canyon Creek, and 1.5 miles northeast of Granite Falls, Snohomish County.
DRAINAGE AREA. 119 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Cl

Date
of
collection

July 22...........

Mean

discharge
(cfs)

555
260
1,070
2,370
4,850
730

242
1,050
510
1,150
2,000
744
262

Silica

(SiQg)

4.1
6.0
5.5
4.1
4.1
6.4

7.8
5.5
6.0
4.9
4.2
4.4
5.7

Iron

(Fe)

Cal-

cium

(Ca)

4.5
6.0
4.5
4.0
3.5
5.0

7.5
5.0
4.5
4.5
4.0
4.0
6.0

Mag-
ne-

sium

(Mg)

0.5
1.0
.8
. 1
.8
1.0

1.6
.6
1.4
. 6
.4
1.0
1.0

Sodium

(Na)

0.7
1.0
1.0
1.0
. 6
1.0

1.2
1.0
1.2
. 9
.9
.9
1.0

Po-
tas-
sium

(K)

0.4
.7
.5
.9
. 5
.4

.3
.2
. 3
.2
.2
.2
.2

Bi-
car-

bon-

ate

(HCO,)

18
24
17
13
13
20

30
17
21
16
13
17
24

Car-
bon-
ate

(CO,)

s Der m llion. July 1959 to Jul\

Sulfate

(S04)

1.6
2.6
2.4
1.6
2.3
2.4

3.3
2.2
2.7
2.0
2.6
2.6
1.6

Chloride

(Cl)

0.0
1.0
.5
1.0
. 2
.8

.5
.5
.8
1.0
.5
1.0
. 2

Fluo-

ride

(F)

0.1
.2
.2
.5
. 1
. 1

. 1
.0
. 1
. 0
. 1
.0
. 2

Ni-

trate

(NO,)

0.0
. 0
.5
.3
.5
.4

.3
.3
. 6
. 3
.2
. 1
.3

Phos-

phate
(P04)

0.01
. 01
.02
.07
.04
.04

.07
.05
. 11
. 00
.02
.04
.00

1960

Dissolved solids

(residue at 180°C)

Parts

per
million

19
29
28
20
30
27

35
24
31
27
22
23
28

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

13
19
14
10
12
17

25
15
16
14
12
14
19

Non-
car-

bon-

ate

0
0
0
0
2
0

0
1
0
0
2
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

micro-

mhos at

25°C)

33
47
37
28
30
42

59
37
44
35
28
33
45

pH

6.8
7.2
6.8
6.7
6.8
7.3

7.2
7.1
7.2
7.0
7.1
7.1
7.4

STILLAGUAMISH RIVER BASIN Continued

12-1685. PILCHUCK CREEK NEAR BRYANT, WASH.

LOCATION. Temperature recorder at gaging station, 500 feet upstream from highway bridge, and 2 miles north of Bryant, Snohomish County.
DRAINAGE AREA. 49.7 square miles.
RECORDS AVAILABLE. Water temperatures: March 1952 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 76°F July 29; minimum, 33°F on several days during January, February, and March. EXTREMES, 1952-60. Water temperatures: Maximum, 82°F July 28, 1958; minimum, 33°F Mar. 7, 1955, several days during January, February, and March 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1716.

Temperature (°F) of water, water year October 1959 to September 1960

October
Maximum ....

November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April

Minimum ....
May
Maximum ....

June
Maximum ....
Minimum ....

July

Minimum ....
August
Maximum ....
Minimum ....

September

Minimum ....

1

52

38

38
37

41

50

52

58

66
53

53

2

52

37

38

42

50

57

57

55
59

51

3

53

37

38

48

5B

58

64
61

53

4

53

38

47

58

60

66
61

55

5

53

38

50

60

62

67
58

55

6

53

38

50

60

65

59

52

7

53

38

48

57

65

J "

52

8

52

37

49

62

53

9

52

37

53

61

54

10

50

54

61

56

11

49

53

59

12

50

53

60

13

51

52

61

14

52

49

61

15

52

50

60

Day

16

51

50

58

17

49

47

59

18

50

47

58

19

51

47

58

20

51

47

56

21

51

48

53

22

51

49

52

23

51

50

52

24

53

50

53

25

53

50

53

26

52

42

36
35

51

53

27

51

41

35
34

51

55

52

28

51

45

41

34
33

54

55

52

29

50

45

40

33
33

48

54

63

65

54

52

30

48

45
45

39

37
37

42

50
48

53

63

67

56

52

31

49

39
38

37
37

42
41

52

70
66

56
55

Aver-
age

51

45
44

43
42

36
36

37
37

40
39

46
45

50

59
56

59
62

62
58

55

SKAGIT RIVER BASIN

12-1790. SKAGIT RIVER ABOVE ALMA CREEK, NEAR MARBLEMOUNT, WASH. Continued

LOCATION. At Cascade Road bridge at Marblemount, Skagit County, 2.5 miles downstream from Diobsud Creek, and 7 miles downstream from gaging station. DRAINAGE AREA. 1,260 square miles, approximately, upstream from gaging station, of which 400 square miles is in Canada.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
Water temperatures: January 1953 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 53°F Aug. 7, Sept. 25, 29; minimum, 37°F on several days during winter months.
EXTREMES, 1953-60. Water temperatures: Maximum, 55°F on several days during July and August in 1958, 1959; minimum, 35°F Mar. 1, 1956. REMARKS. Temperature recorder installed at gaging station. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. Moderate amount of inflow between gaging station and sampling point.

c

Date
of
collection

Mar. 16...........

May 16. ....

July 22. ....

Mean

discharge
(cfs)

11,700
4,320
5,990
11 , 600
6,950
6,780

6,880
5,470
4,650
5,620
5,250
7,180
7,090

Silica

(sick)

4.8
4.7
5.1
5.6
5.3
6.5

6.5
6.4
6.4
6.2
5.4
5.0
4.0

Iron

(Fe)

Cal-

cium

(Ca)

7.0
6.5
6.5
7.5
7.5
8.0

10
8.0
10
10
8.0
6.0
6.0

Mag-
ne-

sium

(Mg)

0.1
.5
.8
1.1
. 5
1.1

1.2
1.4
1.2
. 9
. 7
.8
.5

tiemical analyses, i

Sodium

(Na)

0.6
.6
.8
. 9
. 8
. 8

. 7
.8
.9
.9
. 8
.7
1.0

Po-
tas-

sium

(K)

0.4
. 7
.6
.9
. 2
. 3

.4
. 7
.3
.4
.4
.3
.6

Bi-
car-

bon-

ate

(HCO,)

22
22
23
27
24
29

34
30
34
33
26
21
20

i parts per million. Julv 1959 to July 1960

Car-
bon-

ate

(ccg

SuUate

(S04)

3.0
3.4
3.2
3.7
3.6
4.2

4.8
3.7
4.8
4.8
3.6
3.6
2.8

Chloride

(CD

0.5
.2
.0
.2
. 2
. 2

.0
.2
. 2
. 5
. 0
.2
. 0

Fluo-

rlde

(F)

0.2
. 1
. 1
.0
. 1
. 1

.0
.0
. 1
. 0
. 0
.0
.0

Ni-

trate

(NO,)

0.2
.0
.5
.0
1.1
.3

.2
.2
. 2
. 2
.2
.2
. 0

Phos-

phate
(P0 4)

0.00
.06
.00
.03
. 00
. 00

.05
.02
.00
. 00
.01
.02
.00

Dissolved solids

(residue at 180°C)

Parts

per
million

23
28
32
35
32
31

38
35
42
42
33
27
28

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

18
18
19
23
20
24

30
26
30
29
23
18
17

Non-
car-

bon-

ate

0
0
0
i
i
0

2
1
2
2
2
1
0

So-

dlum
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

43
44
46
54
49
58

64
60
70
66
52
43
40

PH

6.9
7.2
7.2
7.3
7.1
7.2

8.0
7.4
7,4
7.6
7.7
7.2
7.4

SKAGIT RIVER BASIN Continued

12-1860. SAUK RIVER AT DARRINGTON, WASH.

LOCATION. At county bridge at Darrington, Snohomish County, 9.5 miles downstream from Whitechuck River, and 10 miles downstream from gaging station. DRAINAGE AREA. 152 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively.

Chemical analyses, in parts per million. July 1959 to Juli

Date
of
collection

Feb. 17...........

July 22.. ....

Mean

discharge
(cfs)

2,120
498
1,540
1,270
2,500
1,070

264
792
315
948
1,880
1,810
988

Silica

(SiQa)

5.6
8.0
7.1
6.5
5.5
9.3

13
8.3
11
8.5
6.6
6.2
6.2

Iron

(Fe)

Cal-

cium

(Ca)

4.0
4.5
5.0
4.5
3.0
5.0

6.0

5.0
4.0
4.0
4.0

Mag-
ne-

sium

(Mg)

0.4
.9
.8
.8
1.1
1.7

1.0

1.0
1.1
.9
. 5

Sodium

(Na)

0.7
1.5
1.1
1.1
.8
1.3

1.2

1.1
1.0
1.1
1.1

Po-
tas-

sium

(K)

0.4
.9
.6
. 7
.3
.6

.4

.3
.4
.4
.7

Bi-
car-

bon-

ate

(HCO,)

14
19
18
18
13
22

28
23
27
20
18
17
16

Car-
bon-

ate

(cog

Sulfate

(S0«)

2.3
4.1
3.5
3.0
.9

6.1
3.3
5.0
3.4
3.0
3.2
3.0

Chloride

(Cl)

0.2
1.0
.2
.5
.0
1.0

1.2
.5
1.2
.2
.8
. 5
.5

Fluo-

ride

(P)

0.1
.1
.1
.2
. 1
. 1

.0
.0
. 1
. 1
.0
.0
.0

Ni-

trate

(NO,)

0.0
.0
.4
.2
.3
.3

.1
.9
.3
.1
. 1
. 1
.0

Phos-

phate
(P04)

0.02
.01
.01
.00
.01
.02

.04
.08
.01
.00
.04
.01
.02

f I960

Dissolved solids

(residue at 180°C)

Parts

per
million

18
29
29
28
31
33

42
34
41
30
26
24
25

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

12
15
16
14
12
20

24
19
22
17
14
14
12

Non-
car-

bon-
ate

0
0
0
0
2
2

2
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

Imicro-

mhos at

25°C)

30
43
40
38
30
48

66
49
60
45
37
35
33

pH

6.3
7.2
7.0
7.0
5.7
7.3

7.9
7.6
7.3
7.1
7.4
7.1
7.2

SKAGIT RIVER BASIN Continued

12-2005. SKAGIT RIVER NEAR MOUNT VERNON, WASH.

LOCATION. At gaging station at bridge on U.S. Highway 99, 1 mile north of Mount Vernon, Skagit County, and 3 miles downstream from Nookachamps Creek, DRAINAGE AREA. 3,060 square miles, approximately, of which 400 square miles is in Canada.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. No appreciable inflow between gaging station and sampling point except during periods of heavy local runoff.

Chemical analyses, in parts per million, July 1959 to September 1960

Date
of
collection

July 15, 1959.....

AtTtr 9

Sept. 7. ....

Mean

discharge
(cfs)

28,200
11 , 000
18,500
21,100
32,500

18,700
11,700
19,100
11,400
15,600

21,200
20,100
21,000
13,500
10,900

Silica

(sicg

5.3
6.3
6.2
6.8
5.5

8.3
8.6
8.2
7.8
7.6

6.8
6.0
5.3
5.0
6.1

Iron

(Fe)

Cal-

cium

(Ca)

5.5
7.0
6.0
7.5
5.5

8.5
9.0
7.5
9.5
8.0

6.0
6.0
5.5
6.5
6.0

Mag-
ne-

sium

(Mg)

0.4
.3
. 8
1.1
.5

.8
. 7
. 5
.3
.2

. 3
.0
.0
.3
1.1

Sodium

(Na)

0.7
.9
. 8
1.0
.7

. 3
. 1
. 1
.3
. 1

. 0
. 0
.0
.0
.2

Po-
tas-

sium

(K)

0.4
.9
.6
. 8
.3

. 7
.6
.4
.4
.4

.4
.4
. 5
.9
.5

Bi-
car-

bon-

ate

(HCO,)

20
23
22
27
19

28
34
26
34
30

23
22
21
21
23

Car-
bon-

ate

(ccg

Sulfate

(S04)

3.1
3.8
3.5
2.6
3.1

4.0
5.6
4.6
5.0
4.0

3.2
3.4
3.2
3.4
3.6

Chloride

(Cl)

0.0
.2
. 0
.5
.0

1.0
. 2
. 5
.5
.5

.5
. 5
.2
.5
.5

Fluo-
ride

(F)

0.1
. 1
. 2
. 1
. 1

. 1
. 1
. 1
. 1
.0

.0

.1
. 1
.0
.0

Ni-

trate

(NO,)

0.2
.0
.4
. 2
1.5

. 5
. 3
.4
.3
.3

. 2
. 2
. 1
.0
.3

Phos-

phate
(P04)

0.00
.01
.01
.00
.07

.06
.04
.03
.00
.00

.01
. 02
.03
.02
.01

Dissolved solids

(residue at 180°C)

Parts

per
million

23
30
30
38
30

41
41
38
46
41

32
30
26
32
33

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

15
19
18
23
16

24
30
24
29
25

20
19
18
18
20

Non-
car-

bon-

ate

0
0
0

1
0

2
2
3
1
0

1
1
1
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

39
47
44
53
41

60
68
59
67
59

48
46
43
42
48

pH

6.9
7.0
7.0
7.2
6.9

7.1
8.1
7.0
7.4
7.3

7.1
7.2
7.2
7.2
7.1

SAMISH RIVER BASIN

12-2015. SAMISH RIVER NEAR BURLINGTON, WASH.

LOCATION. At Washington State Fisheries Trap, 0.2 mile upstream from bridge on U.S. Highway 99, 0.2 mile downstream from Friday Creek, 0.3 mile upstream from gaging station and 4.9 miles north of Burlington, Skagit County.
DRAINAGE AREA. 87.8 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. No appreciable inflow between gaging station and sampling point except during periods of heavy local runoff.

Chemical analyses, in parts per million, July 1959 to July 1960

Date
of
collection

July 15, 1959.....

July 21...........

Mean

discharge
(cfs)

52
27
146
161
784
450

192
591
363
363
.223
. 140
32

SUlca

(SiQ,)

11
12
9.6
9.7
7.0
7.4

9.0
6.8
6.8
6.4
7.0
8.1
12

Iron

(Fe)

Cal-

cium

(Ca)

10
12
8.0
8.5
5.5
6.0

7.0
5.5
6.5
5.5
6.5
7:0
1O

Mag-
ne-

sium

(Mg)

3.0
2.6
2.4
2.5
1.2
1.3

2.2
1.2
1.1
1.6
1.8
2.7
3.7

Sodium

(Na)

3.0
3.2
2.6
2.7
2.0
2.2

2.9
2.0
2.2
2.0
2.2
2.8
3.4

Po-
tas-

sium

(K)

0.7
1.2
. 7
1.0
.8
.4

.6
.3
.4
.2
. 5
.4
1.0

Bi-
car-

bon-

ate

(HC03)

45
51
31
34
18
21

29
19
22
22
26
33
48

Car-
bon-
ate

(CO,)

Sulfate

(S04)

4.4
4.9
7.1
5.2
4.4
4.0

4.1
4.1
4.1
3.8
4.4
5.8
5.8

Chloride

(Cl)

2.8
3.0
.8
1.8
2.2
.2

2.2
1.2
1.5
1.5
1.2
1.8
2.0

Fluo-
ride

(F)

0.1

.1
.5
.3
.3
. 1

.0
. 1
. 1
. 1
. 1
. 1
.0

Ni-

trate

(NO,)

1.6
1.8
1.7
2.0
2.7
2.2

2.0
1.8
1.8
.8
1.1
1.0
1.0

Phos-

phate
(P04)

0.02
.03
.01
.00
.04
.05

.00
.02
.00
.00
.04
.03
.02

Dissolved solids

(residue at 180°C)

Parts

per
million

56
60
53
58
45
39

51
35
41
39
48
47
64

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

37
41
30
31
18
20

26
18
20
20
24
28
40

Non-
car-

bon-

ate

0
0
4
3
4
3

2
3
2
2
2
2
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

micro-

mhos at

25°C)

91
104
72
72
52
57

70
52
58
55
60
72
97

pH

7.1
7.1
7.6
7.5
7.0
7.0

7.2
6.8
7.2
7.0
7.0
7.3
7.3

NOOKSACK RIVER BASIN

12-2105. NOOKSACK RIVER AT LAWRENCE, WASH.

LOCATION. At bridge on State Highway 1 at Lawrence, Whatcom County, 5.1 miles downstream from gaging station at Deming and 5.3 miles downstream from South Fork.
DRAINAGE AREA. 580 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
Water temperatures: September 1959 to September 1960 (discontinued).
EXTREMES, 1959-60. Dissolved solids: Maximum, 69 ppm Jan. 14-24; minimum, 38 ppm May 29 to June 11.
Hardness: Maximum, 46 ppm Jan. 14-24; minimum, 24 ppm Dec. 15-17.
Specific conductance: Maximum daily, 123 micromhos Mar. 14; minimum daily, 48 micromhos Dec. 15.
Water temperatures: Maximum, 57°F July 30, Aug. 9, Sept. 21; minimum, freezing point Nov. 15-17.
EXTREMES, July 1959 to September 1960. Dissolved solids: Maximum, 69 ppm Jan. 14-24, 1960; minimum, 38 ppm May 29 to June 11, 1960. Hardness: Maximum, 46 ppm Jan. 14-24, 1960; minimum, 24 ppm Dec. 15-17, 1959.
Specific conductance: Maximum daily, 123 micromhos Mar. 14, I960; minimum daily, 48 micromhos Dec. 15, 1959.
Water temperatures: Maximum, 59°F Sept. 1, 1959; minimum, freezing point Nov. 15-17, 1959.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Discharge below
Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636

Chemical analyses, in parts per million, July to September 1959

3,500 cfs not determinec
and 1716, respectively.

