Quality of
Surface Waters of the

United States,
1965

Parts 12-16. Pacific Slope Basins in Wash-ington and Upper Columbia River Basin to Hawaii and Other Pacific Areas

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1966

Prepared in cooperation with the States
of Alaska, Idaho, Montana, Oregon,
Washington, and Wyoming, U. S. Bureau
of Reclamation, and with other agencies

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1970

UNITED STATES DEPARTMENT OF THE INTERIOR

WALTER J. HICKEL, Secretary

GEOLOGICAL SURVEY

William T. Pecora, Director

Library of Congress catalog-card No. GS 43-68

For sale by the Superintendent of Documents, U.S. Government Printing Office Washington, D.C. 20402 - Price $2 (paper cover)

PREFACE

This report was prepared by the U.S. Geological Survey in co-operation with the Statesof Alaska, Idaho, Montana, Oregon, Wash-ington, Wyoming, U.S. Bureau of Reclamation, and with other agencies, by personnel of the Water Resources Division, E. L. Hendricks, chief hydrologist, G. W. Whetstone, assistant chief for Reports and Data Processing, under the general direction of G. A. Billingsley, chief, Reports Section, and B. A. Anderson, chief, Data Reports Unit.

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[Symbols, after station name designate type of data: o3 chemical; t3 water temperature; s 3 sediment}

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QUALITY OF SURFACE WATERS

OF THE UNITED STATES, 1965

PARTS 12-16

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 record of chemical analysis, suspended sediment, and temperature of surface waters given in this volume serve as a basis for determining the suitability of waters for various uses. The flow and water quality of a stream are related to variations in rainfall and other forms of precipitation. In general, lower concentrations of dissolved solids may be expected during periods of high flow than during periods of low flow. Conversely, the sus-pended solids in some streams may change materially with rel-atively small variations in flow, whereas for other streams the quality of the water may remain relatively uniform throughout large ranges in discharge.

The Geological Survey has published annual records of chem-ical quality, suspended sediment, and water temperature since 1941. 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. From 1950 to 1958, the records were published in four volumes and from 1959 to 1963 in five volumes. Beginning with the 1964 water year, water quality records obtained by the Geo-logical Survey were published in a new series of annual releases on a state-boundary basis. These records are then published in six volumes in the Geological Survey water-supply paper series. The drainage basins covered in the six volumes are shown in Figure 1. The data given in this report were collected during the water year October 1,1964 to September 30,1965. The records are 1

QUALITY OF SURFACE WATERS, 1965

WSP 1961
Parts 3.4; WSP 1962
Parts 5-6; WSP 1963
Parts 7-8; WSP 1964
Parts 9-11; WSP 1965

Figure 1. Map of the United States showing basins
covered by the six water-supply papers on quality
of surface waters in 1965. The shaded part repre-
sents the section of the country covered by this
volume; the unshaded part represents the section
of the country covered by other water-supply papers.

arranged by drainage basins in downstream order according to the Geological 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.

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 2 digits followed by a hyphen and a 6-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 num-ber to the right of the hyphen represents the location of the sta-tion in the standard downstream order within each of the 16 parts (Fig. 1). The assigned numbers are in numerical order but are

COLLECTION AND EXAMINATION OF SAMPLES 3

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 num-ber is 04-0100.00.

Descriptive statements are given for each sampling station where chemical analyses, temperature measurements, or sedi-ment determinations have been made. These statements include

location 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, 1965, the Geo-logical Survey maintained 206 stations on 155 streams for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 67 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were meas-ured continuously at 126 and daily at 36 stations. All surface water samples collected and analyzed during the year have not been included. Single analyses made of daily samples before compositing have not been reported. 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 29.

Quantities of suspended sediment are reported for 35 stations during the year ending September 30, 1965. 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 41 of the stations.

COLLECTION AND EXAMINATION OF SAMPLES

Quality of water stations usually are located at or near points on streams where streamflow is measured by the U.S. Geological Survey. The concentration of solutes and sediments at different

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locations in the stream-cross section may vary v/idely with dif-ferent rates of water discharge depending on the source of the material 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 es-

pecially for sediment, to uniformly traverse the depth of flow. These measurements require special sampling equipment to adequately integrate the vertical and lateral variability of the concentration in the section. These procedures yield a velocity-weighted mean concentration for the section.

The near uniformly dispersed ions of the solute load move with the velocity of the transporting water. Accordingly, the mean sec-tion concentration of solutes determined from samples is a pre-cise measure of the total solute load. The mean section concen-tration 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 vertical where the concentration of suspended sediment is great-est 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 difference 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 by Rainwater and Thatcher (1960, 301 p.). No single method of compositing samples is ap-plicable to all problems related to the study of water quality. Although the method of 10-day periods or the equivalent of three composite samples per month generally is practiced, modifications usually are made on the basis of dissolved-solids content as in-dicated by measurements of conductivity of daily samples, sup-plemented by other information such as chloride content, river stage, weather conditions and other background information of the
stream.

COLLECTION AND EXAMINATION OF SAMPLES

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 in order that the data would be relatively unaffected by diurnal variations in temperature. Most large streams have a small diurnal variation in water temperature; small, shallow streams may have a daily range of several degrees and may follow closely the changes in air tem-perature. The thermometers used for determining water tem-perature were accurate to plus or minus 0.5°F.

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 depth-integrating cable-suspended samples (U.S. Inter-Agency, 1963, and 1952.) from a fixed sampling point at one ver-tical in the cross section. A hand sampler was used at many sta-tions during periods of low flow. Depth-integrated samples were collected periodically at three or more verticals in the cross section to determine the cross-sectional distribution of the con-centration 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 concen-tration of the cross section. During periods of high or rapidly changing flow, samples were taken two or more times a day at most sampling stations.

Sediment concentrations were determined by filtration-evaporation method. At many stations the daily mean concentra-tion for some days was obtained by plotting the velocity-weighted instantaneous concentrations on the gage-height chart. The plot-ted concentrations, adjusted if necessary, for cross-sectional distribution were connected or averaged by continuous curves to obtain a concentration graph. This graph represented the esti-mated velocity-weighted concentration at any time, and for most periods daily mean concentrations were determined from the

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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 concen-tration. During extended periods of relatively uniform concen-tration 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 discharge, sediment concentrations observed immediately before and after 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 several days, the suspended-sediment loads for individual days are 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 day sin an 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. Inter-Agency, 1957). The fine fractions were classified by the pipet method (Kilmer and Alexander, 1949) or the bottom withdrawal tube method (U.S. Inter-Agency, 1943).

QUALITY OF SURFACE WATERS, 1965

EXPRESSION OF RESULTS

The quantities of solute concentrations analyzed in the labora-tory are measured by weight-volume units (milligrams per liter) and for reporting, are converted to weight-weight units (parts per million). For most waters, this conversion is made by assuming that the liter of water sample weighs 1 kilogram; and thus milli-grams per liter are equivalent to parts per million (ppm).

Equivalents per million are not reported, but they can be calculated easily from the parts per million data. An equivalent per million (epm) is a unit chemical combining weight of a constit-uent in a million unit weights of water. Chemical equivalence in equivalents per million can be obtained by (a) dividing the con-centration in parts per million by the combining weight of that ion, or (b) multiplying the concentration (in ppm) by the reciprocals of the combining weights. The following table lists the reciprocals of the combining weights of cations and anions generally reported in water analyses.

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

Multi-

ply by Ion

Multi-

ply by

Aluminum (A1+3)...... Barium (Ba+2).......... Bicarbonate (HCO3 -i). Bromide (Br'i) .... Calcium (Ca +2)......... Carbonate (CO3-2)...... Chloride (Cl'i)......... Chromium (Cr+6)...... Cobalt (Co +2) .... Copper (Cu+2).......... Fluoride (F -i).......... Hydrogen (H+i)......... Hydroxide (OH -i) ..... Iodide (I -1)...............

0.11119
.01456
.01639
.01251
.04990
.03333
.02821
. 11539
.03394
.03148
.05264
.99209
.05880
.00788

Iron (Fe+3).............
Lead (Pb *2)............. Lithium (Li+i)......... Magnesium (Mg +2)... Manganese (Mn+2).... Nickel (Ni +2)........... Nitrate (NO3'i)......... Nitrite (NO2 -1)......... Phosphate (PO4 -3).... Potassium (K+i)....... Sodium (Na*1).......... Strontium (Sr+2)....... Sulfate(SO4 -2)......... Zinc (Zn +2).............

,05372
,00965
,14411
,08226
,03640
,03406
,01613
,02174
,03159
,02557
,04350
,02283
,02082
,03060

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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 water analyses in terms of an equivalent quantity of calcium carbonate. 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 quan-tity is called noncarbonate hardness. Hardness or alkalinity val-ues expressed in parts per million as calcium carbonate may be converted to equivalents per million by dividing by 50.

The value usually reported as dissolved solids is the residue on evaporation after drying at 180°Cfor Ihour. 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 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. 25) and the temperature in degrees Fahrenheit. Color is expressed in units of the platinum-cobalt scale proposed by Hazen (1892). A unit of color is produced by one milligram per liter of platinum in the form of the chloro-platinate 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.

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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 average 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. A discharge-weighted average is computed 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 discharges. For most streams, discharge-weighted averages are lower than arithmetical averages because at times of high discharge the rivers generally have low concen-trations of dissolved 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 sediment loads.

The concentration of sediment in parts per million is computed as 1,000,000 times the ratio of the weight of sediment to the weight of water-sediment mixture. Daily sediment loads are expressed in tons per day and except for subdivided days, are usually obtained by multiplying daily mean sediment concentrations in parts per million by the daily mean discharge in cubic feet per second, and the conversion factor, normally 0.0027.

Particle size analyses are expressed in percentages of material finer than classified sizes (in millimeters). The size classification used in this report agrees closely with recommen-dations made by the American Geophysical Union Subcommittee on sediment terminology (Lane and others, 1947). The particle size distributions given in this report are not necessarily rep-resentative of the particle sizes of sediment in transport in the natural stream. Most of the organic matter is removed and the sample is subjected to mechanical and chemical dispersion before analysis of the silt and clay.

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COMPOSITION OF SURFACE WATERS

All natural waters contain dissolved 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. Ground water is generally more highly mineralized than surface runoff because it remains in contact with the rocks and soils for much longer periods. Some streams are fed by both surface runoff and ground water from springs or seeps. Such streams reflect the chemical character of their concentrated underground sources during dry periods and are more dilute during periods of heavy rainfall. 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 water use. The results of analyses generally include silica, iron, calcium, magnesium, sodium, potassium (or sodium and potassium together calculated as sodium), lithium, carbonate, bicarbonate, sulfate, chloride, fluoride, nitrate, boron, pH, dissolved solids, and specific conductance. Aluminum, man-ganese, color, acidity, dissolved oxygen, and other dissolved con-stituents and physical properties are reported for certain streams. Phenolic material and minor elements including strontium, chrom-ium, nickel, copper, lead, zinc, cobalt, and other trace elements are determined occasionally for a few streams in connection with specific problems and the results are reported. 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 in the tables.

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

COMPOSITION OF SURFACE WATERS 11

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 often contain large amounts of aluminum. It may be 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 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 behavior and in its occurrence in natural waters. However, man-ganese in rocks is less 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. It is especially objectionable in water used in laundry work and in textile processing. Concen-trations as low as 0.2 part per million may cause a dark-brown or black stain on fabrics and porcelain fixtures. Appreciable quan-tities of manganese are often found in waters containing objec-tionable 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 silicious sands contain less than 10 parts per million of calcium;

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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 ratio of strontium to calcium is 1:30.

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 waters 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 potas-sium 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.

In this report, sodium and potassium values that are calculated and reported as sodium are indicated by footnote.

Lithium (Li)

Data concerning the quantity of lithium in water are scarce. It is usually found in small amounts in thermal springs and saline

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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 (HCO~,CO~, 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, alkalinity in moderate amounts 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.

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 in considerable 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-inflow carrying appreciable quantities of chloride. Large quan-

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tities of chloride in water that contains a high content of calcium and magnesium increases the water's corrosiveness.

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 appropriate upper control limit (0.6 to 1.7 ppm). Presence of fluoride in average concentration greater than two times the op-timum values shall constitute grounds for rejection of the supply." Concentration 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 nitrogenous material and may indicate contamination by sewage or other organic matter. The quantities of nitrate present in surface waters are generally less than 5 parts per million (as NCL) 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 NCL) may contribute to methe-moglobinemia ("blue babies") (Fauceti? and Miller, 1946), and more recent investigations conducted in Ohio show that drinking water containing nitrates in the range of 44 to 88 ppm (as NCL) may cause methemoglobinemia (Waring, 1949). A report publisned by the National Research Council, Maxcy (1950) concludes that a nitrate content in excess of 44 parts per million (as NCL) 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. Some sources that contribute nitrate, such as organic

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wastes are also important sources of phosphate. The addition of phosphates in water treatment constitutes 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 phosphates in detergents. Domestic and industrial sewage effluents often 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 million 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 surf ace 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 500 parts per million of 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 irrigation 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 considered 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 waters 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).

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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 may be 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 may be introduced into water by solution of copper and brass water pipes and other copper-bearing equipment in contact 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 precipitated. In the normal pH range of natural water containing carbon dioxide, the copper might be precipitated as carbonate. The oxidized portions of sulfide-copper ore bodies contain other copper com-pounds. The presence of copper in mine water is common.

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 cumulative 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 industrial or mine and smelter effluents may contain relatively large amounts of lead. Many of the commonly used lead salts are water soluble.

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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 extent of 31 ppm (Seidell, 1940) 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 freemetaland its oxides are only sparingly soluble. In most alkaline surface waters it is present 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.

Barium (Ba)

Barium may replace potassium in some of the igneous rock minerals, especially feldspar and barium sulfate (barite) is a common 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 ppm is not suitable for drinking and culinary use because of the serious toxic effects of barium on heart, blood vessels, and nerves.

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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 than bromine. Measurable amounts may be 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 extent of less than 1 ppm. Rankama and Sahama (1950) report 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.

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 hardness, 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

approximately equal to the amount of hardness that is removed from water by boiling.

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Noncarbonate hardness is the difference between the hardness calculated from the total amount of calcium and magnesium in solution and the carbonate hardness. If the carbonate hardness (expressed as calcium carbonate) equals 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 report hardness of water is classified as follows:

Hardness range
(calcium carbonate Hardness description
in ppm)

0-60 Soft
61-120 Moderately hard
121-180 Hard
more than 180 Very hard

Durfor and Becker, 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 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

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soil and is an index of the sodium or alkali hazard to the soil. Sodium adsorption ratio is expressed by the equation:

c \n SAR = ?=.
C

- H- ., -H-
a -hMg

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 values 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 generally unsatisfactory for irrigation.

Specific conductance (micromhos per centimeter at 25°C)

Specific 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 specific 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 Decker, 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.

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.

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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 may be 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 denote increasing acidity and those progressively higher than 7.0 denote increasing alkalinity. The pH of most natural surface waters 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 color less 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 mater-ial 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).

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.

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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).

Dissolved oxygen (DO)

Adequate dissolved oxygen is necessary for the life of fish and other aquatic organisms and is an indicator for corrosivity of water, photosynthetic activity, and septicity. It is one of the most important indicators of the condition of a water supply for biological, chemical and sanitary investigations (Rose, 1965).

Biochemical oxygen demand (BOD)

Biochemical oxygen demand is a measure of the oxygen re-quired to oxidize the carbonaceous organic material usable as a source of food by aerobic organisms.

Chemical oxygen demand (COD)

Chemical oxygen demand indicates the quantity of oxidizable compounds present in a water and will vary with water com-positions, concentration of reagent, temperature, period of contact, and other factors.

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 consumed unknowingly. Reported thresholds of detection of taste and odor range from 0.001 to 0.01 ppm.

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Most probable number (MPN). An index for determining the extent of pollution in water is the most probable number which is a direct count of coliform colonies per 100 milliliters of water.

Detergents (MBAS). Anionic surfactants (methylene blue active substance, MBAS) in detergents resist chemical oxidation and biological breakdown. Their persistence in water over long periods of time contributes to pollution of both ground water and surface water. Some of the effects produced from detergent pollution are unpleasant taste, odor, and foaming (Wayman, and others, 1962). Although the physiological implications of MBAS 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 MBAS 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 as an industrial coolant. Temperature is also important, but per-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 stratification and variation.

Surface 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. 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 evaporation and conduction to the air and to the streambed. Thus the temperature 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 summer in lakes and reservoirs of temperate regions result in a separation of the water volume into a circulating upper portion and a non-circulating lower portion. Separating the two is a stratum of water of variable vertical thickness in which the temperature

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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 water than in warm water, hence the reduction of oxygen concentrations by pollution is especially serious during periods of high temper-ature when oxygen levels are already low. Increased temperatures also accelerate biological activity including that of the oxygen-utilizing bacteria which decompose organic wastes. These pol-lutional 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.

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. Although it is reported in terms of parts per million of silica, it is only partly synonymous with the weight of sediment per unit volume 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 or 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

STREAMFLOW 25

sediment is that part which remains in suspension in water owing to the upward components of turbulent currents or by colloidal 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 may be accelerated by agricultural practices. Sediment is also contri-buted 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 dissolved 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 by flocculation 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 solution 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 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. Asa 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 The Geological Survey water-supply paper series, "Surface Water Supply of the United States, 1961-65." The discharge 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

26 QUALITY OF SURFACE WATERS, 1965

are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement.

The water-supply papers and numbers which contain more complete records of stream discharge for this report are listed below:
Part WSP Part WSP

Part 12
Volume 1
Volume 2
Part 13

1932
1933
1934

Part 14
Part 15
Part 16

1935
1937
1936

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 1941-64, are listed below:

Numbers of water-supply papers containing records for
Parts 12-16, 1941-64

Year WSP Year WSP Year WSP Year WSP

1941 942 1950 1189 *1954-56 1486 1961 1885
1942 950 *1948-50 1372 1957 1523 1962 1945
1943 970 1951 1200 *1957 1500 1963 1951
1944 1022 1952 1253 1958 1574 *1961-63 1953
1945 1030 1953 1293 *1958 1570 1964 1959
1946 1050 H951-53 1466 1959 1645 1965 1966
1947 1102 1954 1353 H959 1640
1948 1133 1955 1403 1960 1745
1949 1163 1956 1453 *1960 1720

*Part 15. Alaska.

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 supplies and only incidentally covering the chemical composition of surface waters are not included. Publications that are out of print are preceded by an asterisk.

PROFESSIONAL PAPER

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

PUBLICATIONS 27

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 surface waters of Illinois, 1910.
*273. Quality of the water supplies of Kansas, with a prelimin-
ary report on stream pollution by mine waters in southeastern 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
Quitman, 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 Survey publications still in print may be purchased at a nominal cost from the Superintendent of Documents, Government Printing Office, Washington D. C. 20402, who will, upon request, furnish lists giving prices.

COOPERATION

The Bureau of Reclamation, U.S. Department of the Interior, continued financial assistance for the operation of some chemical-quality and sediment investigations in the Pacific slope basins in Oregon and lower Columbia River basin and in Alaska by the Alaska Power Commission, U.S. Department of the Interior, formerly the Bureau of Reclamation.

Assistance in the form of funds and services was provided by: Corps of Engineers, U.S. Army for some stations in the Snake River basin in Idaho, Pacific slope basins in Washington and Ore-gon and also in Hawaii; by the Fish and Wildlife Service, U.S. Department of the Interior and the Forest Service, U.S. Depart-ment of Agriculture for some stations in the Snake River basin in Idaho and Oregon; and by the U.S. Atomic Energy Commission for some stations on the Columbia River in Oregon.

DIVISION OF WORK

The quality-of-water program was conducted by the Water Resources Division of the Geological Survey, E. L. Hendricks, chief hydrologist, and G. W. Whetstone, assistant chief for Re-ports and Data Processing, under the general direction of G. A. Billingsley, chief, Reports Section, and B. A. Anderson, chief, Data Reports Unit. The data were collected and prepared for publication under the supervision of district chiefs as follows: In Alaska, Harry Hulsing; Hawaii, M. M. Miller; Idaho, Oregon, Washington, and the Kootenai River basin in Montana, L. B. Laird, G. L. Bodhaine, and W. T. Travis; Montana, G. M. Pike; and the Snake River basin in Wyoming, T. F. Hanly.

Correspondence regarding the records in this report or any additional information should be directed to the district chief of the appropriate Geological Survey Water Resources Division offices indicated in the table on page29. Because of reorganiza-tion in recent years, the offices now administering water-quality

State

Alaska

Hawaii

Idaho

Montana

Oregon

Cooperating agency

Alaska Department of Health and Welfare.
City of Anchorage.
Greater Juneau Borough.

Idaho Department of Reclamation, C. E. Tappan, State Reclamation engineer.

Montana Fish and Game Commission, A. N. Whitney, chief of Fisheries Division.

Oregon Board of Higher Education. Cities of Coos Bay and North Bend Water Board.

Drainage basin

Alaska

Hawaii and other
Pacific areas

Pacific slope basins
in Washington and
upper Columbia River
Snake River

Pacific slope basins
in Washington and
upper Columbia River

Snake River
Pacific slope basins
in Oregon and lower
Columbia River

District office

P. O. Box 2480

Anchorage, Alaska 99501

Room 330

First Insurance Bldg.
1100 Ward Ave.
Honolulu, Hawaii 96814

Room 215
914 Jefferson St.
Boise, Idaho 83702

P. O. Box 1696

Room 421, Federal Bldg.
Helena, Mont. 59601

P. O. Box 3202

Portland, Oreg. 97208

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State

Washington

Wyoming

Cooperating agency

Washington Department of Conserva-tion, Earl Coe, director.
Washington State Pollution Control Commission, R. M. Harris,
director.

Drainage basin

Snake River
Pacific slope basins
in Washington and
upper Columbia River

Wyoming Department of Agriculture, Snake River basin O. H. Engendorff, commissioner.
Wyoming State Engineer, F. A. Bishop.
Wyoming Natural Resources Board,
E. J. Van Camp, director of Water
Resources.

District office

1305 Tacoma Ave. south
Tacoma, Wash. 98402

P. O. Box 2087

Cheyenne, Wyo.

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LITERATURE CITED 31

programs in most of the States differ from those that were ad-ministering the programs in 1965.

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WAi'JSR-QUALITY STATIONS IN DOWNSTREAM ORDER

PART 12. PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

BEAR RIVER BASIN

12-95. BEAR RIVER NEAR NASELLE, WASH.

LOCATION. Temperature recorder at gaging station, 3 miles upstream from U.S. Highway 101 crossing, and 5 miles southwest of Naselle, Pacific County.
DRAINAGE AREA. 11.7 square miles.
RECORDS AVAILABLE. Water temperatures: July 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 63°F Aug. 17; minimum, 35°F Dec. 20.
EXTREMES, 1963-65. Water temperatures: Maximum, 63°F Aug. 17, 1965; minimum, 35°F Dec. 20, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

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NASELLE RIVER BASIN

12-100. NASELLE RIVER NEAR NASELLE, WASH.

LOCATION. Temperature recorder at gaging station, 2.5 miles upstream from Salmon Creek, and 3.5 miles east of Naselle, Pacific County.
DRAINAGE AREA. 54.8 square miles.
RECORDS AVAILABLE. Water temperatures: August 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 73°F July 30; minimum, 38°F Dec. 16, 17, 19, 20, Jan. 1.
EXTREMES, 1963-65. Water temperatures: Maximum, 73°F July 30, 1965; minimum, 38°F Dec. 16, 17, 19, 20, 1964, Jan. 1, 1965.

Temperature (°F) of water, water year October 1964 to September 1965

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66
6?

59
L 56

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

and upstream County, 1 mileWalkr Creek. Pacific from m,

38°F 17,8., 2;minimum, Dec. .

28-30, minimum, 1957, 21-23, 6;point 19t freezing Jan.

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a 3 o)

U) < H

<H rH O

tn o o"oT

U) rH rH
rH !» 33

recorder Temperature LOCATION. atgaging station, 0.5 mi

41.4 miles. DRAINAGE AREA. square w

? RECORDS AVAILABLE. Chemical analyses: 1959 Jully to

3 March 1952 Water temperatures; to September 1965.

01 EXTREMES, 1964-65. Water 68°Ftemperatures: Maximum, J ° 72°F EXTREMES, 1952-65. Watertemperatures: Maximum, J

19645 tobero September

a
o

V

(°F) Temperature 0 of water

tc

>

O

CO

o
CO

o
CM

00 II 00 -a- O- II 00 II men II oof-- co 1- II
in m || <) -* ^-^ II in-* II inm II »c-o inin II

00= r-^ rno ^^ , , rnm e,o men ^ n, oo * r- *

coco ,0 m (^ r- j- j- ii eo m en co r- m en o * j- co ,0 >r en

co!

CM

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r^* ^^ *en ^en « m ,0 ^ «o co en ^^ ,0 m e, c, ^ in

~ cc^ ^o~^TT7 ^^ cc^" ro ^ "T^TTT"

ooco rno enex; <,en enex; r-m c^r- en^ oco ^o r-.es, in »

*

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CM- rn o 000 exj^ -om m^ oco m co cor- -t^ m » ex.^

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UO -I cxj rH 0 -a- en en en «i rxj o- m en o <t o in -I ,0 in J- exi re co

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»* <tcn ^^ r^rx, enrx, co * <f o co en eo -o ex, o- m* r- r-

<jcx; o* ^en ev, ex, en ex, en* ^,in O3 en cor-oo- ,n <f ' r- r-
- l<f -in in-ooD-o

5^ S3 33 33 33 33 3S S. SS SS 5S mS

H I! -lv ^rr-H^^-^7-^^ . ~^H
cnen -o^ m^ r^r-j n en r- en r-m exj* ^.co -o<r m^ cor-^
in *<j- <t <t <t <t <t * -t* ^--t .-} -an -ovo -o-r,

^^ <!-<!- -t-l -I-I »<J- * * <f-I in-* * m 03-0 -o-o -cm

5S 3S 33 * 3 53 S3 33 33 S£ SS 3S i S

en- ooo -o* rn rn » m ^>en om r- ^j oxr- ^ rn en CM o-co

<to ooeo r- « rnr, enex, *'m oxen eor- or- ^^ ,nm cnco

5^ °5 33 3S 32 33 SS 33 ° ^ SS SS SS

mexj oo r- r- oo <fen -nm -co oxr- oxm ^en coco oxco

ee66 ee eg eg 66 gg gg eg gg gg^sg 33?133t.33 33 33 33 33 33 33 33 33^33
v- g g-S 6 g^ 6 g ^6 S >-6 6 66 66 gg gg gg S S-o S g

| 3.S | i 5 g 1.5 S 1 S 5 i.S-g 1 S- S.S ^i 5 0 1| ^S 5 |S| |j S

(3 I Q J, 1 S < S 1, "r= <"!"*

NORTH RIVER BASIN

12-166. NORTH RIVER ABOVE JOE CREEK, NEAR RAYMOND, WASH.

LOCATION. At Lund Road bridge,1.5 miles upstream from Joe Creek, and 12.5 miles north of Raymond, Pacific County. DRAINAGE AREA. 188 square miles.
RECORDS AVAILABLE. Water temperatures: October 1964 to September 1965.
Sediment records: October 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 68°F June 29, July 24, 31, Aug. 1, 15; minimum, 36°F Dec. 17, 18. Sediment concentrations: Maximum daily, 210 ppm Jan. 27; minimum daily, 3 ppm on several days during April and May. Sediment loads: Maximum daily, 2,200 tons Jan. 27; minimum daily, less than 0.50 ton July 30, 31, Sept. 10, 11. REMARKS. Water discharge estimated on basis of three discharge measurements, daily stage readings, and water discharge from nearby stations.

Temperature (°F) of water, water year October 1964 to September 1965

November .....
December .....

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

September .....

1

50
49

4>i

63

2

49
47

61

3

50
46

64

4

48
44

65

5

48
42

40

64

6

46
42

67

7

48
43

62

8

45
46

60

9

45
46

60

10

45
45

60

11

44
42

58

12

43
42

59

13

43
42

59

14

47
42

f. a

59

15

40
39

60

58

Day

16

40
39

f. a

60

17

40
36

60

18

40
36

62
64-
58

19

41
37

57

20

41
38

50

58

21

41
37

57

22

42
40

60

60

23

44
40

4-8

63

24

45
41

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45
40

56

26

44
43

56

27

41
42

60

28

41
39

CO

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29

46
39

en

57

30

49
39

60

31

39

Aver-

age

44
41

60

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

NORTH RIVER BASIN Continued

12-166. NORTH RIVER ABOVE JOE CREEK, NEAR RAYMOND, WASH.--Continued

Suspended sediment, water year October 1964 to September 1965

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

356
425
309
264
211

180
160
178
245
291

301
239
211
233
305

416
448
403
324
281

245
223
206
191
178

168
158
153
148
163
175

7788

Suspended sediment

Mean

tration

(ppm)

C 5
C 5
C 5
C 5
C 5

C 5
C 5
C 5
C 5
C 5

C 5
C 5
C 5
C 5
C 5

C 5
C 5
C 5
C 5
C 5

C 5
C 5
C 5
C 5
C 5

C 5
C 5
C 5
C 5
C 5
C 5

Tons
per
day

5
6
4
4
3

2
2
2
3
4

4
3
3
3
4

6
6
5
4
4

3
3
3
3
2

2
2
2
2
2
2

103

JANUARY

1260
2980
3160
2140
1710

1710
1620
1590
1560
1420

1360
1280
1230
1170
1310

1510
1400
1260
1140
1140

1340
1480
1560
2650
2470

2320
3940
4600
4750
4660
4420

66140

22
160
74
46
36

30
28
22
25
19

18
15
18
18
22

30
18
15
12
14

22
23
48
120
54

52
210
140
110
93
86

-

75
1300
630
270
170

140
120
94
110
73

66
52
60
57
78

120
68
51
37
43

80
92
200
860
360

330
2200
1700
1400
1200
1000

13036

NOVEMBER

Mean
dis-

charge
(cf«)

287
320
565
1340
1200

755
541
446
386
343

326
395
343
326
309

292
275
262
257
240

232
240
343
2260
2950

2260
2170
1740
1820
3490

26713

Suspended sediment

Mean
concen-

tration

(ppm)

4
6
12
91
50

20
12
8
5
5

5
5
5
5
5

5
5
5
5
5

5
5
15
150
100

58
45
35
48
140

~

Tons
per
day

3
5
18
330
160

41
18
10
5
5

4
5
5
4
4

4
4
4
3
3

3
3
14
920
800

350
260
160
240
1300

4685

FEBRUARY

3220
2110
1710
1680
2920

3160
2320
2030
1940
1680

1450
1310
1420
1510
1420

1560
1740
1590
1450
1310

1140
1170
1060
952
867

952
1910
2200

47781

70
57
41
58
140

78
49
40
31
24

25
25
26
24
/ 17

27
34
26
21
21

17
16
12
12
12

14
93
65

- -

- -

610
320
190
260
1100

670
310
220
160
110

98
88
100
98
65

110
160
110
82
74

52
51
34
31
28

36
480
390

i

6037

DECEMBER

Mean
dis-

charge
(cfs)

4840
4840
3520
2140
1590

1280
1120
1090
1010
1010

1010
1010
1170
1200
1400

1450
1280
1060
970
935

1030
2000
3070
2590
2200

2170
2770
2320
1790
1510
1280

56655

Suspended sediment

Mean

tration

(ppm)

140
94
66
52
38

28
20
17
14
18

15
14
19
19
30

27
19
12
9
10

12
86
130
60
45

60
72
46
33
27
18

~

Tons
per
day

1800
1200
630
300
160

97
60
50
38
49

41
38
60
62
110

110
66
34
24
25

33
460
1100
420
270

350
540
290
160
110
62

8749

MARCH

1710
1400
1200
1060
901

794
716
662
607
566

517
486
457
429
416

395
378
356
335
324

316
312
305
291
274

270
270
294
497
399
324

17261

33
22
16
13
10

10
10
18
C 5
C 5

C 5
C 5
C 5
C 5
C 5

C 5
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C 5

C 5
C 5
C 5
C 5
C 5

C 5
C 5
C 5
C 5
C 5
C 5

150
83
52
37
24

21
19
32
8
8

7
7
6
6
6

5
5
5
5
it

4
4
4
4
4

4
4
4
7
5
4

538

C Composite period.

QUALITY OF SURFACE WATERS, 1965

NORTH RIVER BASIN Continued

12-166. NORTH RIVER ABOVE JOE CREEK, NEAR RAYMOND, WASH. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31. <

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

298
301
277
257
245

251
270
264
245
239

227
21*
208
208
206

208
211
208
556
1510

1340
1010
867
762
686

583
523
467
425
412

13478

Suspended sediment

Mean

tration

(ppm)

2
73

34
17
11
8
8

C 3
C 3
C 3
C 3
C 3

~

Tons
per
day

3
3
3
3
3

3
3
3
3
3

2
2
2
2
2

2
2
2
41
300

120
46
26
16
15

5
4
4
3
3

629

JULY

88
84
82
81
81

79
77
76
76
77

79
84
81
76
73

72
70
64
59
61

61
61
61
59
56

53
49
48
47
46
45

2106 -

1
1
1
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1

1
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1
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T

30

MAY

Mean
dis-

charge
(cfs)

497
607
534
631
716

680
613
534
486
443

408
382
352
328
340

650
722
556
481
472

453
412
373
352
324

305
287
274
261
251
242

13966

Suspended sediment

Mean
concen-

tration

(ppm)

4
4
4
4
4

4
4
4
4
4

4
4
4
4
16

12
5
4
3
3

3
3
3
3
3

3
3
3
3
3
3

~

Tons
per
day

5
7
6
7
8

7
7
6
5
5

4
4
4
4
15

21
10
6
4
4

4
3
3
3
3

2
2
2
2
2
2

167

AUGUST

44
44
44
45
46

47
46
45
44
43

43
53
67
97
90

69
56
49
53
72

82
88
75
69
59

62
59
62
58
51
49

1811

5
5
5
5
5

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5
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1
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1
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1
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1
1

31

JUNE

Mean
dis-

charge
(cfs)

227
218
206
195
186

178
170
163
158
155

168
186
180
155
155

151
142
133
131
125

119
113
110
105
100

99
95
94
90
88

4395

Suspended sediment

Mean

tration

(ppm)

Tons
per
day

4
4
3
3
3

3
3
3
3
3

3
3
3
3
3

2
2
2
2
2

2
2
2
2
2

2
2
2
1
1

75

SEPTEMBER

46
44
41
41
41

40
39
39
38
37

37
39
39
5*
73

95
90
73
98
51

47
46
44
44
43

41
39
39
39
40

1437

5
5
5
5
5

5
5
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5
5

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1
1

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1
1
1

29

Total discharge for year (cf s-days) .... 259 , 531 Total load for year (tons). 34,109

T Less than 0.50 tot
C Composite period.

NORTH RIVER BASIN Continued

12-170. NORTH RIVER NEAR RAYMOND, WASH.

LOCATION. Temperature recorder at gaging station,1.2 miles upstream from Salmon Creek, and 10 miles northwest of Raymond, Pacific County.
DRAINAGE AREA. 219 square miles.
RECORDS AVAILABLE. Water temperatures: July 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 73°F July 30; minimum, 36°F Dec. 18, 19.
EXTREMES, 1963-65. Water temperatures: Maximum, 73°F July 30, 1965; minimum, 36"F Dec. 18, 19, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....
January
Maximum ....
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February
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June
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Minimum ....

July
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Minimum ....
August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

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CHEHALIS RIVER BASIN

12-275. CHEHALIS RIVER NEAR GRAND HOUND, WASH.

LOCATION. Temperature recorder at gaging station at highway bridge at Meadows, 1.5 miles southwest of Grand Hound, Thurston County, and 6 miles downstream from Skookumehuck River.
DRAINAGE AREA. 895 square miles.
RECORDS AVAILABLE. Water temperatures: March 1952 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 77°F July 29-31, Aug. 1; minimum, 35°F Dec. 18-20.
EXTREMES, 1952-65. Water temperatures: Maximum, 80°F July 22, 23, 1959; minimum, freezing point Jan. 29 to Feb. 4, 1957. Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....
January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....
April
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May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

Day

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Average

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62

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

72
68

77
75

66
64

72
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76
72

65
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Periodic determinations of suspended-sediment discharge, water year October 1964 to September 1965

Date

Dec. 23. ....

Time

(24 hr)

1430
1350

tem-

per-
ature

(°F)

56
40

Discharge
(cfs)

507
22400

Suspended sediment

Mean
concen-

tration

(ppm)

6
191

Discharge
(tons per day)

8.2
11600

CHEHALIS RIVER BASIN Continued

12-310. CHEHALIS RIVER AT PORTER, WASH.

LOCATION. At gaging station at County Highway bridge at mouth of Porter Creek, 700 feet west of Porter, Grays Harbor County. DRAINAGE AREA. 1,294 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
Water temperatures: July 1959 to September 1960, October 1961 to September 1965.
Sediment records: October 1961 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 78°F July 25, 29; minimum, 33°F Dec. 16.
Sediment concentrations: Maximum daily, 222 ppm Nov. 25; minimum daily, 1 ppm on several days.
Sediment loads: Maximum daily, 7,910 tons Nov. 25; minimum daily, 1 ton on many days during July to August.
EXTREMES, 1959-60, 1961-65. Water temperatures: Maximum, 78°F July 27, 1962, July 25, 1965; minimum, 33°F Dec. 16, 1964. Sediment concentrations (1961-65). Maximum daily, 222 ppm Nov. 25, 1964; minimum daily, 0 ppm on many days of most years. Sediment loads (1961-65). Maximum daily, 10,400 tons Jan. 26, 1964; minimum daily, less than 0.50 ton on many days of most yea Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 26, 1964

Jan. 12, 1965

Aug. 3.......
Sept. 13.....

Mean

discharge
(cfs)

604
1230
8000
7070
7920
3360

1420
2020
895
392
242
234

Silica

(Si02)

15
15
12
13
13
15

14
15
14
16
18

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mu)

Cal-

cium

(Ca)

7.0
6.5
3.0
4.4
4.0
5.6

6.4
7.2
8.0
6.4
8.0

Mag-
ne-

sium

(Mg)

2.7
2.1
1.4
1.6
1.5
1.9

1.8

2.4
3.2
3.2

Sodium

(Na)

5.3
4.7
2.7
3.8
3.5
4.6

4.4
5.4
6.6
6.4
6.8

Po-
tas-

sium

(K)

1.0
. 7
.3
.2
.3
.9

.6
.6
. 7
.9
. 8

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

38
32
16
21
20
28

22
36
41
38
44

Can
bon-

ate

py

0
0
0
0
0
0

0
0
0
0
0

Sulfate

(S0«)

3.0
3.4
1.2
3.6
2.8
3.0

2.8
3.0
2.6
3.6
3.4

Chloride

(Cl)

4.8
4.8
3.0
3.5
3.0
3.5

4.0
4.5
6.2
7.2
7.0

Fluo-

ride

(F)

0.1

.1
.0
. 1
. 1
.0

.0
.0
.0
. 1
.2

Ni-

trate

(NOJ

0.7
1.2
1.0
1.7
1.5
1.1

.6
.5
.3
.4
.4

Phos-

phate
(PO.)

0.10
.07
.01
.04
.04
. 01

.06
.07
.O:
. 11
.Of

Dissolved
solids

(residue
at 180°C)

63
61
35
42
45
55

52
59
A 61
66
75

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

28
24
14
18
16
22

23
27
30
29
33

Non-
car -

bon-

ate

0
0
0
0
0
0

5
0
0
0
0

To-

tal
acid-

ity
as

H+1

Specific
conduct*

ance

(micro-
mhos at

25°C)

84
75
41
54
51
64

69
81
91
92
99

pH

6.8
7.0
7.4
7.1
6.9
7.1

7.2
7.0
7.2
7.5
7.0

Col-

or

10
15
10
10
5
5

5
5
0
5
5

D.O.

(dis-
sol-
ved
oxy-
gen
ppm;

11.7
12.5
12.8
12.0
11.8
11.1

10.7
10.2
9.3
9.0
7.2
8.8

MPN

(coli-
form
colo-

nies

per

100 ml)

150
91
91
MOO
L500
91

91
L200
36
36
36
150

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 15, 1964....
June 3, 1965. ....

Time

(24 hr)

1545
1515

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
. .00

Cop-

per

(Cu)

0.04
.04

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
.01

CHEHALIS RIVER BASIN Continued

12-310. CHEHALIS RIVER AT PORTER, WASH. Continued

Temperature (°D of water, water year October 1964 to September 1965

Month

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

January. ....

March.........

June..........

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

September .....

Day

1

52

48

38

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54
58

69

69

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60

48

39

49
54
58

68

69

3

56

44

39

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51

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68

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38

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73

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58
71

72

59

31

51

34

45

60

75

Aver-

age

53
45
41

41

52
55
63

68
68
60

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

Nov. 25, 1964. ....

Jan. 28, 1965.....

Time

(24 hour)

1450
1135
1010

Water
tem-

per-
ature

(°F)

43
48
44

Sam-

pling
point

Discharge
(cfs)

14000
20400
24000

Sediment

concen-

tration

(ppm)

195
91
90

Sediment

discharge
(tons per day)

7370
5010
5830

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

38
29
36

0.004

51
43
52

0.008

64
59
60

0.016

72
69

0.031

80
78

0.062

86
89
87

0.125

91
94
93

0.250

98
98
98

0.500

100
100
100

1.000 2.000

Method
of

analysis

VPWC
VPWC
VPWC

QUALITY OF SURFACE WATERS, 1965

CHKHALIS RIVER BASIN Continued

12-310. CHEHALIS RIVER AT PORTER, WASH. Continued

Suspended sediment, water year October 1964 to September 1965

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

728
1250
971
825
721

647
602
620
664
799

956
801
708
672
692

893
1130
1090
960
854

777
720
676
644
619

604
585
569
559
567
573

23476

Suspended sediment

Mean
concen-

tration

(ppm)

8
15
10

11

-

Tons
per
day

16
51
26
13
12

9
8
7
7
9

23
13
10
7
7

10
31
24
16
12

8
8
7
7
2

3
8
3
5
6
6

374

JANUARY

8030
9390
13800
13400
10300

9930
10700
9610
8320
7370

7310
7070
6520
6130
6610

7720
8090
7400
6800
6700

7120
8330
8820
13000
17200

16800
20000
24600
29200
31700
33300

381270

18
28
56
26
21

22
25
24
18
14

13
14
12
16
14

19
22
20
14
12

15
21
26
81
51

36
50
98
63
48
40

-

390
S 751
2090
9*1
584

590
722
623
404
279

257
267
211
265
250

396
481
400
257
217

288
472
619
2840
2370

1630
2700
6510
4970
4110
3600

40484

NOVEMBER

Mean
dis-

charge
(cfs)

701
800
1230
2270
4270

3200
2290
1810
1510
1350

1320
1590
1690
1870
1690

1480
1330
1230
1150
1090

1040
1020
1310
5370
13200

17100
16300
13100
9670
13400

125381

Suspended sediment

Mean
concen-

tration

(ppm)

5
4
18
25
56

23
11
7
6
6

4
5
6
7
8

8
6
6
4
4

4
4
19
91
222

94
70
40
32
74

Tons
per
day

9
9
60
153
646

199
68
34
24
22

14
21
27
35
37

32
22
20
12
12

11
11
S 82
1320
7910

4340
3080
1410
835
S 2860

23315

FEBRUARY

30200
24500
17300
12500
12400

13500
12600
10900
11100
10200

8660
7570
7450
8140
7920

7570
7750
7460
6890
6350

5820
5590
5440
4960
4590

4450
6620
10300

278730

41
36
33
32
30

32
24
18
22
19

18
24
22
36
27

24
20
22
20
18

17
14
14
14
13

12
39
77

"

3340
2380
1540
1080
1000

1170
816
530
659
523

421
491
443
791
577

491
418
443
372
309

267
211
206
187
161

144
S 744
2140

.

21854

DECEMBER

Mean
dis-

charge
(cfs)

20300
23600
24600
22700
15200

9350
7000
5860
5380
5160

5010
4930
5020
5820
8000

9460
7810
6160
5260
4780

5130
11000
19600
25400
27900

25100
22600
22200
19000
13800
10100

402230

Suspended sediment

Mean
concen-

tration

(ppm)

102
80
73
47
30

27
20
17
14
14

13
14
11
16
50

46
22
14
12
10

20
86
147
84
48

38
48
34
31
26
24

Tons
per
day

5590
5100
4850
2880
1230

682
378
269
203
195

176
186
149
251
1080

1170
464
233
170
129

277
S 2830
7780
5760
3620

2580
2930
2040
1590
969
654

56415

MARCH

9600
7750
6500
5600
4910

4390
3980
3640
3360
3150

2970
2800
2640
2500
2380

2260
2160
2060
1980
1910

1850
1840
1810
1740
1670

1700
1720
1670
1680
1780
1680

95680

37
25
19
15
13

10
10
10
10
10

11
10
9
8
8

8
8

~

959
523
333
227
172

119
107
98
91
85

88
76
64
54
51

49
47
22
37
26

30
25
20
19
18

9
9
18
18
19
18

3431

S Computed by subdividing day.

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

CHEHALIS RIVER BASIN Continued

12-310. CHEHALIS RIVER AT "OHTER, WASH. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cf.)

1630
1640
1560
1480
1420

1380
1360
1360
1320
1290

1270
1210
1190
1200
1220

1190
1210
1190
1770
4700

6740
5640
4440
3640
3200

2790
2440
2180
1990
1900

65550

Sucpended sediment

Mean
concen-

tration

(ppm)

6
4
4
4
4

3
4
2
5
5

2
2

Tons
per
day

26
18
17
16
15

11
15
7
18
17

7
7
4 13
4
4

5
4
4
9
68

66
31
18
13
11

10
8
8
8
6

~

13
13

16
13
13
S 54
863

1200
472
216
128
95

75
53
47
43
31

"

3532

JULY

445
431
420
410
403

392
378
371
368
389

403
420
438
403
375

354
338
326
323
332

332
338
344
329
314

299
287
275
269
260
254

11020

2
1
1
1
1

2
2
2
2
2

1
2
2
2
2

2

3
3
2

4
2
3
4
4

2
2
2
2
2
2

-

2
1
1
1
1

2
2
2
2
2

1
2
2
2
2

2
2
3
3
2

4
2
2
4
3

2
2
1
1
1
1

60

MAY

Mean
dis-

charge
<cfs)

1940
2060
2000
2020
2270

2390
2300
2100
1930
1790

1660
1540
1460
1380
1350

1590
2000
1920
1700
1600

1670
1610
1490
1400
1330

1260
1180
1130
1070
1030
995

51165

Suspended sediment

Mean

tration

(ppm)

6
4
4
4
4

4
4
3
3
2

2
2
4
1
2

6
6
4
4
6

4
6
3
4
4

4
4
4
2
4
2

Tons
per
day

31
22
22
22
25

26
25
17
16
10

9
8
16
4
7

26
32
21
18
26

18
26
12
15
14

14
13
12
6
11
5

529

AUGUST

245
236
2 2
2 2
2 5

2 5
2 5
239
236
230

230
260
305
392
483

392
326
293
290
341

347
406
368
344
323

320
311
314
306
290
278

9326

2
2
3
2
3

4
4
4
2
3

4
4
4
5
6

4
4
4
5
6

8
5
4
5
4

4
2
4
4
4
3

»

1
1
2
1
2

3
3
3
1
2

2
3
3
5
8

4
4
3
4
6

7
5
4
5
3

3
2
3
3
3
2

101

JUNE

Mean
dis-

charge
(cfs)

970
935
895
855
821

790
763
736
722
713

754
740
745
713
704

727
691
655
630
610

590
570
546
526
510

498
487
480
469
459

20304

Suspended sediment

Mean
concen-

tration

(ppm)

-

Tons
per
day

10
10
10
9
9

9
8
8
8
8

8
8
8
8
8

8
7
7
7
7

6
3
3
4
6

3
4
4
5
4

207

SEPTEMB R

266
257
251
248
248

248
239
236
230
227

225
229
234
276
321

359
447
411
354
321

301
286
274
268
263

257
254
252
255
256

8293

3
3
3
3
3

3
1
3
2
2

2
2
3
3
3

3
5
4
' 4
2

2
2
1
2
2

3
1
3
1
2

76

Total discharge for year (cfs-days). Total load for year (tons)..........

1,472,425
150,378

S Computed by subdividing day.

CHKHALIS RIVER BASIN Continued

12-325. CLOQUALLUH RIVER AT ELM A, WASH.

LOCATION. At gaging station on Washington Highway 9, 0.5 mile east of Elma Grays Harbor County, and 1.8 miles downstream from Wildcat Creek DRAINAGE AREA. 64.9 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1961 to September 1965.

'Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 26, 1964

Jan. 12, 1965

Sept. 13.....

Mean

discharge
(cfs)

52
88
484
394
446
209

105
228
42
28
18

Silica

(Si02)

16
15
13
13
12
13

13
17
18
18

Alu-
mi-

num

(Al)

Iron

(Fe)

0.33
.28

. 16
.25
.25

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

5.5
6.0
5.0
4.8
4.0
4.6

4.8
6.8
6.4
6.4

Mag-
ne-

sium

(Mg)

3.2
2.4
1.7
1.7
1.9
2.1

2.0
2.4
2.9
3.1

Sodium

(Na)

4.0
3.8
3.1
3.1
3.0
3.2

3.3
4.2
4.5
4.8

Po-
tas-

sium

(K)

0.8
.9
. 5
.5
.2
.2

. 5
.4
. 5
1.0

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

35
31
22
22
21
25

26
35
36
37

Car-
bon-

ate
POO

0
0
0
0
0
0

0
0
0
0

Sulfate

(S04)

2.2
2.2
2.2
2.4
2.4
2.2

2.0
2.6
2.8
3.0

Chloride

(Cl)

3.5
3.5
3.0
3.0
2.8
2.8

2.5
3.2
3.2
3.5

Fluo-

ride

(F)

0.1
. 1
.0
.0
. 1
.0

.1
.0

.1
.0

Ni-

trate

(NO,)

1.2
1.9
2.6
2.4
2.2
1.5

.9
.8
1.2
1.0

Phos-

phate
iPO,)

0.05
.04
.05
.02
.02
.02

.04
.03
.06
.06

Dissolved
solids

(residue
at 180°C)

59
56
48
41
43
46

46
58
60
67

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

26
25
20
19
18
20

20
27
28
29

Non-
car -

bon-

ate

0
0
2
1
1
0

0
0
0
0

To-

tal
acid

ity
as

H+1

Specific
conduct"

ance

(micro -
mhos at

25'C)

73
70
56
54
51
57

57
73
76
78

pH

7.0
7.1
7.8
7.0
6.8
7.4

7.1
7.1
7.4
7.6

Col-

or

10
5
10
5
5
5

10
10
5
5

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

12.0
12.1
12.5
12.3
11.7
11.9

11.4
10.8
8.2
8.5
9.9

MPN

(coli-
form
colo-

nies

per

100 ml)

91
230
4600
230
430
150

230
930
430
230
930

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 15, 1964....

Time

(24 hr)

1530

Chromium

Hexa-

valent

(Cr«)

0.00

Total
lrr\

0.00

Cop-

per

(Cu)

0.05

Zinc

(Zn)

0.05

Ar-

senic

(As)

0.00

Boron

(B)

0.00

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

CHEHALIS RIVER BASIN Continued

12-325. CLOQUALLUM RIVER AT ELMA, WASH. Continued

Periodic determinations of suspended-sediment discharge, water year October 1964 to September 1965

Date Time
(24 hr)

Water
tem-

per-
ature

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

Nov. 3, 1964.
Nov. 4.......
Nov. 5.......
Nov. 24......
Nov. 24......

Nov. 25......
Nov. 30......
Nov. 30......
Nov. 30......
Dec. 1.......
Dec. 1.......

Dec. 2.......
Dec. 22......
Dec. 22......
Dec. 23......
Dec. 26......

Jan. 2, 1965.
Jan. 27......
Jan. 27......
Jan. 27......
Jan. 28......

Jan. 28......
Jan. 29......
Jan. 30......
Jan. 30......
Feb. 1.......

Feb. 4.......
Feb. 27......
Feb. 27......
Feb. 27......
Feb. 28......

2130
0840
0940
0040
0815

0645
1100
1530
2210
0935
1620

1300
1045
2200
0730
1505

1200
0900
1250
1745
0915

1525
1545
1220
1430
1400

1200
0840
1100
1720
0840

50
49
48
48
47

45
48
49
49
48
49

49
37
38
39
42

37
44
44
44
44

45
45
46
45
44

42
43
43
43
40

364
498
286
970
1700

790
2330
2800
3100
2820
2690

1760
965
1270
1120
1100

748
2340
2270
2080
1950

1980
2120
2150
2290
1140

644
1070
1020
945
720

90
44
10
260
216

32
248
276
226
126
111

62
65
94
40
56

18
170
136
108
86

96
115
104
174
40

12
79
73
52
24

59
7.7
681
991

68
1560
2090
1890
959
806

295
169
322
121
166

36
1070
834
607
453

513
658
604
1080
123

21
228
201
133
47

CHEHALIS RIVER BASIN Continued

12-381. WISHKAH RIVER NEAR WISHKAH, WASH.

LOCATION. At county road bridge 500 feet upstream from East Fork, 2.3 miles downstream from Hamilton Canyon, and 3.2 miles south of Wisbkab, Grays Harbor County.
RECORDS AVAILABLE. Chemical analyses: October 1962 to September 1965.
REMARKS. No discharge records available.

Chemical analyses, In parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 26, 1964

Jan. 12, 1965
Feb. 15......

Sept. 13.....

Mean

discharge
(cfs)

Silica

(S102)

14

12

16

17

Alu-
mi-

num

(Al)

Iron

(Fe)

0.26
.23

.26
.24

_
_
_

~

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

6.0

4.4
3.6

6.8

7.6

Mag-
ne-

sium

(MR)

2.4
2.6

1.5
1.4

1.6
3.1

3.6

Sodium

(Na)

4.2
3.6

3.3
2.9
3.3

4.6

4.9

Po-
tas-

sium

(K)

0.8

. 1

. 7

Lith-

ium

(Li)

Bl-

ear -

bon-

ate

(HCOj)

34

22
20

44

Car-
bon-

ate

PQJ

0

0

0

Sulfate

(S04)

2.2

1.6
1.6

2.0

2.2

Chloride

(ci)

3.8
3.5

3.0
2.8

4.2

4.2

Fluo-
ride

(F)

0.1
. 1

.0

.1

.2

. 1

Ni-

trate

(NO,)

0.7
1.0

.9
.7
. 7

. 2

. 3

Phos-

phate
(P0«)

0.02
.02

.00
. 02

.02
.03
.06
. 05

Dissolved
solids

(residue
at 180"C)

A 51

39
36

60

A 63

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

25
23
16
17
15

30

34

Non-
car -

bon-

ate

0
0

0
0
0

0

0

To-
tal
acid

ity
as

H+ 1

Specific
conduct

ance

(micro-
mhos at

25*C)

69
65

52
44
54

52
79
84
88

pH

7.4
7 5
6 9
6.8
7 T
6 9

7 \
7 3
7 3
7.3

Col-

or

5
0

5
5

5
5
5
5

D.O.

(dis-
sol-
ved
oxy-

ppm)

11.8
12.3

12.5
11.9
12.1

11.0
9.1
8.7
9.8

MPN

(coli-
form
colo-

nies

per

430
230

91
2400
36

430
230
230
430

A Calculated from determined constituents.

Analyses, in parts pe of trace elements

Periodic determinations of suspended-sediment discharge _____water year October 1964 to September 1965_____

Date of
collection

Dec. 15, 1964....

Time

(24 hr)

1400

Chromium

Hexa-

valent

(Cr«)

0.00

Total

(Cr)

0.00

Cop-

per

(Cu)

0.02

Zinc

(Zn)

0.05

Ar-

senic

(As)

0.00

Boron

(B)

0.00

Date

De . 1.. ....

Time

(24 hr)

0100
1200
1205
0350
0920
2050

Water
tem-

per-
ature

(°F)

48
50
47
47
45
48

Discharge
(cfs)

2000
1550
650
4300
2090
3390

Suspended sediment

Mean
concen-

tration

(ppm)

156
63
21
334
58
124

Discharge
(tons per day)

842
264
37
3880
327
1130

HOQUIAH RIVER BASIN

12-385. WEST FORK HOQUIAM RIVER NEAR HOQUIAM, WASH.

LOCATION. At bridge on U.S. Highway 101, 0.5 mile downstream from Poison Creek, 0.8 mile downstream from Hoover Creek, and 4.2 miles northwest of Hoqulam Grays Harbor County. ' RECORDS AVAILABLE. Chemical analyses: October 1962 to September 196b.
REMARKS. No discharge records available.

alys in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 26, 1964

Jan. 12. 1965

Sept . 13 .....