Date
of
collection

Mean

discharge
(cfs)

Silica

(S1Q,)

5.9
8.6
8.5
7.2
8.0
7.5

Iron

(Fe)

Cal-

cium

(Ca)

8.0
12
11
8.0
10
10

Mag-
ne-

sium

(Mg)

1.2
1.2
2.3
1.5
2.1
1.3

Sodium

(Na)

0.9
1.5
1.7
1.4
1.6
1.4

Po-
tas-

sium

(K)

0.5
.9
. 6
1.2
.5
.5

Bl-

car-

bon-

ate

(HCOj)

24
34
36
27
34
32

Car-
bon-
ate

(ccg

Sulfate

(S04)

6.9
13
13
6.3
9.3
7.0

Chloride

(Cl)

0.2
.8
.0
. 5
.8
.5

Fluo-
rlde

(F)

0.2
.2
.2
. 3
. 2
.2

Ni-
trate

(NOJ

0.1
. 1
. 3
.4
.3
.4

Phos-

phate
(P0 4)

0.03
.02
.01
. 05
.02
.03

Dissolved solids

(residue at 180°C)

Parts

per
million

38
51
55
43,
53
49

Tons

per
acre-

foot

0.05
.09
.07
. 06
.07
.07

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

25
35
37
26
34
30

Non-
car-

bon-

ate

6
7
8
4
6
4

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

58
86
89
61
81
71

pH

7.0
7.3
7.3
7.0
7.3
7,3

PEND OREILLE RIVER BASIN

12-3482. BITTERROOT RIVER NEAR CORVALLIS, MONT.

LOCATION.--Temperature recorder at gaging station, 20 feet downstream from present highway bridge, 1.2 miles downstream from Blodgett Creek, 1.5 miles west of Corvallis, Ravalli County.
DRAINAGE AREA. 1,711 square miles.
RECORDS AVAILABLE. Water temperatures: August 1959 to September 1960.
EXTREMES, August 1959 to September i960. Water temperatures: Maximum, 73°F July 20, 21, 29, 1960; minimum, freezing point on many days dui November 1959 to March 1960.
REMARKS. Clock stopped Oct. 30 to Nov. 11, Dec. 22-28, Jan. 10-26; ranges in temperature during these periods 34° to 44°F, 32° to 35°F, 32' respectively. Records of discharge for period August 1959 to September 1960 given in WSP 1716.

Temperature (°F) of water, August to September 1959
/Water-stage recorder with temperature attachment/

ing

to 34°F,

August

September

Minimum. .....

1

67
61

63
54

2

70
60

63
54

3

70
60

6?,
55

4

70
60

61
57

5

70
60

62
56

6

70
59

61
57

7

70
60

64
56

8

69
60

63
58

9

70
59

61
54

10

6P
fiO

63
54

11

70
6fl

65
57

12

66
Rf

64
58

13

6?
58

65
59

14

67
5fi

63
59

15

68
59

61
59

Day

16

69
59

60
57

17

69
60

60
56

18

68
60

58
55

19

64
60

59
55

20

62
59

58
55

21

64
56

57
54

22

62
58

58
53

23

66
57

59
53

24

65
58

58
52

25

66
57

57
54

26

62
57

54
52

27

66
58

52
50

28

66
60

52
49

29

63
58

50
47

30

64
56

49
47

31

62
58

__

~

Aver-
age

67
59

59
55

PEND OREILLE RIVER BASIN Continued

12-3955. PEND OREILLE RIVER AT NEWPORT, WASH.

LOCATION. At bridge on U.S. Highway 2 at Newport, Pend Oreille County, 0.2 mile downstream from gaging station, 1.3 mile downstream from Idaho-Washington State line, and 1.8 miles downstream from Albeni Falls Dam.
DRAINAGE AREA. 24,200 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
REMARKS. Records of discharge for water years October 1958 to September-1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. No appreciable inflow between gaging station and sampling point except during periods of heavy local runoff.

Chemical analyses, in parts

Date
of
collection

July 29, 1959. ....
Aug. 27...........

Aug. 25.. ....
Sept. 29. ....

Mean

discharge
(cfs)

22,600
13,300
28,200
35,500
26 , 500

18 , 200
14,800
19,200
44,300
46,500

64 , 200
50,900
15,700
6,900
8,080

Silica

5.8
5.8
5.9
5.6
6.7

6.4
7.1
6.7
7.3
7.7

7.6
4.8
4.8
4.3
5.6

Iron

(Fe)

Cal-

cium

(Ca)

22
22
22
24
23

22
23
24
22
21

21
18
21
21
22

Mag-
ne-

sium

(Mg)

5.1
4.9
5.5
5.7
4.8

5.3
5.7
5.7
5.6
4.7

5.5
5.1
5.5
5.5
5.7

Sodium

(Na)

1.7
1.7
2.3
2.2
2.2

2.4
2.3
2.4
2.4
2.3

2.4
2.0
2.0
2.1
2.3

Po-
tas-
sium

(K)

0.7
.8
1.0
.8
.8

.8
.8
.6
.7
.8

.7
.9
.7
.6
. 7

Bi-
car-

bon-

ate

(HCO,)

89
88
90
98
92

91
91
95
92
82

84
77
a89
91
92

Car-
bon-
ate

(CO,)

per million. July 1959 to September 1960

Sulfate

(S04)

6.4
6.5
7.3
9.0
8.9

9.0
9.8
9.9
9.0
8.6

9.2
7.4
6.8
6.8
8.0

Chloride

(CD

0.5
.2
1.0
.8
. 5

.5
. 5
.8
.2
.0

.2
1.0
. 5
. 5
. 5

Fluo-

ride

(F)

0.1
.2
. 1
.1
.2

. 1
.2

. 1
.1
.0
. 1
.1

Ni-

trate

(NOJ

0.0
. 1
.3
. 1
.2

. 1
.2
. 1
.3
.2

. 1
. 1
.0
.0
.0

Phos-

phate
(P0 4)

0.03
.00
.01
.03
.00

.00
.01
.02
.01
.00

.03
.00
.01
.02
.01

Dissolved solids

(residue at 180°C)

Parts

per
million

89
85
90
97
98

91
93
97
94
88

92
78
82
88
89

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

76
75
78
84
77

77
81
83
78
72

75
66
75
75
78

Non-
car-

bon-

ate

3
3
4
3
2

2
6
5
2
5

6
3
2
0
3

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

153
148
155
176
165

168
168
174
167
153

153
137
151
154
163

pH

7.8
8.0
7.7
8.2
7.8

7.9
7.6
7.9
7.8
7.8

7.9
8.1
8.4
8.1
8.0

a Includes equivalent of 2 ppm of carbonate (CDs).

PEND OREILLE RIVER BASIN Continued

12-3965. PEND OREILLE RIVER AT MET ALINE FALLS, WASH.

LOCATION. At bridge on State Highway 6 at Metaline Falls, Pend Oreille County, 0.2 mile upstream from Sullivan Creek and 7 miles downstream from gaging station.
DRAINAGE AREA. 25,000 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: December 1948 to September 1950, July 1959 to September 1960.
Water temperatures: December 1948 to September 1950.
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. Small amount of inflow between sampling point and gaging station.

Chemical analyses, in parts c

Date
of
collection

Sept . 29. ....

Mean

discharge
(cfs)

24,800
12 , 000
16 , 700
36,300
28 , 700

19,600
15,200
19,300
45,100
45,400

67,000
54 , 700
17 , 600
7,620
8,400

Silica

(S1Q.)

5.7
5.9
6.0
6.3
6.9

6.5
6.9
6.6
7.8
8.2

9.8
5.1
5.3
4.1
4.5

Iron

(Fe)

Cal-

cium

(Ca)

22
22
20
23
23

22
22
24
21
20

19
18
20
21
22

Mag-
ne-

sium

(Mg)

4.9
5.0
5.6
5.9
4.9

5.4
6.0
5.7
5.7
4.7

5.2
4.6
5.9
5.5
5.5

Sodium

(Na)

1.9
1.8
2.1
2.3
3.5

2.4
2.4
2.5
2.4
2.3

2.1
1.7
2.0
2.1
2.4

Po-
tas-

sium

(K)

0.6
.8
1.2
.6
.8

.7
.8
.6
. 7
.8

.8
. 7
. 7
.6
.9

Bl-
car-

bon-

ate

(HCO,)

88
89
84
96
92

88
89
96
88
80

78
75
a87
91
b91

Car-
bon-

ate

(CO,)

er million. July 1959 to September 1960

Sulfate

(S0«)

6.5
6.6
6.8
8.7
9.4

8.7
9.5
9.9
9.0
8.2

8.0
6.4
6.8
6.8
7.2

Chloride

<C1)

0.5
.2
. 5
.8
1.0

. 5
.5
.5
. 5
.0

.2
.5
.2
.2
. 5

Fluo-
ride

(F)

0.1
.2
.0
. 1
.2

. 1
. 1
.2
. 1
. 1

. 1
. 1
. 1
. 1
. 1

Ni-

trate

(NO,)

0.0
.1
.0
.0
.1

. 1
. 1
.1
.3
.2

. 1
.0
.0
. 1
. 1

Phos-

phate
(P04)

0.01
.00
.03
.01
.00

.00
.01
.04
.01
.00

.02
.00
.01
.01
.01

Dissolved solids

(residue at 180°C)

Parts

per
million

89
87
83
94
96

88
91
96
93
92

87
77
82
88
89

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

75
76
73
82
78

77
80
84
76
70

69
64
74
75
78

Non-
car-

bon-

ate

3
2
4
3
2

5
6
5
4
4

5
2
3
0
3

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

micro-

mhos at

25°C)

152
151
148
169
165

166
165
175
162
148

141
133
148
153
157

PH

7.3
8.2
7.5
7.8
7.8

7.7
7.8
8.0
7.7
7.8

7.7
8.0
8.5
8.1
8.3

a Includes equivalent of 2 ppm of carbonate (CO3) b Includes equivalent of 1 ppm of carbonate (CO3)

COLUMBIA RIVER MAIN STEM

12-3995. COLUMBIA RIVER AT NORTHPORT, WASH.

LOCATION. At bridge on State Highway 22 at Northport, Stevens County and 12 miles downstream from gaging station at International Boundary. DRAINAGE AREA. 59,700 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: February 1910 to January 1911, November 1951 to September 1960.
Water temperatures: November 1951 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 105 ppm Mar. 3-31; minimum, 74 ppm Aug. 15 to Sept. 7.
Hardness: Maximum, 84 ppm Mar. 3-31; minimum, 63 ppm July 22 to Aug. 14.
Specific conductance: Maximum daily, 184 micromhos Mar. 17; minimum daily, 123 micromhos Aug. 2.
Water temperatures: Maximum, 65°F Aug. 3, 5, 8, 14; minimum, freezing point Jan. 18-20, 23.
EXTREMES, 1958-60. Dissolved solids: Maximum, 105 ppm Mar. 3-31, 1960; minimum, 74 ppm Aug. 1 to Sept. 15, 1959,, Aug. 15 to Sept. 7, 1960. Hardness: Maximum, 89 ppm Feb. 17-28, 1959; minimum, 62 ppm July 16-31, Aug. 16-31, 1959.
Specific conductance: Maximum, 188 micromhos Mar. 2, 1959; minimum daily, 123 micromhos Aug. 2, 1960.
Water temperatures: Maximum, 70°F May 14, 19, 1959; minimum, freezing point Jan. 18-20, 23, 1960.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1716. Small amount of inflow between sampling point and gaging station.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-31, 1959...

Nov. 25-Dec. 9....

Jan. 1-28, 1960...
Jan. 29-Feb. 15. . .

Feb. 16-Mar. 2. ...

May 29- June 25. . . .

June 26- July 21...
July 22-Aug. 14. . .
Aug. 15-Sept. 7...

Weighted average

Mean

discharge
(cfs)

97,580
80 , 790
72,610
59,500
42,370
44 , 280

42 , 570
54 , 860
116,300
132,300
193,200
241 , 000

251,300
158,700
84,790
65,030

109,700

Silica

(S1Q.)

6.3

6.1

6.6

4.7

Iron

(Fe)

Cal-

cium

(Ca)

20

24

23

19

~

Mag-
ne-

sium

(Mg)

4.4

4.3

4.5

4.5

Sodium

(Na)

1.8
1.9
2.2
2.3
2.1
2.0

2.0
2.6
2.0
1.8
2.0
1.9

1.2
1.0
1.2
1.2

1.7

Po-
tas-

sium

(K)

1.0

.8

1.0

. 7

Bi-
car-

bon-

ate

(HCO,)

75
78
82
82
82
82

85
88
80
75
76
72

70
67
67
68

75

Car-
bon-

ate

(CO,)

Sulfate

(S04)

12

16

12

10

Chloride

(CD

0.5

.0

.8

.0

Fluo-
rlde

(F)

0.2

.2

. 1

. 1

Ni-

trate

(NCg

0.6

.5

.6

.4

Bo-

ron

(B)

0.01

.04

.01

.04

Dissolved solids

(residue at 180 °C)

Parts

per
million

90
93
100
103.
100
98

99
105
95
82
85
80

84
78
74
76

87

Tons

per
acre-

foot

0.12
. 13
. 14
. 14
. 14
. 13

. 13
. 14
. 13
. 11
. 12
. 11

. 11
. 11
. 10
. 10

0.12

Tons

per

day

23,710
20 , 290
19,600
16,550
11,440
11,720

11 , 380
15,550
29,830
29,290
44,340
52,060

56 , 990
33,420
16,940
13,340

25,770

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

68
73
74
78
78
78

80
84
76
71
73
70

66
63
64
66

70

Non-
car-

bon-

ate

6
9
7
11
10
11

10
12
10
9
11
11

8
8
9
10

9

So-

dium
ad-

sorp-
tion
ratio

0.1

. 1

. 1

. 1

Specific
con-

duct-

ance

micro-

mhos at

25"C)

146
156
166
172
173
172

175
178
161
149
152
142

134
126
134
137

147

pH

7.1
7.1
7.2
7.0
7.4
7.3

7.3
7.1
7.6
7.7
7.7
7.7

7.6
7.9
7.7
7.8

SPOKANE RIVER BASIN Continued

12-4330. SPOKANE RIVER AT LONG LAKE, WASH.

LOCATION. At bridge<0.2 mile downstream from gaging station, 1.2 miles upstream from Chamokane Creek and 12 miles north of Reardon, Lincoln County. DRAINAGE AREA. 5,920 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
Water temperatures: July 1959 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 115 ppm Sept. 8-30; minimus, 46 ppm May 16-June 7.
Hardness: Maximum, 94 ppm Sept. 8-30; minimum, 28 ppm Apr. 1-23.
Specific conductance: Maximum daily, 212 micromhos Sept. 18; minimum daily, 67 micromhos Apr. 14, 15, 19, May 20.
Water temperatures: Maximum, 70°F July 31, Aug. 8; minimum, freezing point Jan. 21, Feb. 26.
EXTREMES, July 1959 to September 1960. Dissolved solids: Maximum, 124 ppm Sept. 1-17, 1959; minimum, 46 ppm May 16 to June 7, 1960.
Hardness: Maximum, 102 ppm Sept. 1-17, 1959; minimum, 28 ppm Apr. 1-23, 1960.
Specific conductance: Maximum daily, 223 micromhos Sept. 6, 1959; minimum daily, 67 micromhos Apr. 14, 15, 19, May 20, 1960.
Water temperatures: Maximum, 76°F Aug. 18, 1959; minimum, freezing point Jan. 21, Feb. 26, 1960.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, repsectively. No appreciable inflow between gaging station and sampling point except during periods of heavy local runoff.

Chemical.analyses in parts per million, July 1959 to September I960

Date
of
collection

July 29-
Aug. 12, 1959...

Sept. 18-30.......

Oct. 30-Nov. 8....

Dec. 26-
Jan. 24, 1960...

Jan. 25-Feb. 16...
Feb. 17-Mar. 9....

Apr. 24-May 15....

Mean

discharge
(cfs)

2,051
1,937
3,044
3,185

4,275
5,867
8,255
16,620
8,208
7,118

6,601

7,432
7,528
10,080
24,630
17,250
18,630
8.342

Silica

(SiQ,)

8.0
8.7
9.9
9.0

8.9
8.5
9.2
12
11
11

10

11
12
12
11
11
10
9.0

Iron

(Fe)

Cal-

cium

(Ca)

17
21
25
24

20
18
13
10
8.0
11

13

14
12
12
7.0
9.0
8.0
8.5

Mag-
ne-

sium

(Mg)

7.0
8.1
9.5
8.1

7.4
6.0
5.2
3.3
2.3
3.7

3.5

4.7
4.0
4.5
2.4
2.0
2.2
3.1

Sodium

(Na)

3.0
3.4
4.2
4.0

3.3
2.9
2.2
2.0
1.7
2.3

2.6

3.1
2.8
2.5
1.7
2.0
2.0
2.2

Po-
tas-

sium

(K)

. 5
.9
' . 5
.3

. 7
.3
.0
.2
.4
. 1

1.2

1.4
1.6
1.3
.8
.9
.8
.9

Bi-
car-

bon-

ate

(HCO,)

82
96
111
104

91
78
60
42
32
47

52

59
50
54
29
35
33
39

Car-
bon-
ate

(CO,)

SuUate

(S0«)

8.4
9.2
9.7
9.7

9.3
9.0
8.1
8.1
7.4
8.1

7.9

8.1
8.0
9.0
7.0
6.6
5.8
6.0

Chloride

(Cl)

2.0
2.8
4.2
3.8

2.5
2.0
1.5
.8
. 5
1.2

2.2

2.2
1.5
1.5
. 5
. 5
.5
1.0

Fluo-
ride

(F)

0.2
.2
. 1
. 1

0.1
. 1
. 1
. 1
. 1
. 1

. 1

. 1
. 1
. 1
.0
. 1
. 1
.0

Ni-

trate

(NOj)

2.0
2.7
3.5
3.0

1.9
1.5
. 7
1.4
.8
.9

1.2

1.7
2.4
1.8
. 7
.9
.5
.5

Phos-

phate
(P04)

0.10
.00
.02
.01

0.16
. 14
. 14
.05
.03
.02

. 12

. 12
. 16
. 13
.06
.05
.03
.01

Dissolved solids

(residue at 180°C)

Parts

per
million

91
102
124.
116

99
86
68
64.
51
63

68

77
79
75
47
5O
46
50

Tons

per
acre-

foot

0.12
. 14
.02
. 16

0.13
. 12
.09
.09
.07
.09

.09

. 10
. 11
. 10
.06
.07
.06
.07

Tons

per

day

504
533
1,020
998

1,140
1,360
1,52O
2,870
1,130
1,210

1,210

1,550
1,610
2,040
3,130
2,330
2,310
1.130

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

71
86
102
93

80
70
54
38
30
42

47

54
46
48
28
31
29
34

Non-
car-

bon-

ate

4
4
10
8

6
6
5
4
4
4

4

6
6
4
4
2
2
2

So-

ri^iny
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

micro-

mhos at

25"C)

156
182
213
199

f 175
151
120
93
74
101

113

127
112
111
69
76
71
82

PH

7.5
7.2
7.4
7.3

^.5
7.5
7.4
7.2
7.2
7.4

7.5

7.4
7.3
7.1
7.1
7.2
7.5
7 3

OKANOGAN RIVER BASIN Continued

12-4473. OKANOGAN RIVER NEAR BREWSTER, WASH.

LOCATION. At bridge on State Highway 10, approximately 11 miles downstream from gaging station near Malott, 1.5 miles upstream from mouth and 3.5 miles east of Brewster, Okanogan County.
DRAINAGE AREA. 8,210 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, in parts per million, July 1959 to September 1960

Date
of
collection

Sept. 20. ....

Mean

discharge
(cfs)

3,070
1,370
2,610
3,440
4,080

2,600
1,800
1,580
1,830
3,260

5,980
6,110
1,920
946
978

Silica

(SiQ.)

11
12
11
11
11

11
8.9
9.4
13
12

12
8.7
10
10
12

Iron

(Fe)

Cal-

cium

(Ca)

24
36
24
24
24

30
37
37
32
26

18
14
24
36
38

Mag-
ne-

sium

(Mg)

4.8
8.7
6.2
5.1
5.7

7.8
7.9
8.4
7.1
4.5

4.3
2.9
7.2
11
11

Sodium

(Na)

4.8
8.8
5.7
4.9
5.3

7.6
8.9
9.5
8.4
5.3

3.8
2.7
6.0
10
11

Po-
tas-
sium

(K)

1.4
2.5
1.5
1.3
1.4

1.6
2.0
2.0
2.6
1.1

1.0
. 7
1.3
2 2 '.3

Bi-
car-

bon-

ate

(HCOj)

89
138
93
91
93

118
136
139
121
96

72
54
98
146
153

Car-
bon-
ate

(CO,)

Sulfate

(S0<)

17
31
19
16
18

25
30
32
28
15

11
8.2
19
32
35

Chloride

(Cl)

0.5
1.0
.5
.5
.2

.8
1.2
1.5
. 5
.2

.0
.0
.5
1.2
1,5

Fluo-
ride

(F)

0.3
.2
.2
.0
.4

.2
.2
. 1
.3
. 1

. 1
. 1
.2
.2
.3

Ni-

trate

(NOJ

0.3
.3
.0
.2
.3

. 1
.0
. 1
.4
.2

. 1
. 1
.0
. 1
.2

Phos-

phate
(P04)

0.03
.01
.00
.04
.05

.03
.06
.04
. 15
.02

.04
.04
.05
.06
. 16

Dissolved solids

(residue at 180"C)

Parts

per
million

114
174
115
114
113

146
169
168
154
117

98
65
128
188
197

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

80
126
86
81
83

107
125
127
109
84

63
47
90
134
141

Non-
car-

bon-

ate

6
12
10
6
7

10
14
13
10
5

4
2
9
15
16

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

micro-

mhos at

25°C)

182
277
189
182
189

244
282
284
254
188

141
104
199
283
312

PH

7.3
7.9
7.4
8.2
7.8

7.9
8.0
8.1
7.8
7.9

7.8
7.5
8.1
8.2
8,1

YAKIMA RIVER BASIN Continued

12-4940. NACHES RIVER AT NACHES, WASH.

LOCATION. At bridge at Naches, Yakima County, 4 miles downstream from gaging station and 4.8 miles downstream from Tieton River.
DRAINAGE AREA. 941 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to June 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1636 and 1716, respectively. No appreciable inflow between sampling point and gaging station except during periods of heavy local rainfall.

Chemical analyses, in parts per million. July 1959 to Ji

Date
of
collection

Mean

discharge
(cfs)

1,330
599
148
913
318

35
1,200
2,560
2,560
2.060

Silica

(S1Q,)

15
16
16
16
15

19
19
16
16
13

Iron

(Fe)

Cal-

cium

(Ca)

7.0
7.0
8.5
7.0
7.5

12
9.0
7.0
7.0
7.0

Mag-
ne-

sium

(Mg)

1.0
1.6
1.8
1.3
1.3

2.8
1.3
1.6
1.3
.8

Sodium

(Na)

2.2
2.4
3.1
2.4
2.7

5.3
3.6
3.0
2.6
2.5

Po-
tas-

sium

(K)

0.7
.9
1.2
.8
.5

.8
.4
. 7
. 7
.6

Bi-
car-

bon-

ate

(HCO,)

31
34
41
32
34

58
42
35
33
30

Car-
bon-

ate

(CO,)

Sulfate

(S04)

2.6
2.6
2.6
2.8
2.9

3.8
2.2
2.0
2.8
1.6

Chloride

(Cl)

0.8
.5
1.0
.8
.5

2.0
.5
1.0
.2
1.0

?hos-
Dhate
(P04)

0.0
.2
. 1
. 1
.0

. 1
. 1
. 1
.0
. 1

Ni-

trate

(NO,)

0.2
.2
.2
. 1
. 1

. 1
. 1
. 1
.0
. 1

Bo-

ron

(B)

0.02
.01
.02
.04
.04

.04
.03
.04
.05
.03

me 1960

Dissolved solids

(residue at 180°C)

Parts

per
million

41
49
55
47
47

87
59
53
52
47

Tons

per
acre-

foot

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

22
24
28
23
24

42
28
24
23
20

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

59
62
72
60
64

108
73
67
59
54

pH

6.9
7.4
7.5
7.8
7.3

7.4
7.5
7.3
7.4
7.5

YAKIMA RIVER BASIN Continued

12-5105. YAKIMA RIVER AT KIONA, WASH.

LOCATION. At highway bridge downstream from gaging station at Kiona, Benton County, 3.5 miles downstream from intake of Kiona Canal and 25 miles upstream from mouth.
DRAINAGE AREA. 5,600 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: December 1952 to September 1960.
Water temperatures: December 1952 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 219 ppm July 31 to Aug. 29; minimum, 76 ppm Dec. 16 to Jan. 15.
Hardness: Maximum, 132 ppm July 31 to Aug. 29; minimum, 42 ppm Dec. 16-31.
Specific conductance: Maximum daily, 374 micromhos Aug. 14, 15; minimum daily, 99 micromhos Dec. 17.
Water temperatures: Maximum, 84°F July 18; minimum, freezing point on several days during January.
EXTREMES, 1952-60. Dissolved solids: Maximum, 242 ppm Oct. 1-11, 1958; minimum, 76 ppm May 1-23, 1957, Dec. 16-31, 1959, Jan. 1-15, 1960. Hardness: Maximum, 148 ppm Oct. 1-11, 1958; minimum, 42 ppm May 1-23, 1957, Dec. 16-31, 1959.
Specific conductance: Maximum daily, 390 micromhos Oct. 10, 1958; minimum daily, 99 micromhos Dec. 17, 1959.
Water temperatures: Maximum, 84°F July 18, 1960; minimum, freezing point on several days during winter months.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1716.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-6, 1959....
Oct. 7-13.........
Oct 14 16

Oct. 25-Nov. 15...

Nov. 23-Dec. 15...

Jan. 1-15, 1960...

Jan. 31-Feb. 25...

Feb. 26-Mar. 19...
Mar 20 23
Mar. 24-31........

Apr. 7-14.........
Apr. 15-30........

Mean

discharge
(cfs)

3,215
3,190
3,610
4,250
4,890
4,813

4,010
9,018
8,912
6,754
3,353
3,222

2,200
3,690
7,301
5,808
7,092
3,415

Silica

(sicg

28

15

23

Iron

(Fe)

Cal-

cium

(Ca)

27

12

15

Mag-
ne-

sium

(Mg)

9.5

3.2

5.3

Sodium

(Na)

16
18
15
16
12
11

12
7.2
6.3
6.4
12
15

17
12
7.4
8.3
6.8
10

Po-
tas-

sium

(K)

3.3

1.0

1.5

Bl-

car-

bon-

ate

(HCO,)

134
144
117
131
106
95

101
64
58
60
92
114

134
105
72
80
69
91

Car-
bon-

ate

(ccg

Sulfate

(S0«)

18

5.9

6.2

Chloride

(Cl)

6.0

2.5

2.8

Fluo-

rlde

(F)

0.2

. 1

. 1

Ni-

trate

(NO,)

1.5

.9

1.1

Bo-

ron

(B)

0.01

. 00

.00

Dissolved solids

(residue at 180°C)

Parts

per
million

168
177
151
165-
137
121

127
87
76
76
116
144

164
131
98
111
94
119

Tons

per
acre-

foot

0.23
.24
.21
. 22
. 19
. 16

. 17
. 12
. 10
. 10
. 16
.20

. 22
. 18
. 13
. 15
. 13
. 16

Tons

per

day

1,460
1,520
1,470
1,890
1,810
1,570

1,380
2,120
1,830
1,390
1,050
1,250

974
1,310
1,930
1,740
1,800
1.100

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

99
106
86
97
80
70

73
47
42
43
67
82

97
76
53
59
51
68

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0,8

.4

. 5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

261
282
232
259
212
188

201
129
114
120
188
231

267
208
140
151
129
177

pH

7.6
7.5
7.6
7.4
7.4
7.4

7.5
7.1
7.1
7.4
7.2
7.2

7.7
7.4
7.2
7.8
7.7
7,9

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

Date
of
collection

Mean

discharge
(cfs)

Silica

(sicg

Iron

(Fe)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium
(Na)

Po-
tas-
sium

(K)

Bi-
car-

bon-
ate

(HCO,)

Car-
bon-
ate

(ccg

Sulfate
(S04)

Chloride
(Cl)

Fluo-
ride
(F)

Ni-
trate

(NO,)

Phos-
phate
(P04)

Dissolved solids

(residue at 180°C)

Parts
per
million

Tons
per
acre-

foot

Tons
per

day

Hardness
as CaCO,

Cal-
cium,
Mag-
ne-

sium

Non-
car-

bon-
ate

So-
dium
ad-
sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at
25°C)

PH

OZETTE RIVER BASIN

12-431.5. OZETTE RIVER AT OZETTE, WASH.

Jan. 21, I960.....

July 19. ....

3.9
3.6
3.0

3
.5

3 4

3.9 .6 9

1 8

2.4

3 2
5 8

5 2
6.0 .0 .2.00

30
30 10 2

39

41

7 2

6.8

PART 13. SNAKE RIVER BASIN

SNAKE RIVER MAIN STEM

13-375. SNAKE RIVER NEAR HEISE, IDAHO

LOCATION. At Eagle Rock canal headgate, 1.2 miles upstream from Heise, Jefferson County, 1.6 miles downstream from Anderson canal headgate, 1.8 miles downstream from gaging station, approximately 4.8 miles east of Ririe, and approximately 21 miles upstream from Henrys Fork.
DRAINAGE AREA. 5,752 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: January 1953 to September 1960.
Water temperatures: January 1953 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 313 ppm Mar. 31 to Apr. 6; minimum, 194 July 8-28.
Hardness: Maximum, 232 ppm Mar. 31 to Apr. 6; minimum, 150 ppm July 29 to Sept. 30.
Specific conductance: Maximum daily, 550 micromhos Apr. 2, 3; minimum daily, 308 micromhos July 27.
Water temperatures: Maximum, 62°F Aug. 14; minimum, freezing point on many days during winter months.
EXTREMES, 1953-60. Dissolved solids: Maximum, 378 ppm Nov. 11-20, 1956; minimum, 161 ppm July 1-10, 1954.
Hardness: Maximum, 276 ppm Feb. 1-28, 1955; minimum, 117 ppm July 21 to Aug. 10, 1955.
Specific conductance: Maximum daily, 791 micromhos Nov. 13, 1956; minimum daily, 240 micromhos June 27, 1954.
Water temperatures: Maximum, 67°F July 19, 1955; minimum, freezing point on many days during winter months.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1717. Approximately 2.5 percent of normal annual streamflow of 5,000,000 acre feet is diverted by Anderson canal between sampling point and gaging station. This diversion occurs during the months of May to November except for leakage through the headgate. No other diversion or appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-15, 1959...

Jan. 1-15, 1960...
Jan. 16-Feb. 13...

Mar. 31-Apr. 6....

Apr. 25-May 1.. ...

Mean

discharge
(cfs)

2,589
3,341
3,381
2,063
1,863
1,884

1,880
1,880
1,726
,634
,544

,576
,787
,466
,744
,775
3.191

Silica

(sicg

6.7

7.5

7.8

Iron

(Fe)

Cal-

cium

(Ca)

52

60

58

Mag-
ne-

sium

(Mg)

12

14

15

Sodium

(Na)

14
13
13
17
17
18

14
17
17
18
18

19
17
18
15
17
14

Po-
tas-

sium

(K)

2.0

2.5

2.4

Bi-
car-

bon-

ate

(HCO,)

172
170
173
194
199
196

162
190
190
194
198

199
189
220
187
206
184

Car-
bon-

ate

(CO,)

Sulfate

(SO,)

50

60

53

Chloride

(Cl)

16

20

20

Fluo-

rlde

(F)

0.4

.4

. 3

Ni-
trate

(NO,)

0.5

.3

1.1

Bo-

ron

(B)

0.00

.03

.03

Dissolved solids

(residue at 180°C)

Parts

per
million

251
244
254
294,
298
282

238
283
283
283
294

296
277
313
271
302
266

Tons

per
acre-

foot

0.34
.33
.35
.40
.41
.38

.32
.38
.38
.38
.40

.40
.38
.43
.37
.41
. 36

Tons

per

day

,750
,200
,320
,640
,500
,430

,210
,440
,320
,250
,230

,260
,340
,240
,280
,450
.290

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

180
180
185
209
215
212

176
208
208
208
216

218
202
232
206
228
202

Non-
car-

bon-

ate

38
41
43
50
52
51

43
52
52
49
54

55
47
52
52
59
51

So-

dium
ad-

sorp-
tion
ratio

0.4

.5

. 5

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

415
408
414
478
488
486

418
473
478
485
497

504
476
527
466
513
452

PH

7.9
8.0
8.0
7.9
8.1
7.9

7.7
7.7
7.9
8.1
8.0

7.9
8.0
8.1
8.0
8.0
8.0

SNAKE RIVER MAIN STEM

13-1545. SNAKE RIVER AT KING HILL, IDAHO

LOCATION. At county highway bridge approximately 400 yards downstream from gaging station at King Hill, Elmore County and 20 miles downstream from Big Wood River.
DRAINAGE AREA. 35,800 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: March 1951 to September 1960.
Water temperatures: March 1951 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 351 ppm Dec. 25-Jan. 11; minimum, 292 ppm Mar. 18-23.
Hardness: Maximum, 212 ppm Oct. 1-13; minimum, 172 ppm Mar. 18-23.
Specific conductance: Maximum daily, 574 micromhos Oct. 7; minimum daily, 454 micromhos Mar. 23, 26.
Water temperatures: Maximum, 70°F on several days during July; minimum, 44°F Jan. 19.
EXTREMES, 1951-60. Dissolved solids: Maximum, 359 ppm Sept. 1-10, 1952; minimum, 252 ppm May 1-10, 1952.
Hardness: Maximum, 220 ppm Nov. 1-10, 21-30, 1953; Oct. 16-31, 1958; minimum, 166 ppm May 1-10, 1952.
Specific conductance: Maximum daily, 594 micromhos Oct. 3, 1952; minimum daily, 394 micromhos May 7, 1952.
Water temperatures: Maximum, 73°F Aug. 2, 1955; minimum, 40°F Feb. 2, 1956.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1717. No appreciable inflow between gaging station and sampling point except during periods of heavy local runoff. Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-13, 1959...

Dec. 25-
Jan. 11, 1960...

Jan. 30-Feb. 29...
Mar. 1-17.........

Mar. 24-Apr. 6....
Apr. 7-30.........
May 1-21 ....