Mean

discharge
(cfs)

Silica

(S102)

16
14
9.2
12
11
13

14
11

17
17
19

Alu-
mi-

num

(Al)

Iron

(Fe)

0.48
.25
.28
. 19
. 15
. 18

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

5.0
4.5
2.0
2.8
2.8
3.2

4.4
4.0

6.0
6.4
6.8

Mag-
ne-

sium

(Mg)

.6
. 2
.3
. 2
.2
.7

. 5

'.0

.2

Sodium

(Na)

4.5
4.6
3.1
3.7
3.6
3.8

4.3
3.7

4.8
5.0
13

Po-
tas-

sium

(K)

0.

1 .

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

31
27
12
16
15
20

26
21

34
38
41

Cap
ben-

ate

pg

0
0
0
0
0
0

0
0

0
0
0

Sulfate

(S04)

1.4
. 8
.0
. 8
1.0
.4

.8
.4

.6
1.0
2.2

Chloride

(Cl)

5.8
4.8
4.0
5.0
4.8
4.8

5.0
4.5

5.8
5.2
19

Fluo-

ride

(F)

. 1
.0
.0

. 1
.0

.0
.0

.1
.1
.1

Ni-

trate

(NO,)

.4
. 5
. 6
.4
.4

.3
.3

. 2
. 2
.2

Phos-

phate
(P0«)

.02
.01
.00
.01
.01

.03
.01

.03
.02
.03

Dissolved
solids

(residue
at 180°C)

A 52
44
25
38
34
41

44
40

53
A 57
86

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

23
20
10
12
12
15

20
16

26
28
34

Non-
car -

bon-

ate

0
0
0
0
0
0

0
0

0
0

J

To-

tal
acid

ity
as

H+l

Specific
conduct-'

ance

(micro-
mhos at

25'C)

68
61
36
45
42
50

61
51

73
80
133

PH

7.3
7.4
6.9
6.8
7.4
7.1

7.2
7.1

7.4
7.2
7.2

Col-

or

5
5
5
5
5
0

5
10

5
5
5

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

12.1
12.3
12.1
12.2
11.9
12.2

11.9
11.0
10.3
9.4
8.0
9.1

MPN

(coli-
forin
colo-

nies

per

100 ml)

2400
150
230
91
230
2400

930
430

430
2400
150

A Calculated fr determined constituents

Analyses, in parts per million, of trace ele

Date of
collection

Dec. 15, 1964.....

Time

(24 hr)

1330

Chromium

Hexa-

valent

(Cr«)

0.00

Total

(Cr)

0.00

Cop-

per

(Cu)

0.02

Zinc

(Zn)

O.05

Ar-

senic

(As)

0.00

Boron

(B)

0.00

QUINAULT RIVER BASIN

12-393. NORTH FORK QUINAULT RIVER NEAR AMANDA PARK, WASH. LOCATION. Temperature recorder at gaging station, 5.2 miles upstream from mouth, and 18 miles northeast of Amanda Park, Jefferson County.
DRAINAGE AREA. 74.1 square miles.
RECORDS AVAILABLE. Water temperatures: March to September 1965.
EXTREMES, March to September 1965. Water temperatures: Maximum, 58°F Aug. 7, 16-18.

Temperature (°F) of water, March to September 1965

October

November

December
Maximum ....

January

February

March
Maximum ....

April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....

Minimum ....
July
Maximum ....
Minimum ....

Maximum ....
Minimum ....
September
Maximum ....

1

40
40

42
40

47
43

52
48

57
55

55

2

41
40

42
40

48
44

b2
48

b6
bb

b3

3

42
40

42
41

47
43

5?
48

55
53

53

4

42
40

41
4C

48
44

b2
49

b3
b3

bl

5

42
41

41
40

48
44

b3
49

55
5?

b3

6

41
40

42
40

48
44

54
bU

56
b3

S3

7

41
4U

43
41

48
44

b3
bU

58
54

b3

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4y
40

44
41

4 /
4b

51
49

56
54

51

9

42
42

44
42

48
4b

BO
49

b7
54

53
51

10

42
41

44
42

4/
45

49
48

b /
5b

b3

11

43
41

44
42

47
46

49
4°

56
54

bl

12

43
42

44
42

46
44

bl
48

b6
53

bl

13

42
42

43
41

46
4b

52
50

53
*?

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14

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4?

4?
41

46
45

53
bl

55
57

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15

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42

4?
41

46
46

b4
52

57
53

50

Day

16

-

4?
42

41
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50
46

S4

bl

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PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

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II ll ll II ll ll II -*nco*o f-o j «o o- r-
II ii ll II ii ll II -*-» -*<f ir"- IP in .a<f

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II II II II II II II -*cvu-vJ-tvO*di\j.-HO

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II ii II ll ii ii ll <ft^f-iro>co*cmr\jo>

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II II II II II II II rv f-in(\.CF-<\j.-io>

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ll ll ll ll ii ii ll t-'or-d-rvoini-icoo'

II ll II II II ii II r-icr~<frHi><frt we-
ll II II II II II II <f<f<f<ttr><finininj-

II II II II II II II <fj-<f<tin<fininm<f

II II II II II II lli-O-O-SrH^m^^O-

II ll II II II ll II rHc-o.aoch.snj.-H

II II II II II ll II f-Hooc^ocoinmjo

e e ^ e e ee ee ee eg ee ee ee ee e e u e s
33 h 331-33 33 33 33 33 33 33 33 33VJ33 ^ e e^ e e^ e e ^e g >-e g eg gg gg gg ee ge^ee
- QgcSgcgxS|5gS§ScjsB5 S5 gc S5 i°^i°§^^

OZQ^^S^S^^^,^

gSS gSSgs'S gSSiSS sSSlS-i S-SS cSS^-SS |S2K.S2

389-675 O - 70 - 5

SKOKOMISH RIVER BASIN Continued

12-595. NORTH FORK SKOKOMISH RIVER NEAR POTLATCH, WASH.

LOCATION. Temperature recorder at gaging station,1 mile upstream from mouth, 6 miles southwest of Potlatch, Hason County, and 7 miles downstream from city of Tacomas Cushman Dam No. 2.
DRAINAGE AREA. 117 square miles, including 99 square miles above Cushman Dam No. 2, which is normally noncontributing. RECORDS AVAILABLE. Water temperatures: March to September 1965.
EXTREMES, March to September 1965. Water temperatures: Maximum, 65°F July 30.

Temperature (°F) of water, March to September 1965

October

November

December

January

February

March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum
August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

1

- -

48
47

52
47

59
50

62
53

62
56

59
52

2

49
46

b2
46

60
51

63
54

60
b6

bS
54

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44

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46

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57
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58
52

4

46
42

52
4b

52
46

60
51

62
54

5f
bb

56
52

5

46
4k

49
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bk
45

61
52

63
54

62
bb

bl
52

6

46
42

46
43

54
45

61
52

64
54

63
bb

b8
bl

7

46
42

50
45

bb
46

62
52

64
55

63
bb

b8
bl

8

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b6
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b8
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bb

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4f

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4f
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4f

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SKOKOMISH RIVER BASIN Continued

12-598. SOUTH FORK SKOKOMISH RIVER NEAR HOODSPORT, WASH.

LOCATION. Temperature recorder at gaging station, 100 feet downstream from Pine Creek, and 13.5 miles west of Hoodsport, Hason County.
DRAINAGE AREA. 26.0 square miles.
RECORDS AVAILABLE. Water temperatures: October 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 57°F on several days during July; minimum, 34°F Jan. 1, 2.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
Decembet
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 ....

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Day

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Average

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SKOKOMISH RIVER BASIN--Continued

(12-615. SKOKOHISH RIVER NEAR POTLATCH, WASH.

LOCATION. Temperature recorder at gaging station on upstream side of right pier of bridge on U.S. Highway 101, 3.4 miles downstream from confluence of North and South Forks, 4.7 miles southwest of Potlatch, Mason County, and 4.9 miles upstream from mouth.
DRAINAGE AREA. 227 square miles.
RECORDS AVAILABLE. Chemical analyses: August 1960 to September 1961.
Water temperatures: Hay 1955 to September 1962, October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 58°F on several days during July; minimum, 35°F Jan. 1, 2.
EXTREMES, 1955-62, 1963-65. Water temperatures: Maximum, 69°F July 13, 1961; minimum (1955-62, 1964-65), 35°F Jan. 1, 2, 1965. REMARKS. Clock was stopped Aug. 24 to Oct. 8; temperature range, 50°F to 57°F.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Dec. 14, 1964.
June 2, 1965..

Mean

discharge
(cfs)

1130
542

Silica
(Si02)

11
12

Alu-
mi-
num

(Al)

Iron

(Fe)

0.04

Man-
ga-
nese

(Mn)

Cal-
cium

(Ca)

8.0
8.4

Mag-
ne-

sium

(Mg)

1.6
2.0

Sodium
(Na)

1.9
2.2

Po-
tas-
sium

(K)

0.3
.3

Lith-
ium

(Li)

Bi-
car-

bon-
ate

(HCO,)

35
37

Car-
bon
ate
PW

0
0

Sulfate
(80 1)

2.0
1.4

Chloride
(CD

1.2
1.0

Fluo-
ride
(F)

0.0

.1

Ni-
trate

(NO,)

0.3
. 3

Phos-

phate
(P0«)

0.04
. 02

Dissolved
solids
(residue
at 180°C)

46
46

as CaCO,

Cal-

cium,
mag-
nesium

26
29

Non-
car-

bon-
ate

0
0

To-
tal
acid
«y
as
H+l

Specific
conduct^
ance

(micro-
mhos at
25'C)

62
67

PH

7.8
7.5

Col-

or

5
0

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

11.2
10.0

(coli-
lorm
colo-
nies
per

JOO ml)

21
110

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 14, 1964.
June 2. 1965.

Time

(24 hr)

0900
1005

Chromium

Hexa-
valent
(Cr»)

0.00
.01

Total
(Cr)

0.00
.01

Cop-
per

(Cu)

0.01
.02

Zinc

(Zn)

0.05
05

Ar-
senic

(As)

0.01
.00

Boron

(B)

0.00
.01

SKOKOMISH RIVER BASIN Continued

12-615. SKOKOMISH RIVER NEAR POTLATCH, WASH. Continued

Temperature (°F) of water, water year October 1964 to September 1965_

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

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49

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Average

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CHICO CREEK BASIN

12-720. CHICO CREEK NEAR BREMERTON, WASH.

LOCATION. At gaging station on left bank at highway crossing, 0.5 mile downstream from Dickerson Creek, and 2.5 miles northwest of Bremerton. Kitsap DRAINAGE AREA. 15. 3 square miles.
RECORDS AVAILABLE. Chemical analyses: November 1964 to September 1965.

Chemical analyses, in parts per million, November 1964 to September 1965

Date
of
collection

Nov. 17, 1964

Jan. 26, 1965

June 3 ....

Aug. 3.......

Mean

discharge
(cfs)

6.0
21
95
30
26

82
21
7.8
2.6

6.3

Silica

(SiO2)

12
12
8.1

8.3

8.3

12
13

11

Alu-
mi-
num

(Al)

Iron

(Fe)

0.20
. 11
.09

.07

.05

.09
.08

.09

Man-

ga-

nese

(Mn)

Cal-
cium

(Ca)

9.0
8.0
5.6

6.8

6.0

8.0
9.2

6.8

Mag-
ne-

sium

(Mg)

3.1
2.9
2.0

2.3

2.3

3.1
3.1

2.0

Sodium
(Na)

3.3
2.9
2.2

2.5

2.3

3.2
3.4

2.9

Po-
tas-
sium

(K)

0.4
.2
.0

.2

.2

.3
.4

. 5

Lith-
ium

(Li)

Bi-
car-

bon-
ate

(HCO,)

44
38
26

33

29

41
45

34

Car-
bon-
ate

TO

0
0
0

0

0

0
0

0

Sulfate

(S0«)

3.0
3.0
2.8

3.0

2.4

3.6
2.4

.4

Chloride

(Cl)

2.5
2.2
1.0

2.0

1.5

1.8
2.0

1.5

Fluo-
ride

(F)

0.1
.0
. 1

.0

.1

.0

.1

.0

Ni-
trate

(NO,)

1.6
1.5
1.3

.9

1.6

.8
.0

. 5

Phos-

phate
(P0«)

0.08
.06
.02

.01

.04

.05
.05

.03

Dissolved
solids

(residue
at 180°C)

58
54
41

46

A 39

A 53
59

49

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

36
32
22

26

24

33
36

25

Non-
car -

bon-
ate

0
1
0

0

0

0
0

0

To-
tal
acid
ity
as

H+l

Specific
conduct-

ance

(micro-
mhos at
25°C)

86
75
55

64

59

78
84

63

PH

7.1
7.0
7.1

7.0

7.2

7.5
7.7

7.1

Col-

or

5
5
10

5

10

5
5

5

D.O.
[dis-
sol-
ved
oxy-
gen
ppm)

11.6

10.6

9.1

MPN

(coli-
form
colo-
nies

per

100 ml)

930

750

430

4600

A Calculated from determined constituents.

Analyses, in parts per million, of tra

Date of
collection

Apr. 20, 1965....

Time

(24 hr)

1200

Chromium

Hexa-
valent

(Cr«)

0.00

Total

(Cr)

0.00

Cop-
per
(Cu)

0.07

Zinc

(Zn)

0.05

Ar-
senic

(As)

0.00

Boron

(B)

0.01

GOLDSBOROUGH CREEK HASIN

12-770. GOLDSBOROUGH CREEK AT SHELTQN, WASH,

from mouth. LOCATION. At bridge on U.S. Highway 101 in Shelton, Mason County, and 0.3 mile upstre RECORDS AVAILABLE. Chemical analyses: November 1964 to September 196S.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, November 1964 to September 1965

Date
of
collection

Nov. 2, 1964
Nov. 19.....
Dec. 14. ....
Jan. 12,1965
Feb. 15.. ...

July 13.. ...
Aug. 3......
Sept. 14....

Mean

discharge
(cfs)

Silica

(SiO2)

17
17
13
14
12
13

15
13
15
19
19
19

Alu-
mi-

num

(Al)

Iron

(Fe)

0.66
.54
.26
. 17
. 18

.54

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

18
20
9.5
9.2
8.8
12

18
13
18
27
27
24

Mag-
ne-

sium

(Mg)

6.9
8.0
3.8
3.9
3.5
4.1

6.4
4.5
7.5
11
11
11

Sodium

(Na)

.0
.2
. 1
.0

.9

.2
.2
.0
.5
.6
.4

Po-
tas-

sium

(K)

0.6
.5
.2
.2
.2
. 1

.6
.3
.2
.5
.5
.3

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCOJ

84
96
46
45
42
54

84
60
87
128
128
118

Cap.
bon-

ate

POO

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(S04)

5.6
6.4
2.8
3.2
3.8
4.6

6.0
4.0
5.8
9.4
9.8
8.4

Chloride

(Cl)

6.2
3.5
3.0
2.5
2.0
3.2

3.0
2.5
3.0
3.5
4.0
4.0

Fluo-
ride

(F)

0.

Ni-

trate

(NOJ

0.8
. 5
.3
. 6
.5
.3

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

Phos-

phate
(PO.)

0.08
.05
.02
.00
.03
.02

.05
.04
.02
. 13
.08
. 13

Dissolved
solids

(residue
at 180°C)

110
113
65
61
59
73

A 95
A 71
105
151
148
142

Hardness

as CaCO,

Cal-

cium,
mag-
nesium

74
83
39
39
36
48

71
51
76
113
112
104

Non-
car -

bon-

ate

4
4
2
2
2
4

2
2
4
8
8
8

To-

tal
acid-

ity
as

H+1

Specific
conduct*

ance

(micro-
mhos at

25"C)

160
175
91
92

103

152
111
158
224
227
211

PH

. 1
.5
.7
.0
.8
.3

.7
.7
.2
'.4

.2

Col-

or

50
40
25
20
20
20

30
35
20
40
35
30

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

11.0

11.2
12.5
11.8
11.7

11.7
10.2
9.4
10.0
8.4
9.2

MPN

(coli-
form
colo-

nies

per

100 ml)

2400
36
430
230
230
930

430
230
230
73
430
430

A Calculated fr nined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 14, 1964....
June 2, 1965. ....

Time

(24 hr)

0830
0855

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.01
.01

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

o.oo
.00

Boron

(B)

0.00
.00

NISQUALLY RIVER BASIN

12-825. NISQUALLY RIVER NEAR NATIONAL, WASH.

LOCATION. Temperature recorder at gaging station,100 feet downstream from railroad bridge, 1 mile west of National, Pierce County, 2.5 miles west of Asbford, and 3 miles upstream from Mineral Creek.
DRAINAGE AREA. 133 square miles.
RECORDS AVAILABLE. Water temperatures: October 1951 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 64°F July 23.
EXTREMES, 1951-65. Water temperatures: Maximum, 65°F July 13, 1961; minimum (1951-63), freezing point on many days during winter months.
REMARKS. Recorder not operating properly Oct. 23 to Apr. 28.

Temperature (°F) of water, water year October 1964 to September 1965

October

November

December

February

March

April
Maximum ....

May
Maximum ....

June
Maximum ....
Minimum ....

July
Maximum ....
August""1""""

Maximum ....

September
Maximum ....

1

45

55

60

60

54
46

2

44

56

59

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42

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5

41

55

60

60

6

46

60

61

7

49

60

61

8

50

54

60

9

52

55

55

10

53

52

57

11

53

51

55

12

51

59

50

13

50

61

58

14

50

61

60

15

44

60

60

Day

16

44

61

60

17

46

59

61

18

50

57

61

19

46

55

52

20

47

51

52

21

50

50

54

22

46

61

51

23

44

64

50

24

45

56

63

51

25

52

50

62

50

48

26

54

48

60

53

48

27

55

55

55

53

48

28

54

58

57

50

46

29

50

60

58

54

>n

48

30

48

60

58

54

5?
49

31

45

58

56

48

54
45

58

56

51
46

CHAMBERS CREEK BASIN

12-906. CLOVER CREEK ABOVE STEILACOOM LAKE, NEAR TACOMA, WASH.

LOCATION. At Clover Crest Drive Bridge, 0.4 mile upstream from Steilacoom Lake, and 2.2 miles southwest of Tacoma, Pierce County. RECORDS AVAILABLE. Chemical analyses: October 1962 to September 1965 (discontinued).
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 20, 1964

Jan. 28, 1965

Mean

discharge
(cfs)

Silica

(Si02)

13
17
21
14
12
14

13
12
7.4
11
9.5
8.4

Alu-
mi-

num

(Al)

Iron

(Fe)

0.13
.26

.24
. 16

.08

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

10
10
9.5
8.0
8.8
8.4

8.4
8.8
8.4
9.2
10
9.6

Mag-
ne-

sium

(Mg)

3.2
3.2
3.5
3.0
2.8
2.9

3.0
2.9
3.3
3.2
3.7
3.8

Sodium

(Na)

.1
. 7
.8
.8
.7
.4

.2
.7
.8
.9
5.1
5.3

Po-
tas-

sium

(K)

0.8
1.1
1.5
1.2
.8
.8

1.0
.7
.6
.8
1.2
1.0

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(Hccg

46
43
48
34
36
37

38
38
40
42
44
48

Car-

bon
ate

TO

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(SO.)

5.0
5.4
4.2
6.2
5.8
5.8

5.6
5.4
5.0
5.6
8.0
5.4

Chloride

(Cl)

4.0
3.5
3.0
4.0
4.5
4.0

3.5
4.5
3.5
3.5
4.0
4.0

Fluo-

ride

(F)

0.0
. 2
.2
.0
.1
.2

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

Ni-

trate

(NO,)

3.2
3.1
2.9
4.5
3.5
3.2

2.2
2.3
2.5
1.9
2.9
2.5

To-
tal

Phos-

phate
(P0«)

0.35
. 17
.06
. 17
.08
.30

. 10
.06
. 14
.27
.22
. 18

Dissolved
solids

(residue
at 180°C)

70
76
76
66
65
69

60
A 61
58
A 61
74
66

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

38
38
33
32
34
33

33
34
34
36
40
40

Non-
car -

bon-

ate

0
3
0
4
4
2

2
3
2
2
4
0

To-

tal
acid-

ity
as

H+1

Specific
conduct"

ance

(micro -
mhos at

25°C)

105
101
100
92
91
91

89
91
92
95
107
106

PH

6.8
7.7
7.7
7.3
7.1
7.2

7.0
7.0
7.1
7.4
6.9
7.4

Col-

or

5
10
5
15
10
10

5
5
5
5
5
5

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

11.8
11.7
11.2
10.2
12.1
10.7

12.3
11.4
11.9
11.5
12.7
8.8

MPN

(coli-
form
colo-

nies

per

100 ml)

750
430
2400
930
150
91

73
73
430
430
24000
1500

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Nov. 28, 1964....
May 5, 1965. .....

Time

(24 hr)

1420
0950

Chromium

Hexa-

valent

(Cr«)

o.oo
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.05
.03

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.01
.00

CHAMBERS CREEK BASIN Continued

12-911. FLETT CREEK AT TACOMA, WASH.

LOCATION. At Custer Road Bridge, 0.3 mile upstream from gage, 0.5 mile west of Tacoma, Pierce County, and 0.9 mile upstream from mouth. DRAINAGE AREA. 8.01 square miles upstream from gaging station, not including some urban storm drainage outside the basin RECORDS AVAILABLE. Chemical analyses: October 1962 to September 1965 (discontinued).
REMARKS. No inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 20, 1964

Jan. 28, 1965

Aug. 3.......

Mean

discharge
(cfs)

2.5
4.0
4.5
19
10
7.7

9.7
6.3
3.9
2.1
1.1
1.1

Silica

(Si02)

20
20
19
15
13
15

14
15
14
16
14
15

Alu-
mi-

num

(Al)

Iron

(Fe)

0.14

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

18
20
17
14
13
14

15
15
15
18
18
18

Mag-
ne-

sium

(Mg)

8.0
8.5
6.9
5.4
4.6
6.0

5.5
5.6
6.7
7.1
8.4
8.9

Sodium

(Na)

7.7
8.1
7.6
6.6
6.4
6.6

6.1
6.6
7.0
7.4
9.0
7.8

Po-
tas-

sium

(K)

2.8
3.7
3.0
2.8
1.7
1.9

2.6
1.6
2.2
2.8
3.4
2.7

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

69
61
56
42
37
44

48
46
52
64
74
75

Car-
bon-

ate

W

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(S0«)

18
29
25
21
18
20

21
19
19
21
20
21

Chloride

(Cl)

10
9.5
7.8
6.5
7.2
9.0

7.0
8.0
7.0
8.0
10
8.8

Fluo-

ride

(F)

0.1
.2
.2
.2
. 1
. 1

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

Ni-

trate

(NO,)

8.3
12
12
11
11
9.9

7.9
9.8
12
8.2
8.3
7.5

Phos-

phate
(P04)

0.22
.32
.30
.46
.21
.23

.60
. 13
. 17
.35
.35
.20

Dissolved
solids

(residue
at 180°C)

126
150
A 127
110
99
A 105

121
105
A 109
A 120
132
129

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

78
85
71
57
52
60

60
60
65
74
80
82

Non-
car-

bon-

ate

22
35
25
22
21
24

20
23
22
22
19
20

To-

tal
acid-

ity
as

H+ 1

Specific
conduct*

ance

(micro-
mhos at

25*C)

201
220
190
155
143
161

161
159
171
192
211
206

PH

7.8
6.8
7.4
7.5
7.6
7.0

6.9
7.8
7.8
7.2
7.1
6.9

Col-

or

5
30
15
50
25
15

35
10
10
10
10
5

D.O.

(dis-
SOl-j
ved
oxy-
gen
ppm

11.8
7.7
9.0
7.3
8.8
7.9

7.4
9.0
12.8
10.4
8.6
9.2

MPN

(coli-
form
colo-

nies

per

100 ml)

750
L1000
91
2400
4600
2100

24000
1500
2400
2400
4600
1500

A Calculated from determined constituents

Analyses, in parts per million, of trace elements

Date of
collection

Nov. 28, 1964....
May 5, 1965.. ....

Time

(24 hr)

1545
0920

Chromium

Hexa-

valent

(Cr»)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.01
.06

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.03
.01

CHAMBEBS CREEK BASIN Continued

12-913. LEACH CREEK NEAR STEILACOOM, WASH.

LOCATION. At gaging station at bridge on Bridgeport Way Road, 0.3 mile upstream from mouth, and 4 miles northeast of Steilacoom, Pierce County DRAINAGE AREA. 5.88 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1962 to_S_eptember 1965 (continued).
REMARKS. No inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 20, 1964

Jan. 28, 1965

May 5

Aug. 3.......

Mean

discharge
(cfs)

8.6
10
10
17
9.1
8.6

15
7.8
5.7
5.3
5.5
6.1

Silica

(Si02)

27
25
25
17
25
24

22
24
25
28
28
29

Alu-
mi-

num

(Al)

Iron

(Fe)

0.25

.29
. 12

.06

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

12
12
12
8.8
12
12

10
12
12
13
12
14

Mag-
ne-

sium

(Mg)

8.6
7.9
7.8
5.1
8.0
8.2

7.2
8.8
8.9
8.6
9.2
8.1

Sodium

(Na)

6.0
5.8
5.8
4.3
6.2
6.7

5.0
6.2
6.1
6.0
6.1
6.1

Po-
tas-
sium

(K)

. 7
.8
.8
. 2
. 3
. 6

.5
.2
.3
.6
.5
. 5

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

67
60
62
39
64
62

55
66
67
70
69
70

Car-
bon-

ate

W

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(SO.)

13
15
15
13
13
15

13
13
13
14
14
14

Chloride

(Cl)

5.2
4.8
4.8
3.5
5.0
6.0

3.5
5.5
5.0
4.8
4.5
5.0

Fluo-

ride

(F)

0.1
.3
.3
. 1
. 1
.2

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

Ni-

trate

(NO,)

4.0
4.2
4.0
3.4
4.1
5.0

3.6
3.9
4.3
5.0
4.0
4.1

Phos-

phate
(P0«)

0.22
.21
. 15
. 18
.21
. 17

. 18
.24
.42
.44
.51
. 30

Dissolved
solids

(residue
at 180°C)

112
115
109
83
110
112

92
A 107
111
A 115
118
121

Hardness
as CaCOs

Cal-

cium,
mag-
nesium

65
62
62
43
63
64

54
66
67
68
68
68

Non-
car -

bon-

ate

10
14
11
11
10
13

10
12
12
10
12
11

To-

tal
acid

ity
as

H+1

Specific
conduct-

ance

(micro-
mhos at

25°C)

160
153
154
111
155
162

133
159
163
161
167
167

PH

.6
.6
.2
. 1
.4
. 5

.3
.4
.6
.4
.8
. 5

Col-

or

5
25
20
40
10
10

50
5
5
5
5
0

D.O.

(dis-
sol-
ved
oxy-
gen
ppm

11.0
11.1
11,1
11.2
10.7
10.9

10.0
10.7
9.3
9.6
9.3
10.3

MPN

(coli-
form
colo-

nies

per

100 ml)

390
1500
2400
2100
91
11000

4600
150
1500
430
4600
750

A Calculated

Analyses, in parts per million, of trace elements

Date of
collection

Nov. 28, 1964....
May 5, 1965. .....

Time

(24 hr)

1615
0905

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.10
.04

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.01
.00

Boron

(B)

0.06
. 01

CHAMBERS CREEK BASIN Continued

12-915. CHAMBERS CREEK BELOW LEACH CREEK, NEAR STKILACCOM, WASH. (Formerly published as Chambers Creek near Steilacoom, Wash.)

LOCATION. At Chambers Creek Road Bridge, 0.9 mile upstream from mouth, 1.5 miles northeast of Steilacoom, Pierce County, and 2.2 miles downstream from gaging station.

DRAINAGE AREA. 104 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1962 to September 1965.
REMARKS. No inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 20, 1964

Jan. 28, 1965

Mean

discharge
(cfs)

Silica

(Si02)

17
17
17
16
16
15

11
13
12
16
17
22

Alu-
mi-

num

(Al)

Iron

(Fe)

0.07

. 19
. 11

.04

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

11
12
11
10
10
10

10
11
11
12
12
12

Mag-
ne-

sium

(Mg)

5.4
5.1
5.5
4.1
4.0
4.6

4.5
4.3
5.4
5.1
5.2
5.5

Sodium

(Na)

5.7
5.8
6.1
5.3
5.2
5.2

5.0
5.6
5.7
5.8
5.7
5.9

Po-
tas-

sium

(K)

1.1
. 5
. 5
.2
.0
.1

. 1
.9
.0
.4
. 3
1.4

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

55
52
53
41
43
45

46
49
51
52
55
56

Ca^
ben-

ate

peg

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(SO,)

8.8
11
10
10
8.8
9.2

8.8
9.0
9.2
10
9.8
10

Chloride

(Cl)

4.5
4.8
' 4.5
4.5
4.8
5.8

4.8
4.0
4.2
4.8
4.8
4.5

Fluo-

ride

(F)

0.0
.2
.2
. 1
. 1
.2

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

Ni-

trate

(NO,)

3.4
4.1
4.0
5.6
4.9
4.1

3.6
3.9
3.4
4.6
4.2
4.4

Phos-

phate
(PO.)

0.25
.25
.22
.32
. 14
. 12

. 18
.38
.22
1.2
1.1
.48

Dissolved
solids

(residue
at 180°C)

85
90
86
A 77
77
A 77

74
77
A 77
A 87
89
96

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

50
51
50
42
42
44

44
45
50
51
51
53

Non-
car-

bon-

ate

4
8
6
8
6
7

6
5
8
8
6
7

To-

tal
acid

ity
as

H+ l

Specific
conduct-

ance

(micro-
mhos at

25'C)

130
134
130
114
112
117

114
118
123
132
133
139

pH

7.1
7.8
7.8
.0
. 3
. 2

. 1
.2
.4
7.1
7.7
7.2

Col-

or

5
5
5
10
5
5

10
5
5
5
5
0

D.O.
CdiST
sol-
ved
oxy-
gen
ppm)

9.7
10.8
10.9
11.3
9.8
10.7

9.9
9.8
8.8

8.3
9.4

MPN

(coli-
form
colo-

nies

per

100 ml)

230
930
230
2400
91
91

430
91
73
150
930
230

A Calculated from determined constituents.

Analyses, in

Date of
collection

Nov. 28, 1964....
May 5, 1965. .....

Time

(24 hr)

1630
0830

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.05
.02

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.02
.01

Boron

(B)

0.02
.04

PUYALLUP RIVER BASIN

12-966. WHITE RIVER NEAR GREENWATER, WASH.

LOCATION. Temperature recorder at gaging station at Yakima Park road crossing, 1 mile upstream from Fryingpan Creek, and 18.5 miles south of Greenwater, Pierce County.
DRAINAGE AREA. 16.2 square miles.
RECORDS AVAILABLE. Water temperatures: December 1964 to September 1965.
EXTREMES, December 1964 to September 1965. Water temperatures: Maximum, 48°F July 14; minimum, freezing point on several days during December, February, and March.

Temperature (°F) of water, December 1964 to September 1965

October

November

December
Maximum ....
Minimum ....
January
Maximum ....
Minimum ....

Maximum ....
Minimum ....

Maximum ....
Minimum ....
April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

Day

1

3 3
33

33
33

36
32

37
35

37
35

45
3/

42
37

43
38

43
37

2

34
33

35
33

36
33

38
35

39
34

45
37

44
38

39
38

43
36

3 4

34
33

3b
34

37
33

41
33

38
36

44
36

44
38

43
38

42
36

34
33

35
34

3/
32

40
35

38
34

44
36

44
38

42
38

41
36

5

3b
33

34
33

3/
33

37
3b

38
34

44
3/

44
37

42
3 /

40
36

6

3b
34

33
33

3 /
34

37
34

43
3b

7 8 9

,,

10

34
33

3b
33

3 /
34

38
33

44
34

44
3 /

44
37

43
36

43
36

44
37

44
38

44
3 /

43
36

3b
33

35 35
34

34
32

3/
34

39
34

44
3t>

44
38

43
37

4&
37

43
36
I

3b

33 34
32

38
34

37
35

44
36

44
38

40
37

40
37

42

33

39
35

39
33

42
36

44
38

40
38

44
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3b

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3b

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3?

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37 37

39 43
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PUYALLUP RIVER BASIN Continued

12-1005. WHITE RIVEH NEAR SUMNER, WASH.

LOCATION. At bridge on Washington Highway 5, 1.7 miles upstream from gaging station, 2.8 miles upstream from White River Powerplant outlet canal, of Sumner, Pierce County.
DRAINAGE AREA. 470 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1961 to September 1965.
REMARKS. 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 1964 to September 1965

nd 4 miles north

Date
of
collection

Oct. 28, 1964

Jan. 11, 1965

May 5........

Mean

discharge
(cfs)

82
779
530
109
490
118

102
808
1080
148
156
94

Silica

(Si02)

14
14
14
18
16
14

19
13

15
13
16

Alu-
mi-

num

(Al)

Iron

(Fe)

0.11

. 13
.30

.32

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

10
6.5
7.0
10
7.2
9.2

10
6.4

9.2
8.8
11

Mag-
ne-

sium

(Mg)

3.1
1.5
1.8
2.5
1.7
2.5

2.5
1.4

2.2
2.0
3.0

Sodium

(Na)

4.5
3.4
3.9
4.2
3.4
4.0

4.5
3.2

4.0
4.1
5.3

Po-
tas-

sium

(K)

1.2
1.2
1.0
2.2
.8
1.1

. 8
. 6

. 9
1.0
1.0

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

44
26
28
39
29
38

41
26

38
34
44

Car-
bon-

ate

py

0
0
0
0
0
0

0
0

0
0
0

Sulfate

(SO.)

10
7.2
8.8
8.4
7.2
9.2

9.6
6.6

9.2
10
13

Chloride

(CD

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

.is

. 5
. 8
.0

Fluo-

ride

(F)

0.

Ni-

trate

(NO,)

0.2
.0
. 8
2.3
.9
.3

. 5
. 1

. 2
. 3
.2

Phos-

phate
(P04)

0.09
. 06
.06
. 10
.07
.04

.04
.08

.05
.09
. 11

Dissolved
solids

(residue
at 180°C)

74
51
55
A 69
59
70

72
47

62
57
75

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

38
22
25
35
25
34

36
22

32
30
40

Non-
car-

bon-

ate

2
0
2
8
1
2

2
0

1
2
4

To-

tal
acid-

ity
as

H+l

Specific
conduct*

ance

(micro-
mhos at

25'C)

100
65
71
92
69
90

94
60

86
84
105

PH

. 1
.6
. 2
. 5
. 3
.2

.4
.2

. 5
.4
.6

Col-

or

5
10
10
5
5
5

5
5

5
5
5

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

11.7
12.2
11.3
12.4
11.7
12.0

11.8
11.7
10.0
9.6
9.5
10.8

MPN

(coli-
form
colo-

nies

per

100 ml)

23
4600
430
430
210
230

230
230
230
73
4600
110

A Calculated from determined constituents.

Analyses, in parts per million, of trace elc

Date of
collection

Mar. 30, 1965....
Sept. 8. ....

Time

(24 hr)

0830
1405

Chromium

Hexa-
valent

(Cr«)

0.00
.no

Total

(Cr)

0.00
.no

Cop-
per

(Cu)

0.03
.04

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.nn

Boron

(B)

0.02
01

DUWAMISH RIVER BASIN

12-1126. BIG SOOS CREEK ABOVE HATCHERY, NEAR AUBURN, WASH.

LOCATION. At State Fish Hatchery diversion dam.1.0 mile upstream from gaging station, 1.8 miles upstream from mouth, and 3 miles DRAINAGE AREA. 66.7 square miles, excluding 3.67 square miles in vicinity of Youngs Lake, upstream from gaging station. RECORDS AVAILABLE. Chemical analyses: October 1962 to September 1965.
REMARKS. Minor inflow between sampling point and gaging station.

Chemical analyses, in parts per million, water year October 1964 to September 1965

ast of Auburn, King County.

Date
of
collection

Oct. 28, 1964

an. 11, 1965

ay 14 ....

Mean

discharge
(ds)

24
252
254
212
196
102

89
81
37
29
46
36

Silica

(SiO2)

17
12
12
12
12
12

14

17
18
18

Alu-
mi-

num

(Al)

Iron

(Fe)

0.06

. 15
. 11
. 10
. 12

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

10
8.5
9.0
8.4
8.4
9.2

9.2

10
9.6
10

Mag-
ne-

sium

(Mg)

3.9
3.5
3.2
3.1
3.1
3.4

3.5

3.8
4.0
4.0

Sodium

(Na)

5.5
6.2
5.9
5.5
5.4
5.3

5.4

4.9
4.5
6.0

Po-
tas-

sium

(K)

1.2
1.3
1.3
1.7
1.2
1.1

. 7

1.2
1.3
.9

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

50
40
41
37
36
43

46

51
50
53

Car-
bon-

ate

py

0
0
0
0
0
0

0

0
0
0

Sulfate

(S0«)

7.4
10
10
9.2
9.8
10

8.6

6.2
6.2
6.8

Chloride

(Cl)

2.2
2.2
2.2
2.8
2.0
2.0

2.0

2.0
2.5
2.0

Fluo-

ride

(F)

0.1
. 5
. 5
. 1
. 1
. 1

. 1

. 1
. 1
. 1

Ni-

trate

(NO,)

2.8
3.1
2.6
3.2
2.7
1.7

.8

. 8
1.2
. 7

Phos-

phate
(P04)

0.19
.06
.05
.04
.04
.04

.03

.06
.09
.07

Dissolved
solids

(residue
at 180°C)

A 75
69
68
A 64
64
74

68

73
A 72
A 75

Hardness
as CaCOs

Cal-

cium,
mag-
nesium

41
36
36
34
34
37

38

40
40
42

Non-
car-

bon-

ate

0
2
2
3
4
2

0

0
0
0

To-

tal
acid

"y
as

H+ 1

Specific
conduct^

ance

(micro-
mhos at

25°C)

109
102
100
94
95
100

100

104
101
105

PH

7.4
7.6
7.2
7.1
7.3
7.3

7.0

7.4
7.1
7.6

Col-

or

5
25
15
10
15
5

5

5
5
5

D.O.

(dis-
sol-
ved
oxy-

ppm)

11.6
12.2
10.9
12.5
12.1
12.0

11.1
12.5
10.3
10.0
9.7
10.5

MPN

(coli-
form
colo-

nies

per

100 ml)

91
930
36
290
73
91

150
2100
91
73
930
91

A Calculated from determined constituents.

Analyses, In parts per million, of trace elements

Date of
collection

Mar. 30, 1965. . . .
Sept. 8. ....

Time

(24 hr)

1750
1300

Chromium

Hexa-

valent

(Cr«)

0.00
. 00

Total

(Cr)

0.00
. 01

Cop-
per

(Cu)

0.04
.03

Zinc

(Zn)

0.05
. 05

Ar-

senic

(As)

0.00
. 00

Boron

(B)

0.02
.05

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. 399 square miles, excluding 3.67 square miles in the vicinity of Youngs Lake, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
Water temperatures: March 1952 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 70T July 26, 30, 31; minimum, 33°F Dec. 18-21.
EXTREMES, 1952-65. Water temperatures: Maximum, 75°F July 28, 1958; minimum (1952-62, 1963-65), 33°F Feb. 16, 17, 1956, Dec. 18-21, 1964.
REMARKS. Temperature recorder located at gaging station. Minor inflow between sampling point and gaging station except during periods of heavy local runoff. Thermograph not operating properly Feb. 19 to May 4.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 28, 1964

Jan. 11, 1965

Sept. 8......

Mean

discharge
(cfs)

632
2140
2040
1080
2160
999

1110
1660
345
295
255
230

Silica

(Si02)

12
12
13
14
12
13

12

14
14
14

Alu-
mi-

num

(Al)

Iron

(Fe)

0.04

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

7.0
6.5
6.5
7.5
6.0
7.6

5.6

10
10
11

Mag-
ne-

sium

(Mg)

1.5
1.5
1.6
1.9
1.4
1.6

1.2

2.9
3.1
2.8

Sodium

(Na)

3.6
3.5
3.8
3.9
3.3
3.6

3.1

5.0
4.9
5.7

Po-
tas-

sium

(K)

0.6
. 7
. 7
1.0
.2
.6

.3

. 7
.6
.7

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

32
28
30
34
28
33

27

48
48
50

Cap
ber-

ate

TO

0
0
0
0
0
0

0

0
0
0

Sulfate

(SO.)

3.0
4.0
4.0
4.6
4.0
4.4

2.6

5.2
5.0
5.2

Chloride

(Cl)

1.5
1.5
1.8
1.5
1.5
1.5

1.0

2.8
2.5
3.8

Fluo-

ride

(F)

0.1
. 1
. 1
. 1
. 1
. 1

.0

.0
.1
.1

Ni-

trate

(NO,)

0.5
1.7
1.2
1.2
1.1
.8

.2

.9
1.1
. 5

Phos-

phate
(P0<)

0.02
.05
.07
.08
.04
.03

.02

.04
.03
.03

Dissolved
solids

(residue
at 180°C)

49
50
A 48
56
48
53

39

A 66
70
A 69

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

24
22
22
26
21
26

19

37
38
39

Non-
car -

bon-

ate

0
0
0
0
0
0

0

0
0
0

To-

tal
acid-

ity
as

H+ 1

Specific
conduct-

ance

(micro-
mhos at

25°C)

64
63
64
71
59
70

52

97
98
103

pH

6.8
7.4
7.6
7.8
7.3
7.5

7.0

7.0
7.1
7.2

Col-

or

5
5
5
5
5
5

5

0
0
0

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

11.4
12.8
11.8
12.2
12.3
11.7

11.2
11.3
8.3
8.3
8.7
9.8

MPN

(coli-
form
colo-

nies

per

100 ml)

23
230
4600
930
430
430

1500
2400
2400
430
1500
430

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Mar. 30, 1965....
Sept. 8..........

Time

(24 hr)

0715
1330

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.02
.02

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
.00

DUWAMISH RIVER BASIN Continued

12-1130. GREEN RIVER NEAR AUBURN, WASH. Continued

Temperature (°F) of water, water year October 1964 to September 1965

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

54
53

44
44

39
39

37
36

41
41

57
51

68
61

68
63

62
58

2

53
52

44
44

39
39

38
37

41
41

58
52

66
59

68
62

60
59

3

52
52

44
44

39
39

38
38

41
41

59
54

67
60

62
60

60
57

4

52
51

44
43

39
39

39
38

41
41

48
47

60
56

66
60

60
58

60
56

5

51
50

43
43

39
39

39
39

42
41

47
46

60
56

66
59

62
58

60
57

6

50
50

43
43

39
39

39
39

42
4?

48
46

59
56

68
60

66
58

60
56

7

50

8

50

50 |50
1
43 43
43

39
39

39
39

42
42

51
46

61
56

66
61

68
61

61
56

42

39
39

39
39

43
42

53
48

60
56

62
57

67
61

61
57

9

50
49

42
41

39
39

10

49
49

41
41

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39

/. -a 43 -,?
42 ' *

56
50

56
54

58
56

66
62

59
58

~>D

56
52

60
53

58
56

64
61

60
57

11

49
49

41
41

1

12

49
49

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41

39 39

39|39

39
39

4 3
43

57
52

60
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58
56

64
60

60
57

39
39

43
43

13

49
49

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43

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64
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57
56

14

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49

41
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43

53
51

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55

66
59

65
59

56
56

15

49
49

40
40

39
38

40
40

43
42

51
51

55
54

66
60

66
60

56
56

16

49
49

40
40

38
36

40
40

42
4?

52
51

62
53

67
59

67
60

56
54

17

49
49

40
40

36
34

40
40

42
4?

53
50

61
56

66
60

67
60

56
52

18

49
48

40
40

34
33

40
40

4?
40

55
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61
57

63
59

68
62

54
51

19

48
47

20

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47

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61
55

62
57

68
61

54
53

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33
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61
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61
58

62
60

56
53

21

47
47

40
40

34
33

40
40

53
50

63
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58
56

63
60

56
55

22

47
47

40
40

34
34

23

48
47

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34
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52
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6?
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61
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38

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48

57
55

70
63

62
60

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46
45

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35
35

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40

56
50

60
54

6P
6?

62
5"

55
54

28

45
45

40
40

35
35

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40

57
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64
56

68
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62
58

55
52

29

45
45

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36
35

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40

56
53

65
58

69
62

61
56

54
53

30

45
44

40
39

36
36

40
40

54
52

67
59

70
62

61
56

55
54

31

44
44

-

36
36

41
40

53
51

- -

70
63

62
57

-

Average

49
48

41
41

37
37

39
39

53
50

60
55

65
59

64
60

58
55

DUWAHISH RIVER BASIN Continued

12-1133.5. GREEN RIVER AT TUKWILA, WASH.

LOCATION. At gaging station at highway bridge, 0.8 mile southeast of Tukwila, King County, and 1 mile upstream from Black River. DRAINAGE AREA. 440 square miles.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
Sediment records: October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 68°F June 30, July 16, 26, 28; minimum, freezing point Dec. 18. Sediment concentrations: Maximum daily, 1,000 ppm Jan. 28; minimum daily, 7 ppm Nov. 21.
Sediment loads: Maximum daily, 31,000 tons Jan. 30; minimum daily, 12 tons Nov. 21.
EXTREMES, 1963-65. Water temperatures: Maximum, 72°F Aug. 24, 1964; minimum, freezing point Dec. 18, 1964. Sediment concentrations: Maximum daily, 1,000 ppm Jan. 28, 1965; minimum daily, 7 ppm Nov. 21, 1964.
Sediment loads: Maximum daily, 31,000 tons Jan. 30, 1965; minimum daily, 7 tons Oct. 3, 5-7, 1963.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October ....

December .....

January. ....

March ....

May...........

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

September .....

Day

1

55

40

47
52
58

67
63
65

2

40

52
57

64
57
63

3

39

48
58

63
60
64

4

39

47
58

60
58
62

5

38

50
57

66
62
62

6

38

52
58

67
66
62

7

52
60

67
63

8

52

59
63
61

9

54

60
56
60

10

54

59
61
62

11

56

58
62
62

12

57

61
56
63

13

50

56

61
60

14

50

53

66
56
60

15

8

53

56
58

16

47

52

60
58

17

54

66
58

18

52
55

67
59

19

47
51

54
59

20

54
56

58
59

21

50
54

58
56

22

52
52

58
56

23

53
52

55
56

24

53
51

58

25

52
55

55

26

55
56

60
59

27

55
58

58
59

28

40

52
56

58
58

29

41

46

52
55
67

56
58

30

39

47

52
55
68

57
59

31

36

40

47

55

64

Aver-

age

52
43
38

39
41
46

50
53
60

63
60
60

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

Feb. 26. ....

Time

(24 hour)

1100
1845
0710
0945

Water
tem-

per-
ature

(°F)

41
41
40
44

Sam-

pling
point

Discharge
(cfs)

12000
12000
11300
2340

Sediment
concen-

tration

(ppm)

646
535
430
100

Sediment

discharge
(tons per day)

20900
17300
13100
632

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

20
17
8
9

0.004

28
23
11
12

0.008

37
32
15
17

0.016

45
39
19
24

0.031

53
50
24
38

0.062

67
58
30
53

0.125

80
73
35
70

0.250

91
85
46
88

0.500

99
99
90
100

1.000

100
100
100

2.000

Method
of

analysis

VPWC
VPWC
VPWC
VPWC

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVEE BASIN

DUWAMISH RIVER BASIN Continued

12-1133.5. GREEN RIVER AT TUKWILA, WASH. Continued

Suspended sediment, water year October 1964 to September 1965

Day

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

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

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

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

21..
22..
2 ..
2 ..
2 ..

2 ..
2 ..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

Mean
dis-

charge
(cfs)

929
932
1270
1290
1290

1690
1730
1730
1720
1690

1630
1570
998
872
860

812
BOO
770
761
752

740
740
728
731
731

719
713
701
692
692
695

31978

1830
1700
1700
1600
1500

1500
1450
1400
1350
1300

1250
1150
1100
1100
1250

2000
2200
2300
2100
2000

1900
2000
2000
2000
1850

1800
2000
8120
10700
11700
12000

87850

OCTOBEF

Suspen

Mean
concen-

("prn"

57
73
130
130
100

89
64
65
58
60

43
48
30
40
27

17
17
23
15

27

19
19
15
11
B

11
10
10
8
9
17

JANUARY

66
48
72
42
83

64
48
60
22
65

95
64
44
50
22

39
30
29
44
47

35

100
88
66

60
640
1000
940
970
920

-

ded sediment

Tons
per
day

140
180
450
450
350

410
300
300
270
270

190
200
81
94
63

37
37
48
31
55

38
38
29
22
16

21
19
19
15
17
32

4222

330
220
330
180
340

260
190
230
80
230

320
200
130
150
74

210
180
180
250
250

180
160
540
480
330

290
3500
22000
27000
31000
30000

119814

Mean
dis-

charge
(cfs)

710
722
992
1290
1550

1380
1310
860
800
779

761
740
830
869
770

722
695
680
677
653

635
629
734
2140
5660

4520
3320
2600
2260
3010

43298

11900
11900
11000
9150
7570

6000
5000
4200
4000
3800

3200
2900
2BOO
3BOO
4000

3500
3800
4800
4800
4600

4500
4000
3500
3000
2700

2360
3140
3380

139300

NOVEMBEF

Suspen

Mean
concen-

Opprn"

33
20
90
93
58

29
29
11
11
16

15
13
31
18
25

22
16
16
24
8

7
15
20
290
320

170
90
110
100
96

FEBRUAR1

570
550
500
510
460

330
260
270
290
250

230
230
490
360
240

240
200
340
260
140

140
160
160
110
95

82
160
170

~

ded sediment

Tons
per
day

63
39
240
320
240

110
100
26
24
34

31
26
69
42
52

43
30
29
44
14

12
25
40
S 2600
4900

2100
810
770
610
780

14223

18000
18000
15000
13000
9400

5300
3500
3100
3100
2600

2000
1800
3700
3700
2600

2300
2100
4400
3400
1700

1700
1700
1500
890
690

520
1400
1600

128700

[

Mean
dis-

charge
(cfs)

6030
8820
7670
5300
4020

3280
2790
2570
2780
2990

3090
2730
2510
2400
2300

2000
1660
1530
1530
1520

1610
2830
6300
5610
4230

3580
3270
2850
2490
2230
2020

104540

2820
1760
1530
1430
1370

1310
1280
1250
1210
1160

1170
1130
1090
1060
1060

1060
1060
1060
1050
950

893
965
5550
6180
4320

1960
1340
1220
1210
1140
1100

51688

)ECEMBER

Suspen

Mean
concen-

tration

(ppm)

170
560
280
140
61

50
71
30
42
90

110
120
42
40
78

34
35
32
21
90

130
410
490
180
200

130
50
38
54
81
56

MARCH

80
21
30
42
48

33
21
24
30
45

27
46
31
24
30

41
24
32
13
52

38
59
910
440
300

81
68
47
26
40
2B

~

ded sediment

Tons
per
day

2800
13000
5800
2000
660

440
530
210
320
730

920
8BO
280
260
480

180
160
130
B7
370

570
S 3400
8300
2700
2300

1300
440
290
360
490
300

50687

610
100
120
160
180

120
73
81
98
140

B5
140
91
69
86

120
69
92
37
130

92
S 210
14000
7300
S 3900

430
250
150
85
120
83

29221

S Computed by subdividing day.

QUALITY OF SURFACE WATERS, 1965

DUWAMISH RIVER BASIN Continued

12-1133.5. GREEN RIVER AT TUKWILA, WASH. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

1160
1300
1160
1160
1150

1170
1210
1110
1070
1070

1070
1040
1060
1130
1130

1370
1730
1640
1720
3580

4460
4140
3330
2800
2580

2550
2700
2880
2860
2540

57870

Suspended sediment

Mean
concen-

tration

(ppm)

41
45
50
56
98

69
150
90
110
47

88
44
31
72
73

42
47
35
40
240

320
120
110
160
78

120
75
81
110
49

~

Tons pel-
day

130
160
160
180
300

220
490
270
320
140

250
120
89
220
220

160
220
150
190
2300

3900
1300
990
1200
540

830
550
630
850
340

17419

JULY

400
395
392
385
380

378
375
372
372
375

400
388
372
360
358

360
352
352
350
352

360
352
348
342
340

335
335
330
323
323
316

11172

C 33
C 33
C 33
C 33
C 33

C 33
C 33
C 33
C 33
C 33

C 33
C 33
C 33
C 33
C 33

C 33
C 33
C 33
C 33
C 33

C 33
C 33
C 33
C 33
C 33

C 33
C 33
C 33
C 33
C 33
C 33

36
35
35
34
34

34
33
33
33
33

36
35
33
32
32

32
31
31
31
31

32
31
31
30
30

30
30
29
29
29
28

993

MAY

Mean
dis-

charge
(cfs)

2280
2040
1800
1690
1640

1520
1420
1350
1290
1290

1380
1530
1690
1700
1420

1560
1610
1 30
1 20
1 60

1 50
1 50
1 60
1 60
1 30

1410
1390
1410
1450
1490
1510

47430

Suspended sediment

Mean
concen-

tration

(ppm)

57
38
45
38
68

57
40
37
34
64

95
71
33
88
110

42
42
18
48
45

32
57
69
52
28

25
25
41
62
53
36

- -

Tons pel-
day

350
210
220
170
300

230
150
130
120
220

350
290
150
400
420

180
180
69
180
180

130
220
270
200
110

95
94
160
240
210
150

6378

AUGUST

309
309
314
316
316

309
306
304
304
328

338
338
350
333
318

311
297
292
302
355

335
316
326
342
335

318
314
302
292
292
290

9811

30
30
30
30
C 30

30
30
30
30
30

30
30
30
30
30

30
30
C 30
30
30

30
30
30
30
30

30
30
30
30
30
30

25
25
25
26
26

25
25
25
25
27

27
27
28
27
26

25
24
24
24
29

27
26
26
28
27

26
25
24
24
24
23

795

JUNE

Mean
dis-

charge
(eft)

1490
1450
1390
1060
1020

1030
1040
827
659
635

629
635
620
617
588

548
532
505
495
485

482
460
438
435
432

428
420
415
432
410

20607

Suspended sediment

Mean
concen-

tration

(ppm)

20
48
44
37
50

93
50
90
50
C 15

15
15
15
15
15

15
15
15
15
15

15
15
15
15
15

15
15
15
15
15

Tons
per
day

80
190
170
110
140

260
140
200
89
26

25
26
25
25
24

22
22
20
20
20

20
19
18
18
17

17
17
17
17
17

1811

SEPTEMBER

280
280
278
274
274

271
269
269
274
276

269
269
274
285
304

314
302
285
278
271

269
269
269
269
269

269
269
267
264
260

8270

32
32
32
32
32

32
32
C 32
C 32
C 32

32
32
32
32
32

32
32
32
32
32

32
32
32
32
32

32
32
32
32
32

24
24
24
24
24

23
23
23
24
24

23
23
24
25
26

27
26
25
24
23

23
23
23
23
23

23
23
23
23
22

712

Total discharge for year (cfs-days) .... 613,814 Total load for year (tons).... .... 374,975 C Composite period.

DUWAMISH RIVER BASIN Continued

12-1134. DUWAMISH RIVER AT TUKWILA, WASH.

LOCATION. At county bridge (Foster Street Bridge), in Tukwila, King County, 1.7 miles west of Renton, and 10 miles upstream from mouth RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
Water temperatures: July 1959 to September 1962.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 28, 1964

Jan. 11, 1965

Aug. 4.......

Mean

discharge
(cfs)

Silica

(Si02)

14
13
13
16
13
14

12
14
18
17
18
18

Alu-
mi-

num

(Al)

Iron

(Fe)

0.29

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

8.5
7.0
7.5
9.6
7.2
8.0

5.6
7.2
12
12
13
20

Mag-
ne-

sium

(Mg)

2.8
2.2
2.1
3.4
2.2
2.8

. 5
2.3
4.8
4.6
4.7
20

Sodium

(Na)

6.8
4.1
4.3
8.3
5.2
5.4

3.2
5.4
14
14
15

Po-
tas-

sium

(K)

0.9
1.2
. 7
1.0
.9
1.0

.4
. 7
1.4
1.3
1.7

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

43
30
34
42
34
40

22
37
62
60
64
68

Ca*
ban-

ate

pcy

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(SO.)

4.2
5.8
6.0
7.2
4.8
5.2

3.8
4.0
6.0
6.8
6.4

Chloride

(Cl)

6.0
2.2
2.8
8.5
4.2
4.0

1.2
4.2
16
15
16

Fluo-

ride

(F)

0.1
. 2
. 2
. 1
. 1
. 1

. 0
. 1
. 1
. 1
. 1

Ni-

trate

(NO,)

1.3
2.6
2.2
2.3
1.3
1.5

1.3
. 7
2.9
3.2
4.2

Phos-

phate
(P0«)

0.15
. 12
. 11
.09
.09
. 14

. 09
. 10
.48
.49
.89

Dissolved
solids

(residue
at 180°C)

70
56
60
77
55
69

42
60
A 107
104
116

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

32
26
27
38
27
32

16
28
50
49
52
133

Non-
car -

bon-

ate

0
2
0
4
0
0

0
0
0
0
0
78

To-

tal
acid-

ity
as

H+ 1

Specific
conduct-*

ance

(micro-
mhos at

25°C)

100
75
79
118
80
91

48
85
170
164
183
934

PH

.2
.4
. 1
. 6
.4
. 3

7.3
6.7
7.1
6.9
6.9
6.9

Col-

or

5
10
5
5
5
5

15
5
5
5
5

D.O.
[dis-
sol-
ved
oxy-
gen
ppm)

10.
11.
10.
10.
11.
10.

10.
9.
7.
7.
7.
9.

MPN

,(coli-
form
colo-

nies

per

100 ml)

24000
4600
11000
4600
1500
2400

4600
930
24000
4600
2100
24000

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Mar. 29, 1965....
Sept. 7... ....

Time

(24 hr)

1625

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.01

Cop-

per

(Cu)

0.02
.03

Zinc

(Zn)

0.05
. 05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.01
.09

LAKE WASHINGTON BASIN

12-1175. CEDAR RIVER NEAR LANDSBURG, WASH.

LOCATION. Temperature recorder at gaging station, 2 miles upstream from Landsburg and intake of Seattle municipal water-supply system, 4.8 miles east of Haple Valley, King County, 5 miles downstream from Taylor Creek, and 12 miles downstream from Chester Horse Lake.
DRAINAGE AREA. 122 square miles, including Rock Creek drainage upstream from Walsh Lake diversion.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July I960.
Water temperatures: August 1953 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 57°F July 14, 24, 26, 29, 30; minimum, 39°F on many days during January and February.
EXTREMES, 1953-65. Water temperatures: Maximum, 67°F July 27, 28, 1960, July 13, 1961; minimum, 36°F Jan. 30 to Feb. 2 Feb. 14-17, 1956, Jan. 23-27, 1957, Jan. 18, 19, 1960.
REMARKS. Recorder pen failed to ink Feb. 3-9.

Temperature (°F) of water, water year October 1964 to September 1965

October

November
Maximum ....
Minimum ....
December

Minimum ....
January
Maximum ....
Minimum ....
February
Maximum ....
Minimum ....
March
Maximum ....

April

May

Maximum ....
Minimum ....
July
Maximum ....
Minimum ....

August
Maximum ....
Minimum ....
September
Maximum ....

1

52

48
48

42
42

40
40

39

42

47

51

55
51

56
53

55

2

52

48
48

42
42

40
40

42

47

50

55
51

55
53

55

3

51

48
47

42
42

40
40

43

47

51

55
51

53
52

54

4

51

47

42
42

40
40

44

47

51

55
51

52
52

53

5

51

42
42

40
40

44

47

51

55
51

55
52

51

6

51

42
42

40
39

42

47

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55
51

56
52

51

7

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42
42

40
39

42

46

51

54
52

56
52

55

8

51

42
42

40
39

44

46

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52
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55
52

55

9

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42
42

39
39

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54
52

54

10

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42

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54

11

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42

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12

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42

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57
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15

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49

50

55
52

55
52

53

Day

16

50

42
41

39
39

43

49

50

56
52

55
52

50

17

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41
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54
52

55
52

50

18

49

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41

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52

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19

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54
52

49

20

49

41
41

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43

49

50

54
52

53
52

52

21

49

41
41

39
39

43

49

50

52
52

53
52

52

22

49

41
41

39
39

41

43

49

51

54
51

53
52

51

23

'*9

41
41

39
39

42

43

49

51

56
51

56
52

52

24

49

41
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39
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57
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25

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56
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56
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26

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56
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50

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45

41
41

39
39

43

46

48

51

55
52

55
52

52

LAKE WASHINGTON BASIN Continued

12-1216. ISSAQUAH CREEK NEAR MOUTH, NEAR ISSAQUAH, WASH.

LOCATION. At gaging station at bridge on SE 56th Street, 1.0 mile upstream from mouth, and 1.5 miles northwest of Issaquah, King County. DRAINAGE AREA. 54.7 square miles.
RECORDS AVAILABLE. Chemical analyses: November 1964 to September 1965.

Chemical analyses, in parts per million, November 1964 to September 1965

Date
of
collection

Nov. 17, 1964

Feb. 2, 1965.

Apr. 14......

July 7.......

Sept. 23.....

Mean

discharge
(els)

113
133
221
398
307
227

93
93
83
47
42
29

37
33

Silica

(Si02)

15
14
14
13

14

14

17
19
19

19
20

Alu-
mi-

num

(Al)

Iron

(Fe)

0.32

.74

Man-

ga-
nese

(Mn)

Cal-

cium

(Ca)

9.5
8.5
8.0
6.4

7.2

8.8

10
12
13

12
13

Mag-
ne-

sium

(Mg)

3.0
3.0
2.9
2.2

2.7

3.5

4.0
4.9
4.6

4.6
4.8

Sodium

(Na)

5.0
4.6
4.1
3.6

4.6

5.4

6.1
7.0
7.1

7.0
7.6

Po-
tas-

sium

(K)

0.9
. 7
.9
.4

.7

1.0

.8
1.0
1.2

1.2
.8

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

40
40
32
26

33

46

50
60
60

59
68

Can
xn-

ate

py

0
0
0
0

0

0

0
0
0

0
0

Sulfate

(S04)

7.4
5.4
6.6
6.4

6.4

6.8

6.8
11
12

10
7.4

Chloride

(Cl)

3.5
2.5
2.8
2.0

1.8

2.5

3.0
2.8
3.0

2.5
3.5

Fluo-

ride

(F)

0.1
. 1
. 1
. 1

. 1

.2

. 1
. 1
. 1

. 1
. 1

Ni-

trate

(NO,)

4.5
4.0
6.2
4.4

3.6

2.3

1.5
2.0
2.2

2.5
2.7

Phos-

phate
(PO.)

0.25
.37
.32
.08

. 19

. 32

.26
.70
.58

. 50
.99

Dissolved
solids

(residue
at 180°C)

75
69
68
55

64

68

A 75
A 90
94

88
A 94

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

36
33
32
25

29

36

42
50
52

49
52

Non-
car-

bon-

ate

2
0
6
4

2

0

0

1
2

0
0

To-

tal
acid-

ity
as
H+1

Specific
conduct*

ance

(micro-
mhos at

25"C)

99
90
90
72

80

97

108
132
136

129
138

pH

6.9
7.2
6.3
7.1

7.1

7.1

7.1
7.1
7.0

7.0
7.0

Col-

or

5
5
5
5

5

10

10
5
5

5
5

D.O.

(dis-
sol-
ved
oxy-
gen
ppm!

11.0

11.9

9.9

9.5

MPN

(coli-
form
colo-

nies

per

100 ml)

24000

11000

24000

11000

onstituents.

Date of
collection

Sept. 23, 1965...

Time

(24 hr)

0830

Chromium

Hexa-

valent

(Cr«)

0.02

Total

(Cr)

0.02

Cop-
per

(Cu)

0.03

Zinc

(Zn)

0.05

Ar-

senic

(As)

0.00

Boron

(B)

0.02

SNOHOMISH RIVER BASIN

12-1350. WALLACE RIVER AT GOLD BAR, WASH.

LOCATION. Temperature recorder at gaging station, 30 feet downstream from highway bridge, 0.2 mile north of Gold Bar, Snohomish county, and 1.2 miles upstream from Olney Creek.
DRAINAGE AREA. 19.0 square miles.
RECORDS AVAILABLE. Water temperatures: July 1955 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 68°F July 30, 31, Aug. 1; minimum, freezing point Dec. 16-18.
EXTREMES, 1955-65. Water temperatures: Maximum, 70°F July 29, Aug. 8, 9, 1960, July 13, 1961; minimum, freezing point on several days during February 1956, January 1957, and Dec. 16-18, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

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 ....

1

48
48

49
47

40
39

36
35

39
39

40
39

44
41

43
42

53
46

60
54

68
61

58
54

2

48
48

47
45

41
40

36
36

39
39

41
40

41
39

44
43

55
47

60
54

63
60

55
54

3 i 4

49 49
48

46
4 5

41

49

46
45

41
41 41

36
36

39
39

43
41

45
40

44
43

54
47

61
55

60
58

56
53

36
36

40
39

43
41

46
41

43
40

55
48

60
55

58
57

56
52

5

51
49

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44

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41

36
36

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38

43
41

43
41

45
40

55
48

61
54

61
56

55
53

6

51

7

52

8

52
50 51 52

45
43

45 44
44 143

41 40140
40 39 39

37
36

38
38

43
42

41
40

45
41

55
48

62
55

64
56

58
52

37 37
37 37

39
38

42
41

44
40

48
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52 51

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44 43

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39 36

37 38
37 37

39^0
39 39

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12"

Day

13

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52 52 51

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36 36

38 38
37 38

40 41

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42 41

45 46
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56
53

43
40

45
4?

48
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14 15 16

51 50 48
50 48 47

40 40 40
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38 35
35 32

39 38
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49 48 48 46 ! 45 48 48
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48 46 44 43

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45 48 J48

j
41 40 J40 37 138
40 1 40 '37 37 37

36

40 39
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36 136
35 i 35

39 38 38
38 38

40 40
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41 39
38 36

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36 36

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37 38

43 42 39

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45
43

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43 46
40 41

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Average

49
48

4?
41

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- j 39

47 j 42
41

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60
52 152

67
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53
50

68

"

55
50

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56

54
51

SNOHOMISH RIVER BASIN Continued

12-1555. SNOHOMISH RIVER AT SNOHOMISH, WASH.

LOCATION. At gaging station at bridge on State Highway 1A in Snohomish, Snohomish County, and 0.8 mile downstream from Pilchuck River. DRAINAGE AREA. 1,714 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
Water temperatures: July 1959 to September 1961.
REMARKS. Only records of discharge above 10,000 cfs are published in Surface Water Supply WSP 1932.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 28, 1964

Jan. 11, 1965

Mean

discharge
(cfs)

21500
15200

22300

13400
10400

Silica

<Si02)

6.8
4.1
6.8
8.6
5.3
6.7

5.8
4.9

7.9
6.5
6.7

Alu-
mi-

num

(Al)

Iron

(Fe)

0.22

.31

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

5.0
3.0
4.5
5.6
3.6
5.6

5.2
4.0

4.4
5.6
6.0

Mag-
ne-

sium

(Mg)

1.3
.8
1.2
1.4
. 8
1.1

.8
. 8

. 5
1.2
1.5

Sodium

(Na)

2.1
1.3
2.2
3.1
1.6
2.2

2.6
1.9

1.6
2.3
2.7

Po-
tas-

sium

(K)

0.8
. 6
. 7
.3
. 7
. 5

.4
.4

.4
. 6
. 6

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

22
12
18
22
14
23

20
16

17
24
27

Car-
bon-

ate

PQJ

0
0
0
0
0
0

0
0

0
0
0

Sulfate

(S04)

3.0
2.2
3.0
4.0
2.0
2.8

3.6
2.4

2.2
2.8
2.8

Chloride

(CD

1.8
1.2
1.2
2.0
1.5
2.0

2.0
. 5

. 8
1.2
1.5

Fluo-

ride

(F)

0.1

.1
.2
. 0
. 0
. 0

. 1
. 0

. 0
. 0
. 1

Ni-

trate

(NO,)

0.6
1.1
1.5
2.1
.9
. 7

. 7
. 2

.4
.4
.4

Phos-

phate
(P0«)

0.01
.00
.05
.00
. 02
. 02

.05
.01

.07
.02
.01

Dissolved
solids

(residue
at 180"C)

A 33
26
31
39
26
A 33

30
24

26
37
35

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

18
11
16
20
12
18

16
13

13
19
21

Non-
car-

bon-

ate

0
1
1
2
1
0

0
0

0
0
0

To-

tal
acid-

ity
as

H+l

Specific
conduct-'

ance

(micro-
mhos at

25°C)

47
30
43
54
34
50

44
35

35
53
55

PH

7.4
6.4
7.3
7.1
6.8
7.1

7.0
6.9

7.0
6.8
7.2

Col-

or

5
10
5
5
5
5

5
5

5
0
0

D.O.

(dis-
sol-
ved
oxy-
gen
PPBO

11.4
11.8
11.3
12.1
12.3
12.3

10.9
10.6
10.2
9.8
8.5
9.3

MPN

(coli-
form
colo-

nies

per

100 ml)

2400
2400
930
750
430
210

930
430
4600
930
24000
11000

A Calculated from determined constituents.

Date of
collection

Mar. 29, 1965....
Sept. 7. ....

Time

(24 hr)

1735
1505

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.03
.01

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.02
.03

STILLAGUAHISH RIVER BASIN

12-1677. STILLAGUAHISH RIVER NEAR SILVANA, WASH.

LOCATION. At bridge on U.S. Highway 99, 1.5 miles east of Silvana, Snohomish County, and 7 miles downstream from confluence of the North and South Forks. RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 28, 1964

Jan. 11, 1965

Mean

discharge
(cfs)

Silica

(SiOJ

6.8
3.5
5.8
9.0
4.9
7.0

6.4
4.6

5.1
8.6
8.8

Alu-
mi-

num

(Al)

Iron

(Fe)

0.22

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

8.0
3.0
5.5
7.2
4.8
6.4

5.6
4.4

6.8
8.8
9.6

Mag-
ne-

sium

(Mg)

2.4
1.1
1.5
2.7
1.4
2.2

1.4
1.2

1.6
2.6
3.0

Sodium

(Na)

2.2
1.0
1.8
2.5
1.5
2.1

1.8
1.4

2.0
2.7
3.3

Po-
tas-

sium

(K)

0.9
.9
. 5
.4
.2
. 5

. 2
. 3

.4
. 7
. 7

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

36
13
23
32
17
30

24
18

28
40
44

Car-
bon-

ate

W

0
0
0
0
0
0

0
0

0
0
0

Sulfate

(SO.)

3.2
2.2
3.2
4.0
2.4
3.4

3.2
2.2

2.6
3.4
4.0

Chloride

(Cl)

2.2
. 8
1.0
1.5
2.0
1.8

1.5
. 8

1.2
2.0
2.5

Fluo-

ride

(F)

0.1

.1
. 0
. 0
.0
.0

. 0
.0

. 0
.0

.1

Ni-

trate

(NO,)

0.6
1.0
1.1
2.0
. 8
. 7

. 8
.3

. 2
. 2
.3

Phos-

phate
(PO«)

0.01
.01
.02
. 00
.01
.00

.00
.08

.01
.02
.01

Dissolved
solids

(residue
at 180°C)

46
28
35
53
29
45

37
29

36
53
53

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

30
12
20
29
18
25

20
16

24
33
36

Non-
car-

bon-

ate

0
2
l
3
4
0

0
1

0
0
0

To-

tal
acid

ity
as

H+ 1

Specific
conduct-

ance

(micro-
mhos at

25"C)

70
30
49
70
39
60

48
38

57
78
87

PH

7.1
6.4
7.6
7.4
6.8
7.1

7.0
6.8

7.1
7.2
7.3

Col-

or

5
25
5
5
15
5

10
10

5
0
0

D.O.

(dis-i
sol-
ved
oxy-
gen
ppm)

11.8
11.8
11.9
12.8
12.3
12.4

11.3
10.4
10.4
9.9
8.4
9.5

MPN

(con-
form
colo-

nies

per

100 ml)

73
430
91
91
230
230

36
750
36
73
150
230

Analyses, in parts per million, of trace elements

Date of
collection

Mar. 29, 1965....
Sept. 7. ....

Time

(24 hr)

1305
1050

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.01

Cop-

per

(Cu)

0.04
. 02

Zinc

(Zn)

0.05
. 05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
.01

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. 52.0 square miles.
RECORDS AVAILABLE. Water temperatures: March 1952 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 72°F July 30, 31; minimum, 36°F on many days during December and January. EXTREMES, 1952-65. Water temperatures; Maximum, 82°F July 28, 1958; minimum, 33°F on many days during winter months.

Temperature (°F) of water, water year October 1964 to September 1965

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....
January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....

Maximum ....
Minimum ....
April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....

Maximum ....
Minimum ....
July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....

Day

1

52
52

46
45

44
44

36
36

39
39

39
39

39
39

49
48

54
52

66
64

71
66

Maximum 60
Minimum 59

2

52
52

46
46

44
44

36
36

39
'39

39
39

39
39

48
48

57
53

66
64

70
66

60
,9

3

52
51

46
46

44
44

36
36

39
39

39
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41
39

48
48

57
56

67
65

66
64

59
57

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51
51

46
46

44
44

36
36

39
39

39
39

41
41

48
45

58
56

bl
66

64
62

58
56

5

51
51

46
46

44
43

36
36

39
39

39
39

41
41

45
44

59
58

b'f

6b

64
61

58
56

6

51
51

46
46

7 8 9 10

51 51 5151
51 51

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46
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46

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46
46

51

46
46

43 ' 43 43 43 ,43
43 43 43 43 42

36 36 36 36
36 i 36

39
3V

39
39

41
41

45
44

59
bd

68
66

67
60

b9
55

36

3 'I

36 36

39 |39 39 39
39

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39

41
41

46
45

60
5B

68
65

69
62

59
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39 ! 39 39

40
4U

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41

47
45

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60

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60

67
62

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56

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60

60
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b9

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58 59
57 58
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51 150
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46 46
i
42 42
42 42

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50

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SKAGIT RIVER BASIN

12-1790. SKAGIT RIVER ABOVE ALMA CREEK, NEAR MARBLEMOUNT, WASH.

LOCATION. Temperature recorder at gaging station,0.8 mile upstream from Alma Creek, and 7 miles north of Harblemount, Skagit County.
DRAINAGE AREA. 1,274 square miles, of which 400 square miles is in Canada.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1960.
Water temperatures: January 1953 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 53°F on several days during August; minimum, 37°F on many days during February and March.
EXTREMES, 1953-65. Water temperatures: Maximum, 56°F July 30, 1961; minimum, 35°F Mar. 1, 1956.
REMARKS. Recorder stopped Dec. 16-18; temperature range, 41°F to 42°F.

Temperature (°F) of water, water year October 1964 to September 1965

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

51
50

48
48

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43

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48
4P

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50

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29 30

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48 48

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40 50

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47
46

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51

50
49

Average

49
49

46
46

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42

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38

41
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45
44

48
47

51
50

51
51

50
50

SKAGIT RIVER BASIN Continued

12-2005. SKAGIT RIVER NEAR MOUNT VERNON, WASH.

1 mile north of Mount Vernon, Skagit County, and 3 miles downstream from LOCATION. Temperature recorder at gaging station at bridge on former U.S. Highway Nookachamps Creek.
DRAINAGE AREA. 3,093 square miles, of which 400 square miles is in Canada.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
Water temperatures: July 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 61°F Aug. 18, 19; minimum, 36°F Dec. 17.
EXTREMES, 1962-65. Water temperatures: Maximum, 62°F Aug. 8, 9, 30, 31, 1963; minimum, 36"F Dec. 17, 1964.
REMARKS. Chemical quality samples are obtained at bridge on U.S Interstate Highway 5, 1,300 feet downstream from gage. Temperature bulb out of 7, 30. Recorder not operating Sept. 27-30; temperature range not determined.

Chemical analyses, in parts per million, water year October 1964 to September 1965

part of Sept .6,

Date
of
collection

Oct. 28, 1964

Jan. 11, 1965

May 12. ......

Mean

discharge
(cfs)

11300
22200
17200
7850
19900
8460

12500
18600
24800
16900
12700
5100

Silica

(Si02)

5.8
5.0
6.4
8.4
6.0
8.5

7.7
6.0

5.1
5.7
7.4

Alu-
mi-

num

(Al)

Iron

(Fe)

0.13

.26

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

7.5
6.0
7.5
9.5
7.6
9.2

8.4
6.4

5.6
6.0
7.6

Mag-
ne-

sium

(Mg)

1.3
1.3
1.5
2.2
1.5
1.8

1.6
1.3

1.1
.9
1.6

Sodium

(Na)

.4
. 2
.6
.0
.4
.8

.8
.3

.0
.5
.8

Po-
tas-

sium

(K)

0.9
.4
.8
1.0
.5
.7

.4
.4

.5
.7
.8

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(Hccg

28
24
28
38
28
36

32
24

22
22
30

Car-
bon-

ate

TO

0
0
0
0
0
0

0
0

0
0
0

Sulfate

<so«)

5.0
4.0
5.0
5.2
4.2
4.8

5.4
4.0

3.2
4.2
4.4

Chloride

(Cl)

0.5
.2
.2
.8
1.0
1.5

.8
.5

.0
. 5
. 5

Fluo-

rlde

(F)

0.1
. 1
.2
. 1
.0
. 1

.0
. 1

.0
.0
. 1

Ni-

trate

(NO,)

0.3
.7
.5
.7
.6
. 5

.7
.3

.0
.2
.2

Phos-

phate
(P0«)

0.00
.01
.03
.04
.01
.02

.00
.01

.01
.02
.01

Dissolved
solids

(residue
at 180°C)

A 37
35
40
52
38
47

A 43
A 32

A 28
30
A 39

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

24
20
24
32
25
30

28
21

18
19
26

Non-
car-

bon-

ate

To-

tal
acid-

ity
as

H+l

Specific
conduct-
ance

(micro-
mhos at

25°C)

56
48
58
76
58
72

65
50

44
46
61

PH

7.3
7.0
7.1
7.8
6.8
7.6

7.3
7.1

7.1
7.1
7.2

Col-

or

0
20
5 .
5
5
0

0
5

5
5
0

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

11.5
11.6
11.8
12.5
11.3
12.5

11.4
10.7
10.7
10.0
9.5
9.6

MPN

(coli-
form
colo-

nies

per

100 ml)

11000
2400
91
930
750
230

430
230
430
4600
11000
930

A Calculated from determined constituents.

Analyses, in parts .per million, of trace elements

Date of
collection

Mar. 29, 1965....
Sept. 7. ....

Time

(24 hr)

1350
1130

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.01

Cop-
per

(Cu)

0.02
.05

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.03
.01

SKAGIT RIVER BASIN Continued

12-2005. SKAGIT RIVER NEAR MOUNT VERNON, WASH. Continued

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....
May
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KOOTENAI RIVER BASIN

12-3018.5. KOOTENAI RIVER AT WARLAND BRIDGE, NEAR LIBBY, MONT.

LOCATION. Temperature recorder at gaging station on right bank at county road bridge, 0.1 mile downstream from Barren Creek, 14.5 miles northeast of Libby, Lincoln County, and at mile 228.6.
DRAINAGE AREA. 8,892 square miles.
RECORDS AVAILABLE. Water temperatures: June 1962 to September 1965.
REMARKS. Recorder stopped Nov. 17 to Apr. 14, June 26 to July 27. Records furnished by Corps of Engineers, U.S. Army. Temperature (°F) of water, water year October 1964 to September 1965

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KOOTENAI RIVER BASIN Continued

12-3020. FISHER RIVER NEAR JENNINGS, MONT.

LOCATION (revised). Temperature recorder at gaging station on right bank, 80 feet downstream from bridge, 1.9 miles downstream from Wolf Creek, 9.0 miles upstream from mouth, and 9 miles southeast of Jennings, Lincoln County.
DRAINAGE AREA. 780 square miles.
RECORDS AVAILABLE. Water temperatures: May to November 1963, May 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 72°F Aug. 1.
EXTREMES, 1963-65. Water temperatures: Maximum, 72°F Aug. 1, 1965; minimum (1963-64), freezing point Nov. 21, 22, 1963. REMARKS. Recorder stopped Oct. 29 to Apr. 15, July 19-27, Aug. 27 to Sept. 30. Records furnished by Corps of Engineers. Temperature (°F) of water, water year October 1964 to September 1965

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KOOTENAI RIVER BASIN Continued

12-3045. YAAK RIVER NEAR TROY, MONT.

LOCATION. Temperature recorder at gaging station on right bank, 400 feet upstream from bridge on U.S. Highway 2, 0.2 mile upstream from mouth, and 7.5 miles northwest of Troy, Lincoln County.
DRAINAGE AREA. 766 square miles.
RECORDS AVAILABLE. Water temperatures: May to November 1963, May 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 75°F Aug. 9.
EXTREMES, 1963-65. Water temperatures: Maximum, 75°F Aug. 9, 1965; minimum (1963-64), freezing point Nov. 30, 1963. REMARKS. Recorder stopped Oct. 29 to Apr. 14, June 19-24, Sept. 29, 30. Records furnished by Corps of Engineers, U.S. Army.

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KOOTENAI RIVER BASIN Continued

12-3050. KOOTENAI RIVER AT LEONIA, IDAHO

LOCATION. Temperature recorder at gaging station at Leonia, Boundary County, 450 feet east of Montana-Idaho State line, and 0.5 mile upstream from Boulder Creek.
DRAINAGE AREA. 11,740 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: July 1962 to May 1963, April to September 1965.
EXTREMES, April to September 1965. Water temperatures: Maximum, 67°F Aug. 2. 3.
EXTREMES, 1962-63, April to September 1965. Water temperatures: Maximum, 67°F Aug. 2, 3, 1965; minimum (1962-63), freezing point on many days during winter months.

Temperature (°F) of water, April to September 1965

Month

April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

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KOOTENAI RIVER BASIN Continued

12-3220. KOOTENAI RIVER AT PORTHILL, IDAHO

LOCATION. Temperature recorder at gaging station on right bank,300 feet upstream from international boundary at Porthill, Boundary County, and at mile 165.63.
DRAINAGE AREA. 13,700 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: January 1949 to September 1950.
Water temperatures: January 1949 to September 1950, May 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 69°F Aug. 3-5; minimum, freezing point on many days during winter months. EXTREMES, 1949-50, 1963-65. Water temperatures: Maximum, 69°F on several days during August 1949, Aug. 3-5, 1965; minimum, freezing point on many days during winter months.

Temperature (°F) of water, water year October 1964 to September 1965

Month

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PEND OREILLE RIVER BASIN

12-3598. SOUTH FORK FLATHEAD RIVER ABOVE TWIN CREEK, NEAR HUNGRY HORSE, MONT.

LOCATION. Temperature recorder at gaging station on left bank, 1,000 feet downstream from Tin Creek, 0.2 mile upstream from Twin Creek, 36 miles southeast of Hungry Horse, Flathead County, and at mile 46.5.
DRAINAGE AREA. 1,600 square miles.
RECORDS AVAILABLE. Water temperatures: May to September 1965.
REMARKS. Recorder stopped July 16-26, range in temperature 50°F to 56°F; Aug. 3-16, range in temperature 56°F to 64°F.

Temperature (°F) of water, May to September 1965

Month

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Minimum ....
November
Maximum ....
Minimum ....
December
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January
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February
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PEND OREILLE RIVER BASIN Continued

12-3600. TWIN CREEK NEAR HUNGRY HORSE, MONT.

LOCATION. Temperature recorder at gaging station on left bank, 300 feet upstream from road bridge, 0.1 mile upstream from mouth, and 36 miles southeast of Hungry Horse, Flathead County.
DRAINAGE AREA. 47.0 square miles.
RECORDS AVAILABLE. Water temperatures: May to September 1965.
EXTREMES, May to September 1965. Water temperatures: Maximum, 66°F July 30.
REMARKS. Recorder stopped July 13-27.

Temperature (°F) of water, May to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
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PEND OREILLE RIVER HASIN--Continued

12-3606. SOLDIER CREEK NEAR HUNGRY HORSE, MONT.

LOCATION. Temperature recorder at gaging station on left bank, 200 feet upstream from culverts on west shore road, 0.2 mile upstream from mouth, and 35 miles southeast of Hungry Horse, Flathead County.
DRAINAGE AREA. 4.77 square miles.
RECORDS AVAILABLE. Water temperatures: October 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 55°F on several days during July and August; minimum, freezing point on many days during November to April.

Temperature (°F) of water, water year October 1964 to September 1965

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Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
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January
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February
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PEND OREILLE RIVER BASIN Continued

12-3610. SULLIVAN CREEK NEAR HUNGRY HORSE, MONT.

LOCATION. Temperature recorder at gaging station on left bank, 0.2 mile downstream from Quintonkon Creek, 1 mile upstream from Hungry Horse Reservoir flow line, and 30 miles southeast of Hungry Horse, Flathead County.
DRAINAGE AREA. 71.3 square miles.
RECORDS AVAILABLE. Water temperatures: May to October 1963, July 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 62°F Aug. 2, 10.
EXTREMES, 1963-65. Water temperatures: Maximum, 62°F Aug. 2, 10, 1965.
REMARKS. Recorder stopped Oct. 13 to June 15, July 10-13, Sept. 3-10. Records furnished by Corps of Engineers, U.S. Army. Temperature (°F) of water, water year October 1964 to September 1965

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PEND OREILLE RIVER BASIN--Continued

12-3615. GRAVES CREEK NEAR HUNGRY HORSE, MONT.

LOCATION. Temperature recorder at gaging station on left bank, 500 feet upstream from Hungry Horse Reservoir flow line and 22 miles southeast of Hungry Horse, Flathead County.
DRAINAGE AREA. 27.0 square miles.
RECORDS AVAILABLE. Water temperatures: November 1964 to September 1965.
EXTREMES, November 1964 to September 1965. Maximum, 61°F Aug. 9-11; minimum, freezing point on many days during January to March.

Temperature (°F) of water, November 1964 to September 1965

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PEND OREILLE RIVER BASIN Continued

12-3616. CANYON CREEK NEAR HUNGRY HORSE, MONT.

LOCATION. Temperature recorder at gaging station on right bank, 50 feet downstream from bridge on east shore road, 400 feet upstream from Hungry Horse Reservoir flow line, and 18 miles southeast of Hungry Horse, Flathead County.
DRAINAGE AREA. 5.8 square miles.
RECORDS AVAILABLE. Water temperatures: October 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 53°F Aug. 3; minimum, freezing point on many days during December to April. Temperature (°F) of water, water year October 1964 to September 1965

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I "V\ "O ^."O || -O !*"* || "NJ '_> || P* >
1 ro n "^ <) II <*\ rf\ II J~ 'J' 11 kf> 4"

3 33 *^ j i ^* £° 55 55 55

3 33 *3 ! i 4! 5 5* 3§ 1? 55

c, ^ . * N «,^. ^ -J 0»

:^^-^^2-^^^

rvj .NCM mrvj rvjrg cx,rM cor- Oco ^CM Oco

^^ fl ^ ^^ ^^ ^^ j-j. ^^,

^ ^ ^,5, ^ m ^^ ^2 ^^ f f p ^

- 33 ^3 3^ S3 5^ ?3 57 55

5 -- -- 33 S? ^° *S JJ J5

^ ^3 W ^ iJ-S ?i! ^3 55 7^-

3 1-J 1- * 1M J3 J- ^0 -.- 3 - 5-

0 ^NJ fT Y,,, JO B 0 _^ 0- 1T>
- > -M J J- J- ^^ ^ *, 0 ^ 00 J-J^ -1-

* -^3 ^ ^ "^ ^ ^ ;^ ,^

= 4;^ j ?; 4;* ^3 "3 53 ?3 ^?
^ ^ * *3 * j| ^ ;j 3^; 3^ j"j ^7
- ,-. * 1 -, N,rM n ^ r,^ ^o />- >, n

j *^ ^^ 23 ^^, 21 3^ S3 ^5

I n .-, -, .-, j- N, ^ g a Y, ~- o J- ., r- v

6 66 66 66 66 66 66 65 66
31*33 33 33 33 33 33 33 33

S.SSS SSg-SS 66 66 65 66 66 c ^S c £3 c 3g Cj23 c 3 C S° S c S c Sl.ls^ll.il^

^ * * n

J j jj
55 5?

^5 -,

?; ?s

m u, rvj o '

g? 5?

S? 5?

£ J £ °

n* *^
* J "^

£S 5^

S? 35

35 33

~ - f -^

N -o r M

-r- s. j
"" . ,
o ^ o -

? ^ t -r

n * ^5
* J r3
^,- -^

" t Z $

00 J M

6 6 6 6
66^66
" S B S B

|55|55

PEND OREILLE RIVER BASIN Continued

12-3625. SOUTH FORK FLATHEAD RIVER NEAR COLUMBIA FALLS, MONT.

LOCATION. Temperature recorder at gaging station on right bank, 1.5 miles downstream from Hungry Horse Dam, 3.5 miles upstream from mouth, and 7 miles east of Columbia Falls, Flathead County.
DRAINAGE AREA. 1,663 square miles.
RECORDS AVAILABLE. Water temperatures: October 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 52°F Aug. 17, 18; minimum, 36°F on many days during March and April.

Temperature (°F) of water, water year October 1964 to September 1965

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

5 1
41

47

41

33

JO
Jo

J O

Jo

Jo
J/

JV

41
41.

43

44

2

41

tl
Hi

30

»

37

HI

43

3

H L

41

41
41

3o

33
3o

3 7
3 7

42

44

44

4

Hi

J3

3.1

3 I

j 7

H ^

44

5

41

HO

JO

3o

JO

)7
37

H,

H4

6

41

4o

3t

ia

JC
36

37
j7

42

40

7

Hi

30

JO

b

JO

4t

8

41

Jti

Jt,

Jt

3V
37

HJ

9

He

41

JO

1 ,

Jb

3 7

**

4 5

10

41

J O

'7

"

4 7

11

H<

41

39

j7
36

. 1

3V

44

12

41

4C
40

3V

3-?
37

3o
3o

3o

39

4'j

4H

13

41

41
41

3o

30

37

36

37

39

47

43

14

41

41
41

3d

3o

37

3b

37

39

47

43

15

41

41

4(

30

3d

37
37

jt

37

4.

47

16

41

4J
4 1

3-:

io

3?
J/

37

t-t

Hi

17

41

HO

Jb

3d

37
36

JO

37

49

42

18

41

40
4u

3d

3d

50
36

36

37

40

52
42

19

41

4C
4C

Jb

37
36

36

37

40

42

42

20

41

H j

40

JB

3d
3d

37
37

JO

37
37

4}

45
45

41

21

41

39

4:
40

3d

Jb
3d

37
37

36

3b
37

40

49
45

41

22

41

3V

4f
3V

Jt-

38
3t

37

jt

3b
37

41
41

41

41

23

41

40

39
3V

3b

36
36

37
36

3b
37

45

41
41

44
4i

41

24

41

41
40

4')

3d
3d

3d

36
36

37
36

40
3b

43

41

45
42

41

25

41

4C
4C

39
39

38
38

3b
38

36
36

37
36

38
38

43

42
41

43
43

42

26

47
41

40
40

39
39

3d
3d

38
33

36
36

37
36

38
37

43

42
41

50
41

42
41

27

47
41

40
40

39
39

38
38

38
3*

36
3h

37
37

3d
37

43
41

42
42

51
45

41
40

28

47
41

40
40

3V
3V

3d
38

3o
3d

36
36

37
3 7

3o
37

41
40

44
42

51
4U

41
4u

29

47
41

4o

39

JO
3d

36
36

37
37

38
37

42
4O

44

49

40

30

47
41

4u

39
39

30

3d

36
36

3V
37

37
3V

41
40

44
42

45
42

40
4C

31

41

J9
Jti

jb
30

36

J7
37

43
43

Average

40
41

4u
39

Jb
30

30
30

37
06

37

38
37

43
39

40

47
44

42
41

PEND OREILLE RIVER BASIN Continued

12-3630. FLATHEAD RIVER AT COLUMBIA FALLS, MONT.

LOCATION. At county road bridge at Columbia Falls, Flathead County, 200 feet upstream from gaging station, 5.7 (revised) miles downstream from South Fork, and at mile 143.0.
DRAINAGE AREA.--4,464 square miles.
RECORDS AVAILABLE. Chemical analyses: January 1949 to September 1950, August 1963 to September 1965.
Water temperatures: January 1949 to September, 1950, August 1963 to September 1965.
Sediment records: July to September 1965.
EXTREMES, 1964-65. Dissolved solids: Maximum, 126 ppm Oct. 1-20; minimum, 88 ppm June 23-30.
Hardness: Maximum, 93 ppm Oct. 1-20; minimum, 76 ppm July 1-15.
Specific conductance: Maximum dally, 200 mlcromhos Nov. 7; minimum dally, 139 mlcromhos July 7.
Water temperatures: Maximum, 67°F Aug. 9; minimum, freezing point Feb. 1.
EXTREMES, 1949-50, 1963-65. Dissolved solids: Maximum, 135 ppm Jan. 11-20, 1949; minimum, 77 ppm July 1-10, 1950. Hardness: Maximum, 119 ppm Jan. 11-31, 1949; minimum, 67 ppm June 1-10, 1949.
Specific conductance (1963-65): Maximum dally, 220 micrombos July 21, 1964; minimum daily, 135 mlcromhos June 4, 1964. Water temperatures: Maximum, 69°F Aug. 23, 1963; minimum, freezing point on many days during winter months.

Chemical analyses, In parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 1-20, 1964.

Jan. 1-8, 1965..
Jan. 9-31. ......

Mar. 1-23..... ..

Mar. 24-Apr. 9..

Apr. 19-30. .....
May 1-4. ....
May 5-11........

Mean

discharge
(cfs)

5340
4255
4137
4492
5575

8485
6884
11010
11130
18240

9242
7096
23120
30100
15060

Silica

SiO.)

.8
.3
. 5
.6
.6

. 5
. 3
.5
.8
.2

.0
.3
.4
5.0
4.9

Iron

(Fe)

0.00
.00
.02
.00
.00

.00
.00
.00
.00
.00

.00
.01
.01
.01
.01

Cal-

cium

(Ca)

27
26
26
26
27

24
25
24
23
24

25
27
25
25
26

Mag-
ne-

sium

(Mg)

6.2
6.1
6.6
6.4
5.3

5.9
5.7
5.4
5.5
6.1

6.0
5.8
6.7
6.2
5.9

Sodium

(Na)

2.0
1.6
1.6
1.0
1.3

.9
1.0
.9
1.1
1.1

1.0
1.0
.9
1.0
.9

Po-
tas-

sium

(K)

0.9
.6
.8
.4
.4

.4
1.1
.4
.4
.6

.4
1.0
.4
.4
.4

Bi-
car-

bon-

ate

(HCO,)

105
107
107
105
104

101
101
99
99
100

102
106
102
106
102

Car-
bon-

ate

(CO,)

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

Sulfate

(SO.)

5.8
5.2
4.8
5.0
5.0

3.8
3 8
3 0
6
4 2

4.8
6.0
5.2
5.2
4.8

Chloride

(Cl)

0.8
.6
1.2
.6
.5

.4
.2
.2
. 0
. 3

. 2
.2
. 1
.1
.2

Fluo-
rlde

(F)

0.1
. 1
. 1
. 1
. 1

.0
.0
.0
. 1
.0

.0
. 1
.1
.3
.1

Ni-

trate

(NO,)

1.7
.9
1.3
.4
. 3

.3
.2
.2
.2
.0

. 1
.0
. 0
. 1
.0

Bo-
ron

(B)

0.02
.01
.01
.02
.21

.26
.01
.00
.00
.01

.02
.01
.02
.01
.01

Dissolved solids

(residue at 180 °C)

Parts

per
million

126
123
103
100
110

104
99
96
100
94

95
100
95
96
97

Tons

per
acre-

foot

0.17
. 17
. 14
. 14
. 15

. 14
. 13
. 13
.14
. 13

. 13
. 14
. 13
. 13
. 13

Tons

per

day

1820
1410
1150
1210
1660

2380
1840
2850
3010
4630

2370
1920
5930
7800
3940

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

93
90
92
91
89

84
86
82
80
85

87
91
90
88
89

Non-
car-

bon-

ate

7
2

5
4

1
3
1
0
3

3
4
6
1
5

So-

dium
ad-

sorp-
tion
ratio

0.1
. 1

.0
.1

.0
.0
.0
. 1
.1

.0
.0
.0
.0
.0

Specific
con-

duct-

ance

micro-

mhos at

25°C)

204
181

173
181

170
168
162
164
177

168
180
170
170
168

pH

i.9

.1

.7
.0

.2
. 1
. 2
.9
.6

.2
.2
.0
. 6
.4

Col-

or

1
1
3
4
1

1
2
1

4

3
3
5
3
3

May 12-26, 1965. May 27-June 10. .

July 1-15.......

Sept. 16-30.....

Weighted aver-
age... ......

Time-weighted
average .....

25310
30010
33390
20720
15830

12040
8479
6396
5353
4480
6816

12130

5.1
5.1
4.7
4.5
4.8

4.6
4.5
4.4
4.4
4.4
4.6

4.7

4.6

. 01
. 02
. 01
. 02
. 00

. 00
. 00
. 00
. 00
. 00
. 00

0.01

0.00

27
25
25
24
22

24
25
25
26
26
27

25

25

aid

4.3
4.8
4.5
4.4
5.1

5.4
5.7
5.5
5.6
6.6
5.5

5.4

5.7

. 9
1.1
. 7
. 8
. 9

. 8
. 8
. 8
1.0
1.2
. 9

1.0

1.1

. 4
. 3
. 3
. 3
. 4

. 6
. 6
. 4
. 4
. 4
. 4

0.4

0.5

14

100
98
98
92
92

102
104
103
105
112
109

100

102

0
80
0

0 0

0
0
0
0

0 0_

5.0
3.0
2.8
2.8
3.2

3.5
3.5
4.5
5.0
5.8
5.2

3.8

4.1

19fi

. 2
. 1
. 1
. 1
. 6

1.2
. 9
. 5
. 7
. 3
. 4

0.3

0.4

P

S

. 1
. 1
. 1
. 1
. 1

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

0.1

0.1

1

n

. 0
. 0
. 0
. 0
. 1

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

0.1

0.3

d

s

. 00
. 01
. 00
. 00
. 00

. 00
. 00
. 01
. 01
. 01
. 00

0.02

0.03

n fii

97
98
94
88
90

94
96
93
100
101
99

97

100

. 13
. 13
. 13
. 12
. 12

. 13
. 13
. 13
. 14
. 14
. 13

0.13_

6630
7940
8470
4920
3850

3060
2200
1610
1450
1220
1820

3190_

85
82
81
78
76

82
86
85
88
92
90

84

86

22

. 0
. 1
. 0
. 0
. 0

. 0
. 0
. 0
. 0

.1

. 0 __

165
162
158
151
150

159
167
168
174
182
178

167

171

7.2
7.5
. 1
. 0
. £

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

7.2

7.2

4 2
1

2 4

4
2
3
4

2 222

PEND OREILLE RIVER BASIN Continued

12-3630. FLATHEAD RIVER AT COLUMBIA FALLS, MONT. Continued Specific conductance (micromhos at 25°C), water year October 1964 to September 1965 Day

12.. ...

1 ° .....

11 .....

Average

October

1 R i

1 77

IT>
17H

November

16f-

1 P U

U r

17^

December

7 }

1 <

}'">

'>7

' ti^t

I f-'f
I'i7

January

161

16^
!^*i

February

i ^ ,

1 1

1 ' '

March

l c,->

\ -^

1 c.4
16'

April

1°1

1 7 s)

171

May

i ^ s
1 71

1 i '

June

1'57

l 1^

July

1 ^^

1 ^o

1 S ^
15°

IS]

August

164

163

172

173
16&

September

I7t>

175

W2

173

PEND OREILLE RIVER BASIN Continued

12-3630. FLATHEAD RIVER AT COLUMBIA FALLS, MONT. Continued

Temperature (°F) of water, water year October 1964 to September 1965

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

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

April..........
May...........

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

September .....

1

46
43

32
36

44

51

58

2

46
41

34
40

42

52

52

55

3

44
43

19
40

42

49

56

54

4

48
40

37
39

41

47

55

55

5

46
39

36
38

40

49

58

55

6

42
38

38
40

46

59

58

7

44
40

38
39

40

47

59

58

8

42
39

39
40

41

48

59

54

9

45
41

38
34

38

51

58

52

10

44
41

39
41

39

52

55

51

11

43
40

38
40

40

52

54

51

12

42
38

39
39

40

48

53

51

13

42
37

38
39

41

47

53

52

14

42
38

37
41

42

46

54

50

15

40
38

36
40

41

49

56

44

Day

16

41
34

37
40

40

50

60

45

17

42
38

40
38

40

47

54

46

18

42
38

40
37

41

4*

55

47

19

40
34

43
37

40

49

55

48

20

40
39

37
36

41

48

55

48

21

38
38

38
37

41

49

55

48

22

42
41

35
36

42

50

57

46

23

43
43

38
38

44

53

59

47

24

44
43

37
34

41

51

58

45

25

42
44

36
38

40

51

59

45

26

40
44

39
37

42

49

64

48

27

40
39

39
38

42

49

63

46

28

38
42

39
40

43

47

62

46

29

39
41

39

42

49

60

48

30

48
37
40

40

52

61

48

31

48

38

40

- -

62

Aver-

age

46
42
39

37
38

41

49

57

49

Periodic determinations of suspended-sediment discharge and particle size, July to September 1965 (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

June 11, 1965. ....
June 11.. ....

Time

(24 hour)

1020
1700

Water
tem-

per-
ature

(°F)

47
45

Sam-

pling
point

Discharge
(cfs)

33100
35000

Sediment
concen-

tration

(ppm)

387
501

Sediment

discharge
(tons per day)

34600
47300

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004

23

0.008 0.016

50

0.031 0.062

94

0.125

95

0.250

99

0.500

100

1.000 2.000

Method
of

analysis

VPWC

QUALITY OF SURFACE WATERS, 1965

PEND OREILLE RIVER BASIN Continued

12-3630. FLATHEAD RIVER AT COLUMBIA FALLS, MONT. Continued

Suspended sediment, July to September 1965 (Where no daily concentrations are reported, loads are estimated)

Day

1..
2..
St.
4..
5..

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

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

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

21..
22..
23..
24..
29..

26..
27..
28..
29..
30..
31..

Total

JULY

Mean
dis-

charge
(cfs)

13800
1*000
1*700
15600
19800

19*00
15*00
19800
16000
17000

19*00
17900
16900
15*00
1*700

1*200
13700
13300
12900
11900

11*00
10900
10*00
96*0
9280

8960
8320
8190
8290
8390
7960

*ojoro

Suspended sediment

Mean
concen-

tration

(ppm)

~

__

-

50
*8

63
39
33
26
20

21
18
19
22
22

17
19
19
21
12

12
11
12
8
6
8

-

Tons
per

day

890
900
1000
1200
1300

1200
1200
1300
2200
2200

3300
1900
1500
1100
790

810
670
680
770
710

920
**0
*20
590
300

290
250
270
180
1*0
170

29110

AUGUST

Mean
dis-

charge
(cfs)

7750
7*20
7190
7190
7290

7320
7020
6720
6*70
5800

5*30
5360
55*0
5520
5^90

5020
4650
4+20
*500
*8*0

5180
4690
5890
6230
58*0

5990
6300
4630
7040
4840
5250

182620

Suspended sediment

Mean
concen-

tration

(ppm)

6
5
6
6
8

8
6
6
6
6

6
7
8
6
5

4
5
5
7
6

6
4
20
10
7

10
10
11
30
6
4

-

Tons
per

day

130
100
120
120
160

160
110
110
100
94

88
100
120
89
71

54
63
60
85
78

84
51
320
170
110

160
170
140
570
78
57

3922

SEPTEMBER

Mean
dis-

charge
(cfs)

4760
4520
4540
4460
4360

3990
3820
4040
4260
4060

3930
3990
4160
4690
7620

6130
7290
5540
5480
5800

6200
7240
7960
7020
6720

6520
7960
9310
6200
6870

169440

Suspended sediment

Mean
concen-

tration

(ppm)

3
3
3
2
2

1
1
^

5
2

1
3
2
4
8

10
11
8
4
6

7
8
12
7
6

6
6
5
3
2

Tons
per

day

39
37
37
24
24

11
10
44
58
22

11
32
22
51
160

170
220
120
59
94

120
160
260
130
110

110
130
130
50
37

2482

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA HIVKR BASIN

S 3 * « *

O WiH -O >> 0 8

- H O O M 0) ft

. a

-a 1 93
Oo 8 S

' So

60 1 B 'S

11

ll

n co oo to 10 c

O O rH rH CM *

] t» 00 t£> 01 f
) rH O 00 00 C

o o o o o i

00 O. O 00 00 O rHlftlftt

oooooo oc

> o o oooooo

CO I I ^» CO I O CO I Ift *
O I t O rH I CM CM I O C

oooooo oooooo
oooooo

I CM CM rH tD rH. CM CM
rH
1 O >» -P

|.0h (H^CrHUa
turt ^^H^sa)

> PT S < S ^3 ^ < CO

|Bm

^!i

11

S&l

Chromium Is

ill
H
a

Q o

0 0

0

0 0
0 0

o

0 0

Q

rH W
0 0

0

0 0
0 0

o

O 0
0 0

0

rH rH

rH rH

* m

rH rH

CO rH

a>
o a

COLUMBIA RIVER MAIN STEM

12-3995. COLUMBIA RIVER AT INTERNATIONAL BOUNDARY, 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 1965.
Water temperatures: November 1951 to September 1965.
EXTREMES, 1964-65. Dissolved solids: Maximum, 104 ppm Feb. 1-28; minimum, 78 ppm Aug. 1-20.
Hardness: Maximum, 86 ppm Feb. 1-28; minimum, 66 ppm Aug. 1-20.
Specific conductance: Maximum daily, 181 micromhos Feb. 20; minimum daily, 129 micromhos Aug. 8.
Water temperatures: Maximum, 62"F Aug. 8; minimum, 33"F on several days during December and January.
EXTREMES, 1958-65. Dissolved solids: Maximum, 158 ppm Feb. 23, 1963; minimum, 71 ppm July 8-25, 1964.
Hardness: Maximum, 128 ppm Feb. 23, 1963; minimum, 62 ppm July 16-31, Aug. 16-31, 1959, July 1-31, 1961, July 26 to Aug. 15, 1964. Specific conductance: Maximum daily, 257 micromhos Feb. 23, 1963; minimum daily, 123 micromhos Aug. 2, 1960, Aug. 12, 1963.
Water temperatures: Maximum, 70°F May 14, 19, 1959; minimum, freezing point on several days during January in 1960, 1962, and 1963. REMARKS. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 1-20, 1964..
Oct. 21-Nov. 7...

Dec. 1-31........
Jan. 1-31, 1965..

Mar. 22- Apr. 13..
Apr. 14-May 10...
Hay 11- June 6. ...

June 7-July 5. ...

Aug. 21-Sept. 13.
Sept. 14-30......

Weighted average

Time-weighted
average ......

Tons per day. . .

Mean

discharge
(cfs)

79000
67400
61800
44600
46400

54300
62800
63100
130000
214100

293300
204500
147100
100300
65306

111800

-

Silica

(810,)

3.5
4.0
4.1
4.1
5.4

5.6
5.3
6.6
6.1
5.5

5.4
4.6
3.6
3.3
4.5

4.9

4.8

1490

Iron

(Fe)

Cal-

cium

(Ca)

20
20
22
24
24

24
24
25
23
21

20
20
20
20
22

21

22

6410

Mag-
ne-

sium

(Mg)

4.1
4.7
4.6
4.2
5.4

6.2
5.8
5.3
4.5
4.5

4.9
4.4
3.8
4.4
4.8

4.7

4.8

1420

Sodium

(Na)

1.5
1.8
2.3
2.4
2.5

2.6
2.5
2.8
2.4
2.2

1.7
1.6
1.5
1.8
1.8

2.0

2.1

597

Po-
tas-

sium

(K)

0.9
.9
1.0
1.0
. 7

.8
.9
1.1
.8
.8

. 7
.7
.5
.8
.8

0.8

0.8

234

Bl-

car-

bon-

ate

(HCOJ

70
74
78
81
86

86
87
88
80
76

73
72
68
70
74

76

78

22800

Car-
bon-

ate

(ccg

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

__
-

Sulfate

(S0«)

13
13
14
15
17

17
16
16
14
12

11
11
11
12
15

13

14

3840

Chloride

(Cl)

0.2
. 5
.0
.0
.0

.0
.5
.0
.5
. 5

.0
.0
.0
.2
.5

0.4

0.6

116

Fluo-

rlde

(P)

0.1
. 1
.3
.2
. 1

.2
.2
.2
.2
.3

. 2
.2
.2
.0
.2

0.2

0.2

59

Ni-

trate

(NOj)

0.4
.3
.4
.4
.4
'.7

.6
.3
.4
.0

.7
.7
.3
.6
.5

0.5

0.5

141

Phos-

phate
(P0 4)

0.17
.22
. 16
. 16
.22

. 14
. 15
.13
. 10
.08

.08
. 10
.09
. 15
.21

0.12

0.14

35

Dissolved solids

(residue at 1800C)

Parts

per
million

80
84
88
96
100

104
100
101
91
85

84
83
78
82
90

87

90

Tons

per
acre-

foot

0.11
. 11
. 12
. 13
. 14

. 14
. 14
. 14
. 12
. 12

. 11
. 11
. 11
. 11
. 12

0.12

Tons

per
day

17060
15290
14680
11560
12530

15250
16960
17210
31940
49140

66520
45830
30980
22210
15870

26300

_.

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

67
70
74
78
82

86
84
84
76
71

70
68
66
68
75

72

75

Non-
car-

bon-

ate

10
9
10
12
11

15
13
12
10
9

10
9
10
11
14

10

11

So-

dium
ad-

sorp-
tion
ratio

0.

0.1

0.1

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

140
148
160
166
171

176
174
176
158
146

142
139
134
139
152

149

155

PH

7.6
7.5
7.7
7.8
7.7

7.8
7.7
7.7
7.8
7.7

7.6
7.6
7.6
7.5
7.5

7.6

7.6

~

COLUMBIA RIVER MAIN STEM Continued

12-3995. COLUMBIA RIVER AT INTERNATIONAL BOUNDARY, WASH. Continued

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 11, 1964...
July 15, 1965. . .

Time

(24 hr)

1400
1315

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total
lrr\

0.00
.03

per

(Cu)

0.03
.03

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
.02

Specific conductance (micromhos at 25°C) , water year October 1964 to September 1965 Day

1.....

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

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

11.....
12.....
1?.....
14.....
15.....

16.....
17.....
IB.....
19.....
20.....

21.....
??.....
23.....
24.....
75.....

26.....
27.....
28.....

30.....
31.....

Average

October

136
137
137
136
140

138
139
137
138
138

139
142
142
141
141

143
143
144
145
143

145
142
144
145
143

146
150
149
153
148
143

142

November

149
147
146
148
145

148
145
144
148
148

147
149
14Q
154
155

155
157
160
158
160

163
164
166
167
164

164
164
168
168
169

155

December

167
168
167
167
165

16'
164
165
16'
167

160
166
164
160

160
163
164
163
163

163
167
165
17fl
167

167
167
164
165
163
164

16*

January

165
164
163
161
162

164
164
168
171
169

169
17?
171
169
171

175
17?
171
171
177

17?
173
174
17'
373

174
178
177
176
174
174

170

February

175
172
76
75
74

75
75
77
176
177

176
176
177
174
176

176
176
178
178
1R1

177
176
174
178
175

177
176
177

176

March

179
170
173
173
174

172
171
177
175
172

17?
176
176
173
171

175
174
175
172
175

174
171
171
171
176

176
175
176
176
174
177

173

April

173
176

177
176

172
170
168
171
171

171
171
166
161
163

163
161
158
161
163

15"
160
154
156
151

157
154
156
153
157

163

May

155
156
153
153

15?
153
153
152
150

148
148
147
148
145

145
143
146
148
148

146
149
149
151
148

146
146
145
145
14?
14?

148

June

144
140
141
141
140

138
143
142
143
142

141
13R
13R
140
138

139
14?
140
1'8
141

14'
144
141
140
14n

138
141
141
145
141

140

July

140
140
138
139
139

136
1'7
139
136
136

137
136
140
1'9
138

1'9
13fl
138
137
1'5

13?
133
134
137

]'R

137
T43
139
134
134
137

137

August

134
133
133
133
133

133
T»C
129
131
132

131
135
134
133
133

134
133
133
1'4
135

130
140
13"
13fl
14"

140
140
140
139
140

135

September

141
138
140
138
138

140
141
139
141
1'9

151
144
148
153
159

158
152
153
152

15?
153
152
152
153

151
154
153
153
155

14R

COLUMBIA RIVER MAIN STEM Continued

12-3995. COLUMBIA RIVER AT INTERNATIONAL BOUNDARY, WASH. Continued Temperature (°F) of water, water year October 1964 to September 1965

November .....
December .....

March ....

May...........

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

September .....

1

50
42

33

3R

45
5?

57

58

2

50

33

38

45
5?

56

59

3

49
43

3?

39

45
53

57

59

4

49
43

33
37
39

45
53

57

59

5

49
43

34

39

53

57

58

6

48
43

40

53

5fl

58

7

48
42

40

54

5fl

58

8

48
42

40

54

5fl

58

9

48
42

55

58

58

10

48
41

55

58

58

11

48

55

58

12

48
40

40

54

57

13

48
41

54

57

14

48
41

57

15

47
40

54

60
57

Day

16

47
40

a p
40

54

60
57

17

46
39

60
57

18

46
38

54

60
57

19

46
38

60

20

46
37

21

45
37

61

22

45
37

3 p

59

23

36

c p

59

24

45
35

59

25

45
35

3 8

59

26

45
34

58

27

44
34

5"

28

33

^8

29

43
33

59

30

43
33

57

31

33

Aver-

age

47
38

58

SPOKANE RIVER BASIN

12-4195. SPOKANE RIVER ABOVE LIBERTY BRIDGE, NEAR OT1S ORCHARDS, WASH.