Mean

discharge
(cfs)

10,790
10,110
9,427
9,301
8,866

8,674

8,734
8,662
8,888
8,567
8,333
8,582
6,545

Silica

(SlQs)

37

39

35

Iron

(Fe)

Cal-

cium

(Ca)

55

49

42

Mag-
ne-

sium

(Mg)

18

20

18

Sodium

(Na)

36
35
-35

35
35

34

33
32
32
30
29
31
32

Po-
tas-

sium

(K)

4.8

4.8

4.1

Bl-

car-

bon-

ate

(HCO,)

210
226
224
224
220

222

220
212
206
194
196
208
207

Car-
bon-
ate

(cog

8
0
0
0
0

0

0
0
0
0
0
0
0

Sulfate

(SO,)

60

55

45

Chloride

(Cl)

27

25

22

Fluo-
rlde

(F)

9.7

. 6

. 5

Ni-

trate

(NO,)

3.4

3.4

3.4

Bo-

ron

(B)

0.10

.06

.04

Dissolved solids

(residue at 180°C)

Parts

per
million

344
336
331
330.
324

351

342
324
310
292
303
325
314

Tons

per
acre-

foot

0.47
.46
.45
.45
.44

.48

.47
.44
.42
.40
.41
.44
.43

Tons

per

day

10,020
9,170
8,420
8,290
7,760

8,220

8,060
7,580
7,440
6,750
6,820
7,530
5.550

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

212
195
202
197
196

203

199
192
185
172
179
195
192

Non-
car-

bon-

ate

26
10
18
13
16

21

19
18
16
13
18
24
22

So-

dium
ad-

sorp-
tion
ratio

l.l

1.0

.9

Specific
con-

duct-

ance

[micro-
mhos at

25"C)

551
538
537
537
534

544

537
513
505
476
470
505
492

pH

8.3
7.9
7.7
7.7
7.7

7.8

8.0
7.8
7.8
7.8
7.7
8.1
8.2

OWYHEE RIVER BASIN

13-1810. OWYHEE RIVER NEAR ROME, OREG.

LOCATION. At bridge at gaging station, 0.5 mile downstream from Jordan Creek and 2.5 miles north of Rome, DRAINAGE AREA. 8,000 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: September 1959 to September 1960 (discontinued).
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to Septembe

County.

1960 given in WSP 1637 and 1717, respectively.

Chemical analyses, in parts per million, September 1959 to September 1960

Date
of
collection

Sept. 16..........

Mean

discharge
(cfs)

67
127
117
120
284

7,930
4,200
228
104
78

Silica

(SiOj

36
32
34
35
25

18
22
26
24
32

Iron

(Fe)

Cal-

cium

(Ca)

15
18
25
24
18

6.5
10
24
19
17

Mag-
ne-

sium

(Mg)

2.5
5.6
6.5
5.6
5.3

1.4
1.9
6.6
6.2
4.5

Sodium

(Na)

50
46
55
48
27

5.6
7.9
31
50
61

Po-
tas-

sium

(K)

3.5
3.5
3.6
3.4
3.2

2.2
2.1
4.0
4.6
3.5

Bi-
car-

bon-

ate

(HCO,)

al30
137
167
156
103

32
50
143
152
152

Car-
bon-

ate

(ccg

Sulfate

(S04)

26
32
40
34
23

4.8
7.4
22
30
34

Chloride

(Cl)

16
12
17
15
9.2

1.2
2.0
10
16
17

Fluo-
ride

(F)

4.5
3.5
3.5
3.4
1.3

.2
.4
1.4
2.7
4.1

Ni-
trate

(NO,)

0.4
1.1
1.0
1.5
2.2

2.4
.8
. 9
. 5
1.5

Bo-

ron

(B)

Dissolved solids

(residue at 180°C)

Parts

per
million

225
226
257
251
169

58
93
195
224
268

Tons

per
acre-

foot

0.31
.31
. 35
.34
.23

. 11
. 13
.27
. 30
.36

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

48
68
89
83
67

22
32
87
73
61

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

3.2
2.4
2.5
2.3
1.4

.5
.6
1.4
2.6
3.4

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

326
345
415
384
254

75
107
303
363
382

pH

8.6
7.9
8.0
8.0
7.7

6.7
7.2
8.0
8.1
8.2

a Includes equivalent of 8 ppm of carbonate (CO3).

BOISE RIVER BASIN

13-2125. BOISE RIVER AT NOTUS, IDAHO

LOCATION. At highway bridge, 1,100 feet downstream from gaging station, 0.2 mile southeast of Notus, Canyon County, and 7 miles northwest of Caldwell. DRAINAGE AREA. 3,820 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: January 1939 to January 1940, November 1950 to September 1960.
Water temperatures: November 1950 to September 1960.
Sediment records: January 1939 to June 1940.
EXTREMES, 1959-60. Dissolved solids: Maximum, 456 ppm July 7-16; minimum, 101 ppm Apr. 8-15.
Hardness: Maximum, 202 ppm Jan. 23-30; minimum, 48 ppm Apr. 8-15.
Specific conductance: Maximum daily, 759 micromhos Jan. 18; minimum daily, 131 micromhos Apr. 14.
Water temperatures: Maximum, 84°F July 16, 18, 19; minimum, 37°F Jan. 18, 19.
EXTREMES, 1939-40, 1950-60. Dissolved solids: Maximum, 914 ppm Aug. 21-31, 1939; minimum, 77 ppm May 1-10, 1952, June 11-20, 1953. Hardness: Maximum, 284 ppm July 21-31, 1939; minimum, 35 ppm June 11-26, 1953.

ober 1959

Chemical analyses, in parts per million, water year October 1959 to September 1960

Date
of
collection

Oct. 1-20, 1959...
Oct. 21-Nov. 9....
Nov. 10-Dec. 2....

Dec. 25-
Jan. 22, 1960...

Jan. 31-Feb. 1....

Feb. 12-Mar. 6....

Mean

discharge
(eta)

778
773
668
616

566
620
1,335

1,480
763
586
654
1,690
4,802
1,397

Silica

(SiQj)

35

37

15

Iron

(Fe)

Cal-

cium

(Ca)

50

55

16

Mag-
ne-

sium

(Mg)

13

11

2.1

Sodium

(Na)

71
76
76
77

81
76
42

36
67
74
62
24
12
17

Po-
tas-

sium

(K)

4.6

5.4

1.3

Bi-
car-

bon-

ate

(HCO,)

276
280
279
280

296
316
261

143
252
267
225
112
68
90

Car-
bon-
ate

(CO,)

Sulfate

(S04)

80

86

12

Chloride

(Cl)

18

20

3.0

Fluo-
ride

(F)

0.6

. 7

.0

Ni-

trate

(NO,)

4.2

2.3

3.1

Bo-

ron

(B)

0.11

. 10

.03

Dissolved solids

(residue at 180°C)

Parts

per
million

410
422
419
422

440
445
290

245
378
404
356
188
101
133

Tons

per
acre-

foot

0.56
.57
.57
.57

.60
.61
.39

.33
.51
.55
.48
.26
. 14
. 18

Tons

per

day

861
881
778
702

672
745
1,050

979
779
639
629
858
1,310
502

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

180
188
176
179

182
202
128

94
168
169
148
80
48
61

Non-
car-

bon-

ate

0
0
0
0

0
0
0

0
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

2.3

2.6

. 7

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

638
662
664
663

675
693
484

358
585
630
558
269
153
205

PH

8.2
8.0
7.4
7.3

.5
.7
.2

.9
.4
.4
.4
. 1
.2
.3

MALHEUR RIVER BASIN

13-2270. BULLY CREEK NEAR VALE, OREG.

LOCATION. At county highway bridge, 2 miles downstream from gaging station, 5 miles upstream from mouth, and 5 miles southwest of Vale, Malheur County.
DRAINAGE AREA. 570 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Water temperatures: October 1958 to September 1960.
Sediment records: April 1958 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 81°F July 9; minimum, freezing point Dec. 5, Jan. 1-3.
Sediment concentrations: Maximum daily, 6,940 ppm Mar. 7; minimum daily, not determined.
Sediment loads: Maximum daily, 7,530 tons Mar. -8; minimum daily, less than 0.50 ton on many days.
EXTREMES, 1958-60. Water temperatures: Maximum, 82°F July 16, 1959; minimum, freezing point Dec. 5, 1959, Jan. 1-3, 1960. Sediment concentrations: Maximum daily, 12,800 ppm Sept. 14, 1959; minimum daily, not determined.
Sediment loads: Maximum daily, 7,530 tons Mar. 8, 1960; minimum daily, less than 0.50 ton on many days.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1717. Minor irrigation return flow between gaging station and sampling point.

Temperature (°f) of water, water year October 1959 to September 1960

January .....
February ....
March ....

1

32
38
36

2

32
40
40

3

32
39
38

4

37
39

5

33
40
40

6

40
40

7

42
40

8

34
40
43

9

35
40
41

10

37
43
40

11

36
43
38

12

35
43
42

13

33
40

14

34
38
43

15

33
40
40

Day

16

40
40

17

35
38
44

18

33
37
46

19

37
45

20

33
38
51

21

38
50

22

34
38
53

23

40
54

24

40

56

25

36
57

26

38
36
55

27

36
34
57

28

39
38
51

29

36
38
46

30

40

49

31

37

43

Aver-

age

39
45

WEISER RIVER BASIN

13-2513. WEST BRANCH WEISER RIVER NEAR TAMARACK, IDAHO

LOCATION. Temperature recorder at gaging station at Price Valley guard station, 0.1 mile upstream from East Branch Weiser River and 5.2 miles northwest of Tamarack, Adams County. ' DRAINAGE AREA. 3.96 square miles.
RECORDS AVAILABLE. Water temperatures: August 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 62°F July 20; minimum, freezing point many days during winter months EXTREMES, August 1959 to September I960. Water temperatures: Maximum, 62°F July 20, 1960; minimum, freezing point many davs during winter months.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1717.

Temperature (°F) of water, August to September 1959

August
Maximum ....

September
Maximum ....
Minimum ....

i

53
46

2

52
44

3

59

53
47

4

57

52
49

5

57

50
49

6

56

53
50

7

56

55
48

8

57

55
49

g

57

50
43

10

57

52
45

11

57

56
50

12

56

55
49

13

54

?4
53

14

54

S3
51

15

56

51
49

Day

16

58

49
45

17

57

49
44

18

56

46
45

19

54

48
46

20

53

48
46

21

52

46
45

22

53

47
44

23

54

48
42

24

52

46
42

25

54

49
46

26

55

48
46

27

55

46
44

28

56

46
42

29

54

43
40

30

53

46
42

31

52 16

27
16

WEISER RIVER BASIN Continued

13-2660. TOISER RIVER NEAR WEISER, IDAHO

LOCATION. Temperature recorder at gaging station, 0.4 mile upstream from county road bridge, 1.8 i and 9 miles northeast of Weiser, Washington County.
DRAINAGE AREA. 1,460 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: November 1958 to September 1959.
Water temperatures: July 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 82°F June 28, July 15, 17, 18, 20; minimum, frees winter months.
EXTREMES, July 1959 to September 1960. Water temperatures: Maximum, 82°F June 28, July 15, 17, li point on many days during winter months.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1717.

downstream from Cr

ing point on many days during

, 20, 1960; minimum, freezing

Temperature (°F) of water, water year October 1959 to September 1960

Month

October
Maximum ....
Minimum ....
No\ ember
Maximum ....
Minimum ....
Dec-ember
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....
February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April

Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

Day

1

56
48

42

34
33

32
32

32
32

33
32

59
55

59
57

79

T>
68

72
63

2

55
49

34
33

33
32

32
32

33

47

55
52

77

67

75
64

3

57
50

34
33

33
32

33
32

33

52
50

76

65

4

60
52

34
33

33
32

32
32

33

51
50

77

67

5

59

34
33

33
32

32
32

33

53

55
50

79

62

6

58

34
33

32
32

33
32

33

53

57
52

80

63

7

54

34
33

33
32

32
32

58

80

an

62

8

53

34
33

32
32

32
32

53

54

79

59

9

54

34
33

33
32

33
32

53
b2

56

79

61

10

52

34
33

33
32

34
33

52

58

79

63

11

55

34
33

32
32

34
32

52

57

78

RO

63

12

58

34
33

33
32

34
33

50

56

78

7=)

66

13

57

33
33

33
32

37
34

53

55

80

65

14

56

33
33

33
33

37
34

52
50

53

81

64

15

57

33
32

33
32

37
34

50

56

82

64

16

56

33
32

34
33

37
34

48

56

82

65

17

55

33
33

34
33

36
33

48
46

53

71

63

18

54

33
32

34
33

34
32

50

53

82

61

19

56

33
32

34
34

35
32

53

55

81

60

20

56

33
32

34
33

37
32

53

54

82

61

21

53

33
32

34
33

38
34

54

52

79

55

22

51

33
32

33
32

38
34

50

52

76

56

23

55

32
32

33
32

37
32

51

53

77

59

24

57

32
32

33
32

36
33

53

51

77

58

25

56

32
32

32
32

36
33

54

51

72

62

26

53

32
32

33
32

36
33

57

56

78

63

27

51

32
32

32
32

35
33

48

55

57

79

79

58

62

28

50

33

32
32

32
32

34
32

48

55

57

82

78

58

64

29

47

33

32
32

33
32

33
32

48

57

59

79
68

81
68

58

67
60

30

46

33

32
32

32
32

46
45

59

61

81
68

78
71

70
60

66
59

31

46
41

32
32

32
32

45
43

61
59

80
69

72
64

Aver-

age

54
49

39
36

33
32

33
32

35
33

43
40

53
49

55
51

68
62

79
67

74
65

70
62

POWDER RIVER BASIN

13-2867. POWDER RIVER NEAR HIGHLAND, OREG.

LOCATION. At gaging station, at bridge on State Highway 86, 0.4 miles upstream from Upper Timber Canyon, and 6 miles west of Richland, Baker County. DRAINAGE AREA. 1,310 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: November 1959 to September 1960 (discontinued).
Water temperatures: June 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Minimum, freezing point on many days during winter months.
EXTREMES, June 1959 to September 1960. Water temperatures: Maximum (1959), 86°F on several days during July 1959; minimum, freezing point on many days during winter months.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1717.

Chemical analv

Date
of
collection

Sept. 27..........

Mean

discharge
(cfs)

46
110
100
1,140
1,370
1,480

445
62
47
42
28

Silica

(S1Q.)

32
24
27
20
27
26

28
26
38
36
38

Iron

(Fe)

Cal-

cium

(Ca)

38
25
26
16
17
18

21
36
38
41
48

Mag-
ne-

sium

(Mg)

10
7.4
6.1
3.9
3.9
4.2

7.1
12
17
17
21

Sodium

(Na)

45
27
28
15
14
14

23
48
68
67
78

ses. in carts per million, November 1959 to September 1960

Po-
tas-

sium

00

4.3
3.1
3.4
4.0
2.7
2.8

3.4
5.1
8.9
7.5
7.6

Bl-

ear-

bon-

ate

(HCO,)

242
157
151
90
96
98

140
228
290
299
331

Car-
bon-

ate

(CO,)

0
0
0
0
0
0

0
13
21
15
22

Sulfate

(S0<)

37
19
19
11
11
11

15
28
36
37
56

Chloride

(CD

6.5
4.0
4.0
2.5
2.5
2.5

1.0
6.5
8.5
8.2
8.2

Fluo-

rlde

(P)

0.3
.2
.3
.2
.2
.2

.2
.3
.4
.4
.4

Ni-

trate

(NO,)

0.2
.2
2.2
2.5
.6
1.1

. 7
.4
.6
.8
. 5

Bo-

ron

(B)

Dissolved solids

(residue at 180°C)

Parts

per
million

302
187
189
133
134
141

177
281
382
394
469

Tons

per
acre-

foot

0.41
.25
.26
. 18
. 18
. 19

.24
.38
.52
.54
.64

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

138
93
90
56
64
62

82
140
166
171
205

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

1.7
1.2
1.3
.9
.8
.8

1.1
1.8
2.3
2.2
2.4

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

457
297
297
180
184
184

253
447
574
571
661

PH

8.2
8.2
7.9
6.8
7.4
7.7

8.0
8.7
8.8
8.7
8.8

SNAKE RIVER MAIN STEM

13-2902. SNAKE RIVER BELOW PINE CREEK, AT OXBOW, OREG.

LOCATION. Temperature recorder at gaging station, at Oxbow, Baker County, 0.1 mile upstre
of Oxbow school, 0.3 mile downstream from Pine Creek, and 3.2 miles north of Homestead.
DRAINAGE AREA. 73,150 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: May 1956 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 74°F several days during August; minimum, 37°F several day EXTREMES, 1956-60. Water temperatures: Maximum, 81°F July 25, 1956; minimum, freezing point several days d REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1717.

from Hansaker Creek, 0.1 mile north

5 during February,
jring January 1957.

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....

August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

1

65

56
56

42

38
38

43
47

55
55

59
59

72

6-J

69

2

"

42

38
38

48
48

55
55

59

3

"

42

38
38

48
48

55
54

ISO

4

56

42

38
38

48
48

55
54

61

5

56

42

38
38

49
48

55
54

61

6

42

38
38

50
49

55
54

61

7

42

38
38

51
bO

55
54

62

8

42

38
38

52
51

55
55

6?