LOCATION. At bridge on U.S. Highway 10 at state line, 3 miles upstream from gaging station, and 3.5 miles east of Otis Orchards, Spokane County. DRAINAGE AREA. 3,880 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
Water temperatures: December 1963 to September 1965.
EXTREMES, 1964-65. Dissolved solids: Maximum, 47 ppm Mar. 27 to Apr. 26; minimum, 35 ppm Oct. 1-31, May 13 to July 11, Aug. 11-31. Hardness: Maximum, 23 ppm Jan. 1-10; minimum, 18 ppm May 13 to June 12.
Specific conductance: Maximum daily, 62 micromhos Jan. 4; mi.iimum daily, 47 micromhos May 4, 9, June 15, 17, 18, 23, 26, 27, 29. Water temperatures: Maximum, 76°F July 19; minimum, 34°F Dec. 18.
EXTREMES, 1963-65. Dissolved solids: Maximum, 47 ppm Mar. 27 to Apr. 26, 1965; minimum, 28 ppm July 21 to Aug. 19, 1964. Hardness: Maximum, 26 ppm Apr. 10 to May 9, 1964; minimum, 17 ppm June 6 to July 20, 1964.
Specific conductance: Maximum daily, 71 micromhos Apr. 27, 1964; minimum daily, 41 micromhos June 18, 1964.
Water temperatures: Maximum, 76°F July 19, 1965; minimum, 34°F Dec. 18, 1964.
REMARKS. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, in]

Date
of
collection

Oct. 1-31, 1964..

Jan. 1-10, 1965..

Jan. 26-Feb. 26..
Feb. 27-Mar. 26..

Mar. 27-Apr. 26..
Apr. 27-May 12. ..
May 13-June 12. . .
June 13- July 11. .
July 12-Aug. 10. .

Sept. 1-30. ......

Weighted average

Time-weighted
average ....

Tons per day. . . .

Mean

discharge
(cfs)

1520
3130
14400
15700
6110
11000
9960

13300
27300
16700
5270
1260
1050
844

-

8430

- -

Silica

(SiO,)

5. 9
5. 9
6.1
6.6
7.1
7.3
8.3

9.1
10
9.3
8.5
7.8
7.7
7.8

8.1

7.7

185

Iron

(Fe)

Cal-

cium

(Ca)

5. 5
6.0
6. 5
6.5
6.0
6.0
5.6

6.0
5.5
5,2
5.2
5.6
6.0
6.0

5.8

5.8

132

Mag-
ne-

sium

(Mg)

. 6
,7
. 6
. 7
.6
.6
.0

.8
.3
.4
.7
.4
.6
.5

1.6

1.6

37

A Calculated from determined constituents.

Sodium

(Na)

. 6
. 8
. 7
.8
.9
.9
. 0

. 1
.8
.7
.6
.5
.6
.5

1.8

1.7

41

sarts per million, water year October 1964 to Sei

Po-
tas-
slum

(K)

1.1
1.1
.8
.8
1.0
.7
. 8

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

0.8

0.8

18

Bl-

car-

bon-

ate

(HCO,)

22
23
22
22
20
20
21

21
21
20
20
20
21
22

21

21

476

Car-
bon-

ate

(CO,)

0
0
0
0
0
0
0

0
0
0
0
0
0
0

-

__

Sulfate

(S0«)

8.0
8.8
9.0
9.6
9.2
9.2
9.6

9.8
7.2
6.4
7.2
6.2
6.8
7.4

8.3

8.1

190

Chloride

(Cl)

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

. 2
. 2
.0
.0
.0
.2
.0

0.1

0.1

2.1

Fluo-
ride

(F)

0

0

0

5

2
3
3
3
3
3
3

3
2
1
1
3
2
2

2

2

0

Ni-
trate

(NO,)

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

. 3
.3
. 1
.2
.4
. 7
. 5

0.3

0.3

6.7

Phos-

phate
(P0«)

0.03
.02
.02
.03
.05
.05
.05

.08
.06
.05
.04
.06
.04
.04

0.05

0.04

1.10

>tember 1965

Dissolved solids
(residue at 180°C)

Parts

per
million

A 35
37
A 38
42
39
40
46

47
45
A 35
A 35
37
35
38

41

39

Tons

per
acre-

foot

0.05
.05
.05
.06
.05
.05
.06

.06
.06
.05
.05
.05
.05
.05

0.06

Tons

per

day

144
313
1480
1780
643
1190
1240

1690
3320
1580
498
126
99.2
86.6

925

_.

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

20
22
22
23
22
22
22

22
19
18
20
20
22
21

21

21

Non-
car-

bon-

ate

2
3
4
5
6
6
5

5
2
2
4
4
5
3

4

4

So-

dium
ad-

sorp-
tion
ratio

0.2
.2
.2
.2
.2
.2
. 2

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

0.2

0.1

Specific
con-

duct-

ance

micro-

mhos at

25*C)

53
56
60
61
57
57
56

58
50
49
49
49
56
56

54

54

pH

.2
.2
.0
.0
.0
.0
.0

.0
. 1
.0
.2
.9
.0
.0

7.0

7.0

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 27, 1964....
June 13. 1965. .. .

Chromium

Time _ _
/,. . _ v Hexa-
<24 **> valent

1415 0.00
1340 .1

Total ,£.
(Cr) (C

P-

er

u)

0.00 0.01

.00 .00

Zinc

(Zn)

0.4
.2

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.02

SPOKANE RIVER BASIN Continued

12-4195. SPOKANE RIVER ABOVE LIBERTY BRIDGE, NEAR OTIS ORCHARDS, WASH. Continued

Specific conductance (micromhos at 25°C), water year October 1964 to September 1965 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.....
23.....

26.....
27.....
28.....
29.....
30.....
31.....

Average

October

51
51
51
51
52

51
51
51
53
53

52
52
51
53
53

53
52
54
51
52

54
54
54
54
54

54
55
55
54
53
55

52

November

54
55
54
55
54

56
56
56
55
55

55
55
54
54
56

57
58
57
56
57

57
57
56
57
56

56
57
57
58
57

55

December

58
58
57
57
58

58
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58

January

61
61
61
62
60

60
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59
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59

57
57
57
56
58

57
56
56
54
55

54
53
54
54
54

60
55
56
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56
56

57

February

55
55
55
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March

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April

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57
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57
55
54
54
51
- -

56

May

49
50
48
47
48

48
48
48
47
48

48
48
? n
48
48

48
48
49
48
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48
49
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48

June

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48
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49
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48
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49
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47
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48
47
49

48

July

48
48
48
48
48

48
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48
48
49

49
48
48
49
48

48
49
48
49
49

48
49
49
48

5?
48
48
49
49
48

48

August

49
49
49
49
49

49
49
49
50
50

54
5?
57
51
52

53
57
57
57
52

52
53
53
5?
53

57
53
53
53
54
55

51

September

53
54
53
55
54

54
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54
53

54
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55
55
56
55
55

54

SPOKANE RIVER BASIN Continued

12-4195. SPOKANE RIVER ABOVE LIBERTY BRIDGE, NEAR OTIS ORCHARDS, WASH. Continued Temperature (°F) of water, water year October 1964 to September 1965

November .....
December .....

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

September .....

1

51
46

64

2

51
48

64

3

51
45

63

4

51
45

64

5

50
45

61

6

50
43

60

7

49
43

60

8

51
45

0 Q

60

9

49
45

62

10

50
45

60

11

48
44

61

12

47
43

60

13

47
40

60

14

46
42

61

15

46
40

70
61

Day

16

45

58

17

45

70
56

18

44
34

55

19

44
35

56

20

45
36

56

21

45
36

59

22

46
41

*9

23

45
42

57

24

47
39

5P

25

46
38

56

26

45
39

56

27

43
40

56

28

45
40

55

29

45
39

56

30

43
40

"

55

31

40

Aver-
age

47
41

59

SPOKANE BIVER BASIN Continued

12-4310. LITTLE SPOKANE RIVER AT DARTFORD, WASH.

LOCATION. At Mill Road bridge, 0.5 mile east of Dartford, Spokane County, and 0.6 mile upstream '. om gaging station. DRAINAGE AREA. 665 square miles, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1960 to September 1965.
REMARKS. No appreciable inflow between sampling point and gaging station except during period . heavy local runoff. Chemical analyses, in parts per million, water ye ;tober 1964 to September 1965

Date
of
collection

Oct. 31, 1964
Nov. 22......
Dec. 27......
Jan. 17, 1965
Feb. 28......
Mar. 21......

Apr. 17. .....
May 16. ......
June 13 ......

July 24. .....
Aug. 28......
Sept. 25.....

Mean

discharge
(cfs)

150
163
291
244
980
627

980
429
225
166
143
160

Silica

(Si02)

17
17
19
20
23
21

23
20
18
17
19
17

Alu-
mi-

num

(Al)

Iron

(Fe)

0.30
.25

.58

. 19
. 10
.09

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

32
31
24
26
15
17

13
19
25
30
31
32

Mag-
ne-

sium

(Mg)

7.6
7.4
5.5
5.8
3.3
3.9

3.7
4.1
6.5
7.7
8.2
7.8

Sodium

(Na)

5.2
5.1
4.8
5.2
5.3
4.7

4.4
4.2
5.0
5.6
5.7
5.6

Po-
tas-

sium

(K)

2.2
2.1
2.1
2.0
2.8
1.9

1.7
1.4
1.5
1.9
2.0
1.8

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

140
132
102
111
64
74

63
82
111
128
136
138

Car-
bon-

ate

py

0
2
0
0
0
0

0
0
0
0
0
0

Sulfate

(SO.)

6.0
6.0
5.2
6.0
6.6
6.0

5.2
4.6
5.6
6.8
6.8
6.8

r

Chli r de

(0)

1 0
1.5
2.0
2.2
1.5
1.0

1.0
.5
1.2
2.5
2.2
2.2

Fluo-

rlde

(F)

0.2
. 2
.2
.2
. 2
. 1

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

Ni-

trate

(NO,)

1.6
1.7
2.1
1.4
3.6
1.1

.9
.0
1.7
2.7
1.6
2.0

Phos-

phate
(P0«)

0.07
. 10
. 12
. 11
. 25
.09

. 10
. 13
. 11
. 13
. 12
. 10

Dissolved
solids

(residue
at 180°C)

144
138
124
124
101
102

89
96
A 120
137
145
149

Hardness
as CaCO,

Cal-

cium,
mag-
leslum

111
108
82
89
52
58

48
64
89
107
112
112

Non-
car -

bon-

ate

0
0
0
0
0
0

0
0
0
2
0
0

To-

tal
acid-

ity
as

H* 1

Specific
conduct"

ance

(micro-
mhos at

25°C)

231
227
183
193
129
136

114
146
188
226
233
237

pH

7.7
8.4
7.2
7.7
7.4
8.0

8.0
7.5
7.7
7.3
8.1
7.6

Col-

or

5
5
10
5
20
15

20
0
5
5
5
5

D.O.
[dis-
sol-
ved
oxy-
gen
ppm)

11.2
13.1
12.0
12.7
12.5
12.9

11.3
9.6
8.8
9.5
10.3
10.3

MPN

(coli-
form
colo-

nies

per

100 ml)

23
23
23
23
73

23
210
1500
930
930
230

A Calculated from determined constituents.

Analyses, in parts per million, of trace ele

Date of
collection

Dec. 27, 1964....
June 13, 1965.

Time

(24 hr)

1640
1515

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.06
.03

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.01

Boron

(B)

0.03
.03

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 Heard on, Lincoln County DRAINAGE AREA. 5,920 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
Water temperatures: July 1959 to September 1962.
REMARKS. No inflow between sampling point and gaging station.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 31, 1964

Jan. 17, 1965

Sept. 25.....

Mean

discharge
(cfs)

2780
3140
30200
8290
14100
12000

16900
22100
14100
410
2360
2180

Silica

(Si02)

7.6
7.6
8.9
6.3
11
11

13
11
9.4
8.4
11
11

Alu-
mi-

num

(Al)

Iron

(Fe)

0.09

.30

.06
.09
.02

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

20
18
8.8
8.8
10
9.6

10
7.6
8.4
15
22
24

Mag-
ne-

sium

(Mg)

8.2
7.4
2.8
3.1
3.2
3.1

3.7
2.1
3.0
6.1
8.4
9.2

Sodium

(Na)

3.4
3.5
2.5
2.6
3.0
2.9

2.8
2.5
1.9
3.0
4.2
4.4

Po-
tas-

sium

(K)

1.6
1.4
1.2
.9
1.2
1.3

1.2
3.6
.8
2.5
2.1
1.6

Lith-

ium

(Li)

31-
car-

brn-

ate

(HCOJ

92
85
31
34
38
39

41
31
35
69
97
110

Car-
bon-

ate

peg

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(SO.)

11
11
9.2
9.8
9.6
9.6

11
8.4
7.4
10
11
12

Chloride

(Cl)

2.8
3.0
1.2
.8
1.0
1.0

1.5
.5
.2
1.5
3.5
3.0

Fluo-

ride

(F)

0.2
.2
.2
.3
.2
.2

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

Ni-

trate

(NO,)

2.6
2.1
2.2
1.2
2.0
1.1

1.3
.8
.7
1.7
2.7
2.8

Phos-

phate
(P04)

0.18
.21
. 14
.08
. 13
. 11

. 15
3.9
. 10
1.4
.44
.25

Dissolved
solids

(residue
at 180°C)

109
A 97
63
58
63
63

69
56
49
A 84
A 114
A 122

Hardness

as CaCO,

Cal-

cium,

nesium

84
76
34
3E
38
37

40
28
33
62
90
98

Non-
car -

bon-

ate

8
6
8
7
7
5

7
2
4
6
10
8

To-

tal
acid-

ity
as

H+1

Specific
conduct-

ance

(micro-
mhos at

25*C)

179
165
80
83
93
89

96
80
76
140
192
214

pH

7.2
7.4
6.6
7.0
7.1
7.3

7.0
6.5
7.0
7.2
7.2
7.6

Col-

or

5
0
10
10
10
10

15
5
5
5
5
10

D.O.

(dis-
sol-
ved
oxy-
gen
ppm;

8.0
6.3
13.4
13.6
13.0
14.0

14.0
12.3
10.7
7.2
3.5
4.7

MPN

(coli-
form
colo-

nies

per

100 ml)

23
30
2300
23
30

23
2400
210
73
4600
36

A Calculated from determined constituents.

parts per million, of trace elements

Date of
collection

Dec. 27, 1964. . . .
June 13, 1965. . . .

Time

(24 hr)

1045
1000

Chromium

Hexa-

valent

(Cr«)

o.oo
.00

Total

(Cr)

0.00
.01

Cop-

per

(Cu)

0.07
.02

Zinc

(Zn)

0.1
. 1

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.04
. 08

CRAB CREEK BASIN

12-4726. CRAB CREEK NEAR SMYRNA, WASH.

LOCATION. At former gaging station, 2.5 miles east of Smyrna, Grant County, and 17 miles upstream from mouth. DRAINAGE AREA. 4,781 square miles of which 665 square miles in the vicinity of Soap Lake is noncontributing. REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 24, 1964

Jan. 10, 1965

Sept. 11.....

Mean

discharge
(cfs)

Silica

(Si02)

21
27
28
32
30
28

19
15
20
18
23
24

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

40
49
50
51
52
47

44
42
35
38
42
45

Mag-
ne-

sium

(Mg)

28
30
31
30
32
32

30
26
24
23
25
26

Sodium

(Na)

114
131
116
139
124
120

102
88
72
71
72
90

Po-
tas-

sium

(K)

13
15
14
20
15
14

12
11
8.5
10
11
11

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

344
351
340
379
354
331

288
264
240
236
249
280

bon-

ate

TO

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(S0«)

128
171
164
170
162
158

143
124
100
103
117
130

Chloride

(Cl)

46
56
50
60
56
55

52
42
34
35
37
42

Fluo-

ride

(F)

0.9
1.0
1.1
1.0
1.1
1.0

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

Ni-

trate

(NO,)

3.7
3.7
3.7
7.1
5.0
3.4

2.9
2.1
2.7
1.9
2.2
2.3

Phos-

phate
(P0t)

0.31
.43
.38
.51
.50
.51

.31
. 23
. 25
. 19
.23
.22

Dissolved
solids

(residue
bt 180°C)

567
658
A 625
A 697
652
627

548
A 481
A 415
A 417
467
512

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

215
247
251
252
260
248

234
210
186
188
208
221

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
4
0

To-

tal
icid

ity
as

Specific
conduct-
ance

(micro-
mhos at

2B"C)

899
1020
967
1050
1010
969

875
770
673
670
717
793

pH

8.0
8.1
8.2
7.8
7.9
8.0

8.1
8.0
7.9
8.2
7.6
8.0

Col-

or

10
10
5
5
5
5

5
5
5
10
5
15

D.O.
[dis-
sol-
ved
oxy-
gen
ppn0

16.6
12.6
12.5
13.1
11.2
12.4

13.3
10.1
9.7
8.0
6.6
12.0

MPN

(coli-
form
colo-

nies

per

100 ml)

230
930
23
210
230
0

73
930
1500
4600
2400
930

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 5, 1964.....
Hay 8, 1965. .....

Time

(24 hr)

0950
1206

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.06
.05

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.05
.02

YAKIMA RIVER BASIN

12-4872. MIDDLE FORK NACHES RIVER NEAR CLIFFDELL, WASH.

LOCATION. At bridge on U.S. Highway 410, 0.2 mile upstream from mouth, 0.7 mile upstream from Milk Creek, and 3.5 miles northwest of Cliffdell, Kittitas County. RECORDS AVAILABLE. Chemical analyses: October 1962 to September 1965.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 24, 1964

Jan. 16, 1965

Sept. 6......

Mean

discharge
(cfs)

Silica

(SiOj)

18
17
16
16
18
18

17
18
16
19
20
20

Alu-
mi-

num

(Al)

Iron

(Fe)

0.03
.02
.06
.Q9

.08
.24
.05

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

8.0
8.0
6.5
6.8
6.8
7.2

8.0
6.8
5.2
7.2
8.8
9.2

Mag-
ne-

sium

(Mg)

.5
. 6
. 1
. 6
. 1
. 7

.3
.2
. 6
.4
.6
.8

Sodium

(Na)

.0
. 2
.0
. 6
. 8
. 7

.2
.6
. 1
.9
.6
5.2

Po-
tas-

sium

(K)

0.9
. 7
. 7
. 3
.4
.5

.8
. 5
. 3
.6
.9
.6

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

41
42
34
39
35
40

39
34
26
37
44
46

Cap
ben
ate

PQJ

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(SO,)

1.8
2.0
1.4
1.8
1.6
2.0

.8
1.4
1.8
1.8
2.2
2.2

Chloride

(Cl)

1.0
1.2
.8
.8
.5
.8

. 2
.2
.5
.5
1.2
1.0

Fluo-

ride

(F)

0.1
. 1
.2
.0
. 1
.0

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

Ni-

trate

(NO,)

0.0
.2
.0
.2
. 1
. 1

. 3
. 1
. 1
. 1
.7
. 1

Phos-

phate
(PO«)

0.11
. 12
.07
.11
.09
. 10

. 10
.27
.07
. 19
.40
.38

Dissolved
solids

(residue
at 180°C)

A 56
59
49
52
55
59

58
51
42
52
63
63

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

26
26
21
24
22
25

25
22
16
24
28
30

Non-
car -

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

To-

tal
acid

ity
as

H+l

Specific
conduct-)
ance

(micro-
mhos at

25*C)

72
72
58
64
59
68

68
59
43
63
79
87

PH

7.8
7.7
7.7
7.6
7.7
7.9

7.3
7.6
7.3
7.3
7.0
7.5

Col-

or

0
0
5
5
5
5

15
5
5
5
5
0

D.O.
[dis-
sol-
ved
oxy-
gen
ppm)

12.3
13.3
13.7
13.2
12.1
12.5

11.3
9.9
10.8
9.9
8.6
10.7

MPN

(coli-
form
colo-

nies

per

100 ml)

23
0
23
23
0
0

0
0
0
0
23
0

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 6, 1964. ....
Hay 8, 1965. .....

Time

(24 hr)

1041
1723

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.03
.03

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
.01

YAKIHA RIVER BASIN Continued

12-4895. NACHES RIVER NEAR NACHES, WASH.

LOCATION. At State Highway bridge approximately, 500 feet upstream from Tieton River, and 4.3 miles west of Naches, Yakima County. RECORDS AVAILABLE. Chemical analyses: October 1962 to September 1965.
REMARKS. No discharge records available.

! Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 24, 1964

Jan. 16, 1965

Mean

discharge
(cfs)

Silica

(Si02)

13
13
11
13
14
16

17
15
12
12
11
12

Alu-
mi-

num

(Al)

Iron

(Fe)

0.03
.03

.09

. 25

. 08

.07

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

7.5
7.5
6.0
7.2
7.2
8.0

9.2
7.2
5.6
6.4
5.6
6.8

Mag-
ne-

sium

(Mg)

. 5
.4
.9
. 2
.4
.9

.2
. 1
. 6
. 1
. 2
.2

Sodium

(Na)

3.3
2.8
2.4
3.3
2.9
4.7

3~.0
2.7
2.5
2.4
3.0

Po-
tas-

sium

(K)

1.0
. 6
.6
.6
.4
. 7

.8
. 5
.4
.4

. 7

Lith-

ium

(LI)

Bi-
car-

bon-

ate

(Hccg

36
35
27
32
34
42

41
32
24
29
26
31

Car-
bon-

ate

py

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(SO.)

2.4
2.4
2.2
3.0
3.0
2.8

2.4
2.4
1.8
2.4
2.2
2.2

Chloride

(Cl)

0.8
1.0
. 5
. 5
. 5

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

Fluo-

ride

(F)

0.1
. 1
. 1
. 1
. 1
.0

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

Ni-

trate

(NO,)

0.1
. 1
.0
. 1
. 1
.2

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

Phos-

phate
(PO.)

0.05
.02
.03
. 05
. 04
.09

. 10
. 28
.06
. 19
. 13
. 19

Dissolved
solids

(residue
at 180°C)

A 48
48
40
47
51
61

59
A 46
A 36
38
A 37
A 42

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

24
24
19
23
24
28

28
22
16
20
19
22

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

To-

tal
acid-

ity
as

H+ l

Specific
conduct-!

ance

(micro-
mhos at

25°C)

65
63
51
59
60
71

72
58
44
52
47
56

pH

7.6
.3
.2
.2
.5
.6

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

Col-

or

0
0
5
5
5
5

10
5
10
0
0
5

D.O.
[dis-
sol-
ved
oxy-
gen
ppm)

12.0
13.6
13.5
13.1
12.7
13.2

11.1
10.1
10.8
9.9
8.9
10.1

MPN

(coli-
form
coli-

nies

per

100 ml)

36
930
91
23
0
0

0
30
390
0
150
73

Analyse in parts per million, of trace

Date of
collection

Dec. 6, 1964.....
May 8, 1965. .....

Time

(24 hr)

0915
1823

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.02
.02

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
. 00

Boron

(B)

0.00
. 00

YAKIMA RIVER BASIN Continued

12-4930. TtETON RIVER AT OAK CREEK GAME RANGE, WASH.

LOCATION. At logging road Bridge at Oak Creek Game Range, 0.2 mile downstream from Oak Creek, 1.6 miles upstream from mouth, and 6 miles west of Naches, Yakima County.
RECORDS AVAILABLE. Chemical analyses: October 1962 to September 1965.
REMARKS. No discharge records available.

Chemical analyses, in parts p3r million, water year October 1964 to September 1965

Date
of
collection

Oct. 24, 1964

Jan. 16, 1965

Mean

discharge
(cfs)

Silica

(sicg

15
15
16
16
16
14

21
18
16
16
15
15

Alu-
mi-

num

(Al)

Iron

(Fe)

0.09

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

8.0

7.5
7.6
7.2
7.2

7.2
7.2
6.8
6.0
6.8

Mag-
ne-

sium

(Mg)

2.0

2.4
1.7
2.0
2.1

2.4
2.0
1.8
2.0
1.8

Sodium

(Na)

3.4

3.2
3.3
3.1
3.2

3.4
3.1
2.8
2.6
2.9

Po-
tas-

sium

(K)

1.4

.8
1.2
.8
.9

1.1
.7
.7
1.1
.8

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

41

38
36
37
40

46
40
38
34
31
34

Car-
bon,
ate

W

0

0
0
0
0

0
0
0
0
0
0

SuUate

(SO.)

3.0

2.8
3.2
3.0
3.2

2.8
3.2
2.4
2.6
2.6
2.8

Chloride

(CD

0.8

. 5
. 5
. 5
.5

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

Fluo-

ride

(F)

0.2

. 1
. 1
. 1
.0

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

Ni-

trate

(NO,)

0.1

. 0
. 3
. 2
. 2

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

Phos-

phate
(P04)

0.06
. 07
. 08
. 10
. 10
. 10

. 11
. 12
. 05
. 29
. 36
.29

Dissolved
solids

(residue
at 180°C)

54
56
55
55
55
58

69
56
A 51
A 48
46
A 48

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

28
28
28
26
26
27

32
28
26
24
23
24

Non-
car -

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

To-

tal
acid^

ity
as

H+1

Specific
conduct-

ance

(micro-
mhos at

25°C)

74
73
71
67
67
69

81
70
66
61
57
61

pH

.9
.2
.4
.5
.4
.5

.4
. 5
.5
.4
7.1
7.4

Col-

or

0
0
5
5
5
5

15
5
5
5
5
0

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

12.1
13.3
13.0
12.8
12.3
12.7

10.7
9.9
10.0
9.6
8.9
9.7

MPN

(coli-
form
colo-

nies

per

100 ml)

23
0
230
23
91
0

230
36
0
30
91
91

A Calculated from determined constituents.

Analyses, in parts of trace elements

Date of
collection

Dec. 6, 1964.....
May 8, 1965... . ..

Time

(24 hr)

0940
1850

Chromium

Hexa-

valent

(Cr«)

0.00
. 00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.03
. 08

Zmc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
. 01

YAKI11A RIVER BASIN Continued

12-4987. NACHES RIVER NEAR YAKIMA, WASH.

LOCATION. At bridge on old U.S. Highway 410, 1.8 miles north of Yakima, Yakima County, and 3.8 miles upstream from mouth. RECORDS AVAILABLE. Chemical analyses; July 1960 to September 1965.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 24, 1964

Jan. 16, 1965

Mar. 7.......

Mean

discharge
(ds)

Silica

(Si02)

15
15
12
14
15
16

17
15
13
15
15
16

Alu-
mi-

num

(Al)

Iron

(Fe)

0.06
.04
.08

. 17

. 18

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

10
10
7.0
7.6
7.6
8.4

8.8
6.4
6.4
7.2
6.4
8.4

Mag-
ne-

sium

(Mg)

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

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

Sodium

(Na)

4.6
4.6
3.1
3.6
3.2
4.0

4.0
2.8
3.0
3.1
2.8
3.6

Po-
tas-

sium

(K)

1.3
1.2
.8
.6
1.0
.9

1.0
.7
.5
.9
1.0
.9

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

51
51
34
36
37
40

44
32
30
35
35
43

Cap.
ben-

ate

PW

0
0
0
0
0
0

0
0
0
0
0
0

Sulfate

(so«)

4.0
4.2
3.0
3.4
3.8
3.2

2.8
2.2
2.2
3.2
2.6
3.4

Chloride

(Cl)

1.5
1.5
. 5
.8
. 5
1.0

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

Fluo-

ride

(F)

0.1

.1
. 2
.0
. 1
.0

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

Ni-

trate

(NO,)

0.2
.2
. 1
.0
.2
.2

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

Phos-

phate
(P0«)

0.07
.05
.06
. 14
.07
. 17

.07
.09
.06
.35
.29
.32

Dissolved
solids

(residue
at 180°C)

65
66
47
55
56
61

60
46
46
48
51
58

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

36
36
24
27
26
28

31
22
20
26
24
31

Non-
car -

bon-

ate

0
0
0
0
0
0

To-

tal
icid-

ity
as

H+l

Specific
conducts

ance

(micro-
mhos at

25'C)

94
92
63
69
67
73

79
57
53
65
61
77

pH

.9
.8
.3
.5
.5
.6

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

Col-

or

0
0
5
5
5
5

5
5
10
5
5
0

D.O.
[dis-
sol-
ved
oxy-
gen
ppm)

12.8
13.9
13.5
13.2
12.5
13.0

11.6
10.4
9.9
9.7
9.4
10.2

MPN

(coli-
form
colo-

nies per'

LOO ml)

150
230
230
23
0
91

210
150
0
230
230
150

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 6, 1964.....
May 15, 1965. ....

Time

(24 hr)

1150
1841

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.03
.04

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.02
.01

YAKIMA RIVER BASIN Continued

12-5050. YAKIMA RIVER NEAR PARKER, WASH.

LOCATION. At Sunnyside diversion dam, 700 feet upstream from gaging station, 1.5 miles east of Parker, Yakima County, 3 miles downstream and at mile 103.7.
DRAINAGE AREA. 3,650 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: August 1959 to September 1965.
Water temperatures: August 1959 to September 1965.
EXTREMES, 1964-65. Dissolved solids: Maximum, 126 ppm Oct. 20 to Nov. 5; minimum, 60 ppm Hay 24 to June 8.
Hardness: Maximum, 74 ppm Oct. 20 to Nov. 5; minimum, 34 ppm Hay 24 to June 8.
Specific conductance: Maximum daily, 205 micromhos Oct. 28, 29; minimum daily, 82 micromhos Apr. 28, 29, Hay 29, June 6-8.
Water temperatures: Maximum, 72°F Aug. 10; minimum, freezing point Dec. 18.
EXTREMES, 1959-65. Dissolved solids: Maximum, 204 ppm Nov. 29, 30, 1962; minimum, 44 ppm Jan. 1-13, 1960.
Hardness: Maximum, 122 ppm Nov. 29, 30, 1963; minimum, 27 ppm Jan. 1-13, 1960.
Specific conductance: Maximum daily, 317 micromhos Nov. 29, 1963; minimum daily, 69 micromhos June 4, 1961, Hay 22, 1963.
Water temperatures: Maximum, 72°F on several days during July or August of most year; minimum, freezing point on many days during most REMARKS. Approximately 15 percent of yearly flow is diverted at Sunnyside Diversion Dam. No inflow between sampling point and gaging stt

from Ahtanum Creek,

Date
of
collection

Oct. 1-19, 1964..
Oct. 20-Nov. 5-

Nov. 30-Dec. 4. . .

Dec. 23- Jan. 20, 1965
Jan. 21-Feb. 11..
Feb. 13-Mar. 3...
Mar. 4-Apr. 2. . . .

Apr. 24-May 23. ..

May 24- June 8. ...
June 9- July 7. ...
July 8- Aug. 3. ...

Aug. 22-Sept. 13.
Sept. 14-30......

Weighted average

Time-weighted
average ......

Mean

discharge
(cfs)

1000
1390
1210
1810
2900
2530

4180
8150
6630
5010
2150
4160

3670
1840
392
415
533
351

B 2910

Silica

S10,)

17
21
20
17
15
15

13
15
15
15
16
14

14
14
19
15
15
15

15

16

Iron

(Fe)

Cal-

cium

(Ca)

13
18
17
14
12
12

10
11
11
10
11
9.2

8.8
9.2
10
10
11
12

11

11

Mag-
ne-

sium

(Mg)

5.4
7.0
7.2
5.6
3.7
4.2

3.1
3.6
4.0
3.4
4.0
3.3

2.8
3.4
4.0
4.2
4.5
5.0

3.8

4.3

28

Sodium

(Na)

8.1
12
12
9.2
6.3
6.9

5.3
5.6
5.7
5.3
5.8
4.7

4.6
5.2
6.0
6.5
7.3
6.7

6.0

6.7

Po-
tas-

sium

(K)

2.1
2.2
2.3
1.8
1.2
1.1

.9
1.4
.9
1.0
1.0
.9

1.0
1.0
1.0
1.2
1.4
1.3

1.2

1.3

Bl-

car-

bon-

ate

(HCO,)

78
104
104
82
62
65

52
57
60
57
61
50

48
52
59
60
66
73

60

65

Car-
bon-

ate

(CO,)

0
0
0
0
0
0

0
0
0
0
0
0

0
0
0
0
0
0

--

Sulfate

(SO.)

6.0
8.8
8.6
7.0
4.6
5.6

4.8
4.8
4.6
3.8
4.0
3.2

3.2
4.0
4.4
4.4
5.2
5.0

4.7

5.1

Chloride

(Cl)

2.8
4.5
4.5
3.5
2.5
2._2

2.0
2.0
2.0
1. 5
1.8
1.5

1.0
1.2
1.2
1.2
2.0
1.8

2.0

2.1

FluO-

rlde

(P)

0.2

0.1

0.1

Ni-

trate

(NO,)

0.6
.8
. 8
. 8
. 8
1. 1

1.1
1.2
.9
.5
. 5
.3

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

1.9

0.7

Phos-

jhate
(P0 4)

0.19
.24
.28
.20
. 17
. 17

. 14
.18
. 13
. 10
. 13
. 14

. 13
. 15
. 14
. 15
. 18
. 16

0.15

0.16

Dissolved solids
(calculated)

Parts

per
million

93
126
124
99
A 81
80

A 70
77
A 80
A 75
A 76
A 69

60
65
75
73
79
84

77

81

Tons

per
acre-

foot

0.13
. 17
. 17
. 13
. 11
. 11

. 10
. 10

.11
. 10
. 10
.09

.08
.09
. 10
. 10
. 11
. 11

0.10

-

Tons

per

day

251
473
405
484
634
_ 546

790
1690
1430
1010
441
775

595
323
79.4
81.8
114
79.6

572

- -

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

54
74
72
58
45
47

38
42
44
39
44
36

34
37
42
42
46
50

77

46

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0
0

0
0
0
0
0
0

0

0

So-

dium
ad-

sorp-
tion
ratio

0.5
. 6
. 6

.4

0.4

0.4

Specific
con-

duct-

ance

micro-

mhos at

25°C)

144
196
193
154
120
126

101
112
114
103
110
91

88
97
107
110
123
136

112

121

PH

7.7
7.8
7.9
7.9
7.7
7.3

7.5
7.4
7.4
7.5
7.4
7.5

7.5
7.6
7.6
7.5
7.8
7.6

7.4

7.5

A Residue at 180°C.

B Mean discharge based on 365 days; mean discharge for 330 days of chemical analyses, 2730 cfs.

YAKIHA RIVER BASIN Continued

12-5050. YAKIMA RIVER NEAR PARKER, WASH. Continued

Date of
collection

May 15, 1965. ....

Time

(24 hr)

1627
1938

Chromium

Hexa-
valen*

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.04
.05

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
.02

Specific conductance (micromhos at 25°C), water year October 1964 to September 1965 Day

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

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

11.....
12.....

13.4...

14.....
15.....

16.....
17.....
18.....

19.4...

20.....

21.4...

22.4...
23.....
24.....
25.....

26.....
27.....
28.....
29.....
30.....
31.....

Average

October

137
131
133
131
131

138
139
141
142
146

147
147
147
155
155

158
157
159
158
175

176
176
179
198
199

199
201
205
205
201
200

163

November

201
?01
200
198
198

190
190
189
190
192

193
195
195
1=7
190

189
190
194
194
198

194
195
195
194
168

146
145
156
156
159

186

December

117
117
108
109
120

120
120
176
127
176

120
120
120
121
128

125
145
149
149
130

130
131
97
94
101

m
102
101
107
105
107

118

January

106
106
106
103
99

99
98
97
99
100

100
99
100
101
99

99
99
100
103
103

109
109
108
107
110

108
1"9
98
95

102

February

__

120
120
116
108

112
113
121
116
114

112

119
118
119

119
123
126
11?
119

114
113
113
113
100

106
106
101

114

March

101
107
107
113
101

100
99
99
97
100

96
100
100
101
100

101
101
102
102
104

103
102
102
103
105

102
110
111
110
110
110

103

April

109
110
107
106
106

107

log
115
115
115

115
116
111
110
110

99

__

89
88

87
84
82
82
83
- -

»

May

91
91
91
92
95

96
94
97
91
92

90
88
S9
87
88

92
92
94
96
97

97
97
98
101
99

92
94
89
82
83
84

92

June

91
91
90
85
85

82
82
87
84
84

86
87
84
87
105

104
103
114

92

93
96
96
100
101

103
103
102
102
104

93

July

103
103
104
105
104

107
106
OR
99
101

9S
101
102
107
108

104
103
101
13?
102

110
116
111
114
116

113
113
110
109
110
110

106

August

110
110
109
104
102

102
103
104
104
106

10S
109
111
120
124

111
112
110
112
114

115
122
172
12R
122

119
123
173
110
109
114

11?

September

171
175
130
130
126

1'4
175
176
177
178

177
127
1?7
130
132

131
133
133
136
135

138
138
137
137
136

138
135
138
138
139

131

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

£§> < *

n

O
CO

o
CM

CD
CN
K

CM
U1

f

CM
CO
CM
CM

O
CM

O

CO

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rt* ^O Q ~

t

co

CN

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o-

CO

IX

«1

V

CM

-

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o

m » en

o 1 *

sss
1 0 *
1 * <n

r~ CT> in

r- co *

frrn m
a. t\i -t

t * to
o fN -tf

^M<f

fsj^tn

(NJ rH ^~
m ^- ro

Si !

SSS
j-^m

4 o<n

\r\ & m

ir> -a- <n
r^ i-i -a-

S^S

5 "

£SS

SIS

s?:s
r^ ^ o*

^ *en

SSS

S3S
r~ co o

CO O »-l
ir> 4 *
r- o >H
in tr> -tf

" W Ul

October Novembe Decembe

in <^ CM

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1 1 »

1 1 *
1 1 *

*O | (NJ

m | -4-

S S3

CO 0 CO

tn j-m

«1 ^CV

4" t-(CO
<n ^ m

* ss

0 i-i ^

in tn o

S 3£

sss
C^ CV-H

° ss

mSS

££3

r^i rn -*

ct IS

£ S5

(Tl (Tl -*

(^ m ^~

-* h- ^t
ro ro -*
^- co in
m m ^~

(^ <f<f

S S3

SSS
<n r- r-

ssp;

S i £

rt S JH

1 IN O

1 tN 1

1 m 1

CO I- * * m <e

* m -o

£££

0*0

^ m in
t> m <f

S^S
1 i t-
1 u. <o

I 0 CO

! ££
1 --I 1
1 m 1

1 5s
1 CO 4

SSS

^SS

S^^S

sss

5SS
I-H -a- r^

^SS

SmS

4- in \o

ro co r- ^- <*- m

4 ^ 1

4 J- o

3^SS

o- .0 r^

55S

1 * m

ili

* en eo

*J- I
o in 1

en r- o
fl lf> »O

S^S

^- o in

* cc r-

*o o in
4- in co

££"

£ SS

r- mco

o «-< »o

sss

5SS

in i-m

ss?;
SS"

*O *O m

O M .M

0 -t r-!
m *O vD

»o r- -o

vo r- *o

S^S

s^s

>O -O iTi

* 0)^
^ CNJ O

sss
r- m -t

fi °& O

sss

: : :

J3
% §

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 at mile 29.8. DRAINAGE AREA. 5,615 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: December 1952 to September 1965.
water temperatures: December 1952 to September 1965.
EXTREMES, 1964-65. Dissolved solids: Maximum, 225 ppm Sept. 5-30; minimum, 93 ppm Apr. 22 to Bay 4.
Hardness: Maximum, 138 ppm Sept. 5-30; minimum, 52 ppm Jan. 30 to Feb. 2.
Specific conductance: Maximum daily, 369 micromhos Aug. 18; minimum daily, 121 micromhos Apr. 23.
Water temperatures: Maximum, 76°F Aug. 1, 11; minimum, freezing point on several days during December.
EXTREMES, 1952-65. 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, 409 micromhos Oct. 3, 10, 1961; minimum daily, 99 micromhos Dec. 17, 1959.
Water temperatures: Maximum, 84°F July 18, 1960, July 21, 1961; minimum, freezing point on several days during winter months.

Chemical analyses, in]

Date
of
collection

Oct. 1-15, 1964..
Oct. 16-Nov. 3. . .

Nov. 27-Dec. 3...

Jan. 1-29, 1965. .
Jan. 30-Feb. 2. . .

Feb. 21-Mar. 18. .
Mar. 19-Apr. 1...

Apr. 22-May 4. ...

May 29- June 2. ...

June 26- July 8. . .

Mean

discharge
(cfs)

2140
2710
2220
2840
3310

3280
6830
4650
17800
8930

8020
5510
3660
5480
7770

4700
5960
5430
3510
1890

Silica

(S10,)

26
25
26
23
20

21
18
18
22
21

19
19
18
20
18

18
17
19
22
25

Iron

(Fe)

Cal-

cium

(Ca)

30
28
30
26
20

24
14
18
14
16

15
16
18
17
14

18
16
17
22
30

Mag-
ne-

sium

(Mg)

13
13
12
9. 2
7.2

8. 4
6.1
5.6
4.3
6.5

5.1
5.8
7.3
5.4
4.5

6.9
5.5
5.3
7.5
9.8

Sodium

(Na)

22
20
21
17
13

16
10
11
8. 8
11

8. 4
9.8
10
8.5
7.5

9.9
8.7
9.5
13
19

jarts per million, water year October 1964 to Se

Po-
tas-

sium

(K)

3. 9
3.4
3. 7
2.9
2.3

3.4
2.2
1.9
3.1
2.4

1.5
1.5
1.8
1.6
1.6

2.2
1.7
1.9
2.4
3.2

Bi-
car-

bon-

ate

(HCO,)

173
165
161
139
109

125
81
92
68
90

80
84
96
85
72

95
82
87
114
153

Car-
bon-

ate

(CO,)

0
0
4
0
0

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

Sulfate

(S04)

22
21
21
17
13

16
10
12
10
11

8.0
10
12
9.2
7.2

11
9.2
9.8
14
20

Chloride

(Cl)

7. 2
7.2
7.5
6. 2
4.5

6.2
3.8
3.8
2.5
3.5

2.5
3.5
4.0
3.0
2.2

3.5
3.0
3.2
4.5
6.5

Fluo-
ride

(P)

0. 3
. 3
.3
3
2

3
2
-2
2
2

.2
.2
.2
.2
.2

.2
.2
-2
.2
.2

Ni-

trate

(NO,)

3. 0
2.9
3.3
3.0
2.5

3. 9
2. 5
1.7
3.5
1.7

1.5
1.2
1.3
1. 6
1.3

1.7
1.4
1.7
2.7
3.7

Phos-

phate
(P0 4)

0.32
.30
.32
.32
.25

.41
.25
.25
.43
.31

.21
. 17
. 18
.22
.21

.20
. 19
.21
.26
.30

atember 1965

Dissolved solids

(residue at 180°C)

Parts

per
million

A 213
203
A 208
177
138

161
111
118
112
119

101
A 108
A 120
109
93

A 119
A 103
111
A 145
A 193

Tons

per
acre-

foot

0. 29
28
.28
.24
. 19

. 22
. 15
. 16
. 15
. 16

. 14
. 15
. 16
. 15
. 13

. 16
. 14
. 15
.20
.26

Tons

per

day

1230
1490
1250
1360
1230

1430
2050
1480
5380
2870

2190
1610
1190
1610
1950

1510
1660
1630
1370
985

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

127
122
124
103
80

94
60
68
52
67

58
64
75
65
54

73
62
64
86
115

Non-
car-

bon-

ate

0
0
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
.8
.8
. 7
.6

.7
.6
.6
.5
.6

.5
.5
. 5
.5
.4

.5
.5
.5
.6
.8

Specific
con-

duct-

ance

[micro-
mhos at

25"C)

336
322
329
275
216

259
166
186
151
183

152
167
195
166
140

187
162
169
223
297

pH

8.0
7.9
8.4
8.2
8.1

7. 9
7.7
8.0
7.2
7.9

7.8
7.9
7.7
8.0
7.9

7.8
7.7
7.8
7.9
8.1

Aug. 31-Sept. 4..
Sept. 5-30. ......

Weighted average

Time-weighted
average ......

1790
2390
1950

~

4210

24
27
24

20

22

A Calculated from determined constitu

33
29
35

20

23

12
9.7
12

7.1

8.6

22
18
19

12

15

A

3.8
2.3
3.9

2.3

2.7

27

nalys

176
152
180

104

125

es, in

Date of
collection

Dec. 12, 1964. ..
June 12, 1965. . .

0
0
0

~

-

partE

Time

(24 hr

095E
141]

22
18
23

13

15

per ml

7.2
5.5
5.5

4.0

4.9

llion, of

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total
(Cr)

0.00
.01

.3
.3
.2

0.2

0.2

trac

Cop-
per

(Cu)

0.02
.03

4.0
3.8
3.2

2.2

2.5

e el

Zinc

(Zn)

0.05
.05

.33
.28
.32

0.26

0.27

ements

Ar-

senic

(As)

0.00
.00

A 216
A 189
225

134

157

Boron

(B)

0.00

.29
.26
.31

0.18

-

1040
1220
1180

1520

"

131
112
138

78

93

0
0
0

0

0

.8
.7
. 7

0.5

0.6

338
293
351

206

245

8.1
7.9
8.0

7.8

7.9

Temperature (°F) of water, water year October 1964 to September 1965

October ....

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

April..........

June..........

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

September .....

1

55

33
37

53

tl

2

37

51

61

71

62

3

36
38

51

66

71

61

4

36
40

51

66

71

62

5

36
39

51

66

73

63

6

35
39

51

65

73

63

7

35
40

50

74

61

8

36
41

51

54

74

61

9

35
40

51

68

62

10

34
40

50

65

69

63

11

38

50

65

68

64

12

38

36
40

52

63

67

64

13

38

37
40

53

59

67

64

14

38

37
41

56

59

15

37

37
41

56

59

70

63

Day

16

32

36
41

55

55

17

32

38
41

53

62

73

55

18

32

40
44

61

72

54

19

32

39
45

52

62

71

55

20

32

40
40

53

65

69

57

21

39
33

40
47

53

66

66

59

22

38
35

40
47

52

66

65

61

23

39
35

33
42

52

67

66

61

24

42
34

37
40

52

67

68

60

25

34

37
40

54

67

70

60

26

39
33

38
43

54

64

73

60

27

42
33

39
44

55

64

72

59

28

43
34

40
42

55

64

74

58

29

42
35

39

54

61

72

57

30

33

39

54

66

73

57

31

32

36

75

Aver-
age

44
37

37
41

53

63

71

60

YAKIMA RIVER BASIN Continued

12-5105. YAKIMA RIVER AT KIONA, WASH. Continued

Specific conductance (micromhos at 25°C), water year October 1964 to September 1965 Day

1.....
2.....
3.....
4. > « .
3.....

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

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

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

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

26.....
27.....
28.....

30.....
31.....

Average

October

356
353
333
321
312

315
310
316
326
345

346
346
346
349
352

342
336
?9?
785
292

285
285
283
302
315

321
326
332
342
345
345

356

November

342
339
339
339
336

336
329
'73
223

}?6

*?f,
326
329
332
3?<J

329
329
379
332
332

336
332
379
332
329

336
308
267
263
269

320

December

278
28*
257
194
187

195
205
213
219
?26

27.9
22?
216
270
22?

226
22"
235
249
776

271
249
235
141
146

143
164
167
173
182
182

214

January

182
188
190
IP*
193

199
198
1«R
17P
175

177
176
178
176
1 RO

180
176
171
170
175

176
190
197
1R9
189

191
194
70?
172
146
143

181

February

153
152
173
187
198

1 P8
180
183
1R?
177

18?
179
180
182
180

180
180
183
173
174

163
156
157
160
163

165
169
145

173

March

156
146
147
156
167

154
150
149
146
145

143
140
141
143
143

144
148
14?
148
161

152
156
156
160
159

159
168
162
1 70
174
175

153

April

181
188
184
178
175

173
174
173
185
195

199
196
204
215
218

213
204
168
158
168

169
123
121
141
132

146
14?
141
136
133

171

May

133
141
148
159
170

183
187
184
183
179

177
178
172
170
168

181
175
177
182
195

205
196
197
201
198

198
204
202
1 R "> Lot.
160
148

178

June

_

153
188
197
191

182
175
16'
158
155

154
163
152
148
155

177
193
707
734
764

230
? r'7

713
220
738

761
778
281
? 8 1
290

2C3

July

299
307
310
306
317

320
316
316
331
346

346
328
325
320
'17

'29
'38
'5?
35?
'48

344
331
313
290
290

300
319
'31
334
338
348

324

August

350
354
350
355
351

334
347
371
7->4

322

325

77J

350
354
354

'51
36?
369
35°
345

349
356
356
33?
314

282
296
323
356
320
281

337

September

268
285
30"
325
347

351
366
362
350
350

357
362
358

362

354
350
344
343
336

340
'32
336
339
360

360
360
352
35?
352

343

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

CHEHALIS RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Mean

discharge
(cfs)

Silica
(S1O2)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium
(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

car-

bon-
ate

(HCO,)

Ca*
bon-
ate

<ay

Sulfate
<SO«)

Chloride
(Cl)

Fluo-
ride

(F)

Ni-
trate

(NO,)

Phos-

phate
(P04)

Dissolved
solids
(residue
at 180°C)

as CaCC3

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

To-
tal
1C id
ity
as

H+l

Specific
conduct-

ance

(micro-
mhcs at

25'C)

PH

Col-

or

D.O.
(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coil-
form
colo-
nies
per

100 ml)

12-200. CHEHALIS RIVER NEAR DOTY, WASH.

Oct. 27, 1964
Jan. 14, 1965

July 6. ......

86
868

48

13
14

16

0.34 6.0
4.4

6.8

1.9
1.3

2.1

4.9
4.4

5.9

Analys

0.6
. 2

. 4

31
20

34

0
0

0

3.4
2.8

3.2

4.8
5.0

6.0

0.1
. 0
- 1
. 0

0.2
1.4

. 2

0.01
. 05

. 02

49
43

56

23
16

26

0
0

0

71
56

78

7.4
7.0
R q
7.2

10
5
5
10

12.6
13.4

8.7

1500
930
750
210

Date of
collection

Oct. 27, 1964....
Apr. 19, 1965....

Time

(24 hr)

1400
0905

Chromium

Hexa-
valent
(Cr«)

0.00
.00

Total
(Cr)

0.00
.CO

Cop-
per

(Cu)

0.05
.04

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

0.00
.00

Boron

(B)

0.03
.01

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

CHEHALIS RIVER BASIN Continued

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica
(Si02)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-
nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium
(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

car-

bon-
ate

(HCO,)

Car-
bon-
ate
PW

Sulfate
(SO.)

Chloride
(Cl)

Fluo-
ride
(F)

1

Ni-
trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids

(residue
at 180°C)

Cal-
cium,
mag-
nesium

Non-
car-

bon-
ate

To-
tal
acid-

ity
as

H+1

Specific
conduct*

ance

(micro-
mhos at
25"C)

pH

Col-

or

D.O.
[dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-
nies
per

LOO ml)

12-250. NEWAUKUM RIVER NEAR CHEHALIS, WASH.

Oct. 27, 1964
Jan. 13, 1965

July 7. ......

109
609

37

14
13

15

7.5
4.4

8.4

2.1
1.1

2.7

4.8
3.4

6.2

0.5
. 2

. 6

36
22

39

0
0

0

1.2
. 0

1.2

6.0
4.0

9.8

0.1
. 0

. 1

0.2
1.2

. 4

0.02
. 03

. 04

55
41

A 63

27
16
30
32

0
0

0

79
48
87
97

7.1
6.8
7 ?,
7.0

5
5

5

12.2
12.7
..

7.9

36
230
__

430
A Calculated from determined constituents

Analyses, in parts per million, of trace elements

Date of
collection

Oct. 27, 1964.....

Time

(24 hr)

1230

Chromium

Hexa-
valent
(Cr«)

0.00

Total

(Cr)

0.00

Cop-
per

(Cu)

0.03

Zinc

(Zn)

0.05

Ar-
senic

(As)

0.00

Boron

(B)

0.03

12-350. SATSOP RIVER NEAR SATSOP, WASH. Dec. 15, 1964
Mar. 9, 1965.

Sept. 13.....

2600
1650
734
233

13
12
14
15

5.0
5.0
6.0
6.8

1.4
1.8
1.9
2.4

3.0
3.0
3.7
3.9

0.2
. 2
. 5
. 1

24
26
32
36

0
0
0
0

2.0
1.8
2.8
3.2

2.0
2.2
2.0
2.8

0.0
. 0
. 0
. 0

0.1
. 5
. 4
. 5

0.01
. 00
. 02
. 02

44
43
A 47
54

18
20
23
27

0
0
0
0

53
53
62
72

7.2
7.0
7.1
7.1

0
0
0
5

12.3
12.2
10.7
10.3

91
36
23
91

A Calculated from determined constitu

Analyses, in parts pe nillion, of trace elem

Date of
collection

Mar. 9, 1965.
Sept . 13 ....

Time

(24 hr)

1010
1055

Chromium

Hexa-

valent

(Cr«)

0.00
oo

Total

(Cr)

0.00
no

Cop-

per

(Cu)

0.02
01

Zinc

(Zn)

0.05
OS

Ar-

senic

(As)

0.00
oo

Boron

(B)

0.01
oo

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

CHEHALIS RIVER BASIN Continued

Chemical analyses, in parts per milli ater year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(Si02)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-

ga-
nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(MR)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

car-

bon-
ate

In^Ugj

Car-
bon-

ate
POJ

Sulfate

(S0«)

Chloride

(Cl)

Fluo-
ride

(F)

Ni-
trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids

(residue
at 180°C)

Cal-

cium,
mag-
nesium

Non-
car-

bon-
ate

To-
tal
acid

ity
as

H+1

Specific
conduct-

ance

(micro-
mhos at

25°C)

PH

Col-

or

sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-

nies

100 ml)

12-368. WTNOOCHEE RIVER NEAR MONTESANO, WASH.

Dec. 15, 1964
Mar. 9, 1965.

Sept . 13 .....

9.1
8.6
8.9
11

0.13

6.0
6.4
7.6
8.4

1.5
1.4
1.5
2.2

2.4
2.1
2.6
3.0

0.4
. 1
. 2
. 5

26
28
32
37

0
0
0
0

2.8
2.0
2.4
3.0

1.8
1.0
2.0
2.0

0.1
. 0
. 0
. 1

0.6
. 6
. 2
. 1

0.01
. 00
. 01
. 00

41
39
42
53

21
22
25
30

0
0
0
0

54
53
61
73

7.5
7.1
7.2
7.2

5
0
0
0

12.6

10.3
9.9

230

36.
91

Analyses, in parts pe of trace elements

Date of
collection

Mar. 9, 1965. ....
Sept . 13 ....

Time

(24 hr)

1335
1510

Chromium

Hexa-
valent

(Cr«)

0.00
nn

Total

(Cr)

0.00
on

Cop-
per

(Cu)

0.01
ni

Zinc

(Zn)

0.05
nS

Ar-

senic

(As)

0.00
nn

Boron

(B)

0.01
nn

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

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m m to t*

e

c

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11
O.K-3

0 »Si

Is
«lt

|lSi

II

Date ofcollection

O rH
O 0
O

O 0
oo
o

m to
00

d

|H O
O O
O

§

c-j
0
d

O .H

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o

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H N
H iH

10°
10
a>
H

s'l

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MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

QUINAULT RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica
(SiO2)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-
nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium
(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-
ate

(HCO,)

Car-
ban
ate

(CO,)

Sulfate
(S0<)

Chloride

(Cl)

Fluo-
ride
(F)

Ni-
trate

(NOJ

Phos-

phate
(P04)

Dissolved
solids
(residue
at 180°C)

Hardness
as CaCO,

Cal-
cium,
mag-
nesium

Non-
car-

bon-
ate

To-
tal
acid-

ity
an

H+l

Specific
conduct-

ance

(micro-
mhos at

25'C)

PH

Col-

or

'dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-
nies

12-395. QUINAULT RIVER AT QUINAULT LAKE, WASH.

Dec. 15, 1964
June 3, 1965.

2700
2460

4.2

4. 6| |

8.5
9.2

0.5
. 7

1.5
1.7

0.1
.3

26
27

0
0

4.8
6.2

1.8
1.0

0.0
. 1

0.5
. 3

0.01
.01

36
38

23| 2 1
26| 4 |

56 I 7.0
62 [7.3

0 11.3 230
010.3 23

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 15, 1964. . . .
June 3, 1965. ....

Time

(24 hr)

1130
1110

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.03
.02

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

0.00
.00

Boron

(B)

°-4 ^

Chemical analys

QUEETS RIVER BASIN

in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica
(SiOz)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(MR)

Sodium
(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-
ate

Car-
bon-
ate

w

Sulfate

(SO.)

Chloride
(Cl)

Fluo-
ride
(F)

Ni-
trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids
(residue
at 180°C)

as CaCO,

Cal-
cium,
mag-
nesium

Non-
car -

bon-

To-
tal
acid-

ity
as

H+ 1

Specific
conduct^

ance

(micro-
mhos at

25'C)

pH

Col-

or

(dis-
sol-
ved
oxy-
gen
ppm.

MPN

(coli-
form
colo-
nies

100 ml)

12-406. QUEETS RIVER AT QUEETS, WASH.

Dec. 15, 1964
June 3, 1965.

5.1
5.1

6.5
9.6

0,8
. 7

2.6
2.3

0.2
. 4

21
28

0
0

4.4
6.8

3.0
2.0

0.0
. 1

0.5
. 3

0.00
. 01

34
46

20
27

2
4

55
68

7.0
7.3

5
0

12.6
10.1

36
36

Analyses, in parts per million, of trace e

Date of
collection

Dec. 15, 1964....
June 3, 1965. ....

Time

(24 hr)

1100
1020

Chromium

Hexa-
valent
(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.04
.02

Zinc

(Zn)

0.05
.05

Lements

Ar-
senic

(As)

0.00
.00

Boron

(B)

0.00
.00

QUALITY OF SURFACE WATERS, 1965

B 8

o ' n in TJ !» a 'a

H o a) K ® a QTJ in > o MO,

0 g
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a

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U 73 S S 2

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m" -

QUILLAYUTE RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica
(Si02)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(MR)

Sodium
(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-
ate

Car-
ben-
ate

po,)

Sulfate
(SO,)

Chloride
(Cl)

Fluo-
ride

(F)

Ni-
trate

(NO,)

Phos-

phate
(P04)

Dissolved
solids
(residue
at 180°C)

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

To-
tal
acid
ity
as

H+1

Specific
conduct-

ance

(micro-
mhos at
25°C)

PH

Col-

or

D.o.

(dis-
sol-
ved
oxy-

ppm'

MPN

(coll-
form
coli-
nies
per

12-420, SOLEDUCK RIVER ABOVE KUGEL CREEK, NEAR FAIRHOLM, WASH.

Dec. 14, 1964
June 2, 1965.

5.4
5.4

0.03 11
10

1.2
1.4

2.3
2.0

0.3
. 4

36
35

0
0

6.4
6.2

1.2
1.0

0.1
. 1

0.2
. 3

0.00
. 01

47
43

32
30

3
2

76
72

7.5
7.5

5
0

11.7
11.3

30
23

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 14, 1964. ...
June 2, 1965. ....

Time

(24 hr)

1515
1600

Chromium

Hexa-
valent
(Cr«)

0.00
.00

Total
(Cr)

0.00
.01

Cop-
per

(Cu)

0.01
.02

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

0.00
.00

Boron

(B)

0.02
.01

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

ELWHA RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica
(Si02)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(MR)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-
ate

^niv'Ug/

Car
ben-
ate

(CO,)

Sulfate
(SOJ

Chloride
(Cl)

Fluo-
ride

(F)

Ni-
trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids

(residue
at 180°C)

Hardness
as CaCOj

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

To-
tal
acid
ity
as

H+ l

Specific
conduct"

ance

(micro-
mhos at
25°C)

PH

Col-

or

Dis-
sol-
ved
oxy-
gen
ppm)

(coli-
form
colo-
nies

12-455. ELWHA RIVER AT McDONALD BRIDGE, NEAR PORT ANGELES, WASH.

Dec. 14, 1964
June 2, 1965.

1240
2110

5.7
5.7

12
12

1.5
1.1

2.0
1.9

Analv

0.2
. 4

in oa

41
38

0
0

7.2
7.2

0.5
1.0

0.0
. 1

0.2
. 3

0.01
. 01

52
49

36
34

2
4

82
79

7.7
7.6

5
0

12.6
11.9

30
23

Date of
collection

Dec. 14, 1964....
June 2, 1965. ....

Time

(24 hr)

1415
1455

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.02
.01

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

0.00
.00

Boron

(B)

0.00
.00

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

S 8

g -,

o H -a i, a a
H o <s> x » a Q-a M > o M a

II

B

113

la II

.so

0 Is

1 -fl-5
^ S^

11

&S5 y O" -

J3 g g£

u S *c3 o

g J^

« s

Q ^

o

rH O
O O
O

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O

O O
o

rH rH
O O
O

o o
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o

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o

n n
rH rH

S

in to

rH Ol
rH

rH N

o e

389-675 O - 70 - 10

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

BIG QUILCENE RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica
(Si02)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(MB)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-
ate

(HCO,)

Car-
ton
ate
W

Sulfate
(SO,)

Chloride
(Cl)

Fluo-
ride

(F)

Ni-
trate

(NO,)

Phos-

phate
(P04)

Dissolved
solids
(residue
at 180°C)

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

To-
tal
acid-

ity
as

H+1

Specific
conduct-

ance

(micro-
mhos at
25C C)

PH

Col-

or

D.O.
Idle-
sol-
ved
oxy-
gen
ppm)

(coli-
form
colo-
nies
I per

12-523. BIG (QUILCENE RIVER NEAR QUILCENE, WASH.

Dec. 14, 1964
June 2, 1965.

9.1
8.0

0.04 14
13

2.4
2.1

4.4
3.4

0.2
. 3

48
48

0
0

3.0
2.2

8.5
6.0

0.0
. 0

1.0
. 3

0.32
. OX

73
61

45
41

6
2

114
99

7.7
7.6

5
0

12.6
10.4

36
36

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 14, 1964....
June 2, 1965. ....

Time

(24 hr)

1200
1250

Chromium

Hexa-
valent
(Cr«)

0.00
.00

Total
(Cr)

0.00
.00

Cop-
per

(Cu)

0.01
.02

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

0.00
.00

Boron

(B)

0.00
.00

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

O W rH T3 t*. fl S

^ o o) M o a
Q 'd ta > o bo a

H «5 33 3

, «r a

-^t § ^P 3
cd 9 d -s
U 'C S S

ts

n

6-3

11

n o

o o

IsA
4 11

11

Chromium

n-S 3
O ftSi

^H.

W >"-

15
PS

s|
32

m H
0 0

d

§§

0

m m
00

d

00

o

O H

oo

d

§3
d

oo

H 04
H H

CT1 U>
HO!
H

H N

V

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

DUCKABUSH RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(els)

Silica

(SiOz)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

car-

bon-
ate
fwrvi \

Car-
bon-
ate

soy

Sulfate
(SO,)

Chloride

(Cl)

Fluo-
ride
(F)

Ni-
trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids
(residue
at 180°C)

Cal-

cium,
mag-
nesium

Non-
car-

bon-
ate

To-
tal
acid
ity
as

H+ l

Specific
conduct*

ance

(micro-
mhos at

25'C)

pH

Col-

or

D.O.

ved
oxy-
gen

MPJT
(coH-
form
colo-
nies
per

100 ml)

12-541. DUCKABUSH RIVER AT U.S. HIGHWAY 101 BRIDGE, NEAR BRINNON, WASH.

Dec. 14, 1964
June 2, 1965.

6.7
6.1

26
10

51
. 7 1.8 0.3

44
33

0
0 4.6

730
1.0

0.3
. 1 0.3.01

1 276 1 240

41 1 28 | 1

2560
66

7.5
7.7

0
0

12.4
11.1

150
36

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 14, 1964. . . .
June 2, 1965. ....

Time

(24 hr)

1100
1140

Chromium

Hexa-
valent
(Cr»)

0.00
.00

Total
(Cr)

0.00
.00

Cop-
per

(Cu)

o.oo

.01

Zinc

(Zn)

O.O5
. 05

Ar-
senic

(As)

o.oo

.00

Boron

(B)

0.17
.06

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

O Bl HT3 >. O
H o o « o a
QT3 K > O MO,

*

E

II

iili

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IsA
ill

11

S
Chromiv

o-S'a o S.H.
3-c

£B

^ ST

IS

e
M O

v °

"S -2 Q 8

H
0

6

o o
o o
0

oo
0

O H
O O
O

o o
o o
o

o o
o o
o"

o m

co m 00

H H

*'

H

H CM
O

14

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

DESCHUTES RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(SIO,)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium
(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

car-

bon-

ate

(HCOj)

Car
ban-

ate
W

Sulfate

(SO.)

Chloride

(Cl)

Fluo-
ride

(F)

Ni-
trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids

(residue
at 180°C)

Hardness

Cal-

cium,
mag-
lesium

Non-
car -

bon-
ate

tal
acid-

ity
as

H+ 1

Specific
conduct-i

ance

(micro-
mhos at

25°C)

PH

Col-

or

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-

nies

100 ml)

12-800. DESCHUTES RIVER AT TUMWATER, WASH.

Oct. 27, 1964
Jan. 14, 1965

July 7.......

22
19

25

0.24

_

10
7.6

11

3.6
2.1
3.2
3.2

6.4
5.0
6.6
6.8

1.1
. 4

1.0

48
34
48
47

0
0
0
0

3.4
2.8
3.8
3.8

8.2
6.5
8.8
9.5

0.1
. 0
. 0
. 0

1.6
1.2
1.0
1.1

0.11
. 00
. 06
. 12

80
64
A 83
89

40
28
40
40

0
0
1
2

115
80
115
118

7.0
7.1
7.3
7.8

5
5
5
5

11.3
11.7

__

9.3

430
23

_

91

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Oct. 27, 1964.

Time

(24 hr)

1515

Chromium

Hexa-
valent

(Cl")

0.00

Total

(Cr)

0.00

Cop-
per

(Cu)

0.02

Zinc

(Zn)

0.05

Ar-
senic

(As)

0.00

Boron

(B)

0.03

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

S £.

rt O O X « O,
QT3 0) > O MO,

8 S.

3 <a X a

J, H M 3 ds (J-a
u 73 H 3

«) sit

O)

a is

a

l

.i Bs

ID >,
P 0 CrH
O "5 "SI

is03
*fs

11

H3
§
u

$il
3-c

H ^

alt s?^
15
PS

c

0
o

8

o

n
o
o

S
o

8

o

8

o

o
en
o

<D

t-

QUALITY OF SURFACE WATERS, 1965

6 1 A A -a £> a ?

H O O X O ft OT> 10 > o Mo,

'o o
O
X
a

ff If If

f23f£3 K

I ° , «- ' s IB 3 -a§S-2 u-SSg

iifj
ini 2^
|f£

1§

qj

11

$.ilE 1 1 **
s § jg t«£j

in

si|g

I1

1*11

o'Sii

1 sis

II

ill!

3s

Sot!
3

a> «

g*|
o

g
£

I

o

ffi

ffi
p

ffiI
rt"
n
I
N
rH

on <o o

« H H O
H H H H
1031010

f. f. t>(O

Ol iH N (D

O O O CM
H

00 00 O 00
rH H CM H

t- ^ oo in
CO-* * *

0000
o
iH-* CM H
H

CM iH H H
O

o m o o
H iH CM iH

O N CM

0 0 OO

CM N CM

O

Cl O tO CM
CM CO CO CM

H iH H H

o oo to oo
in ^ to ^*

CM
o

rH H H H

00 O 00
CM *f 00 to

H H

oo^m" o'

CMCM rH

>,Q XtuD

Is

^ll

Is

s
Chromiu

o.fe-3 o o-a.
3-s-

^B

ill

""S

Is

18 1

11

00
o

oo
00
o

in 10
00
o

o o
o

o o
o o
o

o o
00
o

o o

§3

a> a
rH tO

O)

IO
> X

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

o fflrt-o i>.n a
H O il> M 0> Qt
o -a » > o M a

|lsg«« Illil]

ill

1 Sbofi

I?

o oto

t~&~"

' a's 5 «<
J'c

KlS

afe-3
y a".

a 3-c

| ^^

1 g «t

C o^'

0) 17

f-IN,

«a

f

o

=3

H iH
00
O

00
00
o

m m
O 0
o

to *
00
o

§

o 0
0

00
00
o

O H

to
en in

§

' !>.
d

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

LAKE WASHINGTON BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean ,
discharge
(cfs)

Silica

(SiO2)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCOJ

Car-
bon-

ate

Sulfate Chloride

(Cl)

Fluo-
ride

(F)

Ni-

trate

(NO,)

Phos-

phate
(P04)

Dissolved
solids

(residue
at 180°C)

as CaCO,

Cal-

cium,
mag-
nesium

Non-
car-

bon-

ate

To-

tal
acid-

ity
as

Specific
condvct-<

ance

(micro-
mhos at

25'C)

PH

Col-

or

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

(coli-
form
coli-

nies

per

12-1190. CEDAR RIVER AT RENTON, WASH.

Nov. 28, 1964
Feb. 25, 1965

Aug. 4.. .....

817
1260

73

11
8.8

15 0.05

7.0
5.6

11

1.5
1.2
1.5
3.4

2.9
2.4
2.5
4.7

0.4
. 2
. 4
. 8

28
23
27
53

0
0
0
0

3.8
2.2
2.8
5.4

1.2
1.0
1.0
1.8

0.1
. 0
. 0
. 1

1.9
1.3
o

. 4

0.03
. 02
. 04
. 05

45
37
36
72

24
19
21
42

0
0
0
0

62
47
53
104

7.1
7.4
7.1
7.3

5
5
b
0

11.8
12.5
10.1
9.4

230
91
430
930

Analyses, in parts per

Date of
collection

Nov. 28, 1964....
Feb. 25, 1965. . . .
May 12. ....

Time

(24 hr)

1240
1050
1620

Chromium

Hexa-

valent

(Cr«)

0.00
.00
.00

Total

(Cr)

c.oo
.00
.00

Cop-

per

(Cu)

0.03
.01
.03

Zinc

(Zn)

0.05
.05
.05

Ar-

senic

(As)

0.01
.00
.00

Boron

(B)

0.04
.06
.00

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Nov. 24, 1964
Teb. 18, 1965

Aug. 4.. . . . . .

Mean

discharge
(cfs)

Silica

(SiO2)

9.0
6.7
16

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-

ga-
nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

12-1265. SAMMA

8.4
10
11

3.6
4.3
6.6

4.7
6.0
7.2

1.2
1.0
1.4

Bi-
car-

bon-
ate

(HCOJ

Car-
bon-
ate
W

MISH RIVE

38
47
62

0
0
0

Sulfate

(S0«)

R AT B01

9.6
11
13

Chloride

(Cl)

HELL, WA£

4.0
3.0
4.2

Fluo-
ride
(F)

H.

0.1
.1
. 1

Ni-
trate

(NO,)

Phos-

phate
(PO«)

Dissolved
solids

(residue
at 180°C)

Hardness
as CaCOj

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

To-
tal
acid-

ity
as

H+ l

Specific
conduct-'

ance

(micro-
mhos at

25'C)

PH

Col-

or

D.O.

(disJ
sol-
ved
oxyH
gen
ppm;

MPN

(coli-
form
colo-
nies
per

1100 ml)

2.7
1.6
2.7

0.06
.22
.44

63
63
98

36
42
55

5
4
4

99
114
145

6.7
6.9
7.0

10
10
10

10.5
11.2
10.4
7.6

4600
2400
11000
2400

Analyses, in parts per million, of tr

Date of
collection

Nov. 24, 1364. . . .
May 11, 1965. ....

Time

(24 hr)

1510
1110

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.01
.06

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

o.oo
00

Boron

(B)

0.00
.01

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

SNOROMISR RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(SiOj)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

12-1345. SKYKOMI

Nov. 23, 1964
Feb. 19, 1965

Aug. 10......

1670
6080
6940
1370

5.7
4.9
4.2
5.0

4.5
3.2
3.2
4.0

0.8
.6
.4
.9

2.1
1.4
1.3
2.0

0.6
.7
.4
. 7

Bi-
car-

bon-

ate

(HCO,)

CaF
ben
ate
TO

Sulfate

(SO.)

Chloride

(Cl)

Fluo-
rlde

(F)

Ni-
trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids

(residue
at 180°C)

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

To-
tal
acid

Ity
as

H+l

Specific
conduct-^

ance

(micro-
mhos at
25'C)

PH

Col-

or

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-

nies per'

100 ml)

SH RIVER NEAR GOLD BAR, WASH.

19
13
12
17

0
0
0
0

2.4
1.2
1.6
1.8

1.5
1.0
.2
2.2

0.1
.0
.0
.0

0.4
. 3
.4
.2

0.01
.00
.00
.00

27
24
17
A 25

14
10
10
14

0
0
0
0

41
29
25
36

7.2
6.7
6.9
6.9

5
5
5
0

12.2
13.0
11.6
9.7

36
200
36
36

A Calculated from determined constituents

Date of
collection

Nov. 23, 1964. . . .
May 12, 1965. ....

Time

(24 hr)

1400
1210

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.02
.02

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.04
.00

Chemical analys in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(Si02)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

Car-

ban:
ate

W

Sulfate

(S0«)

Chloride

(Cl)

Fluo-
ride

(F)

Ni-
trate

(Ncg

Phos-

phate
(P04)

Dissolved
solids

(residue
at 180°C)

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

To-
tal
acid

ity
as

H+l

Specific
conduct-

ance

(micro-
mhos at

25°C)

pH

Col-

or

D.o.

(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-

nies

per

100 ml)

12-1382. SULTAN RIVER AT SULTAN, WASH.

Nov. 23, 1964
Feb. 19, 1965

Aug. 10......

4.8
3.8
3.3
8.1

5.0
2.8
3.2
8.0

0.9
. 6
. 7
2.4

1.7
1.0
1.0
2.5

0.6
. 2
. 6
. 9

19
12
13
35

0
0
0
0

3.0
2.2
2.4
4.6

0.8
. 8
. 5
1.5

0.1
. 1
. 0
. 0

0.5
. 5
. 2
. 8

0.02
. 00
. 00
. 02

27
22
18
45

16
10
11
30

0
0
0
2

41
26
27
72

7.0
6.9
7.0
7.3

5
5
5
5

12.0
12.3
10.7
8.5

930
230
23
430

Analyses, in parts per million, of trace elements

Date of
collection

Nov. 23, 1964. . ..
May 12, 1965. ....

Time

(24 hr)

1330
1315

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.03
.04

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.02
.00

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

SNOHOMISH RIVER BASIN Continued

ilyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica
(Si02)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium
(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-
ate

(HCO,)

Car
ton-
ale
TO

Sulfate
(S0«)

Chloride
(Cl)

Fluo-
ride
(F)

Ni-
trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids
(residue
at 180°C)

Hardness
as CaCOj

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

To-
tal
acid
ity
as

ff"

Specific
conduct-<

ance

(micro -
mhos at

25*C)

pH

Col-

or

D.O.

(dis-
sol-
ved
oxy-
gen
ppm;

MPIT

(coli-
form
colo-
nies
per

100 ml)

12-1444. SNOQUALMIE RIVER AT SNOQUALMIE. WASH.

Nov. 23, 1964

Feb. 18, 1965

Aug. 10......

6.0

4.7
3.9
6.1

4.5

2.8
2.8
5.6

0.6

. 5
. 2
. 9

1.6

1.2
1.2
1.6

0.4

. 7
. 3
. 4

18

10

21

0

0

0

2.4

1.6
1.6
2.6

1.0

. 8
. 2
. 8

0.1

. 0
. 1
. 0

0.8

. 5
. 5
. 3

0.01

. 01
. 00
. 02

29

21
17
28

14

9
8
18

0

1
0
0

36

25
22
45

7.4

6.6
6 8
6.9

5

5

5

11.9

13.2

9.0

2400

430

4600

Analyses, in par

Date of
collection

Dec. 11, 1964. . . .
May 12, 1965. ....

Time

(24 hr)

1435
1500

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.04
.04

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

0.00
.00

Boron

(B)

0.00
.00

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(Si02)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-
ium

(Li)

car-

bon-

ate

(HCO,)

Car-
ban-

ate

Py

Sulfate

(SO.)

Chloride

(Cl)

Fluo-

ride

(F)

Ni-

trate

(NO,)

Phos-

phate
(PO.)

Dissolved
solids

(residue
at 180°C)

Hardness

Cal-

cium,
mag-
nesium

Non-
car -

bon-

ate

To-
tal
acid-

ity
as

H+1

Specific
conduct-

ance

(micro-
mhos at

25°C)

pH

Col-

or

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-

nies

per

100 ml)

12-1485. TOLT RIVER NEAR CARNATION, WASH;

Nov. 23, 1964
Fab. 19, 1965

Aug. 10......

605
1690

157

6.2
5.8

7.7

5.0
4.0
4.8
7.6

1.1
. 8
1.1
1.9

1.7
1.3
1.6
2.1

0.3
. 1
. 3
. 3

20
16
19
32

0
0
0
0

4.2
2.4
2.8
4.8

0.8
1.0
. 5
1.0

0.1
. 0
. 0
. 0

0.6
. 5
. 2
.4

0.01
. 01
. 00
. 03

34
28
28
A 42
...

17
13
17
27

0
0
1
1

43
35
40
65

7.1
7.0
7.0
7.2

10
5
5
5

12.0
12.3
10.7
9.8

390
230
230
430

A Calculated from determined constituents.

Analyses, in parts per

Date of
collection

Nov. 23, 1964. . . .
May 12, 1965.. .. .

Time

(24 or)

1300
1420

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.06
.04

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.01
.00

Boron

(B)

0.05
.00

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

STILLAGUAMISH RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(Si02)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-

ium

(Li)

car-

bon-

ate

(HCO,)

Cap
ben-

ate

W

Sulfate

(SO.)

Chloride

(Cl)

Fluo-
ride

(F)

Ni-
trate

(NO,)

Phos-

phate
(POJ

Dissolved
solids

(residue
at 180°C)

Hardness

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

To-
tal
icid-

ity
as

H+l

Specific
conduct^

ance

(micro-
mhos at

25°C)

PH

Col-

or

D.O.

(dis-
sol-
ved
oxy

ppm)

MPN

(coli-
form
colo-

nies

per

100 ml)

12-1610. SOUTH FORK STILLAGUAMISH RIVER NEAR GRANITE FALLS, WASH.

Nov. 23, 1964
Feb. 19, 1965
May 11
Aug. 9.......

1440
2410

200

3.8
4.0
3.4
5.4

4.0
3.2
3.6
5.6

0.9
. 7

2.0

1.1
1.0

1.6

0.2
. 1

. 6

16
14

27

0
0

0

2.8
X.8

2.2

1.0
. 8
. 2
. 8

0.1
. 0
. 1
. 0

0.5
. 4
. 3
. 3

0.03
. 01
. 00
. 01

27
25
19
A 31

14
11
12
22

0
0
0
0

34
28
28
49

6.7
7.1
6 9
7.1

25
5
5
5

12.3
13.2
11.5
9.2

230
120
91
210

A Calculated from determined constituents

Analyses, in parts per million, of trace elements

Date of
collection

Nov. 23, 1964....
May 11, 1965.....

Time

(24 hr)

1545
1250

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.03
.05

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron
(B)

0.00
.00

Chemical analyses, In parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(SiO,)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

12-1670. NORTH FORK

Nov. 23, 1964
Feb. 19, 1965

1660
4600
1840
364

5.7
5.3
4.9
8.8

6.5
5.2
5.2
8.8

1.8
1.1
1.3
2.8

1.6
1.2
1.5
2.9

0.3
.2
. 2
.9

Lith-

ium

(Li)

Bi-
car-

bon-
ate

(HCO,)

Car-
ban:
ate
POJ

STILLAGUAMISH

28
21
22
41

0
0
0
0

Sulfate

(SO,)

Chloride

(Cl)

Fluo-
ride

(F)

RIVER NEAR ARLINGTON,

3.2
2.4
2.4
3.4

1.5
1.0
.8
2.5

0.0
.0

.1
.1

Ni-
trate

(NO,)

Phos-

phate
(P04)

Dissolved
solids

(residue
at 180°C)

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

Non-
car-

bon-
ate

To-
tal
acid

ity
as

H+ 1

Specific
conduct-

ance

(micro-
mhos at

25*C)

PH

Col-

or

D.O.
(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-
nies

per

100 ml)

WASH.

0.6
. 7
.3
.3

0.00
.01
.02
.04

39
28
27
51

23
18
18
34

0
0
0
0

55
42
43
80

7.3
7.0
6.9
7.4

10
5
5
0

12.0
12.6
11.0
9.9

430
430
30
150

Analyses, in parts per million, of tr

Date of
collection

Nov. 23, 1964....
May 11, 1965. ....

Time

(24 hr)

1700
1350

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

o.oo
. 00

Cop-
per

(Cu)

0.10
.05

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.01
.00

Boron

(B)

0.00
.00

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

Chemical analyses,

SKAGIT RIVER BASIN

parts per million water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(S10,)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

car-

bon-

ate

Ca*
bon-

ate

(C<^

Sulfate

(S0«)

Chloride

(Cl)

Fluo-

ride

(F)

Ni-
trate

(NOS)

Phos-

phate
(PO,)

Dissolved
solids

(residue
at 180°C)

Cal-

cium,
mag-
nesium

Non-
car -

bon-

ate

To-

tal
acid-

ity
as
H»

Specific
conduct-

ance

(micro-
mhos at

25'C)

pH

Col-

or

D.O.

sol-
ved
oxy-

ppm)

MPN

form
colo-

nies

109 ml)

12-1810. SKAGIT RIVER AT MARBLEMOUNT, WASH.

Nov. 24, 1964
Feb. 19, 1965

Aug. 9.......

3.6
4.8
4.8
4.4

0.09
. 03

6.0

7.6
6.4

0.7

1.2
1.2

0.8

1.0
. 8

0.4

. 3
. 4

20
29
26
23

0
0
0
0

3.4
3.6
3.8
3.6

0.0
. 0
. 2
. 2

0.1
. 1
. 0
. 1

0.0
. 4
. 3
. 2

0.01
. 01
. 01
. 01

27
32
32
31

18
24
24
21

2
0
2
2

41
54
52
46

7.1
7.3
7.1
7.4

5
5
0
0

11.9
12.6
11.5
11.1

91
230
36
91

million, of trace ele

Date of
collection

Nov . 24 , 1964 ....
May 11, 1965. ....

Time

(24 hr)

0830
1515

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.06
.01

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.04
.01

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

Q T3 M !> O 60 Oi

« 2

1 S"-2 "3 S

i as *ii

to

11

o o oo
X t» ^*^J*
1O i-l H O

0 "S

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Cont inued

SAHISH RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(SiO2)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-
ate

Car-
bon-

ate

fog

Sulfate

(SO.)

Chloride

(Cl)

Fluo-
ride

(F)

Ni-
trate

(NO,)

Phos-

phate
<PO.)

Dissolved
solids

(residue
at 180°C)

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

tal
acid

ity
as

H+ l

conduct-

ance

(micro-
mhos at

25'C)

pH

Col-

or

(dis-
sol-
ved
oxy-
gen
ppm)

(coli-
form
colo-

nies

12-2015. SAMISH RIVER NEAR BURLINGTON. WASH.

Nov. 24, 1964
Feb. 18, 1965

Aug. 9.......

474
1170
130
24

5.2
4.5
6.7
11

5.0
4.8
7.6
11

1.9
1.2
2.5
4.2

2.6
2.7
3.0
3.8

1.4
. 2
. 7
. 9

19
15
33
52

0
0
0
0

4.2
4.4
4.4
5.4

3.2
3.5
1.8
2.8

0.2
. 1
. 2
. 1

4.1
S.I
1.8
2.8

0.05
. 01
. 02
. 04

46
34
45
A 68

20
17
29
44

5
4
2
2

58
50
72
106

6.6
6.6
7.5
7.3

40
5
5
5

10.7
11.9
9.9
10.0

930
4600
930
1500
A Calculated from determined constituents

Analyses, in parts per million, of trac

Date of
collection

Nov. 24, 1964....
May 12, 1965.....

Time

(24 hr)

1250
0935

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.01
.05

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.01
.00

Boron

(B)

0.02
.00

NOOKSACK RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica
(SiO,)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium
(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-
ate

(Hccg

Car-
bon-
ate

Cog

Sulfate

(S0«)

Chloride

(Cl)

Fluo-
ride
(F)

Ni-
trate

(NO,)

Phos-

phate
(POO

Dissohred
solids
(residue
at 1800C)

Hardness
as CaCO,

Cal-
cium,
mag-
nesium

Non-
car -

bon-
ate

To-
tal
ic id
ity
as

H+ l

Specific
conduct^

ance

(micro-
mhos at

25«C)

pH

Col-

or

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-
nies
per

100 ml)

12-2105. NOOKSACK RIVER AT DEMING, WASH.

Nov. 24, 1964

Aug. 9.......

7470

1970

5.6

6.9
6.4

6.0

8.4
8.4

2.3

2.4
1.9

1.4

1.6
1.6

0.9

. 4
. 3

25

25

0

0

4.8

10

1.0

. 2
. 8

0.2

. 1

1.0

. 0

0.01

. 02
. 02

42

A 43
46

24

31
29

4

5
8

55

70
69

7.0

7,2
7.1

40

5
0

10.8

10.1
10.3

1500

91
230

A Calculated from determined constitxi

Analyses, in parts per million, of trace elements

Date of
collection

Nov, 24, 1964...
May 11, 1965. .. .

Time

(24 hr)

1030
1810

Chromium

Hexa-
valent

(Cr«)

0.00
. 00

Total
(Cr)

0.00
.00

Cop-
per

(Cu)

0.02
.04

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

0.00
.00

Boron'

(B)

0.02
.01

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

PEND OREILLE RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(Si02)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-

ium

(Li)

car-

bon-

ate

(HCO,)

Car-
bon-

ate
P«

Sulfate

(SO.)

Chloride

(Cl)

Fluo-
ride

(F)

Ni-

trate

(NO,)

thos-

phate
(PO.)

Dissolved
solids

(residue
at 180°C)

Cal-

cium,
mag-
nesium

Non-
car -

bon-

To-

tal
acid-

ity
as

H+l

Specific
conduct-*

ance

(micro-
mhos at

250C)

PH

Col-

or

(dis-
sol-
ved
oxy-

ppm)

MPN

(coli-
form
coli-

nies

per

LOO ml)

12-3993. PEND OREILLE RIVER AT WANETA, B.C., CANADA

Oct. 2, 1964.

Feb. 22, 1965

Sept . 21 .....

5.0
6.1
7.0

6.3

21
23
24
21
23

5.7
5.8
6.3
5.5
5.8

2.1

3.2
2.3
2.6

0.6
1.0
. 9

. 7

86
93
96
86
93

0
0
0
0
0

9.0
11
12
9.4
9.6

0.5
. 2
. 5
. 2
. 5

0.1
. 2
. 1
. 1
. 2

0.2
. 2
. 2
. 3
. 3

0.04
. 02
. 02
. 02
. 01

89
98
102
87
98

76
82
86
75
82

6
6
8
4
6

155
169
178
155
166

7.9
7.8
7.7
7.7
7.8

5
5
0
0
0

13.7
15.0
10.5
11.0

230
36
23

rts per million, of tr

Date of
collection

Dec. 11, 1964.. .
July 15, 1965. . . .

Time

(24 hr)

0945
1345

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.02
.03

Zinc

(Zn)

0.05
. 05

Ar-

senic

(As)

0.00
. 00

Boron

(B)

0.00
.04

KETTLE RIVER BASIN

a.1 analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(Si02)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-

ium

(Li)

car-

bon-

ate

(HCOJ

Car-
bon-

ate

py

Sulfate

(S0 4)

Chloride

(Cl)

Fluo-

ride

(F)

Ni-

trate

(NO,)

Phos-

phate
(P04)

Dissolved
solids

(residue
at 180°C)

Cal-

cium,
mag-
nesium

Non-
car -

bon-

To-

tal
acid-

ity
as

H+1

Specific
conduct-

ance

(micro-
mhos at

25"C)

pH

Col-

or

sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-

nies

per

100 ml)

12-4049. KETTLE RIVER NEAR BARSTOW, WASH.

Oct. 2, 1964.

Feb. 22, 1965

Sept. 21.....

9.9

11

9.5

0.07
.04
. 11
.05
.04

12
20
21
16
17

1.9
3.4
4.2
2.8
3.6

2.3
3.8
4.5
3.1
3.6

0.4
1.3
1.7
.8
.7

46
77
84
62
69

0
0
0
0
0

5.0
9.6
9.8
7.2
7.6

0.2
.0
.2
.0
.2

0.2
.3
.2
.2
.3

0.2
. 1
. 3
.2
.4

0.00
.00
.02
.01
.01

58
89
96
74
80

38
64
70
52
58

0
1
0
0
1

86
142
155
114
128

7.4
7.9
7.9
7.4
7.b

10
0
b
0
5

13.9
14.5
8.0
9.9

91
23
36

Date of
collection

Dec. 11, 1964.. ..
July 15, 1965. . . .

Time

(24 hr)

1500
1130

Chromium

Hexa-

valent

(Cr«)

0.00
. 00

Total

(Cr)

0.00
. 00

Cop-

per

(Cu)

0.02
. 03

Zinc

(Zn)

0.05
. 05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
. 04

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

COLVILLE RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(S102)

Alu-
mi-

num

<A1)

Iron

(Fe)

Man-

ga-
nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-

ium

(LI)

Bi-
car-

bon-

ate

lm*Uj)

Cap-
ban-

ate

W)

Sulfate

(S0«)

Chloride

(Cl)

Fluo-

ride

(F)

Ni-
trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids

(residue
at 180°C)

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

Non-
car-

bon-

ate

tal
acid-

ity
as

H+ l

conduct^

ance

(micro-
mhos at

25'C)

PH

Col-

or

(dis-
sol-
ved
oxy-
gen
ppm;

(coli-
form
colo-

nies

12-4090. COLVILLE RIVER AT KETTLE FALLS, WASH.

Oct. 2, 1964.

Feb. 22, 1965

Sept. 21.....

92

220

113

16

19

17

44
44
48
44
43

17
16
18

16

6.2
6.6
7.8
6.3
6.3

3.4
5.1
4.4
3.1
2.0

213
206
214
197
206

0
0
0
0
0

17
20
27
21
15

1.8
1.8
2.5
1.2
1.5

0.1
. 3
. 1
. 2
. 1

1.0
2.6
4.1
. 9
1.0

0.25
. 51
. 24
. 19
. 25

217
A 217
242
205
A 203

180
176
194
172
173

6
7
18
10
4

357
354
392
342
345

8.0
7.8
7.7
8,0
7.9

5
5
10
5
5

12.4
12.9
10.3
9.0

930
430
430
~

A Calculated from determined constituents.

Analyses, in

Date of
collection

Dec. 11, 1964....
July 15, 1965....

Time

(24 hr)

1600
1515

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.07
.05

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.11
.15

SANPOIL RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(SiO,)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-
nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

Cap
bon-

ate
CPJ

Sulfate

(SO.)

Chloride

(Cl)

Fluo-
ride

(F)

Ni-
trate

(NOJ

Phos-

phate
(P04)

Dissolved
solids

(residue
at 180°C)

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

Non-
car-

bon-

ate

To-

tal
acid-

ity
as

Specific
conduct-
ance

(micro -
mhos at

25°C)

pH

Col-

or

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-
nies

per

100 ml)

12-4350. SANPOIL RIVER AT KELLER. WASH.

Oct. 2, 1964.
Feb. 2, 1965.

Sept. 21.....

18
20

20

0.03
. 07

_

. 09
. 05

28
27
20

26

6.3
6.4
5.0

7.4

6.4
6.4
6.1
6.3
6.8

. 4
. 1
. 3
. 4
. 1

109
108
83

110

0
0
0
0
0

22
18
14
15
17

1.0
. 8
. 8
. 5
. 8

0 2
3
2
4
4

0.1
. 2
. 5
. 3
. 3

0.03
. 08
. 17
. 09
. 06

140
135
113
129
136

96
94
70
88
95

6
5
2
2
5

218
210
161
199
209

7.6
7.8
7.8
7.7
7.8

5
0
10
5
5

__

14.1
13.5
8.8
10.2

__

36
23
36
~

Analyses, in parts per million, of trace elements

Date of
collection

Feb. 2, 1965.. . . .
July 14. ....

Time

(24 hr)

1015
0930

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.02

Cop-
per

(Cu)

0.02
.04

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
.09

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

OKANOGAN RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Contin

Date
of
collection

Mean

discharge
(cfs)

Silica

<Si02)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-
ate

(HCOj)

Cap-
bon-
ate

(CO,)

Sulfate
(SO,)

Chloride

(Cl)

Fluo-
ride

(F)

Ni-
trate

(NO,)

Phos-

phate
(P0t)

Dissolved
solids

(residue
at 180°C)

Hardness
as CaCO3

Cal-

cium,
mag-
nesium

Non-
car-

bon-
ate

To-
tal
acid
«y
as

H+1

Specific
conduct-

ance

(micro-
mhos at

25°C)

pH

Col-

or

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

(coli-
form
colo-
nies

12-4395. OKANOGAN RIVER AT OROVILLE, WASH.

Jan. 9, 1965.

Sept. 11.....

322

405

3.1

5.2

0.03

. 09

36

33

9.3

9.3

9.9

10

Analv

2.5

2.3

ses.

144

136

0

0

29

27

2.0

1.2

0.3
. 4
. 3

0.4

. 5

0.01

. 02

166
158
162

128
124
121

10
8
10

287
283
272

7.8
8 0
7.8

5
0
5

13.0
11.3
9.3

23
430
91

Date of
collection

Jan. 9, 1965. . . . May 15. ....

Time

(24 hr)

1707
1004

Chromium

Hexa-
valent
(Cr*)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.05
.02

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

0.00
.00

Boron

(B)

0.06
.11

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

Z-h a i » K a

all ll &|
O 10 H 13 >, O "5

H O 0) X 0) O. QTJ in > o M o.

s°

a

8 * its

a a ® g m u H a ir«
saS^t

|s ill*
rt M ^ fi M^

u o a |

||l§
<3"^tj
m +j'~+

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0 » .gSfe fe ^"^

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aiJ^I

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Sill S M gg.

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GHTHAWK, 1964 wate

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K

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K f
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>1"
S n

H'O

StJ
J 0

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to
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t§
<M 0

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rH

f- t-" t"

rH rH

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<N O rK

r-(rK

<C

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O rK i-(
0

OH

0

rH H

O O O

O TJ 03

O I> N
' H H

w n N

!jl C> ^

in N rr

wS w

<D 1 ^
O 1 O
O

<N H N
H rH H

t> cm

o I 1
H
* r-(
H
. -P
C >. ft
d cd o
^ SCO

s

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11

5 SI
3-s

If£
a> '5'

PS

If

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0 0
0

oo
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0

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o

N H
0 rH
O

0 0
0 0
o

0 0
0 0
o

010
0001
HO

H

H
C !>,

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

OKANOGAN RIVER BASIN Continued

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
Of
collection

Mean

discharge
(cfs)

Silica

(Si02)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-
nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCOJ

Car-
ben
ate

CO,)

Sulfate

(SO.)

Chloride

(Cl)

Fluo-

ride

(F)

Ni-

trate

(NO,)

Phos-

phate
(PO.)

Dissolved
solids

(residue
at 180°C)

Hardness
as CaCO,

Cal-

cium,
mag-
resium

Non-
car-

bon-

ate

To-

tal
acid

ity
as

H+ 1

Specific
conduct*

ance

(micro-
mhos at

25"C)

PH

Col-

or

D.O.
(dis-
sol-
ved
oxy-
gen

MPN~

(coli-
lorm
colo-

nies

12-4473. OKANOGAN RIVER NEAR MALOTT, WASH.

Oct. 14, 1964

Jan. 9, 1965.

Sept. 11.....

2230

1150

1030

7.3

8.4

9.1

0.07

. 06

. 17
. 06

23

34

34

6.0

9.7

4.3
10

5.4

9.1

4.1
4.0
9.1

1.1

2.4

1.0
1.0
2.0

91

138
136

74
138

0

0

0
0

18
27
31
29
10
13
31

0.8
. 8
1.0

. 5
. 0
1.2

0.1
. 3
. 3
. 3
. 2
. 2
.2

0.2
. 0
. 4
. 3
. 3
. 3
. 3

0.04
. 02
. 04
. 05
. 07
. 03
. 04

113
A 150
167
169
84
A 86
167

82
115
125
123
60
66
126

8
12
12
12
3
5
14

184
254
276
273
135
147
277

7.8
8 ?,
8.1
8 0
7 ?,
7,4
7.8

5
0
0
0
15
5
5

13.0
12.7
12.8
9.9
8.5
9.5

430
230
0
230
150
230

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Jan. 9, 1965.....
Mav 15...... .....

Time

(24 hr)

1503
1154

Chromium

Hexa-

valent

(Cr»)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.02
.09

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.01
.00

METHOW RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(SiO.)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-
nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

Cap.
ben-

ate
COJ

Sulfate

(S04)

Chloride

(Cl)

Fluo-

rlde

(F)

Ni-

trate

(NO,)

Phos-

phate
(P04)

Dissolved
solids

(residue
at 180°C)

Hardness

as CaCO,

Cal-

cium,
mag-
fesium

Non-
car -

bon-

ate

To-

tal
acid

ity
as
H+ l

Specific
conduct^

ance

(micro -
mhos at

25'C)

pH

Col-

or

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coll-
form
colo-

nies

per

LOO ml)

12-4499.5 METHOW RIVER NEAR PATEROS, WASH.

Oct. 14, 1964

Jan. 9, 1965.

Sept. 11.....

624

400

492

11

12

8.4
12

0.02

. 08
. 03

. 03

24

26

14
26

4.1

5.6
5.3

2.8
5.2

3 6

4 3
4 3

2 4
4 3

0.7

1.1
1.0

. 5
1.2

91
102
107
103
47
57
102

0
0
0
0
0
0
0

10
8.4
9.8
9.4
3.6
4.6
9.0

0.0
. 5
. 2
. 2
. 0
. 0
. 5

0.2
. 2
. 3
. 2
. 2
. 1
. 2

0.6
. 8
1.0
. 7
. 2
. 4
1.0

0.01
. 01
. 00
. 01
. 18
. 00
. 01

102
105
114
115
A 52
61
117

77
84
88
87
38
46
86

2
0
0
2
0
0
3

166
180
188
184
83
101
182

7.4
7.9
7.9
8.1
7.2
7.6
7.9

0
0
0
0
5
5
0

12.9
13.8
12.7
10.5
9.£
10.2

36
23
430
230
0
0

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Jan. 9, 1965.....
May 15.. ....

Time

(24 hr)

1406
1241

Chromium

Hexa-

valent

(Cr»)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.01
.06

Zinc

(Zn)

0.05
. 05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.01
.03

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

CHELAN RIVER BASIN

ical analyses, in parts million, water year October 1S64 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(SiO2)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-

ium

(Li)

Bi-
car-

bon-

ate

Cap
bon-

ate

Sulfate

(SO.)

Chloride

(Cl)

Fluo-

rlde

(F)

Ni-

trate

(NO,)

Phos-

phate
(P04)

Dissolved
solids

(residue
at 180°C)

as CaCO,

Cal-

cium,
mag-
nesium

Non-
car-

bon-

ate

To-

tal
acid-

ity
as

H+1

Specific
conduct*

ance

(micro-
mhos at

25°C)

pH

Col-

or

D.O.

sol-
ved
oxy-
gen

MPN

(coli-
form
colo-

nies

12-4525. CHELAN RIVER AT CHELAN, WASH.

Oct. 14, 1964

Jan. 9, 1965.

Sept. 11.....

1040

2100

1480

4.2

4.9

4.5
4.9

0.02

. 04

. 03

6.5

6.5

6.4

0.8

. 9

1.0

. 2
. 8
. 4

. 5
. 4
. 4

0.5
. 7
. 9
. 6
. 7
. 5
. 8

22
24
24
24
24
24
24

0
0
0

0
0

5.0
4.2
4.6
4.0
4.2
4.2
4.0

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

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

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

0.01
. 01
. 00
. 01
. 02
. 00
. 02

30
A 31
35
35
A 31
30
A 31

20
20
20
20
20
20
20

2
0
0
0
1
1
0

49
48
48
48
49
49
49

. 2
. 2
. 5
3
. 0
. 4
. 1

0
0
0
0
0
0
0

10.7
11.9
12.0
9.3
9.2
9.2

2400
91
1500
150
0
0

A Calculated from determined constituents.

Analyses, in parts per million, of trace elem

Date of
collection

Jan. 9, 1965.....

Time

(24 hr)

1310
1329

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.08
.01

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
.00

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

o Mr-n3 s>, c a
i-i O O K Q) a
Q fl 10 l> O M a

S §

sfi

l

pals?

s
25

CM 00 H 0 H

o o o o ift o

O O O O O O O

O O O O O O O

CM t-CM HCMl

O O O O O O O

O I> <D 00 CM Oi

rH O «D O r-l

+A t> (3
O d
tz; «-D

5""

4|!

11

s

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got 11^-

11

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^^(S|

O iH
0 0
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0 0
0 0

o

0 0

0 0
o

o o
0 0
o

o o
0 0
0

H H

to

iH

H

*i B

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

WENATCHEE RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica
(SiO,)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(LI)

Bi-
car-

bon-
ate

(HCOJ

Car-
ban-
ate

p<y

Sulfate
(S04)

Chloride
(Cl)

Fluo-
ride
(F)

Ni-
trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids
(residue
at 180°C)

Hardness
as CaCOj

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

tal
acid-

ity
as

H+ 1

Specific
conduct-

ance

(micro-
mhos at
25"C)

PH

Col-

or

(dis-
sol-
ved
oxy-
gen
ppm)

(coli-
form
colo-
nies
per

100 ml)

12-4578. WENATCHEE RIVER NEAR LEAVENWORTH, WASH.

Oct. 13, 1964

Mar. 6, 1965.

June 13 ......

Sept . 11 .....

6.3
6.3
8.0

6.3

7.4

0.05
. 06
. 15

. 14

. 06

3.5
3.0
4.0

2.8

4.0

0.8
. 7
1.2

. 6

1.5

1.2
1.4
1.7

. 9

1.4

0.8
1.1
. 8

. 8

1.1

16
16
21

13

21

0
0
0

0

0

3.2
2.0
2.6

2.2

2.2

0.5
. 0
. 2

. 0

. 2

0.0
. 2
. 1

. 2

. 0

0.1
. 2
. 0

. 3

. 1

Q.OO
. 00
. 01

. 01

. 01

26
22
34

20

28

12
10
15

10

16

0
0
0

0

0

34
29
39

25

39

7.2
7.1
7.3

6.9

7.1

5
5
0

5

5

12.7
13.4

9.4

91
73

0

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 5, 1964.....
June 13 , 1965 ....

Time

(24 hr)

1327
1640

Chromium

Hexa-
valent

(Cr«)

0.00
.00

Total
(Cr)

0.00
.00

Cop-
per

(Cu)

0.02
.03

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

0.00
.01

Boron

(B)

0.00
.04

Chemical analyses, in parts per million, water year October 1964 to Septe 1965 Continued

Date
of
collection

Mean

discharge
(cfs)

Silica

(SiO,)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-

ga-
nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(Kl

Lith-
ium

(Li)

Bi-
car-

bon-
ate

(HCO^

Cap
ben-
ate

(CO,)

Sulfate

(S04)

Chloride

(Cl)

Fluo-
ride

(F)

Ni-
trate

(NO,)

Phos-

phate
(P04)

Dissolved
solids

(residue
at 180°C)

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

tal
acid-

ity
as

conduct*

ance

(micro-
mhos at

25"C)

PH

Col-

or

D.O.
(dis-
sol-
ved
oxy-
gen
ppm)

(coll-
form
colo-

nies

per

12-4625.2. WENATCHEE RIVER AT WENATCHEE, WASH.

Oct. 14, 1964

Jan. 9, 1965.

Sept. 11.....

6.2

8.9
9.5

6.1
8.7

0.05

.06
.08

.09
.03

5.0

6.4
6.8

3.2
7.6

2.2

2.7
3 8

1.5
4.2

1.7

2.1

1.2
3.0

0.9

1.2

1.3

28

35
42

19
47

0

0
0

0

3.0
3.6
3.2
3.6

1.8

2.2
4.4

0.5

.5
.5

.0
. 8

0.0

.1
.1

.0

.0

.1

0.4

.6
.5

.3

.3
. 8

0.01

.01
.02

.05

.01
.03

36
A 44
42
54

28

28
A 54

22
28
27
32

16

14
36

0
0
0
0

0

0
0

53
70
64
75

40

35
87

7.4
7 4
7.3
7 7

fi 9

7 0
7.3

5
0
5
5

5

5
0

12.4
14.4
12.7

9.1

930
430
0

930

A Calculated from determined

Analyses, in parts per million, of trace elements

Date of
collection

Jan. 9, 1965.....
May 15. ....

Time

(24 hr)

1120
1555

Chromium

Hexa-
valent

(Cr«)

o.oo
.00

Total

(Cr)

o.oo

.00

Cop-
per

(Cu)

0.06
.04

Zinc

(Zn)

0.05
.05

Ar-
senic

(As)

0.00
.00

Boron

(B)

0.02
.00

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BrtSIN Continued

YAKIMA RIVER BASIN

Date
of
collection

Mean

discharge
(cfs)

Silica

(SiO2)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(MK)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-

ium

(Li)

Bi-

bon-

ate

Car-
bon-

ate

(CO,)

Sulfate

(S0<)

Chloride

(Cl)

Fluo-

ride

(F)

Ni-

trate

(NO,)

Phos-

phate
(P0»)

Dissolved
solids

(residue
at 180°C)

as CaCOa

Cal-

cium,
mag-
nesium

Non-
car -

bon-

ate

To-

tal
acid

ity

H+1

Specific
conduct-

ance

(micro-
mhos at

25°C)

pH

Col-

D.O.

(dis-
sol-
ved

(coil-

colo-

nies

12-4795. YAKIMA RIVER AT CLE ELUM, WASH.

Nov. 21, 1964
Jan. 9, 1965.

July 10... ...
Sept. 11. ....

340
1820

3220
2050

7.8
5.8

5.7
5.4

0.03
.04

.09
.05

6.5
5.0

4.8
4.8

1.7
1.6

2.3
2.2

2.3
1.7

1.4
1.2

Analyse

0.2
.4

.3
.4

34
26

28
28

0
0

0
0

. 6
.6

.4
.4

0.8
. 5

.2
. 5

0.1
. 1

.0
.0

emen

0.0
. 1

.2
. 1

0.01
.01

.01
.02

A 38
32

34
A 30

23
19

22
21

0
0

0
0

57
46

47
46

4
.3

.0
. 1

0
0

5
0

12.0
12.3

9.3
9.1

430
23

230
930

Date of
collection

Jan. 9, 1965.....
May 8. ....

Time

(24 hr)

0830
1438

Chro

Hexa-
valent

(Cr*)

0.00
.00

nium

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.01
.02

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
.00

12-4806. TEANAWAY RIVER NEAR CLE ELUM, WASH.

Jan. 9, 1965.

Sept . 11 .....

2
2

7

0.06
. 07

4
3
3
2

8

6.9
5.7

4.2
7.0
9.5

2.7
2.3
3.3
2.1
2.6
4.0

0.2
1.0
. 5
. 2
. 2
. 9

82
71
69
60
74
106

0
0
0
0
0
0

2.0
2.4
2.0
. 6
1.4
2.2

1.2
1 .0
. 5
1.5
. 2
1.0

0. 0.0
. 2
. 3
. 2
9

. 2

0.00
. 02
. 02
. 01
. 01
. 02

A 79
A 73
83
A 62
A 73
105

63
56
53
47
58
84

0
0
0
0
0
0

31
16

98
20
72

. 7
. 7
. 2
. 6
. 7
. 5

0
0

0
5
0

12.8
13.2

10.0
9.0
8.5

150

230
91
36

parts per mill ion, of tr

Date of
collection

Jan. 9, 1965.....
May 8. ....

Time

(24 hr)

0745
1405

Chromium

Hexa-
valen.

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.01
.02

Zinc

(Zn)

O.O5
.05

Ar-

senic

(As)

0.00
. 00

Boron

(B)

0.00
.01

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN 165

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON
AND UPPER COLUMBIA RIVER BASIN Continued

CHEHALIS RIVER BASIN

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1965

Date Time
(24 hr)

Watof
tem-

per-

ature (°F)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

12-200. CHEHALIS RIVER NEAR DOTY, WASH.

Dec. 22, 1964. ....

Dec. 23. ....

Dec. 26. .... Dec. 26. ....

1120

1010

1710

43
42

4630

4790
3960
2670

3520

619

176
80

135

7740

3050
1880
577

1280

12-210. SOUTH FORK CHEHALIS RIVER AT BOISTFORT, WASH.

Dec. 21, 1964. ....
Dec. 22. ....

Dec. 22. ....

Dec. 24. ....

Dec. 26. 1750

37
39
40
40
40

43

482
1130
1850

2710
1460

1390

118
483
731
722
658

408
331
209
180
21P

154
1470

818

12-211. SOUTH FORK CHEHALIS RIVER AT CURTIS, WASH.

REVISIONS. The following are corrected sediment loads based on revised estin discharge during high water periods in the 1962 and 1963 water years: Apr. 27, 1962. ....

Mar. 30. .... 1530 E 3000

181

94
82
109 880

12-240. SOUTH FORK NEWAUKUM RIVER NEAR ONALASKA, WASH.

Nov. 24, 1964. ....

Dec. 15. 0820

39

38 413

576

87
72

20

2380

159

43
37
22

12-245. NORTH FORK NEWAUKUM RIVER NEAR FOREST, WASH.

Dec. 15. .... 0850 40 291 18

37
14

12-250. NEWAUKUM RIVER NEAR CHEHALIS, WASH.

Dec. 15. ....

1725

1100

57
51
47
46

48
48
40
39

40

40

86
249
2840
4120

3670
3430
1530
1840

2060
2170
2070

1810

4
18
638
807
188

169
238
202
97
146

168
155
113
57
46

0.9
12
4890
8980

1070
2360
1870
401
725

934
908

225

E Estimated.

166 QUALITY OF SURFACE WATERS, 1965

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

CHEHALIS RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1955 Continued

Date Time
(24 hr)

tem-

per-

ature (°F)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

12-250. NEWAUKUM RIVER NEAR CHEHALIS, WASH. Continued

Dec. 21, 1964. ....

Dec. 21. .... Dec. 21. ....

Dec. 22. ....

Dec . 23 .... Dec . 23 .... Dec. 24. .... Dec. 24. .... Dec. 26. ....

Dec. 26. ....

Jan. 2, 1965. .... Jan. 27. .... Jan. 27. ....

Jan. 28. .... Jan. 29. .... Jan. 30. ....

Feb. 1. .... Feb. 4. ....

Feb. 27. .... Feb. 28. .... Mar. 31. .... Apr. 30. .... June 1 ....

0950

1530

1250
1620
0900

1415
2110

1530
1745

1530

0950

1030

35

42

44

42
43

56
59

805

3670

1930

1140

114

1 1O

AnA

148
112

01 o

13

8

83

oo

2.5

12-266. SKOOKUMCHUCK RIVER NEAR CENTRALIA, WASH.

Nov. 24. .... Nov. 24. .... Nov. 25. .... Nov. 25. .... Nov. 25. ....

Dec . 1 .... Dec. 2. .... Dec. 2. .... Dec. 14. .... Dec. 15. ....

Dec. 24. ....

Jan. 26, 1965. .... Jan . 27 .... Jan. 27. ....

Feb. 1. .... Feb. 4. ....

1545

1630

0915

1600
1015

43
41

2660
980

1 19

QQ

214

41
16

1340

294
42

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

CHEHALIS RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1965 Continued

Date Time
(24 hr)

Water
tem-

per-

ature (°F)

Discharge
(cfs)

12-345. MIDDLE FORK SATSOP RIVER NEAR ELMA

NOV. 24, 1964. .... NOV. 25. ....

0150
0800

47
44

3200
1100

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

WASH.

544
38

4700
113

12-348. WEST FORK SATSOP RIVER NEAR ELMA, WASH.

Nov. 24, 1964. ....
Nov. 25. 0745

47
45

12400
5200

572
112

19200
1570

12-350. SATSOP RIVER NEAR SATSOP, WASH.

Oct. 14, 1964. .... Nov. 3. .... NOV. 4. .... Nov. 4. .... Nov. 5. ....

Nov. 24. .... Nov. 24. ....

Nov. 25. .... Nov. 30. ....

Nov. 30. .... Nov. 30. .... Dec. 1. .... Dec. 1. ....

Dec. 26. ....

Jan. 27. .... Jan. 28. ....

Jan. 28. ....

Jan. 30. .... Feb. 1. .... Feb. 4. .... Feb. 24. .... Feb. 27. ....

Feb. 27. .... Feb. 27. .... Feb. 27... .... Feb. 28... ....

June 1 ....