9

41

38
37

53
52

55
55

61

10

40

37
37

54
52

56
55

61

11

40

37
37

54
52

56
56

62

12

40

37
37

52
52

58
56

62

13

39

37
37

53
52

58
57

62

14

39

37
37

54
53

58
58

63

15

39

37
37

55
54

59
58

63

16

39

37
37

55
55

59
58

63

17

39

38
37

55
53

59
59

64

18

39

38
38

54
54

59
59

64

19

39

38
38

55
54

59
58

65

20

39

38
38

55
54

59
58

65

21

39

38
38

55
54

59
59

65

22

39

38
38

55
55

59
59

65

23

39
39

38
38

55
54

59
58

65

24

39
38

38
38

55
54

59
58

65

25

38
38

38
38

55
54

58
58

66

26

38
38

39
38

55
54

58
58

66

27

38
38

39
39

55
54

58
58

65

28

38
38

39
39

55
54

58
58

65

71

29

38
38

40
39

55
54

58
58

65

70

30

38
38

55
54

58
58

65
64

70

70

66
65

31

56
56

"

42

38
38

47
47

59
58

70

70

Aver-

age

60
60

51

44

40
40

38
38

42
42

53
52

57
57

63
62

68

72
70

68
68

SALMON RIVER BASIN

13-3042. BIG SPRINGS CREEK NEAR LEADORE, IDAHO

LOCATION. Temperature recorder at gaging station, downstream from culvert crossing, on State Highway 28, and 2.7 miles northwest of Leadore, Lemhi County.
RECORDS AVAILABLE. Water temperatures: July 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 68°F July 5; minimum, 36°F Feb. 26, 28, 29, Mar. 10.
EXTREMES, July 1959 to September 1960. Water temperatures: Maximum, 68°F July 5, 1960; minimum, 36°F Feb. 26 28 29 Mar. 10, 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1717.

Temperature (°F) of water, July to September 1959

Month

July
Maximum ....

Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

1

62
52

59
49

2

60
51

59
48

3

63
51

58
49

4

63
51

?8
50

5

64
51

56
50

6

63
51

60
52

7

64
51

59
49

8

62
5 1

57
51

9

65
51

57
47

10

66
51

59
48

11

61
50

57
50

12

62
50

57
50

13

62
49

57
51

14

62
49

58
52

15

63
51

59
51

16

64
51

57
47

17

64

59
51

52
47

18

64

59
51

51
47

19

64

60
54

53
48

20

64

59
52

5?
48

21

61

61
49

52
4fa

22

65

61
49

53
46

23

65

62
49

53
4fa

24

61

5«
50

5fa
44

25

66

sa
50

51
47

26

62

sa
50

51
46

27

62

61
52

4a
45

28

62

60
51

50
45

29

64

58
49

52
'1 4

30

63

61
49

49
44

31

60

57
49

Average

40
20

38

SALMON RIVER BASIN Continued

13-3063. PANTHER CREEK NEAR FORNEY, IDAHO

LOCATION. Temperature recorder, 0.6 mile upstream from road leading to Meyers Cove, and 5.5 miles south of Forney, Lemhi County.
RECORDS AVAILABLE. Water temperatures: July to September 1960.

Temperature (°F) of water July to September 1960

July

August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

Day

1

60
54

53
47

2

60
50

56
51

3

59
51

56
49

4

60
51

56
52

5

59
51

53
46

6

60
51

53
45

7

59
52

51
45

8

'

59
51

50
42

9

60
51

51
42

10

59
52

51
45

11

62
53

53
45

12

61
53

51
47

13

60
51

b3
48

14

58
53

53
48

15

55
50

53
45

16

50
48

b2
47

17

56
48

52
45

18

58
49

51
44

19

58
50

bl
43

20

57
50

50
44

21

58
50

48
42

22

55
45

46
39

23

47
43

46
42

24

47
44

47
40

25

50
43

51
45

26

49
42

52
44

27

47
44

51
44

28

50
41

51
45

29

50
43

49
42

30

54
44

48
42

31

54
49

Aver-
age

56
49

51
45

GRANDE RONDE RIVER BASIN Continued

13-3235. GRANDE RONDE RIVER NEAR ELGIN, OREG.

LOCATION. At bridge on State Highway 82, approximately 200 yards downstream from gaging station, 1.6 miles downstream from Willow Creek,and 3.8 miles south of Elgin, Union County.
DRAINAGE AREA. 1,250 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: August 1911 to August 1912, September 1959 to September 1960.
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1637 and 1717, respectively. Chemical analyses, in parts per million. September 1959 to September 1960

Date
of
collection

Sept. 19, 1959....

Sept. 26..........

Mean

discharge
(cfs)

100
562
220
211
150
247

2,400
2,480
34
39
47
42
50

Silica

(siQj)

27
29
33
33
34
29

32
30
34
33
31
33
33

Iron

(Fe)

Cal-

cium

(Ca)

12
7.5
9.5
10
11
9.5

6.5
5.5
14
13
11
12
12

Mag-
ne-

sium

(Mg)

4.5
3.0
3.9
3.7
3.6
3.5

1.9
1.9
5.2
4.9
6.8
4.8
5.2

Sodium

(Na)

11
4.9
7.8
8.0
9.1
8.6

4.0
3.6
9.0
10
10
9.3
9.9

Po-
tas-

sium

(K)

2.9
2.0
2.0
1.8
1.9
2.1

1.6
1.2
3.2
2.8
2.7
2.7
2.6

Bi-
car-

bon-

ate

(HCO,)

85
47
65
64
69
54

38
35
90
87
91
82
84

Car-
bon-

ate

(CO,)

Sulfate

(SO.)

3.1
1.7
3.6
3.4
3.3
4.4

.8
.2
3.4
2.6
3.4
5.4
3.0

Chloride

(CD

4.5
1.2
1.5
1.8
2.5
2.5

.2
.0
1.8
2.2
1.5
2.0
2.0

Fluo-

ride

(F)

0.3
.0
.3
. 1
. 1
. 1

. 1
. 1
.2
.2
.2
. 1
. 1

Ni-

trate

(NO,)

0.2
.5
.4
.6
.4
4.4

.5
.4
.4
1.0
.2
.5
.4

Bo-

ron

(B)

Dissolved solids

(residue at 180°C)

Parts

per
million

107
80
97
96
102
115

82
75
119
118
115
109
121

Tons

per
acre-

foot

0.15
.11
. 13
. 13
. 14
. 16

. 11
. 10
. 16
. 16

. 16

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

48
31
40
40
42
38

24
22
56
53
56
50
52

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.7
.4
.5
.6
.6
.6

.3
.3
.5
.6

.6

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

150
85
117
116
129
115

69
63
156
153
155
139
145

pH

7.7
7.4
7.4
8.0
7.5
7.1

7.0
7.3
7.4
7.4
7.4
7.4
7.3

CLEARWATER RIVER BASIN

13-3355. SELWAY RIVER NEAR SHEARER GUARD STATION, IDAHO

LOCATION. Temperature recorder at Shearer Ranch, 1.5 miles north of Shearer guard station, Idaho County. RECORDS AVAILABLE. Water temperatures: May to September 1960.

Temperature (°F) of water. May to September 1960

October

Minimum ....
November

Minimum ....
December

Minimum ....

January

February

March

April

May

June
Maximum ....
Minimum ....

July

August

September
Maximum ....
Minimum ....

1

48
43

61
56

2

49
44

61
57

3

48
44

61
5B

4

47
44

61
59

5

47
43

60
55

6

48
44

61
58

7

48
45

59
52

8

47
43

59
50

9

47
44

59
49

10

49
45

58
53

11

49
46

61
52

12

49
45

60
55

13

49
46

59
57

14

49
47

62
56

15

47
47

60
56

Day

16

43
46

62
59

17

48
46

60
56

18

50
45

58
53

19

51
48

59
52

20

50
46

58
52

21

49
44

54
46

22

51
46

53
46

23

53
48

52
50

24

54
50

50
48

25

54
51

58
49

26

53
49

56
52

27

54
50

59
52

28

55
50

60
53

29

54
51

58
51

30

55
53

56
50

31

Aver-
age

50
46

58
53

CLEARWATER RIVER BASIN Continued

13-3356. BEAR CREEK NEAR SHEARER GUARD STATION, IDAHO

LOCATION. Temperature recorder at Forest Service pack bridge, 0.2 mile upstream from mouth, and 3 miles northeast of Shearer guard station, Idaho County.
RECORDS AVAILABLE. Water temperatures: May to September 1960.
EXTREMES, May to September 1960. Water temperatures: Maximum, 72°F July 21.

Temperature (°F) of water, May to September 1960

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....
February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

Day

1

46
HZ

57
52

66
61

62
57

2

48
43

55
51

68
59

63
58

3

47
42

57
51

69
60

62
59

4

46
43

58
53

70
63

63
59

5

47
42

59
53

66
59

60
55

6

47
43

60
54

68
59

61
57

7

47
44

63
56

67
59

59
55

8

47
42

62
57

67
59

57
53

9

47
44

62
58

69
59

57
52

10

49
44

63
58

69
61

57
53

11

49
45

64
58

71
62

58
53

12

49
44

64
58

70
62

58
55

13

49
45

62
59

67
59

59
56

14

48
45

66
59

66
60

60
56

15

46
46

68
62

62
58

59
55

16

46
45

69
62

58
56

60
57

17

46
43

68
6V

62
57

58
54

18

48
43

69
60

68
56

56
52

19

50
46

66
61

70
61

56
52

20

49
44

71
62

69
62

55
52

21

48
44

72
64

68
60

52
49

22

49
45

69
65

64
57

50
48

23

52
46

69
62

57
55

51
50

24

53
48

67
59

56
54

50
50

25

53
50

67
58

57
52

54
50

26

52
47

69
60

56
54

52
50

27

53
48

68
63

58
54

53
50

28

54
49

71
62

56
52

53
51

29

43

54
50

71
62

56
52

52
50

30

44

54
52

67
62

60
53

51
49

31

43

67
63

62
56

Aver-

age

49
45

65
61

64
58

57
53

CLEARWATER RIVER BASIN Continued

13-3410. NORTH FORK CLEARWATER RIVER NEAR AHSAHKA, IDAHO

LOCATION. At gaging station at Bruce's Eddy, 1.5 miles northeast of Ahsahka, Clear-water County, and 2 miles upstream from mouth.
DRAINAGE AREA. 2,440 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: October 1957 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 79°F July 20; minimum, freezing point on many days during winter months.
EXTREMES, 1957-60. Water temperatures: Maximum, 79°F July 20, 1960; minimum, freezing point on many days during winter months.
REMARKS. Temperature recorder installed 1.6 miles downstream from gaging station. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1637 and 1717, respectively.

Chemical analyses, in j

Date
of
collection

Aug. 28...........

Mean

discharge
(cfs)

1,550
5,140
16,000
11,200
2,000

Silica

(SiCQ

13
13
13
13
13

Iron

(Fe)

Cal-

cium

(Ca)

6.0
4.0
3.0
4.0
6.0

Mag-
ne-

sium

(Mg)

0.4
.4
.4
. 1
.3

Sodium

(Na)

1.9
1.4
1.7
1.4
2.0

Po-
tas-

sium

(K)

0.9
.4
.6
.5
.8

Bi-
car-

bon-

ate

(HCO,)

26
20
16
15
25

aarts per million, August 1959 to August 1960

Car-
bon-
ate

(COJ

Sulfate

(S04)

1.6
1.0
.6
1.0
1.2

Chloride

(Cl)

0.5
.0
.0
.0
.0

Fluo-

ride

(F)

0.2
.0
. 1
. 1
. 1

Ni-
trate

(NO,)

0.2
. 1
.2
.0
.3

Bo-

ron

(B)

Dissolved solids

(residue at 180°C)

Parts

per
million

39
31
31
29
41

Tons

per
acre-

foot

0.05
.04
.04
.04
.06

Tons

per

day

Hardness
as CaCO,

Cal-

cium,
Mag-
ne-

sium

17
12
9
10
16

Non-
car-

bon-

ate

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.2
.2
.2
.2
.2

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

45
38
28
30
43

PH

7.1
6.9
7.2
7.1
7.1

CLEARWATER RIVER BASIN Continued

13-3413. BLOOM CREEK NEAR BOVILL, IDAHO Continued

Temperature (°F) of water, October to December 1960

October
Maximum ....

November

Minimum ....
December
Maximum ....
Minimum ....

1

53
46

37

2

52
45

38

3

52

37

4

51

15

5

52

3"i

6

50

34

7

5C

35

8

J4

....

9

33

10

'"t

1 1

3^

12

15

13

35

14

-)6

15

3S

Day

16

35

17

35

18

37

19

37

20

36

21

35

22

34

23

34

24

35

25

34

26

35

27

35

28

42

33

29

39

33

30

4j
38

34

31

^
4U

-

4 r
4j

35

CLEARWATER RIVER BASIN Continued

13-3414. EAST FORK POTLATCH RIVER NEAR BOVILL, IDAHO

LOCATION. Temperature recorder at gaging station, 60 feet upstream from highway bridge, and 1.5 miles sc County.
DRAINAGE AREA. 42.5 square miles.
RECORDS AVAILABLE. Water temperatures: September 1959 to December 1960 (discontinued).
EXTREMES, 1959-60. Water temperatures: Maximum, 77°F July 13, 18-20; minimum, freezing point on many di EXTREMES, September 1959 to September I960. Water temperatures: Maximum, 77°F July 13, 18-20, 1960; mil many days during winter months.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1717.

nth of Boville, Latah

.ys during wint(
imum, freezing

!r months.

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....

May
Maximum ....
Minimum ....
June

Minimum ....

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

1

47

38

35
33

33
32

33
32

38

51

70

63

2

»5

39

35
33

32
32

33
33

38

52

69

63

S

41

35
35

32
32

33
32

38

71

65

4

38

35
33

32
32

33
32

34
33

71

64

5

36

33
32

33
33

34

40

58

6

36

33
32

33
32

40

59

7

36

33
32

33
32

lU

58

8

34

33
32

34
33

58

9

35

33
32

36
34

59

10

35

33
32

36
36

59

11

35

33
32

37
36

61

12

35

33
33

36
36

63

61

13

34

34
33

36
36

60

62

14

34

33
32

36
35

60

62

15

34

34
33

36
35

56

58

61

16

33

35
34

36
35

61

56

60

17

33

34
33

35
34

58

59

60

18

33

34
33

35
34

62

58

60

19

33

34
32

34
34

63

58

60

20

33

33
32

35
34

59

58

59

21

3

3
2

35
34

57

55

56

22

34

33
32

35
34

61

54

56

23

34

32
32

35
33

67

52

54
52

24

36

34
32

34
34

69

52

54
51

25

36

33
33

35
34

68

50

58
53

26

33

33
33

35
34

37

66

52

58
51

27

33

33
32

35
34

37

68

51

58
51

28

33

32
32

38

42

69

55
48

56
50

29

36
35

32
32

38

4R
40

46

70

59
52

56
48

30

36
35

32
32

40
37

40

56
50

70

72

62
56

55
48

31

40
38

32
32

40
38

59
52

74

62
55

Aver-

age

46
44

38
35

33
32

35
34

37
35

44
40

50
44

63
55

74

66
58

59
52

CLEARWATER RIVER BASIN Continued

13-3425. CLEARWATER RIVER AT SPALDING, IDAHO

LOCATION. At gaging station 0.2 mile downstream from Lapwai Creek, 0.4 mile northwest of Spalding, Nez Perce County, and 0.4 mile downstream from bridge on U.S. Highway 95.
DRAINAGE AREA. 9,570 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: August 1959 to September 1960 (discontinued).
Water temperatures: October 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 80°F several days during July and August; minimum, freezing point on several days during January and February.
REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1637 and 1717, respectively.

Chemical analyses

Date
of
collection

May 14

Oct. 2....... .....

Mean

discharge
(cfs)

3,310
12,200
10,100
30,400
27,700

65,000
43 , 900
8,990
4,170
2,220

Silica

(SiQs)

13
13
14
17
14

10
8.5
11
12
13

Iron

(Fe)

Cal-

cium

(Ca)

5.5
3.5
4.0
4.5
3.0

3.0
2.5
3.0
5.5
5.5

Mag-
ne-

sium

(MR)

0.5
.6
.4
.2
.8

. 1
.3
.9
. 7
1.2

Sodium

(Na)

2.4
.8
.8
.7
.6

.4
. 1
.6
2.5
2.7

Po-
tas-

sium

00

1.1
.5
.4
.8
.4

.4
.4
.5
. 7
.7

in parts per million, August 1959 to September 1960

Bi-
car-

bon-

ate

(HCO,)

26
20
20
20
17

13
12
19
26
29

Car-
bon-

ate

(CO,)

Sulfate

(SOJ

l.l
1.4
1.2
1.8
.6

.8
2.0
1.0
1.0
1.6

Chloride

(CD

0.5
.0
.2
.0
.0

.2
.0
.2
. 5
.0

Fluo-

ride

(P)

0.3
.3
. 1
.0
. 1

.0
.0
.0
.3
.0

Ni-
trate

(Ncg

0.1
. 1
.2
.3
. 1

.2
.0
.0
. 1
. 1

Bo-

ron

(B)

Dissolved solids

(residue at 180°C)

Parts

per
million

39
33
36
38
33

24
22
34
37
50

Tons

per
acre-

foot

0.05
.04
.05
.05
.04

.03
.03
.05
.05
.07

Tons

per

day

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

16
11
12
12
10

8
8
11
16
18

Non-
car-

bon-

ate

0
0
0
0
0

0
0
0
0
0

So-
dium
ad-

sorp-
tion
ratio

0.2
.2
.2
.2
.2

.2
.2
.2
.3
.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

51
34
35
38
34

39
23
32
47
55

pH

7.2
7.2
7.3
7.3
7.0

6.9
7.2
7.3
7.9
7.4

PALOUSE RIVER BASIN

13-3510. PALOUSE RIVER NEAR HOOPER, WASH.

LOCATION. At bridge on State Highway 11B, 3.3 miles downstream from Cow Creek, 2.7 miles southwest of Hooper, Whitman County and 3.7 miles downstream from gaging station.
DRAINAGE AREA. 2,540 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
REMARKS.--Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1637 and 1717, respectively. Inflow between sampling point and gaging station includes Cow Creek which is estimated to be less than five percent of the flow at the sampling point. Chemical analyses,in parts per million, July 1959 to September 1960

Date
of
collection

July 30, 1959.....