0915
2030
0750
1410
1030

0110
0720
0710
1240
1200

1735
2250
0850
1655
1325

1435
1300
1015
1800
0830

1440
1440
1300
1300
1230
1155
0915

1120
1655
2030
0820
0805
1750
1430

53
49
47
50
46

48
46
45
46
48

48
48
48
48
48

42
35
43
43
43

46
39
44
43
42
44
41

41
42
41
40
46
50
62

835
1960
5390
4830
2810

4990
10400
5530
5010
18000

19500
18300
18000
15300
9860

3760
2280
11800
10800
10000

10100
10100
11600
6980
4690
2480
6710

7130
7220
6740
5470
1200
1400
802

3
46
372
148
30

74
950
314
56
1030

724
591
602
624
392

38
12
631
670
308

304
232
232
87
60
5
177

208
166
110
50
4
4
2

6.8
243
5410
1930
228

997
26700
4690
758
50100

38100
29200
29300
25800
10400

386
74
20100
19500
8320

8290
6330
7270
1640
760
33
3210

4000
3240
2000
738
13
15
4.3

12-374. WYNOOCHE RIVER ABOVE BLACK CREEK, NEAR MONTESANO, WASH.

Oct. 13, 1964. .... Nov. 3. .... Nov. 3. ....

Nov. 4. ....

Nov. 4. .... Nov. 4. ....

Nov. 24. .... Nov. 24. ....

Nov. 25. .... Nov. 25. .... Nov. 30. .... Nov. 30. ....

Dec. 26. .... Jan. 27, 1965. .... Jan. 27. ....

1450
1420
1920
2400
0600

1050
1610
1120
0310
0530

0850
1325
1405
1955
0710

1735
1350
1350
1130
1930

56
49
49
49
48

52
50
46
47
46

44
46
47
47
47

47
47
42
41
42

514
800
1160
1830
2980

4060
3220
1780
5930
7680

3390
3150
16000
15000
12200

10600
6680
2050
7300
7100

1
6
32
142
283

408
160
30
592
1190

88
68
1040
762
600

569
382
44
655
373

1.4
13
100
697
2280

4470
1390
144
9480
24700

805
578
45000
30900
19800

16300
6890
244
12900
7150

QUALITY OF SURFACE WATERS, 1965

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN Continued

CHEHALIS RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1965 Continued

Date Time
(24 hr)

Water
tem-

per-
ature

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

12-374. WYNOOCHEE RIVER ABOVE BLACK CREEK, NEAR HONTESANO, WASH. Continued Jan. 28, 1965.
Jan. 28.......
Jan. 28.......
Jan. 29.......
Jan. 30.......

Feb. 1........
Feb. 4........
Feb. 24.......
Feb..27.......
Feb. 27.......

Feb. 27.......
Feb. 28.......
Feb. 28.......
Mar. 31.......
Apr. 30.......
June 1........

0800
1405
1715
1505
1330

1230
1255
1245
1000
1620

2110
0740
1215
0900
1700
1325

44
44
44
43
44

42
42
47
41
42

40
39
42
46
53
60

6360
6530
6420
6100
7550

3950
3080
1460
4580
5080

4590
3510
3210
737
952
465

246
182
212
173
426

112
110
12
271
328

192
86
80
6
8
2

4220
3210
3670
2850
8680

1190
914
47
3350
4500

2380
815
693
12
21
2.5

LOCATION. At gaging station, 1.8 miles upstream

DRAINAGE AREA. 10 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: July to September 1965.

PART 13. SNAKE RIVER BASIN

FLAT CREEK BASIN

13-183. CACHE CREEK NEAR JACKSON, WYO.

town of Jackson water-Supply intakes, 4.5 miles southeast of Jackson, Teton County, and 5

Chemical analyses, in parts per million, July to September 1965

Date
of
collection

July 20, 1965.....

Discharge,
(cfs)

25.0
13.0
10.0

Silica

(S102)

3.7
4.3
5.2

Iron

(Fe)

0.00
.00
.00

Cal-
cium

(Ca)

34
28
34

Mag-
ne-

sium

(Mg)

12
17
21

Sodium

(Na)

2.0
1.3
3.0

Po-
tas-
sium

(K)

0.5
.5
.4

Bl-
car-

bon-
ate

(HCO.)

160
164
211

Car-
bon-
ate

(CO,)

5
0
0

Sulfate

(SO.)

0.0
5.8
8.2

Chloride

(Cl)

1.4
1.8
1.8

Fluo-
ride

(P)

0.0
.2
. 1

Ni-
trate

(NOJ

0.0
.3
.0

Bo-
ron

(B)

0.01
.01
.01

Dissolved solids
(residue at 180°C)

Parts

per
million

136
142
170

Tons

per
acre-

foot

0.18
. 19
. 23

Tons

per

day

9.18
4.98
4.59

Hardness
as CaCO,

Cal-

cium,
Mag-
ne-

sium

134
138
171

Non-
car-

bon-
ate

0
3
0

So-
dium
ad-

sorp-
tion
ratio

0.1
.0

.1

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

266
290
310

pH

8.4
8.2
7.9

SNAKE RIVER MAIN STEM

13-375. SNAEE 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 down-stream from gaging station, 4.8 miles east of Ririe, and 21 miles upstream from Henrys Fork.
DRAINAGE AREA. 5,752 square miles upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: January 1953 to September 1965.
Water temperatures: January 1953 to September 1965.
EXTREMES, 1964-65. Dissolved solids: Maximum, 262 ppm Nov. 19 to Dec. 15, Jan. 1-8; minimum, 160 ppm July 18 to Aug. 17.
Hardness: Maximum, 197 ppm Nov. 19 to Dec. 15; minimum, 130 ppm July 18 to Aug. 17.
Specific conductance: Maximum daily, 454 micromhos Feb. 12; minimum daily, 268 micromhos July 24.
Water temperatures: Maximum, 56°F July 2; minimum, freezing point on many days during winter months.
EXTREMES, 1953-65. Dissolved solids: Maximum, 378 ppm Nov. 11-20, 1956; minimum, 160 ppm July 18 to Aug. 17, 1965.
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. 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 1964 to September 1965

Date
of
collection

Oct. 1-22, 1964...
Oct. 23-Nov. 5....
Nov. 6-16.........

Nov. 19-Dec. 15...

Jan. 1-8, 1965....

Jan. 9-25.........

Jan. 30-Feb. 28. . .

Mar. 21-Apr. 19...

Apr. 20-May 10.. ..
May 11-29.........
May 30- June 18....
June 19-July 17 ...
July 18-Aug. 17...
Aug. 18-Sept. 16..
Sept. 17-30.......

Weighted average

Time-weighted
average.. .....

Tons per day. . . .

Mean

discharge
(cfs)

4770
2674
2228
2615
2440
2649
2811

3385
2530
7268
10500
10620

11670
13920
14760
15970
12610
8419
5545

- -

8510

Silica

(Si02)

8.1

7.8

11

8.0

~

- -

Iron

(Fe)

Cal-

cium

(Ca)

47

54

45

38

- -

__

Mag-
ne-

sium

(Mg)

13

12

12

8.4

- -

Sodium

(Na)

12
14
16
14
15
15
15

14
16
14
13
13

12
10

7io
6.8
7.8
9.8

10

12

235

Po-
tas-

sium

(K)

2.2

2.2

2.0

1.3

~

Bi-
car-

bon-

ate

(HCO,)

164
178
172
151
185
183
181

177
172
173
168
164

157
156
154
141
134
140
151

155

161

3550

Car-
bon-
ate

(CO,)

0
0
0
0
0
0
0

0
0
0
0
0

0
0
0
0
0
0
0

__

Sulfate

(S0«)

43

53

39

24

~

__

~

Chloride

(CD

12

16

10

5.0

Fluo-

rlde

(F)

0.4

.2

.3

. 3

~

Ni-

trate

(NOJ

0.3

.4

1.5

.6

- -

Bo-

ron

(B)

0.00

.08

.03

.06

- -

Dissolved solids
(residue at 180°C)

Parts

per
million

225
254
255
226
262
257
262

248
256
243
237
232

215
196
185
164
160
179
205

202

217

Tons

per
acre-

foot

0.31
.35
.35
.31
.36
.35
. 36

.34
.35
.33
.32
.32

.29
.27
.25
.22
.22
.24
.28

0.27

Tons

per

day

2900
1830
1530
1600
1730
1840
1990

2270
1750
4770
6720
6650

6770
7370
7370
7070
5450
4070
3070

4640

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

IT'0
190
186
166
197
194
196

192
192
186
182
177

160
153
147
134
130
142
156

157

167

Non-
car -

bon-

ate

35
44
45
42
45
44
48

47
51
44
44
42

31
25
21
18
20
27
32

30

35

So-

dium
ad-

sorp-
tion
ratio

0.4
.4
. 5
.5
.5
. 5
. 5

.4
. 5
.4
.4
.4

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

0.3

0.3

Specific
con-

duct-

ance

(micro-
mhos at

25'C)

373
419
428
380
441
436
436

420
432
411
397
393

356
334
315
281
277
303
339

341

365

PH

7.9
8.0
8.2
8.2
8.2
8.1
7.8

7.9
8.1
8.1
.8
.9

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

7.8

7.8

SNAKE RIVER MAIN STEM Continued

13-375. SNAKE RIVER NEAR HEISE, IDAHO Continued

Analysis of additional sample

Date
of
collection

Apr. 12, 1965.....

Mean

discharge
(cfs)

10700

Silica

(810,)

10

Iron

(Fe)

0.03

Cal-

cium

(Ca)

50

Mag-
ne-

sium

(Mg)

11

Sodium

(Na)

13

Po-
tas-

sium

(K)

2.1

Bl-
car-

bon-

ate

(HCOJ

158

Car-
bon-
ate

(CO,)

0

SuUate

(S04)

48

Chloride

(Cl)

12

Fluo-

rlde

(P)

0.3

Ni-

trate

(NOJ

1.0

Bo-

ron

(B)

Dissolved solids

(residue at 180°C)

Parts

per
million

224

Tons

per
acre-

foot

Tons

per
day

Hardness

asCaCO,

Cal-

cium,
Mag-
ne-

sium

1 170

Non-
car-

bon-

ate

41

So-
dimn
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25'C)

386

PH

7.6

Specific conductance (micromhos at 25°C), water year October 1964 to September 1965 Day

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

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

10.....

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

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

22.....

24.....
25.....

26.....

28.....

31.....

Average

October

363
359
359
357

361
363
363

368

370
370

376
376

388
390
390
386
380

392

403
410

406

417

425

383

November

435
448
431
442

435
403
393

446

405

428
439

446
390
370
444
411

439

433
441

430

439

-

428

December

438
432
435
429

442
444
446

439

432

443
438

432
442
443
431
431

427

407
426

442

443

436

435

January

435
447
438
435

427
432
433

408

394

420
424

418
426
426
426
402

429

422
423

453

430

427

424

February

428
413
413
404

410
419
411

442

452

298
397
397

400
388
402
291
395

399

398
391

391

398

"

407

March

396
397
393
398

400
389
396

393

391
399
391
397
394

396
395
391
395
400

395

393
393

396

399

391
395

395

April

393
392
391
389

395
394
397

390

382
381
377
378
385

379
382
381
379
370

365

353
343

365

350

336

375

May

329
336
345
350

358
362
362

351

335
3 1
3 4
3 7
3 1

3 8
3 1
337
341
335

331

329
326

327

324

318
319

338

June

324
318
315
318

319
319
316

311

312
310
312
305
303

305
297
297
304
294

289

292
287

289

287
289
280

303

July

289
292
289
284

284
280
273

271

273
271
269
275
271

273
275
269
273
275

272

268
275

272

275
275
272
272

275

August

277
275
275
277

277
284
284

288

284
284
284
284
284

284
284
292
292
294

295

292
292

292

295
295
299
299

287

September

307
311
303
316

310
315
313

321

318
321
321
321
324

324
330
327
330
351

328

344
341

347

344
351
344

327

SNAKE RIVER MAIN STEM Continued

13-375. SNAKE RIVER NEAR HEISE, IDAHO Continued

Temperature (°F) of water, water year October 1964 to September 1965

Month

November .....
December .....

March ....

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

September .....

Day

1

52
48

35
39
47

52
53
51

2

50
46
39

32

32

43

56
53
52

3

52
44
40

34
36
46

52
53
53

4

54
43
39

33
33

34
36
44

50
53
53

5

49
34

32

37
43
46

50
52
54

6

50
44
38

33

34
42
45

53
54

7

51
48
36

33
43
43

49
53
53

8

43
36

34
43
46

55
53
54

9

52
42
37

32

34
44
45

52
53
54

10

53
44

35
44
49

53
55
52

11

50
44
37

33

37
45
44

54
55
54

12

51
40
34

32

36
40
49

54
54
53

13

53
40
36

35
44
46

50
54
52

14

54
40
36

33

34
43
44

51
53
54

15

51
40
36

35

35
44
45

52
53
53

16

53
37
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38
42
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53
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49
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36
39
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52
54
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18

49
41

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36
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44

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54
51

19

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38
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46

51
54
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20

52
37

33

36
44
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54

21

49
38
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51

Aver-

age

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42

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4?
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53
52

HENRYS FORK BASIN

13-550. TETON RIVER NEAR ST. ANTHONY, IDAHO

LOCATION. Temperature recorder at gaging station on right bank, 0.5 mile upstream from railroad bridge, 4 miles southeast of St. Anthony, Fremont County, and 22 miles upstream from mouth.
DRAINAGE AREA. 890 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: April 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 70°F Aug. 1, 11; minimum, freezing point on many days during December to February.
EXTREMES, April 1964 to September 1965. Water temperatures: Maximum, 70°F July 27, 29-31, Aug. 4-6, 1964, Aug. 1, 10, 1965; minimum, freezing point on many days during December 1964 to February 1965.

Temperature (°F) of water, water year October 1964 to September 1965

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

53
52

45
44

37
37

33
32

36
33

37
35

43
40

53
49

50
47

60
57

70
65

58
51

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52
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59
57

69
64

58
52

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45
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44
38

54
49

69
64

57
51

Average

47
45

38
37

34
33

33
33

35
34

39
37

47
44

51
48

54
52

64
60

65
60

52
48

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 1965.
Water temperatures: March 1951 to September 1965.
EXTREMES, 1964-65. Dissolved solids: Maximum, 340 ppm Aug. 20 to Sept. 12; minimum, 206 ppm Dec. 23, 24.
Hardness: Maximum, 220 ppm Sept. 13-30; minimum, 125 ppm Dec. 23, 24.
Specific conductance: Maximum daily, 561 micromhos Oct. 26; minimum daily, 329 micromhos Dec. 23.
Water temperatures: Maximum, 70°F July 11; minimum, 41°F Dec. 18, 19, Feb. 13.
EXTREMES, 1951-65. Dissolved solids: Maximum, 375 ppm May 13, 14, 1963; minimum, 206 ppm Dec. 23, 24, 1964. Hardness: Maximum, 221 ppm Apr. 14, 15, 1963; minimum, 125 ppm Dec. 23, 24, 1964.
Specific conductance: Maximum daily, 594 micromhos Oct. 3, 1952; minimum daily, 329 micromhos Dec. 23, 1964.
Water temperatures: Maximum, 73°F Aug. 2, 1955; minimum, 40°F Feb. 2, 1956.
REMARKS. No appreciable inflow between gaging station and sampling point except during periods of heavy local runoff.

Chemical analyses, in parts per millio iter year October 1964 to September 1965

Date
of
collection

Oct. 1-25, 1964...
Oct. 26-Nov. 22...
Nov. 23-Dec. 21...

Dec. 30- Jan. 16,

Jan. 29-31........
Feb. 1-11.........
Feb. 12-Mar. 10...
Nar. 11-Apr. 6....

June 6-16.........
June 17-20... .....

June 21-July 3....
July 4-5. ....

Mean

discharge
(cfs)

9477
11020
10740
16000
25000
14560

11010

13380
18570
17760
20420
14430
19250

12870
11170
10030
10290
9683
13850

Silica

(810,)

27

28

20

Iron

(Fe)

Cal-

cium

(Ca)

49

51

46

Mag-
ne-

sium

(Mg)

22

20

16

Sodium

(Na)

34
33
33
27
18
28

32

29
21
29
29
29
23

25
31
26
28
28
3O

Po-
tas-

sium

(K)

4.7

4.9

4.1

Bi-
car-

bon-

ate

(HCO,)

226
232
232
176
139
197

226

215
164
196
206
208
184

196
208
192
198
196
21 n

Car-
bon-
ate

(ccg

3
2
0
5
0
0

0

0
0
5

0
4

0
0
0
0
4
n

Sulfate

(S0»)

58

55

46

Chloride

(Cl)

26

25

20

Fluo-
rlde

(F)

0.7

.9

.8

Ni-
trate

(NOJ

4.0

4.5

2.3

Bo-

ron

(B)

0.04

.00

.06

Dissolved solids
(residue at 180° C)

Parts

per
million

A 339
339
337
302
206
298

336

316
247
309
321
307
279

284
312
278
292
294

Tons

per
acre-

foot

0.46
.46
.46
.41
.28
.41

.46

.43
.34
.42
.44
.42
.38

.39
.42
. 38
.40
.40

Tons

per

day

8670
10090
9770
13050
13910
11710

9990

11420
12380
14820
17700
11960
14500

9870
9410
7530
8110
7690

Hardness

asCaCO,

Cal-

cium,
Mag-
ne-

sium

212
216
210
170
125
181

208

197
151
195
205
195
182

185
193
177
183
182

Non-
car-

bon-

ate

22
22
20
17

11
19

23

21
16
26
29
24
24

24
22
19
21
15

So-

{Hum
ad-

sorp-
tion
ratio

1.0
1.0
1.0
.9
.7
.9

1.0

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

.8
1.0
.9
.9
.9

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

548
554
550
449
335
476

539

507
388
486
509
491
449

448
494
440
460
469

PH

8.3
8.3
8.1
8.5
7.5
7.9

8.1

8.2
7.9
8.4
8.3
8.2
8.3

7.9
7.9
7.9
7.0
8.3

A Calculated from determined constituents

SNAKE RIVER MAIN STEM -Continued

13-1545. SNAKE RIVER AT KING HILL, IDAHO Continued

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

July 6-11, 1965. ..
July 12-Aug. 8....

Aug. 20-Sept. 12..
Sept. 13-30.......

Weighted average

Time-weighted
average. ......

Tons per day. . . .

Mean

discharge
(cfs)

8930
8029
8493
8859
9583

12503

~

Silica
SiO,)

30

--

--

--

Iron

(Fe)

Cal-
cium

(Ca)

48

Mag-
ne-

sium

(Mg)

20

Sodium
(Na)

25
33
33
35
34

29

30

989

Po-
tas-
sium

(K)

4.6

~

~

Bi-
car-

bon-
ate

(HCOJ

196
221
224
220
218

208

211

7020

Car-
bon-
ate

(CO,)

4
0
0
6
6

Sulfate

(S04)

53

Chloride

(Cl)

25

Fluo-
rlde

(P)

0.7

Ni-
trate

(NOJ

4.5

Bo-
ron

(B)

0.02

Dissolved solids
(residue at 180°C)

Parts

per
million

276
A 328
326
340
334

312

316

Tons

per
acre-

foot

0.38
.45
.44
.46
.45

,0.42

Tons

per

day

6650
7110
7480
8130
8640

10500

Hardness

as CaCOj

Cal-

cium, Mag-

ne-

sium
178
204
204
214
220

198

200

Non-
car-

bon-
ate

11
23
20
24
32

23

23

So-
dium
ad-
sorp-
tion
ratio

0.8
1.0
1.0
1.0
1.0

0.9

0.9

Specific
con-

duct-

ance

[micro-
mhos at

25"C)

453
520
524
545
550

499

506

PH

8.3
8.2
8.2
8.4
8.4

8.1

8.1

A Calculated from determined constituents.

Temperature (°F) of water, water year October 1964 to September 1965

October ....
November .....

January. ....

March.........

May...........
June ....

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

1

54

43

43

56
65

64
68
64

2

54

55
65

66
68
65

3

54

54

66
69
64

4

54

55

67
69
64

5

53

54

68

63

6

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52

68

62

7

53

52

69

62

8

53

62

9

52

63

10

52

63

11

52

64

12

52

63

13

49

63

14

49

62

15

48

60

Day

16

47

58

17

47

57

18

5

19

48

56

20

47

57

21

48

57

22

58

23

58

24

60

25

60

26

60

27

6?

60

28

62

59

29

63

58

30

5"

64

>9

31

62

Aver-
age

50

45

46

58
64

68
66
61

SNAKE RIVER MAIN STEM Continued

13-1545. SNAKE RIVER AT KING HILL, IDAHO Continued

Specific conductance (micromhos at 25°C), water year October 1964 to September 1965

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.....
28.....
29.....
30.....
31.....

Average

October

539
549
542
544
551

543
517
540
546
548

536
544
545
548
553

550
548
547
544
539

544
554
553
544
553

561
553
546
553
556
546

546

November

553
554
552
549
554

549
548
548
548
549

55U
552
552
551
550

552
553

554
552

551
549
554
551
551

550
544
542
550
548

550

December

548
542
545
549
548

547
546
546
549
542

529
543
539
534
556

546
550
542
545
529

558
449
329
335
477

472
476
460
490
532
54U

515

January

539
541
533
549
546

539
539
538
536
524

531
531
531
523
535

531
517
518
525
520

511
478
475
504
506

509
493
493
371
376
423

509

February

4' 8
473
476
485
483

483
489
480
488
478

477
506
513
499
511

511
502
515
507
508

504
507
513
507
507

504
503
507

495

March

5U4
504
500
497
502

502
504
498
495
487

494
495
486
493
489

483
494
490
488
485

484
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485
485
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490
496
496
491
485
487

492

April

481
481
489
499
502

490
526
434
436
452

461
453
45J
452
452

458
467
461
459
462

456
446
433
435
432

433
433
434
436
437

458

May

434
432
428
430
430

435
446
443
443
452

451
451
450
446
454

457
453
450
441
437

442
452
453
449
450

459
452
457
454
457
455

446

June

471
482
490
504
507

451
439
437
443
438

405
434
428
440
449

437
452
458
460
463

469
459
461
470
466

466
462
448
456
472

457

July

4t>3
469
467
499
477

462
445
444
445
451

456
505
504
511
512

506
511
517
514
488

517
517
523
520
523

521
520
517
520
523
520

495

August

522
517
518
520
525

524
532
531
517
515

517
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527
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522
524
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523
531

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543

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539

528

September

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550
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BOISE RIVER BASIN

13-1860. SOUTH FORK BOISE RIVER NEAR FEATHERVILLE, IDAHO

LOCATION. Temperature recorder at gaging station on right bank, 2.5 miles upstream from Deer Creek, and 8 miles southwest of Featherville, Elmore County.
DRAINAGE AREA. 635 square miles.
December 1962 to September 1965 (discontinued).
Maximum, 68°F Aug. 11; minimum, 33°F on many days during winter months.
Maximum, 78°F Aug. 11, 1963; minimum, 33°F on many days during winter months.

RECORDS AVAILABLE. Water temperatures:
EXTREMES, 1964-65. Water temperatures:
EXTREMES, 1962-65. Water temperatures:

Temperature (°F) of water, water year October 1964 to September 1965

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

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Average

51
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BOISE RIVER BASIN Continued

13-2000. MORES CREEK ABOVE ROBIE CREEK, NEAR ARROWROCK DAM, IDAHO

LOCATION. Temperature recorder at gaging station on left bank at State roadside park, 1.7 miles upstream from Robie Creek, 5 miles northwest of Arrowrock Dam, Boise County, and at mile 5.8.
DRAINAGE AREA. 399 square miles.
RECORDS AVAILABLE. Water temperatures: December 1964 to September 1965.
EXTREMES, December 1964 to September 1965. Water temperatures: Maximum, 75°F Aug. 1.
REMARKS. No record Dec. 23 to Mar. 16 when probe was covered by sand and gravel, July 6-27 when probe was out of water.

Temperature (°F) of water, December 1964 to September 196S

Month

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
43

46
44

57
48

64
58

75
68

64
52

2

45
42

45
40

58
48

67
55

73
68

65
55

3

44
40

48
40

59
49

68
58

73
66

64
55

4

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59
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69
60

72
65

62
52

5

45
41

45
41

61
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70
59

71
63

59
55

6

44
42

43
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60
51

71
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62
53

7

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42

44
41

61
51

72
61

63
54

8

46
42

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41

61
51

74
64

61
56

9

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70
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73
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54

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70
64

59
52

14

33
33

51
43

55
46

57
52

69
61

60
52

15

33
33

52
44

53
45

54
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72
65

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55

16

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72
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74
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48
43

58
49

66
55

72
65

62
52

52
48

31

47
41

55
48

74
65

63
51

Average

47
43

52
45

61
52

69
62

58
51

BOISE RIVER BASIN Continued

13-2125. BOISE RIVER AT NOTOS, 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 1965.
Water temperatures: November 1950 to September 1965.
Sediment records: January 1939 to June 1940.
EXTREMES, 1964-65. Dissolved solids: Maximum, -417 ppm Oct. 14-31; minimum, 82 ppm May 9-22.
Hardness: Maximum, 190 ppm Oct. 14-31; minimum, 38 ppm Apr. 19 to May 8, May 9-22.
Specific conductance: Maximum daily, 702 micromhos Oct. 23; minimum daily, 106 micromhos Hay 7.
Water temperatures: Maximum, 72°F July 17, Aug. 11, 16.
EXTREMES, 1939-40, 1950-65. 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.
Specific conductance: Maximum daily, 1,47O micromhos July 30, Aug. 26, 1939; minimum daily, 82 micromhos Apr. 27, 1952.
Water temperatures: Maximum, 85°F on several days during summer months in 1951, 1952, 1954; minimum (1939-40, 1950-64), freezing point Jan. 31, 1956, Jan. 11-14, 1963.
REMARKS. 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 1964 to September 1965

Date
of
collection

Oct. 1-13, 1964...

Nov. 25-Dec. 16...
Dec. 17-
Jan. 6, 1965....

Jan. 29-Feb. 7....
Feb. 8-Mar. 7.....

Apr. 19-May 8. . . . .

May 23-June 2. ....

June 30- July 7 ....
Julv 8-12. ....

Mean

discharge
(da)

636
777
737
886

1007
1040

3349
5551
6949
6974
5284
5695

6136
6399
4143
2674
4934
3276
2702

Silica

(S10a)

34

16

15

Iron

(Fe)

Cal-

cium

(Ca)

50

17

14

Mag-
ne-

sium

(Mg)

16

3.6

2.4

Sodium

(Na)

59
70
70
57

52
34

16
13
11
10
11
9.0

8.9
9.6
12
15
11
14
16

Po-
tas-

sium

(K)

5.3

2.6

1.7

Bi-
car-

bon-

ate

(HCOJ

234
278
276
233

210
148

80
68
64
63
63
52

56
58
68
82
62
74
80

Car-
bon-
ate

(CO,)

0
0
0
0

0
0

0
0
0
0
0
0

0
0
0
0
0
0
0

Sulfate

(SO.)

80

17

10

Chloride

(Cl)

18

4.5

2.5

Fluo-
rlde

(F)

0.7

.5

.3

Ni-

trate

(NOJ

6.3

3.8

2.0

Bo-

ron

(B)

0.08

.01

.04

Dissolved solids
(residue at 180° C)

Parts

per
million

340
A 417
412
353

325
232

126
110
111
97
101
86

82
86
95
119
91
104
116

Tons

per
acre-

foot

0.46
.57
.56
.48

.44
.32

. 17
. 15
. 15
. 13
. 14
. 12

. 11
. 12
. 13
. 16
. 12
. 14
. 16

Tons

per

day

584
875
820
844

884
651

1140
1650
2080
1830
1440
1320

1360
1490
1060
859
1210
920
846

Hardness

aa CaCO,

Cal-

cium,
Mag-
ne-

sium

153
190
185
159

143
103

57
49
45
45
45
38

38
40
46
56
43
50
55

Non-
car-

bon-

ate

0
0
0
0

0
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0

So-

dium
ad-

sorp-
tion
ratio

2.1
2.2
2.2
2.0

1.9
1.5

.9
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. 7
.6
. 7
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.6
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Specific
con-

duct-

ance

micro-

mhos at

25°C)

532
645
642
553

502
353

186
158
141
133
136
115

120
125
155
186
142
167
184

PH

7.9
7.9
7.9
7.9.

7.9
8.0

7.8
7.6
7.2
7.5
7.2
7.3

7.4
7.6
7.4
7.2
7.4
7.5
7.8

BOISE RIVER BASIN Continued

13-2125. BOISE RIVER AT ROWS, IDAHO Continued

Chemical analyses, in parts per million, water ye.ar Octobca; 1,994 to 1965 Continued

Date
of
collection

July 14-Aug. 4. ...

Aug. 8-Sept. 7....

Sept. 17-30..;....

Weighted average

Time -weigh ted
average. ......

Tons per day ....

Mean

discharge
(cfs)

759

849

1309

3152

Silica

(S1O,)

24

~

Iron

(Fe)

Cal-

cium

(Ca)

30

~

Mag-
ne-

sium

(Mg)

8.2

"

Sodium

(Na)

39

43
33

57

17

32

143

tas-
slum

(K)

3.7

~

~

~

~

Bl-
car-

bon-

ate

(HCO,)

166

177
144

242

84

141

718

bon-

ate

(CO,)

0

0

0

--

Sulfate

(SO,)

39

--

~

Chloride

(CD

10

Fluo-

rlde

(F)

'.5

- -

Ni-

trate

(NOJ

4.0

_

~

Bo-

ron

(B)

.06

- -

~

~

DU

(r«sj

Parts

per
million

186
242

247
213

351

130

210

isolved
Ldue al

Tons

per
acre-

foot

.25
.33
.39
.34
.29

.48

0.18

solids

160°C)

Tons

per

day

633
496

566
650

1240

1110

Hard
asC

Cal-

cium,
Mag-
ne-

sium

83
109
125
119
99

166

59

96

ness

»CO,

Non-
car-

bon-

ate

0

0
0

0

0

0

So-

ad-

sorp-
tion
ratio

1.3
1.6
1.9
1.7
1.4
1.6
1.9

0.8

1.3

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

284
374
451
413
339
391
570

189

324

pH

8.2
7.7
7.6
7.9
8.3

7.8

7.4

7.5

A Calculated from determined constituent

Temperature (°F) of water, water year October 1964 to September 1965

November .....
December .....

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

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

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

1

50
49

47
40

61

71
68

2

50
46

40
40

61

71
69

3

45
46

40
41

62

69
68

4

48
46

48
39

61

70
67

5

48
49

48
49

63

69
68

6

40
46

48
40

68

70
68

7

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47

40
40

65

71
67

8

40
40

64

70
67

9

45
41

55
66

70
67

10

48
40

63

71
66

11

57
38

66

72
65

12

48

62

71
65

13

50

63

70
66

14

49
38

61

70
66

15

45
42

61

70
58

Day

16

50
50

57

72
55

17

50
59

62

70
68

18

49
50

61

70
67

19

48
54

65

70
66

20

44
49

64

70
68

21

44
49

67

70
68

22

50
49

65

70
65

23

42

67

70
64

24

51
40

64

69
65

25

51

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70
65

26

50
40

69

69
65

27

40

71

71
66

28

50
48

68

68
66

29

48
50

67

69
67

30

49
48

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67

7P
65

31

47

40

69

Aver-
age

18
16

42

64

69
70
66

BOISE RIVER BASIN Continued

13-2125. BOISE RIVER AT NOTUS, IDAHO Continued

Specific conductance (micromhos at 25°C), water year October 1964 to September 1965 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.....
28.....
29.....
30.....
31.....

Average

October

519
534
507
524
525

517
532
513
458
517

547
575
576
618
624

633
631
627
636
628

638
638
702
645
643

652
635
648
649
643
644

592

November

638
650
656
652
643

656
660
657
670
654

641
670
662
647
665

638
619
612
591
611

6U7
608
602
636
576

575

548
549
544

625

December

554
552
548
542
539

556
542
548
542
544

542
576
569
546
540

555
476
458
465
481

499
496
509
513
510

515
524
531
512
511
497

525

January

493
507
500
501
506

521
387
365
353
319

223
193
182
180
177

181
180
189
189
183

188
196
189
184
184

180
177
178
172
171
169

268

February

154
150
156
150
149

145
146
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145
142

142
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144
147
146

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143
142
143
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138
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137
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143

March

143
140
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128
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128
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128
133

134

April

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154
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132
132
129
123
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113
115
114
114

127

May

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112
112
111
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107
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118

June

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119
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163
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139
157
163

156

July

159
157
157
156
156

199
174
167
167
192

192
192
284
351
359

355
355
359
359
351

351
345

403
378

378
380
380
380
380
388

286

August

380
380
384
384
435

446
435
424
424
418

421
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423
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407

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405
391

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412
424
426

422
421
420
427
429
428

414

September

422
413
421
421
426

421
420
343
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343
340
434

360
580
574
575
574

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574
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578
580

580
579
581
579
577

474

WEISER RIVER BASIN

13-2513. WEST BRANCH WEISER RIVER NEAR TAMARACK, IDAHO

LOCATION. Temperature recorder at gaging station on left bank 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 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 58°F on several days during July and August; minimum, freezing
days during November and December.
EXTREMES, 1959-65. Water temperatures: Maximum (1959-63, 1964-65), 62°F July 20, 1960, Aug. 12, 1963; minimum, several days during winter months.
REMARKS. No record Oct. 1, Mar. 29 to Apr. 21 when clock was stopped; temperature range, 34°F to 40°F.

Temperature (°F) of water, water year October 1964 to September 1965

point on several

freezing point on

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

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SNAKE RIVER MAIN STEM

13-2902. SNAKE RIVER BELOW PINE CREEK, AT OXBOW, OREG.

LOCATION. Temperature recorder at gaging station on right bank at Oxbow, Baker County, 0.1 mile upstream from Hansaker Creek, 0.1 mile north 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: Hay 1956 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 73°F on several days during August; minimum, 38°F on many days during January and February.
EXTREMES, 1956-65. Water temperatures: Maximum (1956-62, 1963-65), 81°F July 25, 1956; minimum, freezing point on several days during January 1957.

Temperature (°F) of water, water year October 1964 to September 1965

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

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71
70

Average

61
61

53
52

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72
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SNAKE RIVER MAIN STEM Continued

13-3343. SNAKE RIVER NEAR ANATONE, WASH.

LOCATION. Temperature recorder at gaging station on left bank, 1.5 miles downstream from Grande Ronde River, 7.8 miles east of Anatone, Asotin County, 22 miles south of Clarkston, at mile 28.4 from Lewiston, and 167.9 miles upstream from mouth. DRAINAGE AREA. 92,960 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: September 1959 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 74°F Aug. 1, 8, 9; minimum, freezing point Dec. 22.
EXTREMES, 1959-65. Water temperatures: Maximum, 77°F Aug. 11, 1960, Aug. 13, 1963; minimum, freezing point Jan. 25, 26, 1962, Dec. 22, 1964.
REMARKS. Clock stopped Aug. 21-23.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....
January
Maximum ....
Minimum ....
February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....
April
Maximum ....
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May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

Day

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74
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SNAKE RIVER MAIN STEM Continued

13-3353. SNAKE RIVER ABOVE CLEARWATER RIVER, AT CLARKSTON, WASH.

LOCATION. At bridge on U.S. Highway 410 at Clarkston, Asotin County, 0.2 mile upstream from Clearwater River, and 4.2 miles downstream from Tammany Creek RECORDS AVAILABLE. Chemical analyses: October 1961 to September 1965.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 28, 1964

Jan. 20, 1965

Sept. 23.....
Sept. 27... ..

Mean

discharge
(cfs)

Silica

(sicg

15
14
23
23
20

19
13

16
21
24

Alu-
mi-

num

(Al)

Iron

(Fe)

0.07
.43

.28

.23
.06

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

33
34
29
29
24

20
16

32
32

Mag-
ne-

sium

(Mg)

15
16
9.2
9.6
6.8

6.6
4.0

7.2
11
11

Sodium

(Na)

36
38
24
20
16

13
9.0

16
31
28

Po-
tas-

sium

(K)

3.9
4.3
3.5
3.2
2.4

2.3
1.5

2.4
3.4
3.2

Lith-

ium

(LI)

Bi-
car-

bon-

ate

(HCO,)

174
186
132
130
105

90
71

106
154
152

Cap.
ben-

ate

PW

0
0
0
0
0

0
0

0
0
0

Sulfate

(S04)

54
58
35
32
23

20
14

22
42
41

Chloride

(Cl)

18
18
12
11
9.2

6.2
3.2

6.2
16
12

Fluo-

ride

(F)

0.6
.6
.6
.6
.6

.4
.3

.4
.6
.5

Ni-

trate

(NO,)

1.0
2.1
2.9
2.8
1.8

1.1
.4

.6
2.2
2.1

Phos-

phate
(P04)

0.08
. 10
. 20
. 28
. 19

.22
.07

.08
. 12

Dissolved
solids

(residue
at 180°C)

A 263
A 279
204
209
158

139
97

A 145
235
A 229

Hardness

as CaCO,

Cal-

cium,
mag-
nesium

142
152
110
112
88

77
56

85
127
124

Non-
car -

bon-

ate

0
0
2
6
2

3
0

0
1
0

To-

tal
acid

ity
as

H+ l

Specific
conduct-*

ance

(micro-
mhos at

25*C)

432
457
321
311
241

213
153

235
372
376

PH

8.1
8.1
7.7
7.9
7.5

7.5
7.7

7.6
8.0
7.8

Col-

or

0
0
5
5
5

10
5

5
5
5

D.O.
[dis-
sol-
ved
oxy-
gen
ppm)

13.2

11.2

8.9

10.4

MPN

(coli-
form
colo-

nies

per

100 ml)

73

36

4600

36

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Jan. 20, 1965.. . .

Time

(24 hr)

0800

Chromium

Hexa-

valent

(Cr»)

0.00

Total

(Cr)

0.00

Cop-

per

(Cu)

0.03

Zinc

(Zn)

0.05

Ar-

senic

(As)

0.00

Boron

(B)

0.00

CLEAHWATER RIVER BASIN

13-3361. MEADOW CREEK NEAR LOWELL, IDAHO

LOCATION. Temperature recorder at gaging station on right bank, 1.1 mile upstream from mouth, and 16.5 miles southeast of Lowell, Idaho County.
DRAINAGE AREA. 241 square miles.
RECORDS AVAILABLE. Water temperatures: August 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 69°F Aug. 1, 2; minimum, freezing point on many days during winter months. EXTREMES, August 1964 to September 1965. Water temperatures: Maximum, 69°F Aug. 1, 2, 1965; minimum, freezing point on many days during winter months.
REMARKS. No record Nov. 16 to Dec. 1, Dec. 8 to Jan. 11, Aug. 15-18 when clock was stopped.

Temperature (°F) of water, August to September 1965

Month

August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....
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

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CLEARWATER RIVER BASIN Continued

13-3410. NORTH FORK CLEARWATER RIVER AT AHSAHKA, IDAHO

LOCATION. Temperature recorder on right bank at cableway at Ahsahka, Clearwater County, 0.4 mile upstream from mouth, and 1.6 miles downstream from gaging station.
DRAINAGE AREA. 2,440 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: August 1959 to August 1960.
Water temperatures: October 1957 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 77°F Aug. 1; minimum, freezing point on several days during December. EXTREMES, 1957-65. Water temperatures: Maximum, 84°F Aug. 11-13, 1963; minimum, freezing point on many days during winter months.
REMARKS. Clock stopped Dec. 27 to Jan. 9 and Aug. 23 to Sept. 26, recorded range 33°F to 37°F, and 49°F to 70°F, respectively. Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....
January
Maximum ....
Minimum ....
February
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March
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April
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June
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Minimum ....
July
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August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

Day

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CLEARWATER RIVER BASIN Continued

13-3410.5. CLEARWATER RIVER NEAR PECK, IDAHO

LOCATION. Temperature recorder at gaging station on left bank, 2 miles upstream from Big Canyon Creek, 2.2 miles northeast of Peck, Nez Perce County, and 3 miles downstream from North Fork Clearwater River.
DRAINAGE AREA. 8,040 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: October 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 77°F Aug. 1, 2; minimum, 33°F Mar. 21, 25.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
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May
Maximum ....
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June
Maximum ....
Minimum ....

July
Maximum ....
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August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

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72

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47
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76
73

64
61

Average

41
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56

CLEARWATER RIVER BASIN Continued

13-3425. CLEARWATER RIVER AT SPALDING, IDAHO

LOCATION (revised). Temperature recorder at gaging station on left bank, 0.4 mile downstream from Lapwai Creek, 0.5 mile northwest of Spaldlng Post Office, Nez Perce County, and 3,100 feet downstream from bridge on U.S. Highway 12 (formerly bridge at U.S. Highway 95), and 11.6 miles upstream from mouth.
DRAINAGE AREA. 9,570 square miles, approximately.
ARECORDS AVAILABLE. Chemical analyses: August 1959 to August 1960.
Water temperatures: September 1959 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 80°F Aug. 1, 2, 9; minimum, 33°F on several days during December and February. EXTREMES, 1959-65. Water temperatures: Maximum, 82°F Aug. 13, 1963; minimum, freezing point on many days during winter months. REMARKS. No temperature record Nov. 4-9, Apr. 24-28, when clock was stopped; recorded range, 43°F to 43°F and 45°F to 46°F, respectively.

Temperature '(°F) of water, water year October 1964 to September 1965

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

57
55

48

36
36

34
34

36
36

38
36

45
43

43
41

48
47

62
59

80
76

66
62

2

56
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43
42

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48

64
61

80
77

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63

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77
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43
41

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47

78
75

66
61

Average

52
50

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42

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46

54
52

70
67

74
71

62
59

TUCANHON RIVER BASIN

13-3445. TUCANHON RIVER NEAR STARBUCK, WASH.

LOCATION.' At county road bridge. 180 feet upstream from gaging station, 3 miles east of Starbuck, Columbia County, and downstream from Pataba Creek.
DRAINAGE AREA. 431 square miles.
RECORDS AVAILABLE. Water temperatures: October 1962 to September 1965.
Sediment records: October 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 82°F Aug. 1; minimum, 34°F Dec. 17, 19, Feb. 11, Mar. 18. Sediment concentrations: Maximum daily, 99,800 ppm Dec. 22; minimum daily, 11 ppm on many days.
Sediment loads: Maximum daily, 1,600,000 tons Dec. 22; minimum daily, 2 tons on many days.
EXTREMES, 1962-65. Water temperatures: Maximum, 82°F Aug. 1, 1965; minimum, freezing point Dec. 11, 12, 1963. Sediment concentrations: Maximum daily, 99,800 ppm Dec. 22, 1964; minimum daily, 8 ppm Nov. 30, 1963. Sediment loads: Maximum daily, 1,600,000 tons Dec. 22, 1964; minimum daily, 2 tons on many days in 1963-65. REMARKS. Maximum observed during water year: Sediment concentration, 193,000 ppm Dec. 22.

Temperature (°F) of water, water year October 1964 to September 1965

October ....

December .....

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

April..........
May...........

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

1

51

48

36
38
36

54

59
82
55

2

54

46

40
37
36

64

3

44

39
38
37

46

4

47

40

38
39

49

70

5

46

42

39
42

43

64

6

48

41

40
40

43

64

7

49

38

38
38

47

68

53

8

58

42

38
41

58

64

9

57

43

39
38

58

59

58

10

46

38
36

51

71

11

40

38
34

52

71

12

37

38
37

54

59

13

40

37

53

61

55

14

39

39

51

63

15

38

38

52

65

59

Day

16

35

40

54

64

17

34

39

46

81

45

18

35

39

45

19

34

49

59

57

20

38

38

50

62

63

21

36

40

51

56

22

35

41

60

23

45

37

40

53

24

38

38

35

49

76

25

38

37

38

52

65

26

40

38

40

55

68

27

39

42

48

70

65

5?

28

38

41

45

55

68

29

39

46

43

58

66

51

30

44

"

60

64
52

31

36

40

48

65

Aver-

age

44
39

39
40
41

52

66

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water;

Date of collection

Nov. 25, 1964. ....

Jan. 27, 1965. ....

Apr. 20. ....

Time

(24 hour)

1100
1250
1300
1910
0120
1315

Water
tem-

per-
ature

(°F)

42
43
43
45
43
57

Sam-

pling
point

Discharge
(cfs)

295
6760
1240
1930
4060
462

Sediment
concen-

tration

(ppm)

813
193000
13800
22800
21400
3740

Sediment

discharge
(tons per day)

648
4040000
46200
119000
235000
4670

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

15
12
14
15
12
12

0.004

20
14
18
20
16
18

0.008

22
23
26
28
24
26

0.016

35
38
38
43
37
37

0.031

54
63
59
64
57
56

0.062

86
91
90
92
82
86

0.125

97
98
98
98
96
96

0.250

100
99
100
99
99
99

0.500

100

100
100
100

1.000 2.000

Method
of

analysis

VPWC
VPWC
VPWC
VPWC
VPWC
VPWC

SNAKE RIVER BASIN

TUCANNON RIVER BASIN Continued

13-3445. TUCANNON RIVER NEAR STARBUCK, WASH. Continued

Suspended sediment, water year October 1964 to September 1965

Day

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

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

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

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

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

26..
27..
28..
29..
30..
31..

Total

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

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

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

16..
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19..
20..

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

26..
27..
28..
29..
30.i
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

79
73
70
70
70

66
68
66
70
73

75
75
73
71
71

73
71
71
71
71

70
68
68
68
68

79
79
82
82
82
82

2255

Suspended sediment

Mean
concen-

tration

(ppm)

39
28
23
22
28

42
59
48
101
34

22
30
54
21
18

17
22
56
27
13

12
18
20
16
11

14
19
21
24
28
23

Tons
per
day

8
6
4
4
5

7
11
9
19
7

4
6
11
4
3

3
4
11
5
2

2
3
4
3
2

3
4
5
5
6
5

175

JANUARY

295
276
276
224
288

638
395
288
243
236

236
217
198
205
205

205
211
282
300
300

360
300
437
592
521

631
1220
1590
2900
3130
1920

19119

220
280

120
972

3820
530
240
205
156

128
123
110
140
210

183
243
228
250
750

700
1200
900
1200
700

3400
17100
17300
22900
19300
12600

"

175
209
A 149
73
S 1280

S 6980
565
187
134
99

82
72
59
77
116

101
138
174
202
608

680
972
1060
1920
985

S 7380
S 56800
S 79400
S 192000
S 167000
S 66000

585677

NOVEMBER

Mean
dis-

charge
(cfs)

79
79
82
79
77

77
77
77
79
79

79
82
84
82
79

79
77
79
79
75

75
75
79
90
226

155
124
110
108
113
~

2735

1400
1010
862
870
742

675
585
542
500
423

314
328
334
321
282

282
302
314
354
416

444
500
416
374
347

321
402
479

__

14139

Suspended sediment

Mean
concen-

tration

(ppm)

16
25
24
22
22

21
20
15
24
25

19
29
23
16
22

22
21
24
25
22

21
21
30
286
1330

115
55
47
39
51

~

Tons
per
day

S 89
812

48
18
14
11
16

1113

FEBRUARY

7750
3700
1950
1100
721

445
301
252
215
178

194
200
196
206
147

163
230
248
375
493

472
656
448
430
442

460
1080
1220

~

29300
10100
4540
2580
1440

811
475
369
290
203

164
177
177
178
112

124
188
210
358
554

566
886
503
434
414

399
S 1260
1580

__

58392

DECEMBER

Mean
dis-

charge
(cfs)

1*9
222
226
206
183

162
146
1*0
146
140

152
140
140
143
149

110
82
75
79

no

152
3590
4620
2920
2140

1400
1000
740
570
444
3*7

20853

472
451
434
416
367

328
321
308
295
302

302
295
269
250
230

217
243
198
205
236

230
224
198
180
173

192
192
167
155
142
148

8140

Suspended sediment

Mean
concen-

tration

(ppm)

163
240
127
84
63

46
47
40
46
41

52
29
34
36
46

68
87
86
89
89

90
99800
45900
19900
12000

5300
2500
1240
820
580
260

Tons
per
day

73
144
77
47
31

20
19
15
18
15

21
11
13
14
18

20
19
17
19
34

37
S 1600000
S 582000
S 168000
69300

20000
6750
2480
1260
695
244

2451411

MARCH

995
803
760
485
473

393
395
305
420
570

400
302
220
170
160

280
154
125
670
750

170
153
124
88
112

109
75
43
41
55
41

1270
978
891
545
469

348
342
254
335
465

326
241
160
115
99

164
101
67
371
478

106
93
66
43
52

56
39
19
17
21
16

8547

S Computed by subdividing day.
A Computed from partly estimated-:oncentration graph.

QUALITY OF SURFACE WATERS, 1965

TBCANNON RIVER BASIN Continued

13-3445. TDCANNON RIVER NEAR STARBUCK, WASH. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dU-

charge
(cfs)

155
205
211
205
198

198
173
167
186
211

198
180
180
198
230

308
321
288
321
449

508
449
432
392
352

364
349
360
416
485

8689

Suspended sediment

Mean
concen-

tration

(ppm)

57
127
103
81
78

47
48
55
71
100

106
78
92
134
360

685
565
342
480
3960

6280
3600
2240
1510
1150

1060
840
1000
1330
1570

-

Tons
per
day

24
70
59
45
42

25
22
25
36
57

57
38
45
72
224

570
490
266
416
4600

S610
4360
2610
1600
1090

1040
792
972
1490
2060

32007

JULY

125
114
114
119
112

106
104
100
100
96

94
104
98
90
90

86
83
83
83
83

100
114
96
92
86

85
88
86
81
77
76

2965

25
26
20
26
27

20
21
16
13
12

12
20
13
14
16

13
16
16
12
21

39
46
22
14
12

14
21
13
53
53
19

8
8
6
S
S

6
6
4
4
3

3
6
3
3
4

3
4
4
3
5

11
14
6
3
3

3
5
3
A 12
A 11
4

174

MAY

Mean
dis-

charge
(cfs)

476
420
388
384
352

322
285
274
260
257

264
296
337
388
372

368
380
345
322
376

356
337
337
337
322

322
318
318
364
380
360

10617

Suspended sediment

Mean
concen-

tration

(ppm)

1120
770
410
306
211

143
109
89
74
80

130
305
447
352
225

170
170
108
86
257

113
80
77
74
70

74
64
101
258
212
130

Tons
per
day

1440
873
430
317
201

124
84
66
52
56

93
244
407
369
226

169
174
101
75
261

109
73
70
67
61

64
55
87
254
218
126

6946

AUGUST

74
76
83
79
77

76
72
70
70
67

69
88
88
77
74

72
69
67
69
76

72
77
77
74
86

92
85
81
79
79
79

2374

17
13
IS
22
98

145
42
16
16
11

12
12
23
95
41

11
C 11
C 11
C 11
C 11

C 11
C 11
C 11
C 11
C 11

C 11
C 11
C 11
C 11
C 11
C 11

3
3
3
5
A 20

A 30
8
3
3
2

2
3
5
A 20
8

2
2
2
2
2

2
2
2
2
3

3
3
2
2
2
2

153

JUNE

Mean
dis-

charge
(cfs)

326
300
296
296
285

289
278
271
254
257

260
264
243
229
218

194
209
246
218
200

191
174
171
171
163

154
147
142
137
130

6713

Suspended sediment

Mean
concen-

tration

(ppm)

107
105
83
76
65

66
72
61
56
54

51
41
34
33
35

32
40
131
91
33

28
24
26
24
22

25
54
44
31
20

Tons
per
day

94
85
66
61
50

51
54
45
38
37

36
29
22
20
21

17
23
87
54
18

14
11
12
11
10

10
21
17
11
7

1032

SEPTEMBER

76
70
70
74
79

79
77
72
70
70

72
76
76
79
85

94
86
85
85
85

81
81
83
81
81

79
79
79
79
T9

2362

C 11
C 11
C 11
C 11
C 11

C 11
C 11
C 11
C 11
C 11

C 11
C 11
C 11
C 11
C 11

C 11
C 11
C 11
C 11
C 11

C 11
C 11
C 11
C 11
C 11

C 11
C 11
C 11
C 11
C 11

2
2
2
2
2

2
2
2
2
2

2
2
2
2
3

3
3
3
3
3

2
2
2
2
2

2
2
2
2
2

66

Total discharge for year (cfs-days). .... 100,961 Total load for year (tons). .... 3,145,693 A Computed from partly estimated-concentratio
C Composite period.

graph.

PALOUSE RIVER BASIN

13-3510. PALOUSE RIVER AT HOOPER, WASH.

LOCATION. At bridge on State Highway 26 at Hooper, Whitman County, 150 feet upstream from gaging station, and 0 4 mile upstream from Cow Creek DRAINAGE AREA. 2,500 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
Water temperatures: October 1961 to September 1965.
Sediment records: October 1961 to September 1965.
EXTREMES, 1964-65. Sediment concentrations: Maximum daily, 31,300 ppm Dec. 23; minimum daily, 9 ppm on many days during November and July
Sediment loads: Maximum daily, 588,000 tons Dec. 23; minimum daily, 1 ton on several days during August
EXTREMES, 1961-65. Water temperatures (1961-64): Maximum (1962-64), 86«F July 13, 1964; minimum, freezing point on several days during December 1961, January January and February 1963. ti Sediment concentrations: Maximum daily, 45,100 ppm Feb. 5, 1963; minimum daily, 6 ppm on several days during November 1961.
Sediment loads: Maximum daily, 2,110,000 tons Feb. 5, 1963; minimum daily, 1 ton on many days in 1962, 1963, and 1965.
REMARKS. Maximum observed during water year: Sediment concentration, 24,100 ppm Dec. 23.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 20, 1964

Jan. 19, 1965

Sept. 22.....

Mean

discharge
(cfs)

62
86
3500
1020
2650
1090

3350
373
70
20
63

Silica

(SiO,)

13
19
21
25
25
25

21
14
22
24
17

Alu-
mi-
num

(Al)

Iron

(Fe)

0.22

.24

Man-

ga-
nese

(Mn)

Cal-

cium

(Ca)

27
27
8.4
19
15
16

8.0
20
28
30
29

Mag-
ne-

sium

(Mg)

11
11
3.0
5.5
5.4
6.4

3.0
8.1
11
13
12

Sodium

(Na)

23
22
5.2
15
11
12

6.1
15
20
24
23

Po-
tas-

sium

(K)

4.5
4.2
2.7
3.5
3.0
3.3

2.3
3.7
5.0
5.8
4.4

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

172
168
42
88
72
93

45
125
174
196
179

Car
ben
ate

peg

0
0
0
0
0
0

0
0
0
0
3

Sulfate

(S0»)

8.8
8.4
6.4
9.2
7.8
8.0

4.6
7.6
10
11
10

Chloride

(Cl)

8.8
10
1.0
3.2
2.5
2.5

1.5
4.5
5.2
7.8
7.2

Fluo-

ride

(F)

0.3
.3
. 1
.3
. 1
. 1

.2
.5
.3
.4
.4

Ni-

trate

(NO,)

1.7
3.5
6.4
L4
9.7
6.8

2.5
2.1
2.3
2.2
2.0

Phos-

phate
(P0»)

0.76
L.O
.38
.60
.49
.39

.32
.33
.37
.27
.25

Dissolved
solids

(residue
at 180°C)

A 184
191
89
143
128
131

79
A 138
193
A 215
198

Hardness
as CaCOa

Cal-

cium,
mag-
nesium

114
112
33
70
58
66

32
84
117
130
122

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0
0
0
0

To-

tal
acid-

ity
as

H+ 1

Specific
conduct-

ance

(micro-
mhos at

25"C)

310
312
97
196
162
182

92
228
304
349
323

pH

7.3
8.0
6.4
7.6
7.2
7.7

7.0
7.6
8.2
7.9
8.3

Col-

or

5
0
15
10
10
5

25
0
5
5
5

D.O.
(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-

nies

per

100 ml)

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Jan. 19, 1965....
Aug. 19..........

Time

(24 hr)

1040
1230

Chromium

Hoxa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.05
.03

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.02
.09

PALOUSE RIVER BASIN Continued

13-3510. PALOUSE RIVER AT HOOPER, WASH. Continued

Temperature (°F) of water, water year October 1964 to September 1965

December .....

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

May...........
June ....

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

1

39

33
36
41

57

~

2

44

37
37
41

75
68

3

43

36

56

76

-_

4

41

35
44

65

5

39

36

52

75

6

39

38

65

7

39

36

57

80
79

8

34

65

9

39

35

62

78

10

40

35

71

64

11

38

37

66

76

12

35

37

76

65

13

38

38

64

67

14

34

37

73

62

15

33

61

81
76

Day

16

--

54

17

36

58

80

18

36

5*

19

38

60

20

39

60

21

3*

37

65

65

22

35

37

62

23

36

36

72

24

36

38

63

81

66

25

36

35

76

26

37

37

70

76

_

27

37

40
41
46

68
59

28

36

39
41
43

72

85

29

34

39

48

66

30

35

42

50

61

31

40

"

80
67

Aver-
age

37

44

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water;

Date of collection

Dec. 24, 1964.... .

Jan. 28, 1965. ....

Feb . 1 ....