Sept. 28..........

Mean

discharge
(cfs)

26
51
120
160
294

190
1,770
200
2,340
962

545
158
10
15
36

Silica

(S10*)

23
20
21
26
28

31
27
33
24
28

22
18
22
16
20

Iron

(Fe)

Cal-

cium

(Ca)

33
29
29
24
18

26
18
26
9.0
14

15
22
36
32
31

Mag-
ne-

sium

(Mg)

12
12
11
8.6
5.3

8.3
5.2
8.0
2.8
4.5

5.5
7.8
12
14
13

Sodium

(Na)

22
22
21
16
11

16
11
16
6.3
9.0

10
16
24
25
24

Po-
tas-

sium

(K)

5.3
5.5
5.3
3.7
3.4

3.9
4.8
3.6
1.8
2.2

2.6
3.5
5.4
5.5
4.9

Bl-

car-

bon-

ate

(HCOj)

200
a 190
178
142
99

140
79
135
49
77

90
b!34
C210
209
198

Car-
bon-

ate

(CO,)

Sulfate

(S04)

11
11
8.5
7.0
5.5

7.3
7.2
8.8
4.2
4.8

4.8
6.4
11
11
11

Chloride

(Cl)

6.0
6.2
9.0
5.5
3.2

4.5
3.0
4.2
.8
1.8

3.0
7.2
7.8
8.8
8.8

Fluo-
rlde

(P)

0.4
. 5
. 3
.3
.3

. 2
. 2
.3
.2
.2

. 1
. 3
.2
.7
.4

Ni-

trate

(NOJ

0.6
1.0
1.6
1.9
4.5

8.8
21
11
2.2
3.6

2.4
. 7
. 1
.3
1.0

Phos-

phate
(P0 4)

0.14
. 11
.05
.65
.05

.04
. 86
.64
.04
.01

.40
.39
.09
.20
.20

Dissolved solids

(residue at 180°C)

Parts

per
million

215
198
196
162
136

181
173
180
89
118

123
149
221
220
213

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCOa

Cal-

cium,
Mag-
ne-

sium

130
121
119
95
67

99
66
98
34
54

60
87
139
136
133

Non-
car-

bon-

ate

0
0
0
0
0

0
2
0
0
0

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

368
326
316
257
182

271
188
264
98
152

163
235
354
361
357

PH

8.1
8.5
8.0
8.0
8.1

7.9
7.1
7.9
7.2
7.5

7.3
8.3
8.6
8.1
8.1

a Includes equivalent of 7 ppm of carbonate (C03). b Includes equivalent of 2 ppm of carbonate (CO3). c Includes equivalent of 8 ppm of carbonate (CO 3).

PART 14. PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

WALLA WALLA RIVER BASIN

14-100. SOUTH FORK WALLA WALLA RIVER NEAR MILTON, OREG.

LOCATION. Temperature recorder at gaging station, 1 mile downstream from Elbow Creek, and 13 miles southeast of Milton, Umatilla County.
DRAINAGE AREA. 63 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: June 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 63°F July 17, 18; minimum, 34°F Feb. 27, 28.
EXTREMES, June 1959 to September 1960. Water temperatures: Maximum, 63°F July 19, 20, 1959, July 17, 18, 1960; minimum, 34°F Feb. 27, 28, 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

1

44

37

41
40

37
36

41
39

53

57

54
50

54
47

2

44

36

42
41

42
41

54

57

59
48

)4
47

3

44

36

41

54

58

55
50

52
47

4

42

38

41

52

59

58
48

51
49

5

41

38

41

54

60

59
48

51
48

6

41

39

41

54

60

49

51
46

7

42

39

41

52

60

59
49

50

8

42

39

41

53

60

49

52

9

42

39

41

50

60

49

51

10

42

39

40

54

59

50

51

11

41

39

40

55

59

50

51

12

40

38

40

56

61

48

52

13

38

38

40

53

59

52

14

38

38

39

49

61

52

15

38

38

39

50

61

51

16

37

38

39

50

62

50

17

37

38

38

63

18

38

37

39

43

63
51

19

39

37

39

61
51

20

41

42

38

39

61
50

21

41

41

38

38

60
50

22

42

40

39

38

41

57
50

23

42

41

40

38
37

45

58
48

24

43

41

40

39
37

59
47

25

43
42

41

41

39
38

58
48

26

39

41

38
35

60
49

27

38

41

36
34

61
50

51

28

45

38

41

36
34

50

61
50

52

48

29

44

38

41
41

37
35

41

51

48

58
49

51

47
45

30

44

38

41

41

42

51
45

49

52
50

54

47
45

31

44
44

38
37

41
40

40
39

51
47

59
50

Aver-

age

46
45

42
41

40
40

39

38

40
39

43
41

47
43

47

59
49

55
48

50
46

WALLA WALLA RIVER BASIN Continued

14-185. WALLA WALLA RIVER NEAR TOUCHET, WASH.

LOCATION. At bridge on U.S. Highway 410, 6 miles downstream from gaging station and 6 miles northwest of Touchet, Walla Walla County. DRAINAGE AREA. 1,660 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1960.
Water temperatures: July 1959 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 507 ppm July 13 to Aug. 1; minimum, 94 ppm Mar. 22 to Apr. 2.
Hardness: Maximum, 262 ppm July 13 to Aug. 1; minimum, 34 ppm Mar. 22 to Apr. 2.
Specific conductance: Maximum daily, 796 micromhos July 26; minimum daily 86 micromhos Mar. 31.
Water temperatures: Maximum, 85°F Aug. 9; minimum, freezing point, Jan. 21, 23, Feb. 28, Mar. 2, 4.
EXTREMES, July 1959 to September I960. Dissolved solids: Maximum, 507 ppm July 13 to Aug. 1, 1960; minimum, 94 ppm Mar. 22 to Apr. 2, 1960. Hardness: Maximum, 262 ppm July 13 to Aug. 1, 1960; minimum, 34 ppm Mar. 22 to Apr. 2, 1960.
Specific conductance: Maximum daily, 796 micromhos July 26, 1960; minimum daily, 86 micromhos Mar. 31, 1960.
Water temperatures: Maximum, 85°F Aug. 9, 1960; minimum, freezing point Jan. 21, 23, Feb, 28, Mar. 2, 4, 1960.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1638 and 1718, respectively. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, in parts per million, July to September 1959

Date
of
collection

July 30-
Aug. 22, 1959...

Sept. 17-27. ......
Sept. 28-30.......

Mean

discharge
(cte)

12.5
30.8
20.1
46.7
88.7
209
672

Silica

(S1CU

36
30
34
37
32
35
34

Iron

(Fe)

Cal-

cium

(Ca)

65
43
55
58
34
26
14

Mag-
ne-

sium

(Mg)

23
15
20
18
12
9.6
3.9

Sodium

(Na)

59
36
50
49
29
21
8.5

Po-
tas-

sium

(K)

9.2
6.5
7.4
7.4
5.7
5.3
4.1

Bl-

car-

bon-

ate

(HCOa)

283
211
269
276
184
144
67

Car-
bon-
ate

(cog

Sulfate

(S04)

99
45
64
61
27
16
5.5

Chloride

(Cl)

40
21
30
28
15
12
4.5

Fluo-

ride

(F)

0.4
. 3
. 3
.3
.3
. 2
. 1

Ni-

trate

(NO,)

1.4
1.1
.8
1.6
.9
1.7
3.5

Phos-

phate
(P0 4)

0.00
. 00
.00
.40
.42
.42
.63

Dissolved solids

(residue at 180°C)

Parts

per
million

470
298
391
401
256
206
125

Tons

per
acre-

foot

0.64
.41
.53
.55
.35
. 28
. 17

Tons

per

day

15.9
24.8
21.2
50.6
61.3
116
227

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

257
170
218
220
135
104
51

Non-
car-

bon-

ate

18
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

738
483
618
617
394
302
146

pH

7.6
7.8
7.9
7.9
7.9
7.8
7.6

UMATILLA RIVER BASIN

14-200. UMATILLA RIVER ABOVE HEACHAH CREEK, NEAR GIBBON, OREG.

LOCATION. Temperature recorder at gaging station, 0.8 mile downstream from Ryan Creek, 2.2 miles upstream from Meacham Creek, and 2.5 miles northeast of Gibbon, Umat11la County.
DRAINAGE AREA. 125 square miles.
RECORDS AVAILABLE. Water temperatures: June 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Naxlmum, 76°F July 18; minimum, freezing point Jan. 18-20.
EXTREMES, June 1959 to September 1960. Water temperatures: Maximum, 76°F July 18, 1960; minimum, freezing point Jan. 18-20, 1960. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

Month

October
Maximum ....
Minimum ....
November

Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
.Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

1

53

39
38

36

39

37

41

66
53

68
61

53

2

53

40
38

35

40

35

42

68
52

73
58

54

3

54

40
40

35

39

35

1

4

4

54

40
37

36

40

3R

59

55

5

53

38
37

37

40

38

58

53

6

49

39
37

38

39

41

59

51

7

50

41
38

39

40

60

50

8

49

38
37

38

40

60

50

9

50

38
38

37

40

58

50

10

50

40
38

36

41

60

52

11

52

41
40

37

40

59

52

12

52

41
40

36

40

55

13

51

40
38

35

40

57

14

52

40
38

35

38

54

15

52

41
40

35

39

54

16

51

42
41

35

38

51

17

51

41
40

35

37

52

18

51

40
39

33

38

51

19

51

40
38

32

38

51

20

50

40
39

33

38

52

21

49

39
38

34

39

48

22

51

38
38

35

38

46

60

47

23

53

41
38

36

35

48

61

53

24

54

42
41

38

36

48

59

52

25

53

41
40

40

36

50

60

54

26

50

40
37

40

34

49

59

52

27

49

38
36

39

34

40

61

52

28

49

38
38

40

33

41

75

62

51

29

48

38

38
35

40
39

35
33

41

41

71

62
53

56
49

30

46

38

37
36

41
39

40

49
42

67
62

65
54

56
48

31

47
43

37
36

39
38

40

71
61

63
54

Aver-

age

51
47

40

40
38

37
35

40
38

42
38

46
41

49
43

72
57

67
56

60
52

DESCHUTES RIVER BASIN

14-765. DESCHUTES RIVER NEAR CULVER, OREG.

LOCATION. Temperature recorder at gaging station, 0.7 mile downstream from bridge on Cove-Grandview, 2.5 miles upstream from Crooked River, 4 miles northwest of Culver, Jefferson County, and at mile 116.5.
DRAINAGE AREA. 2,723 square miles.
RECORDS AVAILABLE. Water temperatures: September 1952 to September 1957, January 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 62°F June 16; minimum, 39°F on several days during January.
EXTREMES, 1952-57, 1959-60. Water temperatures: Maximum, 64°F July 13, 17, 1956; minimum, 38°F on several days during winter months.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....
February

March

April

May
Maximum ....
Minimum ....
June
Maximum ....

July
Maximum ....
Minimum ....
August
Maximum ....

September
Maximum ....
Minimum ....

1

52
50

in

4o

40
40

55
54

59

59
55

59

54

2

53
51

48

49

40
39

60

58
54

i9

54

3

53
51

49

40

60

58
54

59

55

4

53
51

6:

59
54

59

54

5

53
52

60

59
55

59

53

6

53
52

60

59
55

60

53

7

52
51

58

59
55

60

52

8

52
51

59

59
55

59

52

9

52
52

59

59
55

59

53

10

52
51

58

59
54

59

54

11

53
51

60

59
55

59

54

12

52
51

60

59
55

58

5*

13

52
51

59

59
55

58

53

14

53
51

58

50
56

57

53

15

54
53

56

60
56

56

53

Day

16

54
51

62

60
56

57

53

17

53
51

60

60
56

58

52

18

53
52

55

59

60
56

58

52

19

53
51

54

59

60
56

59

52

20

53
52

53

57

59
55

57

52

21

53
52

53

57

59
55

56

50

22

55
52

53
51

58

59
55

55

50

23

55
54

54
52

58

58
55

54

52

24

54
53

54
52

59

58
54

55

52

25

54
53

53
52

59

56
54

55

53

26

53
51

55
52

57

58
55

56

52

27

51
50

56
53

59

59
55

55

52

28

51
50

56
53

59

59
56

56

52

29

50
49

58
54

59

58
56

57

51

30

50
49

44

47

58
55

59

57
56

56

51

31

50
49

44
40

47
46

59
55

58
56

56

~

Aver-

age

53
51

47
46

44
43

42
41

56
53

59

59
55

57

53

DESCHUTES RIVER BASIN Continued

14-795. CROOKED RIVER NEAR POST, OREG.

LOCATION. At county highway bridge, 4.5 miles downstream from gaging station, and 7 miles southeast of Post, Crook County. DRAINAGE AREA. 2,160 square miles, approximately, of which 500 square miles is probably noncontribution, upstream from gaging station.
RECORDS AVAILABLE. Water temperatures: July 1959 to September 1960.
Sediment records: July 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 1,020 ppm Mar. 20, minimum daily, 2 ppm May 22-24, June 4.
Sediment loads: Maximum daily, 2,370 tons Mar. 20; minimum daily, less than 0.50 ton on many days during November and June to September.
EXTREMES, July 1959 to September 1960. Water temperatures: Minimum, freezing point on many days during winter months. Sediment concentrations: Maximum daily, 1,020 ppm Mar. 20, 1960; minimum daily, 2 ppm May 22-24, June 4, 1960.
Sediment loads: Maximum daily, 2,370 tons Mar. 20, 1960; minimum daily, less than 0.50 ton on many days during November 1959, June to September 1960.
REMARKS. Sediment records available for site near Prineville for period April 1958 to June 1959. Records of discharge for wate years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1638 and 1718, respectively.

Temperature (°F) of water. July to September 1959

Month

July...........
August ....
September ..

Day

1 2 3

70

4

- -

5

72

6

- -

7

66

8

- -

9 10

70
60

11

65

12

69

13

75

14

69

15

76

16 17

78
67

18 19

63

20

76

21

66

22

80

23 24

75
73

25 26

70
54

27

76

28

67
52

29

66

30 31

75
67

Aver-

age

Temperature (°F) of water, water year October 1959 to September 1960

December ..

January . ....
February ....
March ....

August ....
September ..

1

32
35
32

77

2

38

32
35
33

59

3

39

32
34
35

7ft

4

34

32
34
35

62

5

33
35
37

72

6

39

34
36
36

55

7

32
37
41

74

8

-

33
35
41

9

33
36
39

77

10

33

33
36
38

70

11

32
37
38

73

12

33

32
40
39

69

13

-

32
42
38

63

14

32
40
37

70

15

35

32
41
40

64

Day

16

42

32
41
43

65

17

34

32
32

66

18

36

33
35
49

67

19

35

32
38
49

73

20

33

32
40
49

58

21

34

32
36
47

55

22

33

32
37
46

63

23

34

34
34
42

56

24

34

34
34
43

63

25

34

34
33
42

57

26

33

34
32
42

69

27

33

34
32
43

56

28

32

34
32
43

78

66

29

32

34
32
41

57

30

32

34

41

70

65

31

32

34

39

61

Aver-

age

- -

33
36
41

DESCHUTES RIVER BASIN Continued

14-915. METOLIUS RIVER NEAR GRANDVIEW, OREG.

LOCATION. Temperature recorder at gaging station, 0.7 mile upstream from Street Creek, 7.5 miles northwest of Grandview, Jefferson County, and 13 miles northwest of Culver.
DRAINAGE AREA. 324 square miles, hydrologic drainage boundary uncertain owing to ground-water exchange.
RECORDS AVAILABLE. Water temperatures: July 1952 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 54°F on several days during June and July; minimum, 38
during January to March.
EXTREMES, 1952-60. Water temperatures: Maximum, 56°F July 5, 1957; minimum, 38°F Jan. 31-Feb. 2, 1956, during January to March 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

F on several days

on several days

Temperature (°F) of water, water year October 1959 to September 1960

Month

October
Maximum ....

November
Maximum ....

December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....
February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....
September

Minimum ....

Day

1

44

42

40

48
45

53
47

54

52
47

47

2

45

42

39

40

48
44

53

53

51

49

3

40

47

54

54

51

4

39

49

54

54

51

5

40

50

53

54

51

6

41

50

53

54

52

7

39

49

52

54

52

8

39

50

52

53

52

49

9

39

51

53

53

52

10

39

52

52

53

52

11

40

52

54

53

52

12

40

51

54

53

51

13

38

49

52

53

51

14

39

50

52

53

50

15

40

49

52

53

50

16

41

49

52

53

51

48

17

40

48

52

54

51

18

39

50

53

54

52

48

19

38

49

52

54

52
47

20

39

47

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53

51

21

39

47

53

53

49

22

39

47

53

53

49

23

40

48

54

52

48

48

24

41

49

54

52

48

25

42

48

53

51
47

48

48

26

43

41

42

43

50

53

51
48

48

48

27

43

41

41

44

51

54

53
48

49

28

43

42

41

44

51

54

53
48

49

29

43
42

42

41

44

53
47

54

52
48

50

30

43
42

42

4?
41

45

44

52
48

54

50
48

50

31

44
42

41
40

45
43

53
48

51
47

49

-

Aver-

age

45
44

44
42

43
42

41
40

44
41

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43

50
46

53
48

53
48

51
46

48
45

COLUMBIA RIVER MAIN STEM

14-1057. COLUMBIA RIVER NEAR THE DALLES, OREG.

LOCATION. At The Dalles Dam, 3.2 miles upstream from gaging station and 2.6 miles northeast of The Dalles, Wasco County. DRAINAGE AREA. 237,000 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: December 1950 to September 1960.
Water temperatures: December 1950 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 135 ppm Mar. 1-28; minimum, 77 ppm May 16-19.
Hardness: Maximum, 82 ppm Mar. 1-28; minimum, 48 ppm May 16-19.
Specific conductance: Maximum daily, 225 micromhos Mar. 16, 17; minimum daily, 109 micromhos May 17.
Water temperatures: Maximum, 71°F Aug. 11; minimum, 33°F Jan. 22, 23.
EXTREMES, 1950-60. Dissolved solids: Maximum, 163 ppm Dec. 2-11, 14, 1955; minimum, 72 ppm June 1-15, 1959.
Hardness: Maximum 104 ppm Dec. 21-31, 1952; minimum, 38 ppm May 18-31, 1958.
Specific conductance: Maximum daily, 324 micromhos Dec. 7, 1955; minimum daily, 102 micromhos May 27, 1956.
Water temperatures: Maximum, 81°F Aug. 12, 13, 1958; minimum, freezing point on several days during winter months.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1718. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Date
of
collection

Oct. 1-20, 1959...
Oct. 21-Nov. 11...

Nov. 30-Dec. 6....

Jan. 1-14, 1960...

Apr. 1-30.........

June 6-18.........

Mean

discharge
(cfs)

165,000
181,000
156,200
188 , 600
138,500
126,700

110,100
123 , 400
125,200
122,900
221,700
261,400

241,300
357,800
352,200
382,600
416,100

Silica

(SiQs)

9.9

12

13

Iron

(Fe)

Cal-

cium

(Ca)

21

~

21

18

~

Mag-
ne-

sium

(Mg)

4.8

5.9

4.2

"

Sodium

(Na)

8.1
6.9
7.0
5.8
7.6
8.0

8.7
9.5
9.2
11
7.8
4.8

4.5
3.8
4.1
4.1
3.4

Po-
tas-
sium

(K)

1.1

1.2

1.0

Bi-
car-

bon-

ate

(HCOS)

83
78
82
70
83
85

90
93
92
98
78
71

66
56
66
66
58

Car-
bon-
ate

(CO,)

Sulfate

(S04)

18

18

12

~

Chlorlde

(Cl)

3.5

4.0

1.8

~

Fluo-

ride

(P)

0.2

.2

. 1

Ni-

trate

(NO,)

0.3

.6

.6

Bo-

ron

(B)

0.00

.08

.00

-

Dissolved solids

(residue at 180°C)

Parts

per
million

108
101
104
91
105
110

120
126
120
135
108
93

85
77
84
88
81

Tons

per
acre-

foot

0.15
. 14
. 14
. 12
. 14
. 15

. 16
. 17
. 16
. 18
. 15
. 13

. 12
. 10
. 11
. 12
. 11

Tons

per

day

48 , 110
49,520
43,860
46,340
39,260
37 , 630

35,670
41 , 980
40 , 560
44,800
64,650
65 , 640

55,380
74,390
79,880
90,910
91.000

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

72
67
70
61
71
73

77
80
77
82
64
62

58
48
58
57
51

Non-
car-

bon-

ate

4
3
3
4
3
3

3
4
2
2
0
4

4
2
4
2
4

So-

dium
ad-

sorp-
tion
ratio

0.4

.4

.3

Specific
con-

duct-

ance

[micro-
mhos at

25°C)

180
167
171
149
179
184

194
198
200
215
167
148

135
113
133
131
118

pH

7.7
7.8
7.7
7.9
7.8
7.9

7.9
8.0
7.8
7.8
7.3
7.8

7.7
7.8
7.8
8.1
7.7

LOCATION. Temper
and 7 miles up
DRAINAGE AREA. 1
RECORDS AVAILABLE
Water temperatu
EXTREMES, 1959-60
EXTREMES, 1950-60
1956, Jan. 3-7
REMARKS. Records

KLICKITAT RIVER BASIN

14-1130. KLICKITAT RIVER NEAR PITT, WASH.

iture recorder at gaging station, 3.5 miles south of Pitt, Klickitat County, 5 miles upstream from Silvias Creek, stream from mouth at Lyle.
,290 square miles, approximately.
, Chemical analyses: October 1958 to September 1959.
:es: August 1950 to September 1960.
, Water temperatures: Maximum, 69°F July 18; minimum, 33°F Feb. 27-29, Mar. 3-5.
. Water temperatures: Maximum, 69°F July 28, 29, 1958, July 18, 1960; minimum, freezing point Jan. 31, Feb. 1-4,
, 1959.
of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....

February
Maximum ....

March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....

May
Maximum ....
Minimum ....
June

Minimum ....

July

Minimum ....

August

Minimum ....

September

Minimum ....

1

49

42

38

35

40

51

65
61

57
55

2

49

42

41
39

35

40

53

hit

57

3

49

39

35

40

53

56

A3

4

38

35

41

52

ftl

5

36

42

53

58

6

42

52

59

56

7

41

51

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WILLAMETTE RIVER BASIN

14-1448. MIDDLE FORK WILLAMETTE RIVER NEAR OAKRIDGE, OREG.

LOCATION. Temperature recorder at gaging station, 0.2 mile downstream from Cone Creek, 1.1 miles upstream from Hills Creek Reservoir, and 10 miles south of Oakridge, Lane County.
DRAINAGE AREA. 258 square miles, including those of Gold and Buck Creeks.
RECORDS AVAILABLE. Water temperatures: October 1958 to January 1959, September 1959 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 65°F on several days during July and August; minimum, 35°F Jan. 5, 13. EXTREMES, 1958-60. Water temperatures: Maximum, 65"F on several days during July and August 1960; minimum, 35°F Jan. 5, 13, 1960. REMARKS. Records of discharge for water year October 19S9 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

October

Minimum ....
November

Minimum ....
December
Max mum ....
Min mum ....

Janua y
Max mum ....
Min mum ....
February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April

Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....

July

Minimum ....
August

Minimum ....
September
Maximum ....

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Day

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WILLAMETTE RIVER BASIN Continued

14-1480. MIDDLE FORK WILLAUETTE RIVER BELOW NORTH FORK, NEAR OAKRIDGE, OREG.

LOCATION. Temperature recorder at gaging station, 0.5 mile downstream from Whitehead Creek, 4.2 miles downstream fi of Middle Fork Willamette River, and 7 miles northwest of Oakridge, Lane County.
DRAINAGE AREA. 924 square miles.
RECORDS AVAILABLE. Water temperatures: September 1950 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 73°F July 28, 29; minimum, 37°F on several days during January, F« EXTREMES, 1950-60. Water temperatures: Maximum, 73°F July 21, 22, 1959, July 28, 29, 1960; minimum, 35°F on severs during winter months.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

North Fork

b. 28, 29.
1 days

October

Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January

Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....

May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ...:

August

Minimum ....

September
Maximum ....
Minimum ....

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Day

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WILLAMETTE RIVER BASIN Continued

14-1520. MIDDLE PORK WILLAMETTE RIVER AT JASPER, OREG.

LOCATION. Temperature recorder at gaging station, 25 feet downstream from highway bridge at Jasper, Lane County, and 650 feet downstream from Hills Creek.
DRAINAGE AREA. 1,340 square miles.
RECORDS AVAILABLE. Water temperatures: October 1953 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 66°F July 6, Aug. 7; minimum, 38°F Jan. 5, Feb. 28.
EXTREMES, 1953-60. Water temperatures: Maximum, 69°F July 27, 28, 1958; minimum, 36°F Feb. 1-3, 16, 1956.
REMARKS. Records of discharge for water year October 19S9 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

Month

October
Maximum ....
Minimum ....

Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....

September

Minimum ....

Day

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LOCATION. Temperature recorder at gaging station
and 9 miles southeast of town of Blue River.

DRAINAGE AREA. 160 square miles at cableway 0.2 i
RECORDS AVAILABLE. Water temperatures: November
EXTREMES, 1959-60. Water temperatures: Maximum,
EXTREMES, 1957-60. Water temperatures: Maximum,
REMARKS. Records of discharge for water year Oct'

WILLAMETTE RIVER BASIN Continued

14-1592. SOUTH FORK MCKENZIE RIVER ABOVE COUGAR RESERVOIR, NEAR RAINBOW, OREG.

100 feet upstream from Tipsoo Creek, 8 miles south of Rainbow, Lane County, its are made. lile downstream, where all discharge measur
1957 to September 1960.
60°F July 18; minimum, 34°F Feb. 27-29.
60°F July 18, 1960; minimum, 34°F Feb. 27-29, 1960.
>ber 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April

Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....

August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

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Aver-

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WILLAMETTE RIVER BASIN Continued

14-1910. WILLAMETTE RIVER AT SALEM, OREG.

LOCATION. At bridge on State Highway 22, 300 feet downstream from gaging station at Salem, Marion County.
DRAINAGE AREA. 7,280 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: August to December 1910, August 1911 to August 1912, February 1951 to September 1960. Water temperatures: February 1951 to September 1960.
EXTREMES, 1959-60. Dissolved solids: Maximum, 57 ppm Apr. 1-30, July 9-31; minimum, 44 ppm Nov. 20 to Dec. 1.
Hardness: Maximum, 24 ppm Aug. 1-23; minimum, 15 ppm Nov. 20 to Dec. 1.
Specific conductance: Maximum daily, 67 micromhos Nov. 16, 17; minimum daily, 44 micromhos Nov. 21, 23, 24, Feb. 10.
Water temperatures: Maximum, 75°F July 17; minimum, 38°F Jan. 1, 3, 7, 8.
EXTREMES, 1951-60. Dissolved solids: Maximum, 69 ppm Nov. 1-30, 1952; minimum, 38 ppm Nov. 22-30, 1953.
Hardness: Maximum, 28 ppm Sept. 16-20, 24-29, 1951, Aug. 11-20, Oct. 11-31, 1952, Aug. 1-10, 1953; minimum, 13 ppm Feb. 1-28, 1958. Specific conductance: Maximum daily, 133 micromhos Nov. 7, 1954; minimum daily, 35 micromhos Jan. 20, 1953.
Water temperatures: Maximum, 78°F July 22, 1959; minimum, freezing point on several days during February 1956.
REMARKS. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water ye to September 1960 given in WSP 1718.

Chemical analyses, in parts per million, water year October 1959 to September 1960

October 1959

Date
of
collection

Oct. 1-20, 1959...
Oct. 21-Nov. 8....

Nov. 20-Dec. 1....

Jan. 1-31, 1960...

Feb. 22-Mar. 6....
Mar. 7-31. ....

*«,". 24-Sept. 30..

Weighted average

Mean

discharge
(cfs)

16,720
17,880
10,660
22,370
11,190
14,620

17,800
53,010
23,010
50,490
43,020
38,290

15,510
7,448
5,961
5,653
6,606

22,480

Silica

(S1Q,)

16

16

16

14

-

Iron

(Fe)

Cal-

cium

(Ca)

5.0

5.0

4.5

5.5

-

Mag-
ne-

sium

(Mg)

1.1

1.3

1.2

2.0

-

Sodium

(Na)

3.8
4.0
4.1
3.5
4.3
3.9

4.0
3.4
3.5
3.2
3.3
2.8

3.2
3.7
4.0
4.1
3.9

3.4

Po-
tas-

sium

(K)

0.9

.6

.4

. 6

Bi-
car-

bon-

ate

(HCO,)

27
28
30
24
27
25

26
23
24
25
21
24

28
32
32
30
30

25

Car-
bon-

ate

(CO,)

Sulfate

(S04)

2.4

2.6

3.0

2.2

Chloride

(Cl)

2.0

2.2

2.0

2.8

Fluo-

ride

(F)

0.1

. 1

. 1

. 0

Ni-

trate

(NO,)

0.5

. 7

.4

.0

Bo-

ron

(B)

0.01

.07

. 04

.03

Dissolved solids

(residue at 180°C)

Parts

per
million

49
48
52
44
54
50

54
49
54
51
57
53

55
54
57
53
51

52

Tons

per
acre-

foot

0.07
.07
.07
.06
.07
. 07

.07
.07
.07
.07
. 08
. 07

.07
.07
. 08
. 07
. 07

0.07

Tons

per

day

2,210
2,320
1,500
2,660
1,630
1,970

2,600
7,010
3,350
6,950
6,620
5,480

2,300
1,090
917
809
910

3,160

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

17
17
20
15
19
18

18
16
18
16
16
17

20
22
22
24
21

17

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

0
0
0
0
0

0

So-

dium
ad-

sorp-
tion
ratio

0.4

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Specific
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[micro-
mhos at

25°C)

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63
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55

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6.6
6.7
6.7
6.7
6.8
6.8

6.7
6.5
6.5
6.6
6.8
7.2

7.1
7.1
7.0
6.9
7.1

WILLAMETTE RIVER BASIN Continued

14-2117.9. WILLAMETTE RIVER AT PORTLAND, OREG.

LOCATION. At Spokane, Portland and Seattle Railroad bridge in Portland, Multnomah County, 0.7 mile upstream from St. John's Bridge, and 5.8 miles upstream from mouth.
RECORDS AVAILABLE. Chemical analyses: October 1959 to September 1960 (discontinued).
REMARKS. No discharge records available.

Chemical analyses, in parts per million. October 1959 to Sentember 1960

Date
of
collection

Sept. 19..........

Mean

discharge
(cfs)

Silica

(SiQ.)

17
16
16
17
15
15

15
15
16
14
17

Iron

(Fe)

Cal-

cium

(Ca)

6.0
5.0
5.5
6.0
6.0
5.5

5.5
5.0
6.0
7.5
7.0

Mag-
ne-

sium

(Mg)

1.9
1.4
1.5
2.1
1.6
1.1

1.1
1.2
2.0
2.7
2.2

Sodium

(Na)

4.7
2.9
3.1
3.5
3.3
2.9

3.2
2.8
4.1
5.2
5.4

Po-
tas-

sium

(K)

1.1
.5
.5
. 7
.8
.4

.4
.4
. 7
.8
.9

Bi-
car-

bon-

ate

(HCOS)

28
24
24
27
26
24

25
24
31
38
36

Car-
bon-

ate

(CO,)

SuUate

(S04)

2.8
2.3
3.5
4.4
2.1
2.6

2.8
3.0
4.0
4.8
4.0

Chloride

(Cl)

4.2
1.8
1.8
3.5
2.5
1.8

2.5
1.5
3.5
4.5
4.8

Fluo-
rlde

(F)

0.

.0
.0
.0
.2
. 1

Ni-

trate

(NO,)

0.0
.4
.4
. 7
.6
.5

.4
. 1
.2
.2
.4

Bo-

ron

(B)

Dissolved solids

(residue at 180°C)

Parts

per
million

57
46
52
51
55
47

51
44
61
65
65

Tons

per
acre-

foot

0.08
.06
.07
.07
.07
.06

.07
.06
.08
.09
.09

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

22
18
20
24
22
18

18
18
23
30
26

Non-
car-

bon-

ate

0
0
0
2
0
0

0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

0.4
.3
.3
.3
.3
.3

.3
.3
.4
.4
.4

Specific
con-

duct-

ance

|micro-
mhos at

25°C)

68
53
58
70
63
54

57
51
68
89
82

pH

6.9
6.7
6.7
7.0
7.1
6.8

6.7
7.0
6.7
6.7
6.8

LEWIS RIVER BASIN

14-2205. LEWIS RIVER AT ARIEL, WASH.

LOCATION. At bridge at Ariel, Cowlitz County, 500 feet downstream from Ariel Dam, 0.5 mile upstream from gaging station and 3.5 miles upstream from Cedar Creek.
DRAINAGE AREA. 731 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to June 1960 (discontinued).
Water temperatures: October 1950 to September 1960.
EXTREMES, 1959-60. Water temperatures: Minimum, 40°F on many days during winter months.
EXTREMES, 1950-60. Water temperatures: Maximum (1950-59), 61°F Oct. 2-5, 1951; minimum, 36°F several days during February and March 1956. REMARKS. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1638 and 1718, respectively.

Chemical analys s, in parts per million. July 1959 to June 1960

Date
of
collection

June 14. ....

Mean

discharge
(cfs)

4,110
705
4,230
10,100
8,930
8,770

6,120
7,960
6,160
11,300
10,300
7,300

Silica

(SIOJ

14
14
14
14
14
15

15
14
14
14
13
12

Iron

(Fe)

Cal-

cium

(Ca)

3.5
4.0
4.5
4.0
3.5
3.5

4.0
3.5
4.0
3.5
3.5
3.5

Mag-
ne-

sium

(Mg)

0.6
.2
.2
.5
. 7
.6

.4
.6
.2
.5
.5
. 5

Sodium

(Na)

2.1
1.9
2.3
2.4
2.3
2.3

2.5
2.1
2.5
2.2
2.2
2.2

Po-
tas-

sium

(K)

0.3
. 7
.4
. 7
. 7
.3

.4
.4
.2
.2
.3
.3

Bl-

car-

bon-

ate

(HCOJ

18
19
20
20
19
19

19
18
18
18
18
18

Car-
bon-

ate

(CO,)

Sulfate

(SO.)