Time

(24 hour)

1400
1145
1110
1410
1345

Water
tem-

per-
ature
(°F)

34
34
37
38
36

Sam-

pling
point

Discharge
(cfs)

12100
3500
7600
15400
8660

Sediment
concen-

tration

(ppra)

7290
1340
6860
6510
1920

Sediment

discharge
(tons per day)

238000
12700
141000
271000
44900

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

30
17
14
22
10

0.004

38
20
20
30
25

0.008

50
29
26
38
28

0.016

65
42
40
54
40

0.031

81
69
56
76
57

0.062

94
89
95
95
91

0.125

98
98
99
98
97

0.250

100
100
100
100
100

0.500 1.000 2.000

Method
of

analysis

VPWC
VPWC
VPWC

VPWC VPWC

SNAKE RIVER BASIN

PALOUSE RIVER BASIN Continued

13-3510. PALOUSE RIVER AT HOOPER, WASH. Continued

Suspended sediment, water year October 1964 to September 1965

Day

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

6..
7..
8..
9..
10.4

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

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

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

26.1
27..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

47
44
47
48
53

51
55
63
57
53

53
55
59
67
80

68
67
65
63
62

62
67
63
59
62

63
63
66
71
71
68

1872

Suspended sediment

Mean
concen-

tration

(ppm)

33
33
33
15
15

15
15
15
15
15

15
15
C 15
15
15

15
15
15
15
15

15
15
15
15
15

15
15
15
15
15
15

-

Tons
per
day

4
4
4
2
2

2
2
3
2
2

2
2
2
3
3

3
3
3
3
3

3
3
3
2
3

3
3
3
3
3
3

86

JANUARY

933
822
772
767
735

1100
1300
1240
1020
909

850
800
762
720
776

1100
1180
1110
1020
987

1010
1180
1150
1120
1710

1670
2330
7910
14900
16000
12400

80285

144
134
178
91
59

491
266
145
95

79
68
57
63
120

152
198
165
109
95

72
250
198
160
510

330
2190
8340
8100
5390
3570

-

363
297
371
188
117

2200
1720
891
399
233

181
147
117
122
B 250

451
631
495
300
253

196
A 800
615
S 487
A 2400

1490
S 19100
S 178000
S 318000
S 237000
S 128000

895814

NOVEMBER

Mean
dis-

charge
(cfs)

72
76
68
75
74

70
71
74
79
77

80
81
80
83
86

90
88
86
79
79

76
77
83
90
96

410
620
362
263
242

3887

Suspended sediment

Mean
concen-

tration

(ppm)

9
9
9
9
9

9
9
9
9
9

9
9
9
9
9

9
9
9
9
9

9
9
9
9
9

110
298
267
104
69

- -

Tons
per
day

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

S 248
499
261
74
45

1177

FEBRUARY

8330
5430
3930
3440
3180

3240
2750
2430
2660
2050

1710
1480
1500
2300
1710

1670
2820
3290
2950
2800

2780
2700
2650
2070
1890

1750
1710
2680

77900

1940
1380
844
564

1610
395
240
540
695

440
155
260
1400
608

415
1700
2080
1120
468

370
275
390
165
150

165
244
1900

-

S 44600
20200
S 9020
5240
3300

A 4400
2930
1570
A 3900
3850

B 2000
619
B 1100
A 8700
2810

1870
A 13000
18500
8920
35/.0

2780
2000
2790
922
765

780
S 1200
A 14000
»

185306

DECEMBER

Mean
dis-

charge
(cfs)

236
688
1510
1950
1380

835
602
452
392
366

416
392
3*5
328
298

170
110
100
100
100

150
1180
10500
12200
7360

3500
2560
2120
1580
1290
1110

54320

Suspended sediment

Mean
concen-

tration

(ppm)

51
208
605
654
325

107
62
56
47
25

64
60
160
108
75

51
29
26
18
12

190
6740
21300
8230
2990

1350
603
541
325
193
138

Tons
per
day

32
S 540
S 2500
3440
S 1300

S 249
S 103
68
50
25

72
64
A 150
96
60

B 2
B
B

B

B 77
S 50900
S 588000
S 275000
S 60000

S 13500
4170
S 3110
S 1410
S 678
414

1006055

MARCH

2400
1920
1730
1620
1490

1400
1360
1350
1360
1360

1340
1620
1610
1380
1260

1180
1090
975
855
784

794
806
816
750
665

605
640
665
670
720
665

35880

1020
279
172
146
128

120
110
94
73
66

78
170
140
133
87

77
64
61
60
52

49
51
46
44
30

28
40
32
37
56
38

6610
1450
803
639
515

B 450
404
343
268
242

282
B 740
B 610
496
296

245
188
161
138
110

105
111
B 100
89
54

46
69
57
67
109
B 68

15865

S Computed by subdividing day.
A Computed from partly estimated-concentration graph. B Computed from estimated-concentration graph.

C Composite period.

389-675 O - 70 - 14

QUALITY OF SURFACE WATERS, 1965

PALOUSE RIVER BASIN Continued

13-3510. PALOUSE RIVER AT HOOPER, WASH. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

Day

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

5.4

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

11..
12..
13..
14..
IS..

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

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

26..
27..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

625
645
816
1090
1120

1070
1060
1040
975
1070

1470
1390
1260
1220
1220

1240
1360
1510
1360
2950

5000
4500
3350
2400
1980

1880
1610
1410
1280
1180

49081

153
137
117
130
111

84
68
80
81
71

72
70
68
65
61

57
55
46
46
46

53
65
66
63
57

59
63
71
55
44
38

2254

Suspended sediment

Mean

tration

(ppm)

64
88
124
120
148

138
115
83
52
58

220
224
102
70
56

57
77
190
82
1770

5100
3180
885
470
252

780
273
160
115
88

JULY

13
12
10
9
10

9
9
>

C 23

C 23
C 23
C 23
C 23
C 23

C 23
C 23
C 23
C 23
C 23

C 23
C 23
C 23
C 23
C 23

C 23
C 23
C 23
C 23
C 23
C 23

Tons
P*r

day

108
153
273
A 350
448

399
329
233
137
A 170

B 870
841
B 350
231
184

B 190
283
B 770
301
S 18300

A 69000
38600
8000
3050
1350

A 4000
1190
B 610
397
280

151397

B
B

B
B

B

106

MAY

Mean
dis-

charge
(cfs)

1110
1040
927
828
745

725
660
605
564
523

505
469
448
436
428

408
392
370
359
362

396
444
396
373
373

380
370
342
307
277
280

15842

34
33
34
30
25

22
22
20
23
22

20
25
25
25
27

30
25
22
20
19

24
27
33
32
31

51
50
45
50
52
63

961

Suspended sediment

concen-

tration

(ppm)

68
54
46
43
41

36
C 20
C 20
C 20
C 20

C 20
C 20
C 20
C 20
C 20

C 20
C 20
27
81
69

C 37
C 37
C 37
C 37
C 37

C 37
54
62
63
54
42

AUGUST

C 17
C 17
17
17
17

17
17
17
C 17
C 17

C 17
C 17
C 17
C 17
C 17

~

«

-

C 25
C 25
C 25

C 25
C 25
C 25
C 25
C 25
C 25

Tons
P*r

day

204
B 150
115
B 96
82

B 70
36
33
30
28

27
25
24
24
23

22
21
B 27
A 79
B 67

40
44
40
37
37

38
B 54
57
B 52
B 40
B 32

1654

2
2
2
1
1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
2
2
2
2

3
3
3
3
4
4

52

JUNE

Mean
dis-

charge
(cfs)

244
242
231
214
209

148
184
180
158
155

147
140
140
140
140

146
144
160
229
529

408
283
231
202
180

166
155
156
155
127

5993

Suspended sediment

Mean
concen-

tration

(ppm)

33
31
28
23
20

C 19
C 19
C 19
C 31
C 31

C 31
C 31
C 31
C 31
C 31

C 31
C 31
C 31
37
93

98
74
58
46
C 32

C 32
C 32
C 32
C 32
C 32

Tons
per
day

22
B 20
B 17
B 13
B 11

10
9
9
13
13

12
12
12
12
12

12
12
13
B 23
B 130

B 110
B 57
36
B 25
16

14
13
13
13
11

695

SEPTEMBER

53
45
40
42
40

38
40
42
39
37

34
33
35
37
37

39
37
41
44
68

66
63
60
55
50

50
50
50
48
46

1359

C 17
C 17
C 17
C 17
C 17

C 17
C 17
C 17
C 17
C 17

C 17
C 17
C 17
C 17
C 17

C 17
C 17
C 17
C 17
C 17

C 17
C 17
C 17
C 17
C 17

C 17
C 17
C 17
C 17
C 17

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
3

3
3
3
3
2

2
2
2
2
2

65

Total discharge for year (cf s-days) .... 329, 634 Total load for year (tons) .... 2 , 258, 272 S Computed by subdividing day.
A Computed from partly estimated-concentration graph.

B Computed from estimated-
concentration graph.
C Composite period.

SNAKE RIVER MAIN STEM

13-3530. SNAKE RIVER BELOW ICE HARBOR DAM, WASH.

LOCATION. At U.S. Highway 395 bridge, 7 miles downstream from gage, 0.3 mile upstream from mouth, and 2 miles southeast of Pasco, Franklin County DRAINAGE AREA. 108,500 square miles, approximately upstream from gaging station
RECORDS AVAILABLE. Chemical analyses: July 1960 to September 1965.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 26, 1964

Jan. 26, 1965

July 23......

Mean

discharge
(cfs)

25000
33000
34600
60900
88000
170000

184600
107000
43900
19400
29800

Silica

(SiO,)

12
17
17
22

17

11
11
13
16
16

Alu-
mi-

num

(Al)

Iron

(Fe)

0.06
.06

.20
. 17

Man-

ga-
nese

(Mn)

Cal-

cium

(Ca)

25
30
23
23

13

7.2
11
14
22
22

Mag-
ne-

sium

(Mg)

12
12
8.6
7.3

4.2

1.6
2.7
3.5
7.6
7.6

Sodium

(Na)

29
29
20
18

8.5

4.3
7.5
9.0
20
?0

Po-
tas-

sium

(K)

3.3
3.8
3.0
2.7

1.7

.8
1.2
1.5
2.6
2.7

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCOJ

138
152
113
106

60

32
50
63
108
107

Car
ben
ate

pog

0
0
0
0

0

0
0
0
0
0

Sulfate

(SO,)

40
44
32
26

12

5.6
12
12
27
28

Chloride

(Cl)

14
14
10
9.0

4.5

1.0
3.0
3 2
s'.5
8.8

Fluo-

ride

(F)

0.5
.6
.5
.4

.3

.2
.2
.3
.4
.4

Ni-

trate

(NO,)

0.8
1.6
1.6
2.6

.8

.2
.2
.0
.9
1.0

Phos-

phate
(P0«)

0.06
. 10
. 18
.22

. 15

.02
.09
.06
.08
. 11

Dissolved
solids

(residue
at 180"C)

204
A 227
177
165

100

48
76
A 88
A 158
159

Hardness

as CaCO,

Cal-

cium,
mag-
nesium

110
125
93
88

50

24
38
50
86
86

Non-
car-

bon-

ate

0
0
0
0

0

0
0
0
0
0

To-

tal
acid-

ity
as

IT"

Specific
conduct*

ance

(micro-
mhos at

25°C)

340
374
281
259

137

68
113
138
257
259

PH

7.6
8.1
7.6
7.5

7.2

7.2
7.2
7.6
7.6
7.7

Col-

or

5
5
10
5

15

5
5
0
5
5

D.O.
[dis-
sol-
ved
oxy-
gen
ppm)

12.2

11.7

10.7

7.8

MPN

(coli-
form
colo-

nies

per

100 ml)

36

0

150

0

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Dec. 12, 1964.....
June 12, 1965.. .. .
Aug. 24...........

Time

(24 hr)

1348
1300
1430

Chromium

Hexa-

valent

(Cr«)

0.00
.00
.00

Total

(Cr)

0.00
.00
.00

Cop-

per

(Cu)

0.01
.04
.02

Zinc

(Zn)

0.05
.05
.05

Ar-

senic

(As)

0.00
.00
.00

Boron

(B)

0.00
.00
.08

MISCELLANEOUS ANALYSES OF STREAMS IN SNAKE RIVER BASIN

ical analyses, in parts per million, water year October 1964 to September 1965

of
collection

Discharge
(cfs)

Silica
(SiOa)

Iron

(Fe)

cJum

(Ca)

ne-

siura

(Mg)

Sodium

(Na)

tas-
sium

(K)

Bi-
car-

bon-
ate

(HCOS)

bon-
ate

(COJ

Sulfate
(SO,)

Chloride
(Cl)

Fluo-
rlde
(F)

Ni-
trate

(NOJ

Bo-
ron

(B)

Dissolved solids
(residue at 180°C)

Parts
per
million

Tons

per
acre-

foot

Tons

per

day

as CaCOj

Cal-

cium,
Mag-
ne-

sium

Non-
car-

bon-
ate

So-

ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25°C)

PH Cot
or

SNAKE RIVER MAIN STEM

13-225. SNAKE RIVER ABOVE RESERVOIR, NEAR ALPINE, WYO.

Apr. 12, 1965..
Aue. 27........

4060
6070

15
14

0.04
.00

33
29

7.6
6.9

11
7.8

2.5
1.7

117
104

0
0

32
23

5.5
4.3

0.8
.6

0.2
.0 n.ni

A166
14K

0.22
. 2n

1820
23flf>

114
inn

18
15 n.a

270
241

7.9
7.1

0

cal analys parts per milli year October 1964 to September 1965

Date
of
collection

Discharge
(cfs)

Silica

(Si02) num
(Al)

Iron

(Fe)

ga-

nese

(Mn)

Cal-
cium

(Ca)

ne-

sium

(Mg)

Sodium

(Na)

tas-
sium

(K)

Lith-
ium

(Li)

Bi-
car-

bon-
ate

(HCO,)

bon-
ate

py

Sulfate
(SO,)

Chloride

(Cl)

Fluo-
ride
(F)

Ni-
trate

(Ncg

Phos-

phate
(P0«)

solids
(residue
at 180°C)

as CaC03

Cal-

cium,
mag-
nesium

Non-
car -

bon-
ate

To-

acid-

ity
as

H+1

Specific

ance

(micro-
mhos at
25'C)

pH

Col-

or

Oxygen
consumed

Fil-
tered

Un-
fil-
tered

BOISE RIVER BASIN

13-2020. BOISE RIVER NEAR BOISE, IDAHO

June 10, 1965
July 21. . . . . .

June 9, 1965.
July 30. . . .. .

A 7100
A 5030

78.5
83.8

12
9.E

20
23

7.2
6.8

22
24

0.9
.6

6.5
7.4

2.9
2.6
13-2

19
20

0.7
.7

106.5. TEI.

3.7
3.7

31
29

[MILE (
119
132

0
0

2.0
1.6

REEK NEAR 1

0
0

17
19

0.5
.0

«VMPA , ID/

5.2
3.2

0.2
.2

HO

0.5
.4

0.4
. 3

0.06
.03

3.2|0.62
4.2| .36

47
43

162
B 170

22
20

82
90

0
0

0
0

57
51

244
265

7.5
7.6

7.4
7.5

15
15

25
15

13-2106.8. FIVEMILE CREEK NEAR NAMPA, IDAHO

June 9, 1965.
July 30. . . .. .

82.2
90.9

17
23

20
26

1 5.9|
8.0

20
29

3.0
3.8

110
150

0
0

20
29

4.0
5.5

0.4
. 4

2.6
4.3

0.52
. 38

151
206

74
98

0
0

233
316

7.4125
7.7 15

A Daily mean discharge.
B Calculated from determined

SNAKE RIVER BASIN

MISCELLANEOUS ANALYSES OF STREAMS IN SNAKE RIVER BASIN Continued

DEADMAN CREEK BASIN

13-3436.8. DEADMAN CREEK NEAR CENTRAL FERRY, WASH.

(Formerly published as 13-3437.5.)

Monthly and annual summary of suspended-sediment discharge,
water year October 1964 to September 1965

Month

September. ....

Total for year. ....

Discharge
(cfs)

54

340

84
60

3,590

Suspended sediment
(tons)

E 2
A 480,000

A 42,000

E

o

E 42
E 2

520,000

E Estimated.
T Less than 0.50 ton.
A Partly estimated.

Drainage area 135 square miles.
Discharge-weighted mean concentration for year (ppm), 52,000. Sediment yield (tons/square mile), 3,900.
Maximum daily load, 324,000 tons Dec. 22.
Minimum daily load, less than 0.50 ton on many days.
Maximum daily concentration, 94,500 ppm Dec. 22.
Minimum observed concentration, 2 ppm Nov. 17.
Maximum observed concentration, 309,000 ppm Dec. 23.

MISCELLANEOUS ANALYSES OF STREAMS IN SNAKE RIVER BASIN Continued

DEADMAN CREEK BASIN Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 196' (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in nati ______________P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)_______

iter year October 1964 to September 1965
ive water;

Date of collection

Time

(24 hour)

Water
tem-
per-
ature

(°F)

Sam-

pling
point

Discharge
(cfs)

Sediment
concen-

tration

(ppm)

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0. 002]0. 004 lo. 008 |o. 016 JO. 031
III!

0.062 0.125 0.250 0.500 1.000 2.000

Method
of
analysis

13-3436.8. DEADMAN CREEK NEAR CENTRAL FERRY, WASH. Continued

Dec 23

Sept. 20. 1350

35
49

43
42

34
45

. _

45
57

70

E 3

2.0

23900

10

12500

T

13

32

24

52 81 96

99

WWC

WWC

PWC

E Estimated.
T Less than 0.50

SNAKE RIVER BASIN 201

MISCELLANEOUS ANALYSES OF STREAMS IN SNAKE RIVER BASIN--Continued

DEADMAN CREEK BASIN Continued

13-3438. MEADOW CREEK NEAR CENTRAL FERRY, WASH.

Monthly and annual summary of suspended-sediment discharge, water year October 1964 to September 1965

Month

March. ....
April. ....
Ma v

July. ....

Discharge
(cfs)

36.6
31.7
506.6

377.6
117.4
71.1
67.0
62.9
38.3
21.6
43.4
51.1

1,425.3

Suspended sediment
(tons)

E
A 290

13
E
E
E
E
E
E
E
E

303

T
1
,000

,000
49
4
13
3
25
2
37
3

,000

E Estimated.
T Less than 0.50 ton.
A Partly estimated.

Drainage area 66.2 square miles.
Discharge-weighted mean concentration for year (ppm), 76,000. Sediment yield (tons/square mile), 4,600.
Maximum daily load, 286,000 tons Dec. 22.
Minimum daily load, less than 0.50 ton on many days.
Maximum daily concentration, 95,200 ppm Dec. 22.
Maximum observed concentration, 188,000 ppm Dec. 22.
Minimum observed concentration, 2 ppm Nov. 25.

MISCELLANEOUS ANALYSES OF STREAMS IN SNAKE RIVER BASIN Continued

DEADMAN CREEK BASIN--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 Continued (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)

Water
tem-
per-
ature

Sam-

pling
point

Discharge
(cfs)

Sediment
concen-

tration

(ppm)

Sediment
discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002JO. 004[0.008 10.016|0.03110.062 0.125|o.250|0.50011.000|2.000

Method
of
analysis

13-3438. MEADOW CREEK NEAR CENTRAL FERRY, WASH. Continued

Dec 23
Dec 23
n 9**
Dec 24

Jan. 27, 1965. ....

J n 29 ' ' '''' '

Sept. 20. ....

1520

1405

40

44

43

45

69

168

2.2

44800

y\

20

- !Q

21100

T

11 15 20 32 56 92 97 99 100 VPWC

SNAKE RIVER BASIN 203

MISCELLANEOUS ANALYSES IF STREAMS IN SNAKE RIVER BASIN Continued

PALOUSE RIVER BASIN

Periodic determinations of suspended-sediment discharge, water year October 1964 to September 1965

Date Time
(24 hr)

Water
tem-

per-
ature

(D

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

13-3454. PALOUSE RIVER AT PALOUSE, WASH.

Oct. 21, 1964. .... Apr. 20, 1965. .... Apr. 20. ....

Apr. 28. ....

Aug. 17.....................

1320
0650
1610
0715
1400

2000
1350
1310
1330
1830
0830

48
44

46
47

48
48
48
54
70
68

26
298
4000
4050
3900

3780
2900
2150
1500
29.8
13.8

7
2670
847
647
1120

348
265
220
64
13

T
21500
9150
7070
11800

3550
2070
1280
259
1
- -

13-3461. PALOUSE RIVER AT COLFAX, WASH.

Oct. 21, 1964. .... Nov. 18. ....

Nov. 25. ....

Nov. 26. ....

Dec. 23. ....

Dec. 23. .... Dec. 24. ....

Jan. 6, 1965. ....

Feb. 25. .... Mar. 17. ....

Apr. 20. ....

July 14. .... Aug. 18.................. ...

0750
1005
1120
1500
1630

1950
2355
0520
0905
1950

1045
1540
2220

1350

1905
0805
1500
1400
1635

1640
1700
1550
0910
2310

0600
1440
2025
0800
1440

2030
1135
1210
1420
1350
1010
1230

42
32
39
40
40

39
39
35
35
34

32
33
34
36
37

36
33
35
33
33

34
37
40
34
51

47
50
50
48
50

49
49
51
56
62
68
69

20
20
97
822
808

944
806
724
568
400

245
2630
5440
6370
6340

7130
8620
1450
835
856

542
800
737
523
1880

2790
3280
3870
4550
4220

3910
3280
2080
856
168
25
14

10
8
86
958
930

1340
992
385
262
136

63
14600
5800
10800
5460

4330
2370
303
475
478

73
181
188
30
2100

3590
2970
2540
2910
1960

1320
432
278
56
12
22

0.5
. 4
23
2130
2030

3420
2160
753
402
147

42
104000
85200
186000
93500

83400
55200
1190
181
207

107
391
374
42
10700

27000
26300
26500
35700
22300

13900
3830
1560
129
5
1
- -

13-3480. SOUTH FORK PALOUSE RIVER AT PULLMAN, WASH.

Dec. 22. ....

Dec. 23. ....

Jan. 30, 1965. ....

1305
1705
2335
0935

1430
1950
1030
1405
1425

42
33
35
37

38
36
32
35
40

25
700
1440
2390

1780
1240
222
108
850

152
3530
4570
12200

11400
8800
1150
260
949

10
6670
37200
78700

55100
29500
689
76
2180

T Less than 0.50 ton.

QUALITY OF SURFACE WATERS, 1965

MISCELLANEOUS ANALYSES OF STREAMS IN SNAKE RIVER BASIN Continued

PALOUSE RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge, water year October 1964 to September 1965 Continued

Date Time
(24 hr)

Water
tem-

per-
ature

(F)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

13-3485. MISSOURI FLAT CHEEK AT PULLMAN, WASH.

Nov. 25, 1964. .... Dec. 22. .... Dec. 22. .... Dec. 23. ....

Dec. 23. .... Dec. 23. .... Dec. 24. ....

Jan. 30, 1965. ....

1315
1730
2345
0850

1440
1955
0940

1620

41
33
35
37

36

32

40

399

354

23

187 2090

17000

19
1060

13-3492. SOUTH FORK PALOUSE RIVER AT COLFAX, WASH.

Oct. 21, 1964. ....

Nov. 25. .... Nov. 26. .... Nov. 26. ....

Dec. 22. .... Dec. 22. .... Dec. 23. ....

Dec. 26. .... Jan. 6, 1965. ....

Jan. 21. ....

Feb. 24. .... Feb. 25. .... Feb. 25. .... Mar. 17. ....

Apr. 19. ....

Apr. 20. .... Apr. 20. .... Apr. 20. ....

Apr. 21. ....

Apr. 21. .... Apr. 22. ....

Apr. 28. .... May 26. ....

1 1 OR

1645
0845
2015

1615

1445
1420
1620

1550
0800
1445
0835
2050

0540
1520

2045
1120

0650

39
40
39
38

33
34

38
38

33
33
34

38
38
40
35

51
53

52
50

57

4.7
41
100

32
59

183
294
219

690

300

380
270

38

1480
68
88

1 OQAA
1 AOAA

4430

99

254

O-lOrt

2410
5040

001

57

1 Q

24
19

1 QKAAA

1 AO

4710
1950
7760

QQ
On

6

13-3493.1. PALOUSE RIVER AT WINONA, WASH.

Oct. 20, 1964. .... Nov. 18.. .... Nov. 25. .... Nov. 25. .... Nov. 26. ....

Nov. 26. .... Nov. 26. ....

Dec . 1 ....

Jan. 19, 1965. .... Jan. 27. .... Jan . 27 .... Jan. 27. .... Jan. 28. ....

Jan. 28. .... Jan. 29. .... Jan. 29. ....

Jan. 30. ....

1425
1155
1045
1855
0610

1905
2300

1215

1245

1140
1550

1545

53
35
39
39
39

38
38

39

36
34

oe

35

36
36

37
40

37
43
69
70
1000

780

At V

590

9350
7900
7900
8450
9100

194

of\e

46

79

KQQrt

A Ann

2260

2
524

511

QQQ
21

1 1 QAA

55500

SNAKE RIVER BASIN

MISCELLANEOUS ANALYSES OF STREAMS IN SNAKE RIVER BASIN -Continued

PALOUSE RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge, water year October 1964 to September 1965 Continued

Date Time
(24 hr)

TVofpvt
tem-

per-

ature (°F)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

13-3493.1. PALOUSE RIVER AT WINONA, WASH. Continued

Jan. 31, 1965. .... Feb. 1. .... Feb. 1. ....

Feb. 3. ....

Feb. 23. ....

Apr. 19. ....

Apr. 21. ....

Apr . 23 ....

May 24. .... July 12. .... Aug. 18. ....

1715
1215
1710

1245

1150
1050
1150
0910
1350
1940
0940

0825
1130
0825
1230
1010
1410

38
36
36
35
36

36
40
47
48
50
51
49

50
48

59
65
79

5300
4300
3950

2400

1800
770
1060
3150
3750
3950
4800

4450
4200

153
42.8
23

1870
1150
1140
704
372

372
54
67
2340
3930
5840
2980

1780
600

18
16

26800
13400
12200
5990
2410

1810
112
192
19900
39800
62300
38600

29800
20200
4730
210
7
2

13-3493.2. REBEL FLAT CREEK AT WINONA, WASH.

Oct. 20, 1964. .... Jan. 27, 1965. .... Jan. 27. .... Jan. 27.. .... Jan. 28. ....

Jan. 29. .... Jan. 29. .... Jan. 30. ....

Jan. 31. .... Feb. 1. .... Feb. 2. .... Mar. 15. ....

Apr. 20. ....

1630

1725
1950
0830

1205
2355
1525

1700
1230
1250
1015
0900
1335

47
34
34

34

37
37
40
40
47

40
38
37
39
53
55

2

535
338
310

730
480
120
56
117

22
16
13
4.1
13
10

69
31700
26400
18100
41000

55200
20500
10000
4470
18700

2100
803
463
73
482
440

44100
38100
16500
35600

113000
26600
3240
676
5910

125
35
16
1
17
12

13-3494. PINE CREEK AT PINE CITY, WASH.

Nov. 30, 1964. ....

Jan. 28. ....

Feb. 3. ....

1730
2245
1345
2140
0605

1405
1920
0125
0935
1800

1355
2300
1930

0855

41

34
33
33

34
34

33
35

36
34

34

9.2
9.6
395
978
1120

1970
2570
3490
3010
2270

1720
3080
635

305

25
28
1280
4030
3510

6500
6920
7610
4980
3870

3550
7290
1480
816

244

0.6
. 7
1370
10600
10600

34600
48000
71700
40500
23700

16500
60600
2540
943
331
201

13-3495. HOCK CREEK NEAR EWAN, WASH.

Nov. 30, 1964. ....

Feb. 3. ....

1810

1015
0830
1140

39
38

35
37

14

1200

18

80
68
51

1
1
207
471
307
165

T Less than 0.50 ton.

206 QUALITY OP SURFACE WATERS, 1965

MISCELLANEOUS ANALYSES OF STREAMS IN SNAKE RIVER BASIN Continued

PALOUSE RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge, water year October 1964 to September 1965 Continued

Date Time
(24 hr)

tem-

per-
ature

(*;

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

13-3496.9. COTTONWOOD CREEK BELOW PLEASANT VALLEY CREEK, NEAR EWAN, WASH.

Nov. 30, 1964. .... Nov. 30. .... Jan. 27, 1965. .... Jan . 27 ....

Feb. 1. .... Feb. 2. .... Mar. 15. ....

1835

1310

1505

1730

1430
2215
1000

1155

43
41
34

IA

33
00
00

34

40

44

12
12

1160

14

22800

49

4
6

71400

76

2

13-3499. ROCK CREEK NEAR WINONA, WASH.

Oct. 20, 1964. .... Apr. 20. ....

1550
0930

49
52

18
123 51

1
17

13-3505. UNION FLAT CREEK NEAR COLFAX, WASH.

Oct. 20, 1964. .... Nov. 18. ....

Jan. 31. .... Feb. 2. .... Feb. 24. ....

Feb. 24. ....

Apr. 28. ....

July 13. .... Aug. 18. ....

1915
0935

1445
1125
0800
1700
0900

1455
1110
1410
0750
0730

49

00

39
35

60

66
67

1.6

2640
1270
1250

141

124

40
17
2.0
1.8

4

3430
2700

40

19

11800
9110

104

4
1
T

13-3507. UNION FLAT CREEK NEAR LaCROSS, WASH.

Oct. 20, 1964. .... Apr. 20, 1965. .... Apr. 20. .... Apr. 20. .... Apr. 21. ....

Apr. 21. .... Apr. 22. .... Apr. 23. .... Apr. 24. .... May 24. ....

1335
0830
1230
1905
0900

0750
1100
0900
1120

54

57
48
58
60
61

4.7
225
380
300
212

185
103
64
41
26

20

5980
4310

564
66
24

T
1110
6140
3490

1030

97
7
2

13-3509. WILLOW CREEK AT GORDON, WASH.

Dec. 22, 1964. ....

Apr. 20. ....

1210

1115

1120 61

320

13

2.0

12400

22

10700

T

T Less than 0.50 ton.

SNAKE RIVER BASIN

MISCELLANEOUS ANALYSES OF STREAMS IN SNAKE RIVER BASIN Continued

PALOUSE RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge, water year October 1964 tc September 1965 Continued

Date Time
(24 hr)

tem-

per-
ature

(*)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

13-3525. COW CREEK AT HOOPER, WASH.

Oct. 20, 1964. .... Nov. 18. .... Dec. 22. ....

Jan. 22, 1965. ....

Jan. 27. .... Jan. 27. .... Jan. 27. ....

Jan. 31. ....

Feb. 1. ....

Feb. 3. ....

Mar. 17. ....

Mar. 17. .... Mar. 18.....................

Mar. 20. ....

Mar. 21. .... Mar. 21. ....

Mar. 23. .... Mar. 24. .... Mar. 24. .... Mar. 25. .... Mar. 25. .... Mar. 26. ....

Mar. 26. .... Mar. 27. .... Mar. 28. .... Mar. 28. .... Mar. 29. ....

Mar. 30. .... Mar. 30. ....

Mar. 31. .... Apr. 1. .... Apr. 2. ....

Apr. 20. .... Apr. 21. ....

Apr. 23, ... Apr. 24. ....

Apr. 25. .... Apr. 29. .... 'fay 24
July 14. ....

1300
2100

1130

1235
1825
1930
0700
1035
1700

2130
1315
2130
0900
1655
1620

1445

1330
0900
1230

1800
0700
1730
1800
0830
1800

1000
1800
0700
1730
0700

1800
0700
1600
0700
1630
0700

1800
0700
0900
1800
0700
1800

0700
1800

1630
1630
0700

1100
1100

1700
1900

1630
1000

1100

49
37
33
34
35

41
41
43
38
41
45

44
45
47
40
48
40

40
39
39
40
39

38
32
43
43
37
45

42
46
44
47
36

47
34
44
36
42
37

41
44
42
46
43

47
54

58
56
45

56
57
61
62
61

62
62
58
71

3.0
6.5

A 15
14

16
17
18
19
21
19

22
22
22
27
28
37

35

28
56
103

103
104
106
108
107
108

108
108
108
107
108

109
109
111
111
112
114

116
116
116
115
113

111
111

111
111
112

118
118
117
124
119

114
100

20

4
12
217
18
18

22
44
41
264
204
59

64
96
73
62
68
376

89
51
46
124
96

100
86
89
105
71
83

77
125
110
103
80

64
60
56
62
52
50

46
74
46
53
56
66

68
68
7e

75
82

79
86
96
135
141

128
105
85
41

T
T

. 7
. 7

. 9
2
2
14
12
3

4
6
4
5
5
38

8
4
3
19
27

28
24
25
31
21
24

22
36
32
30
23

19
18
17
19
16
15

14
23
14
16
17
20

20
20
99

22
25
31

25
27
30
45
45

39
28
14
2

T Less than 0.50 ton.
A Daily mean discharge.

PART 14. PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

WALLA WALLA RIVER BASIN

14-136. HILL CREEK BELOW BLUE CREEK, NEAR WALLA WALLA, WASH.

LOCATION. At county road bridge 2 miles downstream from Blue Creek, 6.0 miles downstream from gaging station near Walla Walla, and 5.5 miles east of Walla Walla, Walla Walla County.
DRAINAGE AREA. 91 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: October 1962 to September 1965.
Sediment records: October 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 75°F July 1, 15; minimum, 33°F Dec. 20, Feb. 11.
Sediment concentrations: Haximum daily, 8,000 ppm Dec. 23; minimum daily, 2 ppm Har. 7, 8, and on several days during August. Sediment loads: Haximum daily, 59,300 tons Dec. 23; minimum daily, less than 0.50 ton on many days during November, August, and September.
EXTREMES, 1962-65. Water temperatures: Maximum, 75°F July 1, 15, 1965; minimum, freezing point Dec. 26, 1962.
Sediment concentrations: Haximum daily, 8,000 ppm Dec. 23, 1964; minimum daily, 2 ppm Nov. 3, 4. 1962, Nov. 1-5, 1963, Har. 7, 8, and on several days during August 1965.
Sediment loads: Haximum daily, 59,300 tons Dec. 23, 1964; minimum daily, less than 0.50 ton on many days in 1962-65. REMARKS. Maximum observed during water year: Sediment concentration, 12,800 ppm Dec. 22. Records of discharge given are the combined discharge of Blue Creek near Walla Walla and Mill Creek near Walla Walla. No appreciable inflow between gaging stations and sampling point.

Temperature (°F) of water, water year October 1964 to September 1965

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

January........

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

July...........
August ....

1

49
b2
45

36

46
49

68

2

48
48
44

34

42
45

3

56
40
43

38

45
46

74

4

51
48
41

36

44
47

5

48
41

40

43
43

71

6

41
39

38

43
42

7

42
38

38

41
45

8

44
43

34

44
45

74

9

43
42

45
48

10

44
44

34

44
49

73

11

45
39

36

43
52

12

41
40

34

44
56

13

40
40

36

46
50

14

42
39

37

48
50

15

40
39

36

50
52

Day

16

36

38

47
53

17

38

37

44
45

!:

18

38

36

44
45

19

37

47
49

20

33

36

47
49

68

21

36

38

45
49

22

42

38

49
50

65

23

43

36

47
47

24

39

36

48

61

25

39

35

58
51

61

26

38

47
52

61

27

40

42

49
55

28

34

41

50

64

29

40

42

48

30

38

44

47

64

51

31

34

40

63

"

Aver-

age

40

37
40

46
49

~

Particle-size analyses of suspended sediment, water year October 1964 to September 1965

(Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water;

Date of collection

Jan. 30, 1965. ....

Time

(24 hour)

0155
2020
440
1940

Water
tem-

per-
ature

(°F)

42
43
42
42

Sam-

pling
point

Discharge
(cfs)

1480
1160
1800
2290

Sediment
concen-

tration

(ppm)

5680
4260
12800
2200

Sediment

discharge
(tons per day)

21600
12500
65300
10100

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

22
18
14
11

0.004

29
24
21
18

0.008

36
29
32
26

0.016

53
44
48
38

0.031

72
66
66
56

0.062

89
85
86
80

0.125

94
93
93
90

0.250

97
96
97
96

0.500

99
98
99
100

1.000

100
100
100

2.000

Method
of

analysis

VPWC
VPWC
VPWC
VPWC

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

WALLA WALLA RIVER BASIN Continued

14-136. MILL CREEK BELOW BLUE CREEK NEAR, WALLA WALLA, WASH. Continued

Suspended sediment, water year October 1964 to September 1965

Day

1..
2..

.

«

..

>

81.
9..
10..

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

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

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

26..
27..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

35
33
33
32
31

30
30
29
30
32

30
30
30
29
32

33
32
31
31
31

31
31
30
30
30

36
32
30
30
36
31

971

Suspended sediment

Mean
concen-

tration

(ppm)

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C
C

-

Tons
per
day

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1
1

31

JANUARY

150
140
133
120
119

134
130
124
112
112

107
100
99
105
118

132
137
135
134
129

135
131
172
390
284

225
408
2180
3270
2800
1380

13845

12
10
13
15
44

90
12
10
10
6

8
8
43
78
12

15
15
14
110
11

142
19
95
157
37

33
1800
4690
4060
2370
543

-

5
4
5
5
14

33
4
3
3
2

2
2
11
22
4

5
6
5
A 40
4

52
7
S 52
S 175
28

20
A 2000
27600
S 38800
17900
S 2320

89133

NOVEMBER

Mean
dis-

charge
(cfs)

32
40
33
33
32

32
31
31
32
33

36
39
38
36
33

32
32
31
31
31

31
31
36
586
660

249
183
151
145
199

2939

Suspended sediment

Mean
concen-

tration

(ppm)

7
16

4600
1180

81
26
19
36
150

-

Tons
per
day

1
2

T
T

T
T
E 1
S 13200
S 3540

54
13
8
14
S 91

16931

FEBRUARY

683
444
336
284
266

265
229
209
185
177

171
162
227
247
207

203
237
288
312
298

273
247
199
170
167

175
296
306

7263

106
39
27
45

_ -

30
11
9

8
11
68
29
16

13
20
38
30
18

10
10
7
6
6

5
39
31

-

195
47
24
34
E 30

E 26
E 22
17
5
4

4
5
42
19
9

7
13
30
25
14

7
7
4
3
3

2
31
26

655

DECEMBER

Mean
dis-

charge
(cfs)

915
1270
570
324
239

192
170
179
202
231

247
214
183
178
178

1*9
128
117
126
134

232
1460
2550
1150
750

481
372
307
250
205
173

13876

Suspended sediment

Mean
concen-

tration

(ppm)

2330
2710
223
52
32

15
12
39
16
232

27
15
11
66
25

23
370
42
40
30

990
6280
8000
1560
306

94
58
34
24
14
12

Tons
per
day

S 6760
S 10300
S 381
45
21

8
6
A 19
9
S 155

18
9
5
32
12

9
B 130
B 13
B 14
11

A 620
24800
S 59300
S 5120
620

122
58
28
16
8
6

108655

MARCH

263
229
204
184
166

150
142
135
128
128

124
120
110
106
103

103
94
86
83
81

78
79
72
68
68

70
68
48
67
69
72

3517

9
12
7
3
3

3
2
2
90
17

14
13
12
10
6

6
8
5
5
5

5
5
5
5
5

5
5
6
5
5
5

6
7
4
1
1

1
1
1
B 31
6

5
4
4
3
2

2
2
1
1
1

1
1
1
1
1

1
1
8
1
1
1

95

E Estimated.
S Computed by subdividing day.
T Less than 0.50 ton.
A Computed from partly estimated-concentration graph.

B Computed from estimated-
oncentration graph.
C Composite period.

QUALITY OF SURFACE WATERS, 1965

WALLA WALLA RIVER BASIN Continued

14-136. MILL CREEK BELOW BLUE CREEK NEAR,WALLA WALLA, WASH. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

Day

1..
2..

..
..

..
..

8..
9..
10..

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

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

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

26..
27..
28. .
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

82
96
94
92
94

95
92
92
106
120

116
111
119
128
147

182
163
162
318
594

538
418
334
294
262

245
239
236
231
215

6015

Suspended sediment

Mean
concen-

tration

(ppm)

C 6
C 6
C 6
C 6
C 6

C 6
C 6
C 6
8
10

7
7
11
13
19

30
14
40
250
348

1*3
103
30
38
44

18
13
11
10
10

Tons
per

day

1
2
2
1
2

2
1
1
2
3

2
2
4
4
8

15
6
17
215
558

208
116
27
A 30
31

12
8
7
6
6

1299

JULY

47
47
47
46
43

41
40
40
40
38

38
38
38
36
36

36
35
35
35
38

46
40
38
36
35

35
37
34
34
34
32

1195

18
C 8
C 8
C 8
C 8

C 8
C 8
C 8
C 8
C 8

C 8
C 8
C 8
C 8
C 8

C 8
C 8
C 8
C 8
12

20
10
C
c
c

c
c
c
c
c
c

-

2
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

2
B 1
1
1
1

1
1
1
1
1
1

33

MAY

Mean
dis-

charge
(cfs)

179
151
124
123
107

98
91
88
86
87

99
108
118
111
100

98
89
80
90
115

95
90
99
107
100

100
99
105
105
95
91

3228

Suspended sediment

Mean
concen-

tration

(ppm)

12
9
8
12
9

3
3
14
14
10

12
20
17
12
9

7
8
10
25
50

Tons
per

day

6
4
3
4
3

1

1
3
3
2

3
6
5
4
2

2
2
2
B 6
16

2
2
2
3
2

2
2
3
3
2
2

103

AUGUST

32
32
32
32
32

32
32
30
32
30

30
35
33
32
30

30
30
30
32
34

36
47
38
35
52

41
38
37
35
35
35

1061

6
6
6
6
6

6
6
C 6
19
34

38
29
13
7
31

45
22
6
9
6

7
21
4
2
28

9
C 2
C 2
C 2
C 2
C 2

1
1
1
1
1

1
1
T
B 2
3

8 3
3
1
1
B 3

4
B 2
T
1
1

B 1
A 3
T
T
4

1
T
T
T
T
T

43

JUNE

Mean
dis-

charge
(cfs)

84
81
79
78
74

74
72
68
66
63

63
66
59
61
60

58
126
197
138
106

89
79
70
68
6*

62
57
57
52
50

2321

Suspended sediment

Mean

tration

(ppm)

C
769
49
10
5

37
28
23
12
12

12
12
12
12
12

Tons
per

day

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
S 3650
261
39
B 15

B

2
2
2
2
2

4014

SEPTEMBER

35
35
37
35
35

35
34
34
32
32

32
32
32
37
54

43
36
34
34
32

32
32
32
32
32

32
32
32
32
32

1030

1

1

_

T
T
T
T
T

T
T
T
T
T

T
T
T
T
B 2

2
T
T
T
T

T
T
T
T
T

T
T
T
T
T

14

Total discharge for year (cfs-days) .... 57,261 Total load for year (tons). 221,006

S Computed by subdividing day.
T Less than 0.50 ton.
A Computed from partly estimated-concentration graph.

B Computed from estimated-
concentration graph.
C Composite period.

WALLA WALLA RIVER BASIN Continued

14-185. WALLA WALLA RIVER NEAR TOUCHET, WASH.

LOCATION. At county road bridge, 0.9 mile downstream from Warm Springs Canyon, 2.5 miles downstream from gaging station, and 3.7 miles west of Touchet, Walla Walla County.
DRAINAGE AREA. 1,657 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
Water temperatures: July 1959 to September 1965.
Sediment records: October 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 84°F July 1; minimum, freezing point Dec. 17.
Sediment concentrations: Maximum daily, 51,500 ppm Dec. 23; minimum daily, 8 ppm on several days during November.
Sediment loads: Maximum daily, 3,230,000 tons Dec. 23; minimum daily, 1 ton Aug. 6-9.
EXTREMES, 1959-65. Water temperatures: Maximum, 94°F Aug. 4, 1961; minimum (1959-61, 1962-65), freezing point on several days during winter months. Sediment concentrations (1962-65), Maximum daily, 58,800 ppm Feb. 5, 1963; minimum daily, 4 ppm June 20, 1963.
Sediment loads (1962-65), : Maximum daily, 3,230,000 tons Dec. 23, 1964; minimum daily, less than 0.50 ton on many days.
REMARKS. Maximum observed during water year: Sediment concentration, 89,600 ppm Dec. 22. No appreciable inflow between gaging station and sampling point. Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 21, 1964

Jan. 11, 1965

Mean

discharge
(cfs)

42
113
828
1080
1120
804

2540
107
41
23
56

Silica

(SIC,)

28
33
29
31
29
28

27
33
35
27
34

Alu-
mi-

num

(Al)

Iron

(Fe)

0.31
. 28

. 32

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

35
29
11
17
12
16

7.2
31
52
53
36

Mag-
ne-

sium

(Mg)

15
11
3.9
5.4
4.4
5.1

3.0
11
20
19
14

Sodium

(Na)

31
25
6.9
11
7.3
9.6

5.0
27
46
41
27

Po-
tas-

sium

(K)

5.4
5.0
2.9
3.1
2.6
3.0

2.4
5.3
7.8
7.3
6.1

Lith-

ium

(LI)

Bl-

car-

bon-

ate

(HCO,)

199
163
58
80
60
76

42
148
260
254
186

Car-

ton
ate
POJ

0
0
0
0
0
0

0
0
0
0
0

Sulfate

(SO.)

33
22
5.6
10
6.8
9.6

3.2
26
55
59
29

Chloride

(Cl)

16
14
4.0
7.0
5.0
6.2

2.5
26
30
24
17

Fluo-
rlde

(F)

0.5
.3
. 1
. 1
. 1
. 1

. 1
. 2
.4
. 3
. 3

Ni-

trate

(NO,)

0.9
1.7
2.7
2.1
3.9
4.2

1.7
1.4
1.8
1.9
2.7

Phos-

phate
(P04)

0.25
.45
.48
.31
.37
.36

.31
. 29
.37
.3t
.46

Dissolved
solids

(residue
at 180°C)

265
A 222
112
129
107
126

81
A 234
375
358
A 259

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

150
119
44
66
48
61

30
124
212
210
146

Non-
car-

bon-

ate

0
0
0
0
0
0

0
2
0
2
0

To-

tal
acid-

ity
as

H+l

Specific
conduct*

ance

(micro-
mhos at

25"C)

420
345
124
185
133
171

85
357
587
573
399

PH

. 6
.9
. 7
. 1
.2
. 6

. 0
.4
. 7
. 7
. 7

Col-

or

5
5
10
5
10
10

20
5
5
5
5

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

13.5

11.4

8.7

8.2

MPN

(coli-
form
colo-

nies

per

LOO ml)

2400

2400

1500

230

A Calculated from determined constituents.

Analyses, in parts per million, of trace ele

Date of
collection

Dec. 12, 1964....
June 12, 1965. . . .
AUK. 19..........

Time

(24 hr)

1218
1150
1500

Chromium

Hexa-
valent

(Cr«)

0.00
.00
.00

Total

(Cr)

0.00
.00
.00

Cop-

per

(Cu)

0.05
.03
.05

Zinc

(Zn)

0.05
.05
.05

Ar-

senic

(As)

0.00
.00
.01

Boron

(B)

0.01
. 12
. 10

WALLA WALLA RIVER BASIN Continued

14-185. WALLA WALLA RIVER NEAR TOUCHET, WASH. Continued

Temperature (°F) of water, water year October 1964 to September

October ....

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

September .....

1

-

2

71

3 4

58

5 6

58

7 8

54

70

9 10

-

11 12

61

13

63

14

60

15

59

Day

16 17 18 19 20

51

21 22

66

23

67

24

51

25

63

26 27 28

50

29

49

30

55

31

49

Aver-
age

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water;

Date of collection

Nov. 25, 1964. ....

Apr. 22. ....

Time

(24 hour)

1330
2120
1710
1130
0710
1825

0125
2300
1030
1550
1015
1340

Water
tem-

per-
ature
(°F)

44
47
44
37
43
42

35
37

41
53
53

Sam-

pling
point

Discharge
(cfs)

3470
2570
4000
986
19200
17400

3400
3410
4980
5400
1970
2560

Sediment
concen-

tration

(ppm)

6410
2420
3300
5700
42800
31000

65900
13300
37800
8910
3430
2140

Sediment

discharge
(tons per day)

60100
16800
35600
15200
2300000
1460000

627000
122000
527000
130000
18200
14800

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

34
24
21
28
25
20

11
10
9
8
10
11

0.004

48
37
28
50
38
28

14
15
11
10
12
13

0.008

64
52
40
66
53
41

22
23
15
14
15
16

0.016

79
69
57
86
72
60

32
37
25
25
30
30

0.031

90
84
75
96
90
84

58
59
49
48
53
47

0.062

98
96
94
100
99
99

94
91
92
86
96
84

0.125

99
98
98

100
100

99
99
100
97
100
98

3.250

100
100
100

100
100

100

100

0.500 1.000 2.000

Method
of

analysis

VPWC
VPWC
VPWC
VPWC
VPWC
VPWC

VPWC
VPWC
VPWC
VPWC
VPWC
VPWC

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

WALLA WALLA RIVER BASIN Continued

14-185. WALLA WALLA RIVER NEAR TOUCHET, WASH. Continued Suspended sediment, water year October 1964 to September 1965

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..
28..
29..
30..
31..

Total

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

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

ll.i
12..
13..
14..
15..

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

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

26..
27..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

50
66
60
57
55

62
62
55
40
34

98
46
41
39
37

39
42
42
45
43

42
43
43
46
43

42
45
64
62
82
69

1539

Suspended sediment

Mean
concen-

tration

(ppm)

19
19
19
19
19

19
19
19
19
19

16
19
19
19
19

19
19
19
19
19

19
19
19
19
19

19
19
19
19
19
C 19

-

Tons
per
day

3
3
3
3
3

3
3
3
2
2

4
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
3
3
4
4

76

JANUARY

1360
1290
1810
1240
1120

3320
1410
1180
1080
1040

1080
1010
918
1010
1010

1120
1070
1000
970
930

1190
1320
1220
2430
2590

2320
4550
7050
11600
14500
9900

83638

1000
2510
14700
4310
2140

41200
5220
1410
772
710

600
910
830
700
560

580
680
700
800
890

875
3250
7250
11600
4950

29t)0
27000
23400
18200
18700
10500

-

3670
9130
80200
17400
B 9400

S 450000
S 21100
S 4510
S 2280
1990

1750
2480
2060
1910
1530

1750
1960
B 1900
B 2100
2230

2810
A 11600
A 24000
S 79500
S 36500

S 20500
S 347000
S 442000
S 609000
S 744000
S 284000

3220260

NOVEMBER

Mean
dis-

charge
(cfs)

74
80
82
90
82

77
77
80
90
98

103
107
117
115
107

100
98
107
113
113

111
109
103
124
2000

1180
755
565
474
528

7859

5840
3920
3100
2640
2420

2260
2060
1840
1720
1540

1390
1340
1360
1620
1540

1500
1640
1760
1890
1840

1740
1660
1120
1360
1250

1220
1450
1760

__

54780

Suspended sediment

Mean

tration

(ppm)

C 16
C 16
16
16
16

16
16
16
16
16

16
16
16
16
8

8
8
8
8
8

8
8
8
18
3520

770
212
128
70
106

Tons
per
day

3
3
4
4
4

3
3
3
4
4

4
5
5
5
2

2
2
2
2
2

2
2
2
6
S 24700

2450
432
195
90
151

28096

FEBRUARY

9010
6430
4800
3060
2080

1420
1330
1220
860
660

519
524
660
860
513

510
1500
858
811
672

574
480
438
384
384

470
1300
1700

S 143000
S 68600
S 40600
S 22000
13600

S 8700
S 7390
S 6070
3990
2740

1950
1900
2420
A 3800
2130

2070
A 6600
4080
4UO
3340

2700
2150
1320
1410
1300

1550
A 5100
A 8100

_

372750

DECEMBER

Mean
dis-

charge
(cfs)

1610
3540
2960
1700
1060

864
716
625
695
690

937
828
728
680
985

667
410
460
550
670

850
10500
20300
12000
7770

4620
3680
2760
2270
1880
1600

89605

1540
1360
1250
1180
1100

1030
986
958
906
882

870
858
804
766
728

695
675
610
565
585

585
560
41
92
60

87
92
60
446
415
415

23705

Suspended sediment

Mean
concen-

tration

(ppm)

1600
3300
2010
778
357

214
132
102
200
275

1050
330
132
357
6880

1040
210

__

32600
51500
16700
9870

7550
4590
3350
2270
1600
1040

Tons

per
day

S 8160
S 31400
S 16900
S 3750
S 1070

499
255
172
A 380
512

2660
738
259
S 703
S 20000

S 1990
232
250
450
540

920
S 1960000
S 3230000
S 607000
S 208000

S 95700
S 46100
S 25200
S 14000
S 8160
4490

6290490

MARCH

640
400
315
262
238

212
258
240
260
310

324
390
396
270
320

335
230
198
173
205

228
161
150
117
116

105
103
85
63
50
150

_

2660
1470
1060
835
707

756
687
621
636
738

761
903
860
558
629

629
419
326
264
324

360
243
219
155
144

138
137
106
76
56
A 170

17647

S Computed by subdividing day.
A Computed from partly estimated-concentration graph. B Computed from estimated-concentration graph.
C Composite period.

QUALITY OF SURFACE WATERS, 1965

WALLA WALLA RIVER BASIN Continued

14-185. WALLA WALLA RIVER NEAR TOUCHET, WASH. Continued

Suspended sediment, water year October 1964 to September 1965 Contin

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..
28..
29..
30..
31..

Total

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

6..
7..
a..
9..
10..

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

16..
17..
IB..
19..
20..

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

26..
27..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cf.)

451
523
5*1
505
514

518
514
496
496
615

610
560
532
565
565

665
804
755
852
2080

2820
2540
2030
1700
1510

1370
1250
1200
1170
1140

29891

Suspended sediment

Mean
concen-

tration

(ppm)

155
141
143
146
141

85
72
71
58
114

122
92
90
118
94

180
480
254
385
4250

4050
2500
1500
1060
1020

922
558
460
440
270

-

Tons
per
day

189
199
209
199
196

119
100
95
78
189

201
139
129
180
143

A 320
A 1000
518
886
S 27500

30800
17100
8220
4870
4160

3410
1880
1490
1390
831

106740

JULY

66
63
55
55
56

48
48
39
3*
33

39
41
46
50
43

41
35
33
33
33

45
100
111
70
56

51
54
50
41
39
37

1545

C 34
C 34
C 34
C 34
C 34

C 34
C 34
C 34
C 34
C 34

C 34
C 34
C 34
C 34
C 34

C 34
C 34
C 34
C 34
C 34

C 34
C 34
C 34
34
C 34

C 34
34
34
C 34
C 34
34

1

143

MAY

Mean
dis-

charge
(cfs)

1030
890
744
665
615

514
456
411
379
348

332
348
371
391
383

356
375
311
270
372

469
375
371
442
424

383
356
325
318
325
290

13639

Suspended sediment

Mean
concen-

tration

(ppm)

230
205
182
224
198

119
94
77
48
43

49
43
41
39
51

50
44
33
29
55

56
50
49
50
40

30
21
26
31
28
30

Tons
per
day

640
493
366
402
329

165
116
85
49
40

44
40
B 41
41
53

48
45
28
21
S 63

A 71
51
49
60
46

31
20
23
27
25
23

3535

AUGUST

34
32
28
28
19

15
16
14
15
14

16
15
33
54
40

32
25
23
23
33

37
66
78
62
51

113
146
113
100
96
94

1465

C 34
C 34
C 34
C 34
C 34

C 34
C 34
C 34
C 34
C 53

C 53
C 53
C 53
C 53
C 53

C 26
C 26
C 26
C 26
C 26

C 26
37
32
85
62

68
63
63
59
370
288

3
3
3
3
2

1
1
1
1
2

2
2
5
8
6

2
2
2
2
2

3
7
7
14
9

A 21
B 25
19
B 16
A 96
73

343

JUNE

Mean
dis-

charge
(cfs)

245
239
202
172
162

146
144
139
134
122

113
107
113
103
103

105
228
1280
816
546

420
284
207
153
132

107
100
84
75
69

6850

Suspended sediment

Mean
concen-

tration

(ppm)

26
19
17
14
18

18
12
22
22
22

22
22
22
22
22

C 22

13000
2100
490

229
132
103
95
70

33
34

21

Tons
per
day

17
12
9
7
8

7
5
8
8
7

7
6
7
6
6

6
13000
47000
4630
A 720

259
101
58
39
25

10
9
6
4
4

65991

SEPTEMBER

80
66
54
56
62

64
63
59
50
47

45
42
41
50
59

103
141
132
126
122

111
105
90
96
98

84
89
92
87
89
- -

2403

140
98
76
8
7

0
6
3
32
32

32
32
32
32
32

36
36
36
36
36

36
36
33
33
33

33
33
33
33
33

B 30
17
B 11
10
10

B 9
B 8
7
4
4

4
4
4
4
5

10
14
13
12
12

11
10
8
9
9

7
8
8
8
8

278

Total discharge for year (cfs-days) .... 316,919 Total load for year (tons) .... 10,106,349 S Computed by subdividing day.
A Computed from partly estimated-concentration
graph.