1.1
1.1
1.1
1.4
1.6
1.4

1.0
1.1
1.1
1.0
.8
1.6

Chloride

(Cl)

1.0
1.0
1.2
1.2
. 5
1.0

1.0
1.0
1.2
.8
1.2
1.0

Fluo-
rlde

(F)

0.2
. 1
. 1
.0
.2
. 1

. 1
. 1
. 1
.0
.0
. 1

Ni-

trate

(NO,)

0.2
.2
.0
.2
. 1
.2

. 1
. 1
. 1
.0
. 1
. 1

Bo-

ron

(B)

0.02
.00
.00
.00
.02
.03

.03
.02
.00
.00
.02
.02

Dissolved solids

Parts

per
million

32
34
31
34
37
30

38
31
32
30
32
29

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCOs

Cal-

cium,
Mag-
ne-

sium

11
11
12
12
12
11

12
11
11
10
10
11

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

[micro-
mhos at

25"C)

36
35
37
37
38
38

40
37
36
34
35
33

PH

6.9
6.5
6.9
6.9
7.0
7.0

6.6
6.9
7.2
7.1
7.4
6.9

LOCATION. Temperature r<
County, and 20 miles i
DRAINAGE AREA. 125 squai
RECORDS AVAILABLE. Wate]
EXTREMES, 1959-60.--Watei
EXTREMES, 1950-60. Watei
February 1957.
REMARKS. Records of disc

LEWIS RIVER BASIN Continued

14-2225. EAST FORK LEWIS RIVER NEAR HEISSON, WASH.

ipstream from mouth.
e miles.
temperatures: June 1950 to September 1960.
temperatures: Maximum, 73°F July 27, 28, Aug. 9, 10; minimum, 34°F Jan, temperatures: Maximum, 74°F Aug. 4, 1952; minimum, freezing point on st

charge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September

northeast of Heisson, Clark

10, 11, 19.
veral days during Jan

October
Maximum ....

November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January

Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....
May
Maximum ....

June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....
August

Minimum ....

September
Maximum ....
Minimum ....

1

50

36

Id
36

49

55

<>a

57

60
56

2

50

36

47

57
50

56
54

3

50

35

47

58
52

59
56

4

50

35

45

58
52

59
57

5

50

36

50

57
52

57
55

6

50

38

50

58
54

55
53

7

50

38

48

55
51

56
53

8

50

37

48

56
51

57
54

9

50

36

52

58
53

60
57

10

49

34

52

58
55

63
60

11

50

34

54

58
54

63
61

12

50

37

54

60
55

62
60

13

50

37

50

60
57

60
59

14

50

36

49

59
55

61
59

15

51

37

49

55
53

60
58

Day

16

50

38

49

54
53

58
56

17

50

37

47

54
50

59
56

18

50

35

54
50

59
56

19

50

34

51
50

57
55

20

50

35

51
49

55
53

21

50

35

54
49

55
51

22

51

35

57
51

54
52

23

51

38

60
54

54
53

24

51

39

60
56

55
54

25

51

41

57
53

57
55

26

50

41

47

55
52

58
56

27

49

41

38

47

59
55

59
56

28

49

41

37

50

61
57

59
57

29

49

42

37
35

52

61
58

59
56

30

47

42

43

42

52

61
59

62

58
55

31

46

39
39

43

42
42

50

68
64

61
60

Aver-

age

50

44
42

42
41

37

43
42

43
42

46

57
53

66
62

64
60

58
56

COWLITZ RIVER BASIN Continued

14-2335. COWLITZ RIVER NEAR KOSMOS, WASH.

LOCATION. At bridge on State Highway 5, 0.8 mile upstream from Shelton Creek, 4.3 miles southwest of Kosmos, Lewis County, and 13 miles downstream from gaging station.
DRAINAGE AREA. 1,042 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960 (discontinued).
Water temperatures: November 1952 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 64°F several days during July and August; minimum, 35°F Jan. 18-20.
EXTREMES, 1952-60. Water temperatures: Maximum, 65°F July 11, 12, 1958; minimum, 35°F Jan. 18-20, 1960.
REMARKS. Temperature recorder installed at gaging station. Records of discharge for water years October 1958 to September 1959 and October 1959 to September 1960 given in WSP 1638 and 1718, respectively. Slight amount of inflow between sampling point and gaging station.

Chemical analyses, in parts per million, July 1959 to Julj

Date
of
collection

Sept. 24..........

Mar. 17.... ....

May 23..... ....

July 8.... ....

Mean

discharge
(cfs)

4,150
1,610
2,530
5,890
6,770
5,400

1,710
4,970
2,640
5,420
8,240
7,450
4,340

Silica

(S1Q.)

11
17
14
14
16
16

18
16
18
15
14
8.9
12

Iron

(Fe)

Cal-
cium

(Ca)

5.0
7.5
6.0
6.0
6.5
6.5

8.0
6.5
8.0
6.0
5.5
4.5
5.0

Mag-
ne-

sium

(Mg)

0.8
. 5
1.1
1.0
.8
.8

1.3
1.1
. 7
.9
. 7
.8
.8

Sodium

(Na)

2.0
2.8
2.8
2.4
2.6
2.6

3.5
2.7
3.2
2.5
2.1
1.9
2.2

Po-
tas-

sium

(K)

0.3
. 7
.4
.7
.4
.3

.8
.3
.2
.2
.2
.2
.5

Bi-
car-

bon-

ate

(HCOj)

24
30
28
27
29
29

36
29
34
27
24
21
23

Car-
bon-

ate

(ccg

Sulfate

(S04)

1.5
3.0
2.7
2.1
1.9
2.0

2.7
2.0
2.6
2.0
1.4
1.6
1.6

Chloride

(Cl)

0.5
1.2
1.0
. 5
1.5
. 5

1.5
1.0
1.8
1.0
1.0
.8
.8

Fluo-
ride

(F)

0.2
.2
. 1
. 1
. 1
. 1

. 1
. 1
. 1
.0
.0
.0
.0

Ni-
trate

(NO,)

0.4
.2
.0
.0
. 1
.2

.0
. 1
. 1
. 1
.0
. 1
.0

Phos-

phate
(P0 4)

0.02
.05
.01
.00
.08
.03

.01
.03
.03
.00
.03
.02
.07

1960

Dissolved solids

(residue at 180°C)

Parts

per
million

33
49
43
44
46
38

55
42
52
40
35
30
34

Tons

per
acre-

foot

Tons

per

day

Hardness
as CaCO3

Cal-

cium,
Mag-
ne-

sium

16
20
20
19
20
20

26
20
23
18
16
14
16

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

43
59
53
50
58
55

69
57
63
51
45
39
43

pH

7.4
7.2
7.6
7.1
7.6
7.3

7.6
7.5
7.5
7.2
7.3
7.2
7.6

COWLITZ RIVER BASIN Continued

14-2380. COWLITZ RIVER NEAR HAYFIELD, WASH.

LOCATION. Temperature recorder at gaging station, 1 mile upstream from Hill Creek, 2 miles downstream from Winston Creek, and 2.2 miles west of Hayfield, Lewis County.
DRAINAGE AREA. 1,400 square miles.
RECORDS AVAILABLE. Water temperatures: October 1950 to September 1960.
EXTREMES, 1959-60. Water temperatures: Minimum, 35°F Jan. 20-22.
EXTREMES, 1950-60. Water temperatures: Maximum (1950-59), 70°F July 28, 29, 1958; minimum, 33°F Jan. 28 to Feb. 2, 1956. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....
May

Minimum ....
June
Maximum ....
Minimum ....

July

August

Minimum ....

September
Maximum ....
Minimum ....

1

SI
50

46

41
41

39

48

52
50

61

58
56

2

51
50

46

41
41

37

48

54

51

60

56
55

3

52
50

41

37

54
52

56
55

4

5?
52

41

37

54
52

58
56

5

52
52

40

37

54
51

57
57

6

52
52

38

54
52

57
55

7

52

39

38

52
51

56
55

8

50

39

38

54
51

56
56

9

50

39

38

55
52

57
56

10

39

38

55
53

58
57

11

40

37

55
52

59
58

12

41

37

56
53

59
58

13

41

37

56
53

58
58

14

41

37

58
58

15

37

52
50

58
57

Day

16

41

37

50
50

57
56

17

41

37

51
50

56
56

18

37

51
50

58
56

19

41

36

51
50

57
56

20

36

51
50

56
54

21

41

35

52
49

57

54
53

22

40

36

56
52

56

53
53

23

37

59
55

56

53
53

24

40

38

59
56

55

53
53

25

41

39

57
56

55
55

55
53

26

39

56
54

55
54

56
55

27

40

39

38
38

55
53

56
56

28

40

38
37

55
54

57
56

29

41

37
37

50

56
55

56
56

30

41

41

42

51

56
56

56
56

31

44

41

42
42

51
50

58
56

Aver-

age

49

43
43

41
40

38

41
41

42
41

51
44

49
47

54
52

60
59

56
56

COWLITZ RIVER BASIN Continued

14-2425. TOUTLE RIVER NEAR SILVER LAKE, WASH.

LOCATION. Temperature recorder at gaging station, just downstream from highway bridge, 0.5 mile downstream from confluence North and South Forks, and 5 miles northeast of Silver Lake, Cowlitz County.
DRAINAGE AREA. 474 square miles.
RECORDS AVAILABLE. Water temperatures: October 1950 to September 1959, June to August 1960.
EXTREMES, 1950-59. Water temperatures: Maximum, 72°F Aug. 4, 1952; minimum, freezing point Jan. 4, 5, 1959. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water. June to Aueust 1960

June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....

Maximum ....
Minimum ....

Day

1

__

51
52

53
51

2

5?
49

54
50

53
51

3

5?
49

51
49

54
51

4

53
50

5?
49

54
53

5

52
49

52
47

54
50

6

53
50

51
47

53
48

7

54
51

51
48

53
48

8

54
50

5?
49

52
47

9

53
49

53
50

51
47

10

53
50

54
51

51
49

11

53
50

53
50

52
50

12

53
49

53
49

52
SO

13

52
50

51
50

53
51

14

52
49

53
49

55
53

15

52
52

52
48

55
53

16

52
52

52
47

54
53

17

53
52

51
47

53
49

18

53
52

51
47

52
50

19

53
53

52
48

20

54
53

52
48

21

54
51

52
48

22

53
49

52
49

23

52
48

54
50

24

51
49

54
49

55
54

25

53
51

54
50

55
54

26

53
52

52
48

55
55

27

54
50

52
48

55
53

28

53
49

52
47

29

52
50

52
50

30

53
52

52
51

31

53
50

Aver-
age

53
50

52
49

COWLITZ RIVER BASIN Continued

14-2430. COWLITZ RIVER AT CASTLE ROCK, WASH.

Toutle River, and 14 miles upstream from mouth.
DRAINAGE AREA. 2,238 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1959.
Water 'emperatures: August 1950 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 67°F Aug. 9, 10; minimum, 38°F on many days during January. EXTREMES, 1950-60. Water temperatures: Maximum, 75°F July 28-30, 1958; minimum, freezing point Jan. 29, 30, 1951. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

(°F) of wate year October 1959 to September 1960

April

August
Maxirr

September
Maximurr

Day Aver-age

ALSEA RIVER BASIN

14-3061. NORTH FORK ALSEA RIVER AT ALSEA, OREG.

LOCATION. Temperature recorder at gaging station at Alsea, Benton County, 0.2 mile upstream from bridge on Lobster Valley Road, and 0.7 mile upstream from confluence with South Fork.
DRAINAGE AREA. 63.0 square miles.
RECORDS AVAILABLE. Water temperatures: March 1958 to September I960.
EXTREMES, 1959-60. Water temperatures: Maximum, 71°F during period July 9 to Aug. 5; minimum, 39°F Feb. 29.
EXTREMES, 1958-60. Water temperatures: Maximum, 76°F July 27, 28, 1958; minimum, 39°F Feb. 14, 1959, Feb. 29, 1960. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

October

November

Minimum ....
December
Maximum ....
Minimum ....

January

February
Maximum ....
Minimum ....
March
Maximum ....

April

Minimum ....
May

Minimum ....
June
Maximum ....
Minimum ....

July

August
Maximum ....

September

Minimum ....

1

48

48
48

42

46

51

59

57

2

48

46
47

42

49

50

61

55

3

42

49

49

61

56

4

45

50

49

61

56

5

46

50

49

61

58

6

43

48

50

52

66

56

7

43

48

52

51

70

55

8

44

47

51

49

70

56

9

44

46

48

52

68

57

10

45

46

47

53

69

60

11

44

47

49

53

66

61

12

45

47

49

51

68

61

13

43

47

49

51

66

61

14

40

46

46

49

65

60

15

41

47

47

49

65

60

Day

16

43

47

46

50

65

57

17

42

50

46

50

68

57

18

45

50

48

49

70

57

19

48

51

48

49

69

57

20

48

52

46

50

65

55

21

49

52

47

48

62

53

22

46

53

46

46

60

52

23

50

53

46

46

56

59

55

24

51

54

46

49

56

59

55

25

50

47
45

52

48

49

63
56

59

59

26

48

46
42

51

46

50

63
56

59

56

27

46

42
40

51

50

50

64
56

61

56

28

47

42
40

49

49

50

65
56

62

56

29

49

42
39

48

49

51

63
59

64

57

30

49

46

49

52

61
56

64

55

31

49

54

61

-

Aver-

age

46

47
46

46

46

50

61
55

65

57

ALSEA RIVER BASIN Continued

14-3062. SOUTH FORK ALSEA RIVER NEAR ALSEA, OREG.

LOCATION. Temperature recorder at gaging station, 0.8 mile upstream from confluence with North Fork, and 1.1 miles south of Alsea, Benton County.
DRAINAGE AREA. 49.5 square miles.
RECORDS AVAILABLE. Water temperatures: April 1958 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 72°F July 28; minimum, 35°F sometime during period Dec. 31 to Jan. 21. EXTREMES, 1958-60. Water temperatures: Maximum, 76°F July 27, 28, 1958; minimum, 35°F sometime during period Dec. 31, 1959 to Jan. 21, 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

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ALSEA RIVER BASIN Continued

14-3066. DRIFT CREEK NEAR SALADO, OREG.

LOCATION. Temperature recorder at gaging station, 0.3 mile downstream from Cape Horn Creek, 4.1 miles southwest of Salado, Lincoln County, and 8.5 miles southeast of Toledo.
DRAINAGE AREA. 20.6 square miles.
RECORDS AVAILABLE. Water temperatures: October 1958 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 70°F July 28; minimum, 38°F Mar. 3.
EXTREMES, 1958-60. Water temperatures: Maximum, 70°F July 28, 1960; minimum, 38°F Mar. 3, 1960.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

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ALSEA RIVER BASIN Continued

14-3067. NEEDLE BRANCH NEAR SALADO, OREG.

LOCATION. At gaging station, 500 feet upstream from mouth, 4.6 miles southwest of Salado, Lincoln County, and 8.5 miles southeast of Toledo.

DRAINAGE AREA. 0.32 square mile.
RECORDS AVAILABLE. Water temperatures: October 1958 to September 1960.
Sediment records: November 1958 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 59°F Aug. 8, 10, 12, 18; minimum, 37°F Mar. 2, 3.
Sediment concentrations: Maximum daily, 100 ppm Feb. 9; minimum daily, no flow on many days during August and September. Sediment loads: Maximum daily, 4.9 tons Feb. 9; minimum daily, 0 ton on many days during August and September. EXTREMES, 1958-60. Water temperatures: Maximum, 59°F Aug. 8, 10, 12, 18, 1960; minimum, 37°F Mar. 2, 3, 1960. Sediment concentrations: Maximum daily, 100 ppm Feb. 9, 1960; minimum daily, no flow on many days during August to October Sediment loads: Maximum daily, 4.9 tons Feb. 9, 1960; minimum, 0 ton on many days during August to October. REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to September 1960

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LOCATION. At gaging station, 1,000 feet upst
of Toledo.
DRAINAGE AREA. 0.84 square mile.
RECORDS AVAILABLE. Water temperatures: September 1958 to September 1960. Sediment records: November 1958 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 59°F Aug. 18; minimum, 39°F Mar. 2, 3.

ALSEA RIVER BASIN Continued

14-3068. FLYNN CREEK NEAR SALADO, OREG.

11 from mouth, 3.4 miles west of Salado, Lincoln County, and 6.9 miles southeast

Sedin nt concentrations: Max
Sediment loads: Maximum dail
EXTREMES, 1958-60. Water tempe
Sediment concentrations: Max
Sediment loads: Maximum dail
REMARKS. Records of discharge

mum daily, 95 ppm Feb. 9; minimum daily, 0 ppm ny days.
10 tons Feb. 9; minimum daily, less than 0.05 ton on many days, atures: Maximum, 59°F Aug. 18, 1960; minimum, 39°F Mar. 2, 3, 1960. mum daily, 95 ppm Feb. 9, 1960; minimum daily, 0 ppm on many days.
, 11 tons Jan. 9, 1959; minimum daily, less than 0.05 ton on many days, or water year October 1959 to September 1960 given in WSP 1718.

Temperature (°F) of water, water year October 1959 to Septembe

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ALSEA RIVER BASIN Continued

14-3068.1. DEER CREEK NEAR SALADO, OREG.

LOCATION. At gaging station, 1,000 feet upstream from mouth, 4.6 miles west of Salado, Lincoln County, and 6.5 miles Toledo.

DRAINAGE AREA. 1.20 square miles.
RECORDS AVAILABLE. Water temperatures: September 1958 to September 1960.
Sediment records: November 1958 to September 1960.
EXTREMES, 1959-60. Water temperatures: Maximum, 59°F Aug. 18; minimum, 40°F Nov. 14, 15, Mar. 3.
Sediment concentrations: Maximum daily, 130 ppm Feb. 9; minimum daily, 0 ppm on many days.
Sediment loads: Maximum daily, 21 tons Feb. 9; minimum daily, less than 0.05 ton on many days.
EXTREMES, 1958-60. Water temperatures: Maximum, 59°F Aug. 18, 1960; minimum, 40°F Nov. 14, 15, 1959, Mar. 3, 1960. Sediment concentrations: Maximum daily, 130 ppm Feb. 9, 1960; minimum daily, 0 ppm on many days.
Sediment loads: Maximum daily, 21 tons Feb. 9, 1960; minimum daily, less than 0.05 ton on many days.
REMARKS. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

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