B Computed from estimated-concentration
graph.
C Composite period.

COLUMBIA RIVER MAIN STEM

14-192. COLUMBIA RIVER BELOW McNARY DAM, NEAR UMATILLA, OREG.

LOCATION. At McNary Dam, Benton County, 1.2 miles upstream from gaging station, 2.5 miles east of Plymouth, and about 3 miles upstream from Umatilla River. DRAINAGE AREA. 214,000 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: July 1959 to September 1965.
Water temperatures: October 1961 to September 1962.
Sediment records: May to September 1965.
EXTREMES, May to September 1965. Sediment concentrations: Maximum daily, 40 ppm May 20; minimum daily, 7 ppm Sept. 24-26.
Sediment loads: Maximum daily, 49,200 tons June 8; minimum daily, 1,810 tons Sept. 26.
REMARKS, Sediment samples collected at gaging station. 1.2 miles downstream from McNary Dam, 2 miles northeast of Umatilla, 2.3 miles upstream from Umatilla River, and at mile 290.8. No appreciable inflow between sampling point ana gaging station.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct., 22, 1964

Jan. 12, 1965

Bay 21 ....

Mean

discharge
(cfs)

122000
95200
99800
160000
168000
197000

184000
391000
494000
183000
148000
131000

Silica

(sicg

6.3
7.4
9.1
9.7
12
15

15
8.2

5.5
6.2
7.2

Alu-
mi-

num

(Al)

Iron

(Fe)

0.08
.06
. 12

.03

. 11
. 13

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

20
22
21
21
20
22

19
19

19
20
20

Mag-
ne-

sium

(Mg)

6.0
6.!
5.9
6.5
6.1
6.7

5.8
3.8

4.4
5.4
5.6

Sodium

(Na)

7.1
11
9.4
8.5
8.0
12

6.9
2.7

3.3
5.8
6.0

Po-
tas-

sium

(K)

1.4
1.8
1.7
1.4
1.6
2.1

1.5
.8

1.0
1.2
1.2

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

84
95
88
89
83
95

80
68

72
79
80

Can
ban-

ate

PQJ

0
0
0
0
0
0

0
0

0
0
0

Sulfate

(S04)

18
22
20
18
18
20

17
12

12
15
15

Chloride

(Cl)

3.0
4.8
4.0
4.0
4.2
6.0

3.2
.5

1.2
2.2
2.2

Fluo-

ride

(F)

0.2
.4
.4
.2
.2
.3

.2
.2

.2
.2
.2

Ni-

trate

(NO,)

0.7
.8
.8
1.6
1.1
2.0

1.5
.3

.5
.9
.9

Phos-

phate
(P04)

0.08
. 11
. 15
.14
.21
. 18

. 18
. 10

.08
.08
.09

Dissolved
solids

(residue
at 180°C)

A 104
A 124
117
A 115
122
134

111
84

82
A 96
96

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

75
83
77
78
75
82

72
63

66
72
73

Non-
car-

bon-

ate

6
5
5
5
7
4

6
8

6
8
8

To-

tal
acid-

ity
as

H+ l

Specific
conduct'

ance

(micro-
mhos at

25"C)

181
214
195
191
189
213

174
139

142
166
167

PH

.4
.8
.7
.6
.5
.8

.6
.4

.4
.4
.5

Col-

or

5
5
5
5
10
10

5
5

5
0
0

D.O.
(dis-
sol-
ved
oxy-
gen
ppm)

11.7

13.1

11.4

9.2

MPN

(coli-
form
colo-

nies

per

100 ml)

23

0

91

0

A Computed from determined constituents.
Analyses, in parts per million, of trace elements

Date of
collection

Dec. 12, 1964....
Aug. 24, 1965....

Chromium

Hexa-

valent

(Cr»)

0.00
.00

Total

(Cr)

o.oo
. 02

Cop-

per

(Cu)

0.03
. 02

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.00
.03

QUALITY OF SURFACE WATERS, 1965

COLUMBIA RIVER MAIN STEM Continued

14-192. COLUMBIA RIVER BELOW McNART DAM, NEAR UMATILLA, OREG. Continued

Suspended sediment, May to September 1965

Day

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

6..
7..
!
9..
10..

11..
12..
13..
1*..
15..

16..
17..
11..
19..
20..

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

26..
27..
28..
29..
30..
31..

Total

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

i..
7..
1..
9..
10..

11..
12..
13..
14..
19..

16..
17..
11..
19..
20..

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

26..
27..
21..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(K cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Tons
per
day

JULY

377
362
352
352
339

335
332
335
335
332

334
326
320
313
316

287
266
261
255
237

238
243
243
252
249

232
214
208
183
113
168

8779

31
31
30
30
30

29
29
29
28
28

21
27
27
27
26

24
22
21
C 20
C 20

C 20
C 20
C 20
20
20

C 20
C 20
C 20
C 20
C 20
20

31600
30300
2ISOO
28500
27500

26200
26000
26200
25300
25100

25300
23800
23300
22800
22200

11600
15800
14100
13800
12800

12900
13100
13100
13600
13400

12SOO
11600
11200
9880
9880
9070

S98630

MAY

Mean
dis-

charge
(K cfs)

416
383
339
351
3S8

348
344
369
395
410

408
408
410
410
388

391
400
387
384
390

386
372
374
406
444
462

10133

Suspended sediment

Mean
concen-

tration

(ppm)

»

20
21
22
22
23

C 24
C 24
C 24
C 24
29

34
C 39
C 39
C 39
40

36
33
30
C 28
C 28

C 28
C 28
C 28
30
32
34

Tons
per
day

22500
21700
20100
20800
22200

22600
22300
23900
25600
32100

37SOO
43000
43200
43200
41900

38000
35600
31300
29000
29500

29200
28100
28300
32900
38400
42400

805300

AUGUST

148
151
163
165
177

180
177
175
176
178

181
179
176
167
158

158
172
173
170
166

158
150
141
148
170

166
142
140
136
146
148

5035

19
19
18
18
17

16
15
14
C 13
C 13

C 13
C 13
C 13
13
12

12
12
12
12
12

12
13
13
13
13

C 13
C 13
13
12
C 13
C 13

Total discharge for period May 6 to Sept. 30, 1965 (K cf Total load for period Mav 6 to Sept. 30, 1965 (tons)...

7590
7750
7920
8020
8120

7780
7170
6610
6180
6250

6350
6280
6180
5860
5120

5120
5570
5610
5510
5380

5120
5260
4950
5190
5970

5830
4980
4910
4410
5120
5190

187300

JUNE

Mean
dis-

charge
(K cfs)

468
475
475
470
473

479
487
492
494
489

487
494
502
494
462

450
452
461
468
472

475
472
470
470
468

465
453
424
411
401

14053

Suspended sediment

Mean
concen-

tration

(ppm)

36
C 38
C 31
C 38
37

37
37
37
36
36

36
36
35
35
35

35
34
34
34
34

33
33
33
33
32

32
32
32
31
31

~

Tons
per
day

45500
48 700
48700
48200
47300

47900
48700
49200
48000
47500

47300
48004
47400
4*700
43700

42500
41500
42300
43000
43300

42300
42100
41900
41900
40400

40200
39100
36600
34400
33600

1317900

SEPTEMBER

139
125
134
131
110

97.5
116
120
127
118

95.2
95.2
98.2
108
109

107
123
117
98.2
106

113
114
101
106
97.5

96.0
94.5
99.0
105
103

3303.3

C 13
12
C 13
C 13
C 10

C 10
C 10
C 10
C 10
C 10

11
12
C 14
C 14
C 14

C 14
C 14
C 14
12
11

10
9
8
C 7
C 7

C 7
11
12
12
12

s-days)......... ....

4880
4050
4700
4600
2970

2630
3130
3240
3430
3190

2830
3080
3710
4080
4120

4040
4650
4420
3180
3150

3050
2770
2180
2000
1840

1810
2810
3210
3400
3340

100490

41303.3
3009620

C Composite period
K Expressed in thousands.

Hi -Jill t)ASl«

14-200. UMATILLA RIVER ABOVE MEACHAM CREEK, NEAR GIBBON, OREG.

LOCATION. Temperature recorder at gaging station, 0.8 mile downstream from Ryan Creek, 2.2 miles upstream from Heacham Creek, and 2.5 miles northeast of Gibbon, Umatilla County.
DRAINAGE AREA. 125 square miles.
RECORDS AVAILABLE. Water temperatures: June 1959 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 73°F July 28, 31, Aug. 1; minimum, 33°F Feb. 11, Mar. 18, 19. EXTREMES, 1959-65. Water temperatures: Maximum, 77°F July 13, 15, 21, 1961; minimum, freezing point on several days during January of most years.
REMARKS. Recorder stopped Jan. 3-31; temperature range, 36°F to 41°F.

Temperature (°F) of water, water year October 1964 to September 1965

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 ....

1

54
50

49
47

45
44

37
36

39
38

39
35

45
41

46
42

57
45

67
52

73
60

64
54

2

53
47

49
44

44
43

37
36

38
37

39
35

42
39

47
41

60
46

67
53

71
63

65
54

3

53
46

45
42

44
42

39
38

40
36

47
38

50
42

59
47

63
54

71
60

64
56

4

51
45

46
45

42
41

40
39

41
36

47
38

46
42

58
46

69
55

69
57

62
53

5

52
44

48
44

41
40

41
39

41
37

44
39

45
41

60
46

71
55

70
57

62
55

6

53
45

44
40

40
39

39
38

42
37

42
39

48
40

60
48

72
56

72
57

62
53

7

53
46

45
41

41
39

39
37

42
37

44
38

52
41

60
48

72
58

72
58

62
53

8

54
51

45
44

42
40

38
38

42
37

45
39

50
42

60
47

70
57

72
59

62
53

9

53
49

45
44

43
42

38
34

42
37

42
39

54
42

62
48

67
54

72
59

62
54

10

54
50

46
44

43
41

37
36

43
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43
39

55
43

63
49

65
55

71
60

62
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11

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58
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65
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67
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61
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59
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71
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68
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58
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50
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72
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70
58

56
53

Day

16

50
46

40
37

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50
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54
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72
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71
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55
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44

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73
58

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52

__

Average

50
46

44
42

41
39

40
38

42
37

46
41

52
44

60
49

69
56

68
58

59
52

UMATILLA RIVER BASIN Continued

14-200. UMATILLA RIVER ABOVE MEACHAM CREEK, NEAR GIBBON, OREG. Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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

July 28... ....

Time

(24 hour)

0755
2135
1450
0830
1730

1050
1720
0850
1640
1420
0710

Water
tem-

per-
ature

(°F)

38
44
39
36
39

38
45
41
49
76
59

Sam-

pling
point

Discharge
(cfs)

50
806
726
192
392

2850
280
520
1150
50
74

Sediment
concen-

tration

(ppm)

2
18
18
1
56

4200
26
15
83
4
2

Sediment

discharge
(tons per day)

T
39
35
T
59

32300
20
21
258
1
T

Suspended sediment

Percent finer than size indicated, in millimeters

D.002

16

0.004

22

0.008

34

0.016

53

0.031

62

0.062

97

84

0.125

97

91

0.250

97

96

0.500

100

99

1.000

100

2.000

Method
of

analysis

V

VPWC

UMATILLA RIVER BASIN Continued

14-335. UMATILLA RIVER NEAR UMATILLA, OREG.

LOCATION. At gaging station, 1.5 miles downstream from West Division main canal of Umatilla project, 1.8 miles southeast of Umatilla, Umatilla County, and 2 miles upstream from mouth.
DRAINAGE AREA. 2,290 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: August 1911 to August 1912, August 1960 to July 1962.
Water temperatures: October 1962 to September 1965.
Sediment records: October 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Minimum, freezing point Dec. 16-20.
Sediment concentrations: Maximum daily, 39,000 ppm July 27; minimum, daily, 4 ppm Nov. 6-17, May 29.
Sediment loads: Maximum daily, 438,000 tons Jan. 30; minimum daily, less than 0.05 ton June 6-8.
EXTREMES, 1962-65. Water temperatures: Minimum, freezing point Jan. 29, 1963, Dec. 16-20, 1964.
Sediment concentrations: Maximum daily, 39,000 ppm July 27, 1965; minimum daily, 2 ppm Aug. 16, Dec. 17, 1963. Sediment loads: Maximum daily, 438,000 tons Jan. 30, 1965; minimum daily, less than 0.05 ton on several days during 1964 and 1965.

Temperature (°F) of water, water year October 1964 to September 1965

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

April..........

June ....

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

Day

1

_

54
49

54

_
__

~

2

_

48

54

81

_

73

3

60

46

55

70

4

_

44

55
Cn

____

70

5

_

42

55

73

68

6

_

43

53

81

_

7

61
49
43

54

74
80
~

8

_

49
45

54

_

9

__

47

53

80

_

BO
74

10

64
49

54

66

11

__

49
43

56

_ .

75
73

12

6?
46

57

65

69

__

13

__

42

60

__
__

14

58

44

61

73

65

15

_

.

42

63

_

16

JR
48
32

53

74

17

__

32

40

55

_

R">

65

18

56
46
32

44

51

65

_

~

19

_

47
32

55

68

6?

__

66

20

_

47
32

56

74

_

21

4-i
47

52

6?

__

70

22

__

47
35

53

74

75
71

23

_ _

48
45

55

_

70

24

5?
49
40

57

68

73

__

25

__

48

_

74
69

26

__

49
38

57

61

71

_

27

i-j
44
41

- -

61
62
58

28

57
46
40

61

78

29

__

46
40

59

79

__

68

30

__

48
39

56

71

__

70

31

__

.

39

75

_

Aver-

age

__

41

55

~

__
__

~

QUALITY OF SURFACE WATERS, 1965

UMATILLA RIVER BASIN Continued

14-335. UMATILLA RIVER NEAR UMATILLA, OREG. Continued

Suspended sediment, water year October 1964 to September 1965 (Where no daily concentrations are reported, loads are 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..
28..
29..
30..
31*.

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

6 8
6 8
6 8
6 8
7 0

7.0
49
178
165
104

7.0
6.6
6.3
6.3
6.0

6.0
6.0
6.0
6.3
6.3

6.6
17
13
8.0
6.0

5.8
6.0
16
26
39
51

794.4

1340
1160
1070
998
880

1510
1120
932
850
810

801
783
738
756
943

1020
1020
1010
998
987

965
1160
910
1670
2200

1620
1560
2880
9570
15600
15500

73361

Suspended sediment

Mean
concen-

tration

(ppm)

10

_

26
49
29
17

C
C
C
C
C

C 6
21
11
B
9

10
11
12
12
14
7

-

Tons
per
day

0.2
. 2
. 2
. 2
. 2

. 2
A 3.4
B 24
B 13
4.B

. 1
. 1
. 1
. 1
. 1

. 1
. 1
. 1
. 1
. 1

. 1
B 1.0
B .4
. 2
B .1

B .2
. 2
A .5
B .6
B 1.5
8 1.0

53.4

JANUARY

250
186
128
170
118

1 200
36BO
670
164
103

75
64
60
64
240

293
165
100
86
84

74
4100
690
3900
2600

820
1280
1 400
7510
1 400
5950

B 900
583
370
A 460
280

41600
11100
1690
376
225

162
135
B 120
131
A 610

807
454
B 270
232
224

193
J 14000
1700
J 21000
J 16000

3590
S 5760
S 97600
S 181000
438000
249000

1088572

NOVEMBER

Mean
dis-

charge
(cfs)

21
48
113
133
88

71
67
67
69
69

67
69
67
65
63

69
88
93
90
90

104
90
68
68
88

322
278
178
125
104
- -

2972

9140
5780
4370
3690
3260

2850
2600
2340
2070
1540

1320
1240
1150
1030
1220

1300
1460
1790
2100
2220

2100
1840
1640
1390
1250

1220
1220
1400

64530

Suspended sediment

Mean
concen-

tration

(ppm)

8
12
14

C
C
C
C
C

C
C
C
C
C

C
C
42
57
30

36
48
30
38
32

54
35
24
22
19

-

Tons

per
day

A 0.5
B 1.6
B 4.3
3.2
1.5

. 8
. 7
7
. 7
. 7

. 7
. 7
. 7
. 7
. 7

. 7
1.0
A 11
A 14
7.3

10
12
7.1
9.0
7.6

J 52
26
12
7.4
5.3

200.6

FEBRUARY

3760
2900
2300
1770
1400

1100
900
700
490
320

236
190
162
150
190

156
230
375
530
440

318
225
170
147
142

140
149
190

~

92800
45300
27100
17600
B 12000

8460
B 6300
4420
2740
1330

841
B 640
503
417
A 630

548
907
1810
B 3000
A 2600

1800
1120
B 750
552
479

B 460
491
A 720

2363 IB

DECEMBER

Mean
dis-

charge
(cfs)

193
1210
1730
1140
774

549
404
327
266
250

296
418
390
341
320

300
300
320
350
400

549
2540
7950
9490
8790

6970
4380
3180
2400
1920
1590

60037

1420
1240
1100
1010
987

830
792
756
720
720

684
720
675
603
567

532
516
476
411
397

341
272
260
245
174

210
230
201
178
151
137

175S5

Suspended sediment

Mean
concen-

tration

(ppm)

61
440
517
130
55

32
17
15
16
20

25
32
24
19
17

_

_

4730
12200
5340
4500

2430
1900
1490
980
990
355

-

MARCH

152
116
100
97
95

92
97
90
91
160

112

102
81
90

143
141
114
110
130

170
103
46
38
63

110
.

102
115
73
66

Tons
per
day

J 58
A 1400
2420
400
115

47
19
13
11
B 14

A 20
B 36
25
17
15

13
13
15
17
19

25
S 69600
262000
137000
B 110000

45700
22500
12800
6350
3060
1520

675242

583
388
B 300
265
253

206
207
184
177
A 310

207
210
186
132
B 140

205
196
147
B 120
A 140

A 160
76
A 32
J 27
A 30

A 62
65
55
55
30
24

5172

S Computed by subdividing day.
A Computed from partly estimated-concentration graph, B Computed from estimated-concentration graph.
C Composite period.

J Computed from partly estimated-concentration graph and subdividing day.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

UMATILLA RIVER BASIN Continued

14-335. UMATILLA RIVER NEAR UMATILLA, OREG. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

144
355
492
432
484

576
500
484
272
411

468
383
302
397
657

921
1020
850
738
1790

4490
3940
3090
2440
2010

1840
1600
1360
1310
1240

34996

Suspended sediment

Mean
concen-

tration

(ppm)

49
100
120
75
57

80
51
42
32
43

92
48
21
46
190

200
230
109
78
972

3040
1620
926
527
330

252
180
128
109
92

-

Tons
per

day

J 20
A 96
A 160
87
74

A 120
69
55
24
48

116
50
17
A 49
A 340

A 500
A 630
250
155
S 6630

36900
17200
7730
3470
B 1800

1250
B 780
470
386
308

79784

JULY

8.6
8.6
8.6
9.0
9.0

9.0
12
11
9.6
9.0

9.6
8.6
9.0
10
9.3

8.6
7.9
7.9
7.9
8.2

10
53
32
12
9.3

9.3
686
69
9.3
2.6
5.0

1078.9

C 16
C 16
C 16
C 16
C 16

C 16
C 16
C 16
C 16
C 16

C 16
C 16
C 16
C 16
C 16

C 16
C 16
C 16
C 16
C 16

C 16
31
16
11

12
39000
1930
339
120
110

-

0.

.
.

.
.

,

.

.

«

.
.

.
.
.
.
.

MAY

Mean
dis-

charge
(cfs)

1120
910
693
558
460

362
215
154
112
84

29
5.0
3.8
4.0
7.6

8.6
9.6
11
92
4.0

109
91
79
106
115

64
16
10
5.8
12
5.0

5455.4

Suspended sediment

Mean
concen-

tration

(ppm)

78
58
41
38
35

25
20
17
13
24

14
C 26
C 26
C 26
C 26

C 26
51
72

18

210
32

14

11

4
-

8

-

Tons
per

day

236
143
77
57
B 43

24
12
7.1
3.9
5.4

1.1
.4
. 3
. 3
. 5

.6
B 1.3
2.1
31
B .2

B 62
A 7.9
4.0
4.0
4.0

1.9
. 3
. 2
. 1
. 3
. 1

731.0

AUGUST

5.0
4.8
4.8
4.8
6.8

4.8
2.8
2.8
2.8
3.0

3.2
3.0
4.0
4.5
3.2

2.8
2.8
3.2
3.0
3.6

15
A 4.
1.

. 3
125000
S 479
8.5
A .8
A 1.5

125504.9

14
14
9.3
14

50
84
42
26
7.6
10

361.6

53

46
61

25
C 19
C 19
C 19
C 19

C 19
C 19
C 19
C 19
C 19

C 19
C 19
C 19
19
19

45
36
45

69

__

140
65
32
20

0.8
. 7
. 6
. 6
B 1.1

B .3
. 1
. 1
. 1
.2

.2
. 2
. 2
.2
. 2

. 1
. 1
.2
. 2
. 2

B 1.8
1.4
B 1.7
. 5
A 2.6

24
A 32
B 7.4
B 2.2
.4
. 5

80.9

JUNE

Mean
dis-

charge
(cfs)

5.2
4.8
4.
3.
3.

2.
2.
2.
3.
2.

4.
4.
4.
4.5
4.8

6.5
19
678
480
188

97
6 8
5
6
9

9
9
7
8 2
8 6

1595.1

Suspended sediment

Mean
concen-

tration

(ppm)

27
-

5

~

45
22

C 11
C 11
C 11
C 11
C 11

22

7700
1380
162

_

36
36
C 36
C 36

C 36
C 36
C 36
C 36
18

~

Tons
per

day

0 1
A 3
1
1
1

T
T
T
A 4
B 1

1
1
1
1
1

B .4
130
J 17000
S 2150
S 89

16
. 7
. 5
. 6
9

.9
.9
.8
.8
4

19395.7

SEPTEMBER

18
25
6.2
4.0
3.4

3.4
3.6
3.6
3.6
3.4

3.2
3.0
2.8
2.8
3.2

2.8
3.2
14
3.4
3.0

2.8
2.6
1.9
1.9
1.8

1.7
1.7
1.8
1.6
1.5

134.9

_

C 15
C 15

C 15
C 15
C - 15
C 15
C 15

C 15
C 15
C 15
C 15
C 15

C 15
C 15
40
C 22
C 22

C 22
C 22
C 22
C 22
C 22

C 22
C 22
C 22
C 22
C 22

1.2
2.0
3
.2
. 1

. 1
. 1
. 1
. 1
. 1

. 1
. 1
. 1
. 1
. 1

. 1
. 1
B 1.5
2
. 2

.2
.2
. 1
. 1
. 1

. 1
1
. 1
. 1
. 1

6.1

Total discharge for year (cfs-days).
Total load for year (tons)..........

. 262,871.3
. 2,231,062.6

S Computed by subdividing day.
T Less than 0.05 ton.
A Computed from partly estimated-concentration graph.
B Computed from estimated-concentration graph.

C Composite period.
J Computed from partly estimated-concentration graph and subdividing day.

UMATILLA RIVER BASIN Continued

14-335. UMATILLA RIVER NEAR UMATILLA, OREG. Continued

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

Dec. 2, 1964......
Dec. 2............
Dec. 3............

Time

(24 hour)

1130
1845
1020
1545
2010

1550
0150
0950
2000
1225

1120
1615
0920
1630
1715

2245
0900
1415
0830
1615

2150
1815
0815
1040
1815

Water
tem-

per-
ature
(°F)

48

46
35

45
41
40
38
42

40
43
39
39
44

44
44
44
43

41
42
52
61
77

Sam-

pling
point

Discharge
(cfs)

1190
1260
1810
1680
5720

8350
8910
9710
5530
2030

1150
987
943
1920
3870

4100
9740
10400
13800
18600

12500
516
3170
666
30

Sediment

concen-

tration

(ppm)

415
296
508
374
19200

5940
4890
6080
1980
15200

2880
3920
626
5400
16600

19600
7120
4410
11500
11700

4120
125
971
39400
900

Sediment

discharge
(tons per day)

1330
1010
2480
1700
297000

134000
118000
159000
29600
83300

8940
10400
1590
28000
173000

217000
187000
124000
428000
588000

139000
174
8310
73500
73

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

29
25
25
24
25

24
25
18
15
18

30
32
23
25
12

21
18
17
18
13

16

13
30
80

0.004

41
34
31
27
39

35
37
26
18
36

50
48
38
34
18

31
27
24
25
22

23
55
21
48
96

0.008

57
49
46
40
58

50
52
41
33
56

67
69
61
50
29

48
41
39
41
35

34

31
73
98

0.016

78
73
65
60
78

68
72
63
54
83

86
96
88
74
51

70
62
58
64
58

59
89
48
100
100

0.031

95
92
84
80
92

83
85
82
80
99

96
100
94
97
79

86
82
79
85
76

79

75

0.062

99
99
97
96
95

89
90
87
93
100

100

100
100
97

96
91
91
94
92

91

91

0.125

100
100
100
100
98

94
94
91
97

100

99
98
97
98
98

98

100

0.250

-

100

97
97
95
98

100
100
99
99
99

99
100

0.500

100
100
99
100

100
100
100

100

1.000

100

2.000

Method
of

analysis

VPWC
VPWC
VPWC
VPWC
VPWC

VPWC
VPWC
VPWC
VPWC
VPWC

VPWC
PWC
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VPWC
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VPWC

VPWC
VPWC
VPWC
PWC
PWC

ALDER CREEK BASIN

14-343.5. ALDER CREEK AT ALDERDALE, WASH.

LOCATION (revised). At county road bridge,1 mile upstream from gaging station, 1.8 miles north of Alderdale, Klickitat County, and 0.8 mile downstream from Six Prong Creek. Prior to Oct. 1, 1964, at former gaging station 1.4 miles downstream. DRAINAGE AREA (revised). 196 square miles.
RECORDS AVAILABLE. Water temperatures: October 1962 to September 1965.
Sediment records: October 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Minimum, 33°F Dec. 16-19.
Sediment concentrations: Maximum daily, not determined; minimum daily, 1 ppm Feb. 12.
Sediment loads: Maximum daily, (estimated) 180,000 tons Dec. 22; minimum daily, less than 0.05 ton on many days. EXTREMES, 1962-65. Water temperatures: Minimum, freezing point on several days during January and December 1963. Sediment concentrations: Maximum daily, 5,180 ppm Feb. 3, 1963; minimum daily, 0 ppm on many days.
Sediment loads: Maximum daily, (estimated) 180,000 tons Dec. 22, 1965; minimum daily, less than 0.05 ton on many days. REMARKS. Maximum observed during water year: Sediment concentration, 53,800 ppm Jan. 23.

Temperature (°F) of water, water year October 1964 to September 1965

November .....
December .....

January........

March.........

May...........

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

1

54

48

45

~

68

2

50
48

59

83

75

3

5?

44

57

~

4

50
40

57

77
61

5

47

45

38

44

52

6

45
43

38

63

78

7

55

43

35

59

70

57

8

45
45

35

58

62

9

54
55
45

38

58

76
73

10

55
45

40

48

63

67

11

45

40

44

66

61

12

38

38

48

59

-

13

38

35

49

60

65

14

43

35

54

65

77

68

15

46

35

49

60

57

Day

16

33

40

53

58

17

*?

33

40

18

33

41

46

48

19

33

41

63

68
68

20

35

38

42

-

62

21

42

46

72

63

63

22

35

42

45

-

65

23

35

38

50

76
69
58

24

35

45

65

71
65

25

36

40

43

72
55

26

35

42

43

60

78
72

27

48

73
54

28

40

41

50

67

29

40

40

52

B?

30

57

R?
72

31

55

67

Aver-

age

40

39

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

Jan. 27, 1965. ....
Aug. 23.. ....

Time

(24 hour)

1425
1010

Water
tem-

per-
ature

(°F)

44
69

Sam-

pling
point

Discharge
(cfs)

448
16

Sediment
concen-

tration

(ppm)

5950
13500

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

9
61

0.004

14
86

0.008

17
97

0.016

26
100

0.031

40

0.062

70

0.125

86

0.250

95

0.500

99

1.000

100

2.000

Method
of

analysis

VPWC
PWC

QUALITY OF SURFACE WATERS, 1965

ALDER CREEK BASIN Continued

14-343.5. ALDER CREEK AT ALDERDALE, WASH. Continued

Suspended sediment, water year October 1964 to Set

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

0.8
.8
.8
.8
.8

.8
.8
.8
.8
.8

.8
.8
.8
.8
.8

.8
.8
. 8

.

.
.

.8
.8

.8
.8
.8
.8
.8
.8

24.8

Suspended sediment

Mean
concen-

tration

(ppm)

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C
C

Tons
per

day

0.3

JANUARY

22
23
23
20
11

6.0
6.0
6.0
6.0
6.0

6.0
6.0
6.0
6.0
6.0

7.5
10
9.8
7.0
7.0

10
12
9.2
7.0
6.0

6.4
419
719
256
134
117

1895.9

C
C

C 9

20
39

13
13
17
300
1900

4200
6100
33000
1000
570

190
2860
1100
51
38
40

"

0.4
.4
.4
. 3
. 1

. 1
. 1
. 1
. 1
. 1

. 1
. 1
.2
. 3
. 6

. 3
.4
. 4
A 6.0
36

A 110
A 200
A 820
A 19
9.2

3.3
S 6350
2140
35
14
13

9760.0

NOVEMBER

Mean
dis-

charge
(cfs)

0.8
. 8
. 8
. 8
. 8

. 8
.8
. 8
. 8
. 8

. 8
. 8
.8
. 8
. 8

. 8
.8
. 8
.8
.8

.8
. 8
. 8
. 8
. 8

. 8
.8
. 8
. 8
. 8

24.0

Suspended sediment

Mean
concen-

tration

(ppm)

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C

C
C
C
C
C

-

Tons
per

day

0.3

FEBRUARY

100
83
56
46
43

40
38
34
32
30

30
28
26
24
22

20
20
19
18
18

17
17
16
16
15

15
14
14

.

851

8
10
6
5
9

3
4
13
19
4

3
1

41

.

-

2.2
2.2

,
,

1.

B.

,

1.
1.

.

.2
. 1
. 1
. 1
. 1

A 2.0
.4
.2
. 1
. 1

. 1
. 1
. 1
. 1
. 1

. 1
. 1
. 1

14.9

tember 1965

DECEMBER

Mean
dis-

charge
(cfs)

0.8
.8
.8
.8
.8

.8
.8
.8
8
.8

.8
.8
.8
.8
.8

.8
.8
.8
. 8
.8

. 8
3600
4000
450
130

80
55
46
40
35
26

8478.8

Suspended sediment

Mean
concen-

tration

(ppm)

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2

__

2200
1400

1900
2100
16
13
7
7

Tons
per

day

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
180000
75000
S 5340
A 490

A 410
A 310
2.0
1.4
. 7
.5

261554.7

MARCH

13
12
12
12
11

11
10
10
9.2
9.2

9.2
9.2
8.0
8.0
8.0

7.5
7.0
7.0
7.0
6.4

6.0
6.0
6.0
6.0
6.4

7.0
7.0
7.0
6.0
5.2
5.2

254.5

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«
«.

C 6

C 6
C 6
C 6
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2
C 2

0.1
. 1
. 1
.2
.2

.2
. 2
.2

2.2

S Computed by subdividing day.
A Computed from partly estimated-concentration gi
T Less than 0.05 ton.
C Composite period.

aph.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

ALDER CREEK BASIN Continued

14-343.5. ALDER CREEK AT ALDERDALE, WASH. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

14

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.
.

.
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.

.8

Suspended sediment

Mean

tration

(ppm)

Tons
per

day

0 1
1
1
1
1

1
1
1
1
1

. 1
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

2.0

JULY

.0
.0
. 0
.0
.0

1.0
.8
. 8
.8
.8

.8
.8
.8
.8
.8

.8
. 7
.5
. 6
. 7

.8
.8
.8
.8
.8

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

25.0

5
5
5
5
5

5
5
5
5
5

5
5
5
5
5

5
5
5
5
5

5
5
5
5
5

5
5
5
5
5
5

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T

T
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T
T
T

T
T
T
T
T

T
T
T
T
T
T

0.3

MAY

Mean
dis-

charge
(cf.)

4.4
4.4
4.4
4.4
4.0

3.3
3.3
3.0
2.4
2.4

2.4
2.1
2.1
2.4
2.4

2.4
2.4
2.1
2.1
2.1

2.1
2.1
2.1
2.4
2.1

1.9
1.9
1.9
1.9
1.9
1.7

80.5

Suspended sediment

Mean
concen-

tration

(ppm)

Tons
per

day

0.

.

t

,

t

.

AUGUST

0.6
. 7
. 7
. 7
. 6

.6
.6
.6
.5
. 5

5
.6
.6
.6
. 6

. 6
. 6
. 6
. 7
. 7

.6
.9
22
6.0
4.8

3.6
2.7
2.4
1.9
1.7
1.7

60.5

5
5
5
5
5

5
5
5
5
5

5
5
5
5
5

5
5
5
5
5

5
5
20000
1500
354

165
105
70
50
42
24

~

A 120
2

. 6

6

1.6
. 8
. 5
,3
.2
. 1

1232.3

JUNE

Mean
dis-

charge
(cfs)

1.7
1.7
1.9
1.5
1.5

1.5
1.5
1.5
1.3
1.0

1.0
1.1
1.3
1.3
1.3

1.3
3.0
3.3
2.1
1.7

1.3
1.3
1.3
1.3
1.3

1.3
1.3
1.3
1.1
1.1

44.7

Suspended sediment

Mean
concen-

tration

(ppm)

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

Tons
per

day

SEPTEMBER

1.3
1.3
1.3
1.3
1.1

1.1
1.0
1.0
1.0

.8
.8
8
. 8
.6

tl
1 1

,1
,3
.3

.3
,3
1.1
1.1
1.1

1.1
1.1
1.1
1.1
1.1

32.9

11
11
11
11
11

11
11
11
11
11

11
11
11
11
11

11
11
11
11
11

11
11
11
11
11

11
11
11
11
11

__

. 2

1.0

Total discharge for year (cf s-days) .... 11 , 913 . 0 Total load for year (tons) .... 272 , 569 . 8 A Computed from partly estimated-concentration graph.
T Less than 0.05 ton.
C Composite period.

WILLOW CREEK BASIN

14-345. WILLOW CREEK AT HEPPNER, OREG.

LOCATION. At Court Street bridge*100 feet downstream from gaging station, 800 feet southeast of Morrow County Courthouse at Heppner, Morrow County, and 0.3 mile downstream from Balm Fork.
DRAINAGE AREA. 87 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: February 1963 to September 1965.
Sediment records: February 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 77°F July 27, Aug. 9; minimum, freezing point Dec. 16-20.
Sediment concentrations: Maximum daily, 25,500 ppm Dec. 22; minimum daily, 11 ppm Oct. 18-26, Sept. 1-4.
Sediment loads: Maximum daily, 28,400 tons Dec. 22; minimum daily, less than 0.05 ton on many days during October, July, and August.
EXTREMES, 1963-65. Water temperatures: Maximum, 78°F Aug. 24, 1964; minimum, freezing point on several days during 1963 and 1964.

Sediment concentrations: Maximum daily, 25,500 ppm Dec. 22, 1964; minimum daily, 6 ppm on many days during June, November, and December 1963.

Sediment loads: Maximum daily, 28,400 tons Dec. 22, 1964; minimum daily, less than 0.05 ton on many days each year. REMARKS. Flow affected by ice Dec. 16-21.

Temperature (°F) of water, water year October 1964 to September 1965

October ....
November .....

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

1

49
45

34

40

75
66

2

58
48
43

37
38

A Q

61

62

3

37

50
62

75

4

52
47
38

37
A a

4?

52

5

38

43

65

75
60

6

41
36

38

42

55

7

56

36

34

4?

47
62

67
75
60

8

43
40

37

47
57

62

64

9

59

41

37

56

77
62

10

40
40

3a

11

42

34

4?

49

63

69
62

12

38
38

45

65
65

13

55

38

54

60

14

39

52

62
60

15

50
38
33

42

55
54

75
56

Day

16

3?

37

47

54

17

36
32

36
47
39

48

57

58
48

18

49
37
32

47
39

47
>?

75
55

19

3?

48

66
47

20

38
32

39
44

50

65

58

21

53
36
38

40
43

60

54

22

39

4")

4?

f. A

63
68
62

23

50
45
44

50
50

67
58

24

48
45

38
44

62

70
62

25

48
45
43

a o

38

50
57

70
65
62

26

38
40

41

39

56
57
53

70
58

27

44

37

41
43

58
62
56

77

56

28

47
41
35

45

45

57
65

76
53
52

29

47
43
35

45

54
58

62
57

30

44
4?

48

56
65

62

31

37

43

49

52

Aver-

age

38

38
42

49
54

58

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

WILLOW CREEK BASIN Continued

14-345. WILLOW CREEK AT HEPPNER, OREG. Continued

Suspended sediment, water year October 1964 to September 1965

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..
28..
29..
30..
31..

Total

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

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

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

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

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

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

Total

OCTOBER

Mean
dis-

charge
(cfs)

0.

.
.
.

9
.
.
.

.

,

.
.

1.
1.
1.
2.
2 .

2 ,
2.
1.
1.
2 «

2.
2.
2.
3.
3.
4.1

44.3

Suspended sediment

Mean
concen-

tration

(ppm)

C 18
C 18
C 18
C 18
C 18

C 18
C 18
C 18
C 18
C 18

C 18
C 18
C 18
C 18
C 18

18
18
11
11
11

C 11
11
11
11
C 11

C 11
14
18
25
50
41

-

Tons
per
day

0.1
. 1
. 1
. 1
. 1

. 1
. 1
. 1
. 1
. 1

. 1
. 1
. 1
A .2
B .5
B .5

2.9

JANUARY

54
55
51
46
36

39
37
35
33
30

31
32
32
36
49

59
60
56
54
52

57
55
87
99
61

70
71
278
368
486
353

2884

96
85
66
43
46

140
108
50
46
67

54
61
125
2400
380

184
128
102
76
72

460
260
860
830
235

800
800
12000
3970
7700
2600

-

14
13
9.1
5.3
4.7

A 15
11
B 4.7
4.1
5.4

4.5
B 5.3
11
A 230
50

29
21
15
11
10

A 71
B 39
J 260
A 220
51

A 150
153
A 9000
S 4330
J 11000
2480

28227.1

NOVEMBER

Mean
dis-

charge
(cfs)

3.
3.
3.
3.
3.

3.
3.
3.
3.
4.

4.
4.
4.
4.
3.

3.
3.
3.
3.
3.

3.
3.
4.8
5.4
11

7.8
5.8
6.6
6.8
7.8

136.4

Suspended sediment

Mean
concen-

tration

(ppm)

C 15
C 15
C 15
C 15
C 15

C 15
C 15
C 15
C 15
C 15

15
15
15
C 15
C 15

C 15
C 15
15
15
15

C 15
C 15
17
22
140

120
52
19
12
22

-

Tons
per
day

0.1
. 1
. 1
. 1
. 1

. 1
. 1
. 1
. 1
. 2

. 2
. 2
. 2
. 2
. 1

. 1
. 1
. 1
. 1
. 1

. 1
. 1
. 2
. 3
A 4.2

A 2.5
B .8
. 3
. 2
A .5

11.7

FEBRUARY

235
164
139
116
98

81
64
63
58
54

47
54
55
55
54

53
58
61
64
66

66
63
58
56
55

53
59
56

2105

1100
710
572
580
347

193
140
113
102
90

130
100
83
64
150

70
63
77
87
98

77
62
58
50

67
45
-

~

698
314
215
A 180
92

42
24
19
16
13

A 16
15
12
9.5
A 22

10
9.9
13
15
17

14
11
A 9.1
7.6
7.4

7.0
A 11
6.8

1826.3

DECEMBER

Mean
dis-

charge
(cfs)

12
11
12
9.8
9.1

7.4
7.4
8.6
7.8
7.8

8.6
6.6
7.1
7.8
9.8

4.0
3.0
4.0
5.0
10

40
285
288
369
280

250
170
115
85
67
53

2160.8

Suspended sediment

Mean
concen-

tration

(ppm)

140
50
32
24
20

14
14
14
14
14

C 14
C 14
C 14
21
42

_

10400
25500
5900
4600
2200

1170
807
540
296
200
135

-

Tons
per
day

A 4.5
1.5
1.0
. 6
. 5

. 3
. 3
. 3
. 3
. 3

. 3
. 2
. 3
. 4
A 1.1

. 3
. 2
. 3
4
1.0

1120
S 28400
J 4900
A 4600
A 1700

790
370
168
68
36
19

42185.1

MARCH

53
48
45
42
40

37
37
35
33
33

33
33
30
29
27

27
25
14
17
23

22
22
20
16
17

20
20
19
19
19
22

877

39
45
42
42
44

C 29
C 29
C 29
C 29
C 29

C 29
C 29
C 29
C 29
C 29

29
29
19
19
19

19
19
19
19
C 19

C 19
C 19
C 19
C 19
C 19
26

A 5.6
B 5.8
5.1
A 4.8
4.8

2.9
2.9
2.7
2.6
2.6

2.6
2.6
2.3
2.3
2.1

2.1
2.0
. 7
. 9
1.2

1.1
1.1
1.0
. 8
. 9

1.0
1.0
1.0
1.0
1.0
A 1.5

70.0

S Computed by subdividing day.
T Less than 0.05 ton.
A Computed from partly estimated-concentration graph. B Computed from estimated-concentration graph.

C Composite period.
J Computed from partly estimated-oncentration graph and subdividing day.

389-675 O - 70 - 16

QUALITY OF SURFACE WATERS, 1965

WILLOW CREEK BASIN Continued

14-345. WILLOW CREEK AT HEPPNER, OREG. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(eft)

32
35
37
39
40

39
38
38
38
38

36
34
35
39
43

52
54
54
60
98

130
119
99
87
81

78
80
82
81
75

1791

Suspended sediment

Mean
concen-

tration

(ppm)

65
67
52
74
56

48
C 35
C 35
C 35
C 35

C 35
C 35
C 35
C 35
95

200
140
100
180
1300

1070
615
505
460
335

380
305
292
256
223

~

JULY

11
9.4
8.6
8.2
6.4

. 6
. 6
. 2
. 7
. 1

. 1
. 5
. 1
. 5
. 3

. 6
. 3
. 3
. 1
. 1

.8
. 5
.9
. 8
. 5

. 6
.3
. 5
. 1
. 8
. 6

108.1

C 19
C 19
C 19
C 19
C 19

C 19
C 19
C 19
C 16
C 16

C 16
C 16
C 16
C 16
C 16

C 16
C 16
C 16
C 16
C 16

C 16
C 16
C 16
C 16
C 16

C 16
C 16
C 16
C 16
C 16
C 16

T
per

day

A 5.
6.
5.
7.
6.

5.
3.
3.
3.
3.

3.
3.
3.
3.
A 11

A 28
20
15
29
J 380

376
198
135
108
73

80
66
65
56
45

1749.0

0.

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T
T

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v

.
.

5.4

MAY

Mean
dis-

charge
(eft)

67
61
64
60
57

53
51
46
41
37

34
33
32
32
32

32
32
28
28
39

32
32
30
29
25

24
22
19
22
20
19

1133

Suspended sediment

Mean
concen-

tration

(ppm)

170
213
168
120
85

85
81
70
57
C 42

42
42
42
42
42

C 42
C 42
C 42

130

59
43
37
37
37

37
37
37
240
87
63

T
per

day

31
35
29
19
13

12
11
8.
6.
4.

3.
3.
3.
3.
3.

3.
3.
3.
4.
J 15

A 5.
A 3.
3«
2.

2^

2.
2.
1.
A 14
A 4.
A 3.

262.9

AUGUST

1.
1.
1.
1.

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. i

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1 a
1.
1.
1.

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

6.3

C 15
C 15
C 15
C 15
C 15

C 15
C 15
C 15
C 15
C 15

C 15
15
15
15
C 15

C 15
C 15
C 15
C 15
C 15

C 15
15
15
15
15

15
15
15
15
15
15

T
0.1
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T

1.6

JUNE

Mean
dis-

charge
(cfs)

17
14
12
10
10

9 7
8 2
6 1
6 1
6 1

6 7
7 8
5 9
8 6
12

13
45
58
49
41

35
33
27
24
22

20
17
15
14
12

565.2

Suspended sediment

Mean

tration

(ppm)

40
37
31
C 23
C 23

C 23
C 23
C 23
C 23
C 23

C 23
C 23
C 23
C 23
30

53
930

125
86

58
43

32

22
C 14
C 14
C 14
C 14

-

T
per

day

1.8
1.4
1.0
6
. 6

. 6
. 5
.4
.4
.4

. 4
. 5
.4
5
1.0

A 1.9
J 130
61
17
9.5

5.5
A 3.8
2.5
2.1
1.7

1.2
.6
. 6
. 5
. 5

248.9

SEPTEMBER

3.
3.
3.
3.
3.

3.
3.
3.
3.
3.

2.
2.
2.
2.
3.

8.
5.
4«
4.
3.

3.
3.
3.
3.
3.

3.
3.
3.
3.
3.

108.7

C 11
C 11
C 11
C 11
120

71
53
83
45

60
24

30
40

460
210
180
48
52

90
170
150
80
140

230
50
45
63
30

0.1
. 1
. 1
. 1
A 1.2

. 7
. 5
A .7
.4
.4

. 5
. 2
. 2
. 2
.4

A 10
3.0
A 2.3
. 6
B .5

9
A 1.6
A 1.3
. 7
A 1.2

A 1.9
.4
A .4
. 6
. 3

31.5

Total discharge for year (cfs-days).
Total load for year (tons)..........

11,949.8
74,622.4

T Less than 0.05 ton.
A Computed from partly estimated-concentration graph. B Computed from estimated-concentration graph.
C Composite period.

J Computed from partly estimated-concentration graph and subdividing day,

WILLOW CREEK BASIN Continued

14-345. WILLOW CREEK AT HEPPNER, OREG. Continued

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

Nov. 25, 1964.....

Jan. 27, 1965.....

Time

(24 hour)

2315
2315
0640
1220
1300

1145
2215
0835
0740
2330

0805
1240
0810
1805
1340

Water
tem-

per-
ature

(°F)

40
36
40
45
44

45
39
37
41
42

44
44
35
40
50

Sam-

pling
point

Discharge
(cfs)

9.1
58
130
410
318

374
184
149
65
85

300
484
243
213
96

Sediment
concen-

tration

(ppm)

166
8920
10400
120000
11000

5720
825
818
361
2320

2600
6800
1140
975
452

Sediment

discharge
(tons per day)

4.1
1400
3650
143000
9440

5780
410
329
63
532

2110
8890
748
561
117

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

71
36
18
23
21

19
16
14
32
26

26
20
20
12
13

0.004

87
51
27
32
32

27
19
16
44
39

27
26
22
16
18

0.008

92
67
39
45
45

38
27
25
58
55

42
36
34
23
28

0.016

95
85
60
70
64

56
43
35
73
75

58
56
48
34
42

0.031

98
98
83
91
86

74
64
61
84
87

80
76
61
53
61

0.062

99
98
96
98
92

85
76
79
90
92

86
84
76
67
77

0.125

100
100
99
99
95

95
92
94
97
97

96
97
93
91
92

0.250

100
100
100

99
99
99
100
100

99
99
98
99
99

0.500

~

100
100
100

100
100
100
100
100

1.000 2.000

Method
of

analysis

TBWC
TPWC
TPWC
TPWC
TPWC

TPWC
TPWC
TPWC
TPWC
TPWC

TPWC
TPWC
TPWC
TPWC
TPWC

230 QUALITY OF SURFACE WATERS, 1965

0)

i**

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o'O a a a o
a o a o

a

|' SS w

feS h a a ,H E o> o o a

H V *>

3

o §5 60

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ft rH +J

a a <H »w 3 o M fe a
g -P d O rH

§
H -H d -H

O
dO rH OJ13

a «* fe
>> rH
*rH W -H

"O

60 .a

8

0)

bOSrH 3

g

3 3 d

S
<! S rH -H

-

H 0) fl^'

S fl > -HW a-r! 0) SO)

> +»

H

«D O -H O W

H

o> o co o> o> IN

rH HI bO 01

E

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a

oi O -H 3 o ra O +j N <! v
0) P N

WW __....__ ao> 10 s o <H ao o> H 3 H «o -H « «, -

O) M O «0

O
rH fe 0> O> 3 O O> 0> rH
8 " .Q

3
^iHt^-x -
'O fl<£> 13

H rH .Q s feo> o

P-P-P ooqoioeraa>-H a>

o

3 s o a> a -P s -vcute HO-H -p O oj fe<8 Q CM

UK a-ri g rH S |
0) O 0> -P -H " -H -H O *
a o> ra

<H O I I I h 0) 0) ' N o 10 n .H-> ao 13 oo w 1310 10 a ..
MM ImO

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1^ I O^d

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fcM§«: H H ^QoT
-^ 0) < > +-> +-> -PVI I
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co

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CM

CO
CM

CM

O
CM
IO
CM

CM

CO
CM

CM
CM

CM

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CM

0-

CO£
Q

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122
co

CM^0

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r-o
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-f

CO

CM

JS1

i i :

(M | |
m l l

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oo i

m

O 1

1 m i i

5! !

r- l oo

i : i

1SS

In !

3

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1 1 1 1 1 1

1 r- I

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I

l *

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l a r-

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1 1

O

t i -t

t 5 !

1 r- m 1 -* *

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1 1 1 1 1 t

(M 1 1 in | I
1 1 co
1 1 *

1 * 1
t *

1

1 in

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15 !
l 1 r-
1 1 *

1 1 1 l l 1

October Novembs

Decembe

13!

r-i i

m

0 1

1 m i i

r- i m * i m

r- * l
Ci *

1
r* «

1

15!

K! i

m l
m * l
1 m i
1 * l

o> r- i

O f-

1

- *O

1

tt m

j
r- o i
o in

)

* (M OO

crt in -^

.* rv< o>
Cl> -* -*

*f- |

* *
1

o m i

1 <N | 1 m I
m°

5

1 0 (M 1 m m

co -*

m

r- f- o>
<»> * -*

1 a

m

1 «d* "^

K!

5

I m -o l * *

t 1 vO

l 1 -*
l i -a
i i -*

1 1 -0

1 l -*
*ON a

i!i

O <M

1

in o i

! S!

00 0

1

in i-

1

M OO 1- * <o r-

o> o l
m r- i

QO (M m in r- r-

09 00 I

in -o i
m in

o
m -a r-

in -> l
m <0

1

* m <o

r-l | 00

00 O O> m -a r-

o oo * *o ^o i*-
O 1

O

m l f-

* m i m in i

m i to

* 00 |
in m l
f- i

m

O f-

1 m -o I
a -o i
in to l

m >o >o

.n o 1 in r- 1

m >o r-
-* *
1

mo-*
m >o f-

m -a i

* * f^
in in r*-
iTI fM

1

in in

j

in in I

in in f*-

O (V(

*

in in f*-
m m ->

Ui.

: 1 1

1 r- l

oo o i

r- 1

m

o o i
00 -0

1
f\ ON

1

i?!
1 o> -a
i -o <o

1 o> l

j »-H i >o -o

1 m l l r- 1

i l -a i i ^o

i i i

i i a i i m

: i i
1 1 oo
1 1

m

l 1 1 l 1 l
l 1 ->
1 1 -o

1 1 l

rsi I r-

1 1 1
- H i a
co i -a

: : i
m l

o
f- i r-

1 1 m

(M | -<

\ 1 <M
1 1 -0

CO 1 -O

1 1 r-
1 1 -0
O 1 CO
CO 1 >O

1 1 (M

O 1 O>

3

§

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

WILLOW CREEK BASIN Continued

14-360. WILLOW CREEK KEAR ARLINGTON, OREG. Continued

Suspended sediment, Water year October 1964 to September 1965 (Where no daily concentrations are reported, loads are 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..
28..
29..
30..
31..

Total

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

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

11..
12..
13..
14..
IS..

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

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

26..
27..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cf«)

0.5
. 3
0
0

.1

.1.1

. 2
. 3
. 2

. 2
. 1
. 1
0
0

0
. 2
. 2
0
0

0
1
2
1
2

2
2
1
1
2
1

4.1

300
300
200
170
140

120
130
100
90
80

65
85

85
87
162

147
121
114
112
104

230
200
160
592
360

300
570
566
992
1650
1100

94S4

Suspended sediment

Mean
concen-

tration

(ppm)

. _

_

29
«-

__

-

_

_

48
46
48
48

48
48
46
48
48
48

-

Tons
per
day

T
T

0.4

JANUARY

411

1520
2100
3300
400
330

610
450
370
4700
2700

24SO
905
804
600
500

21000
22000
5050
25000
5650

3900
30000
18700
13800
24000
15000

-

333
400
430
460
470

492
B 740
A 890
97
B 71

A 140
B 100
85
A 1100
A 1200

972
296
247
181
140

J 18000
A 12000
2180
A 40000
5490

B 3200
J 50000
S 40600
S 41700
J 120000
J 49000

391014

NOVEMBER

Mean
dis-

charge
(cfs)

0.1
. 1
. 2
. 1
. 1

. 1
0
0
0

.1

. 2
. 2
. 1
0
. 1

. 1
. 1
. 2
. 3
. 3

. 3
. 5
. 5
. 5
. 4

. 3
. 3
. 5
. 7
1.2

7.6

720
500
380
300
254

230
212
172
147
134

125
125
125
129
129

127
125
147
147
147

147
147
134
129
110

92
92
106

5332

Suspended sediment

Mean
concen-

tration

(ppm)

C 69
C 69
C 69
C 69
C 69

C 69*

C 30

C 30
C 30
C 30
>

C 18

C IB
C 18
C IB
C 18
C 18

C 18
C 18
C 18
C 18
C 18

C 18
C 18
C 18
C 18
C 18

-

Tons
per
day

T
T
T
T
T

T
0
0
0
T

T
T
T
0
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
0.1

0.5

FEBRUARY

6050
3500
2200
1500
1150

_

440
423
303
162

172
170
162
180
260

211
300
320
299
173

146
129
178
186
180

304
318
248

~

-

11800
4700
B 2300
B 1200
789

450
252
196
120
66

58
57
55
63
A 91

72
A 100
127
119
69

58
51
64
65
B 53

76
79
71

23201

DECEMBER

Mean
dis-

charge
(cfs)

1.5
1.2
1.0
. 4
. 1

. 3
. 3
. 1
0
. 4

. 3
1.0
1.4
1.9
3.0

1.0
0
0
0
0

700
3240
1040
1080
973

750
610
418
252
280
260

9636.9

106
96
86
70
70

61
58
45
44
36

34
30
31
30
30

21
16
18
19
25

26
26
26
24
22

24
30
30
29
34
40

1237

Suspended sediment

Mean
concen-

tration

(ppm)

C 29
C 29
C 29
C 29
C 29

C 29
C 29
C 29

_

C 37

C 37
C 37
C 37
C 37
C 37

C 37

_

23000
24000
14000

6400
4900
3600
1990
_

-

MARCH

332
207
150
213
237

C 69
C 69
C 69
C 69
C 69

C 69
C 69
C 69
C 69
C 69

C 12
C 12
C 12
C 12

_
_

__

_

-

16

8

~

Tons
per
day

0.1
. 1
. 1
T
T

T
T
T
0
T

T
. 1
. 1
. 2
. 3

. 1
0
0
0
0

76
980000
B 65000
A 70000
B 37000

A 13000
8070
B 4100
1350
1000
600

1180197.3

95
54
35
40
45

11
11
8.4
8.2
6.7

6.3
5.6
5.8
5.6
5.6

. 7
. 5
6
. 6
. 9

1.0
1.0
1.0
. 9
. 8

. 9
1.3
1.3
1.3
1.1
. 9

356.0

5 Computed by subdividing day.
T Less than 0.05 ton.

A Computed from partly estimated-concentration graph. 6 Computed from estimated-concentration graph.

C Composite period.
J Computed from partly estimated-oncentration graph and subdividing day.

QUALITY OF SURFACE WATERS, 1965

WILLOW CREEK BASIN Continued

14-360. WILLOW CREEK NEAR ARLINGTON, OREG. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cf.)

46
55
55
55
55

52
45
34
29
32

35
33
28
24
23

29
41
50
54
57

121
140
129
112
104

96
84
78
76
76

1848

0.

.

2,
3.
3.

1.
3.
2.
3.
2.

1 ,
1 f
1.8
0
0

0
0
0
0
0

0
0
0
0
0

0
26
4.6
.5
. 1
0

57.4

Suspended sediment

Mean
concen-

tration

(ppm)

32
39
30
35
30

32
19
8
13
22

14
12
8
4
11

12
33
23
38
40

1400
1280
690
386
287

235
174
128
135
190

-

JULY

C 33
33
33
33
33

33
33
33
33
33

33
33
C 33

_

>

_

_

65600
2670
562
168

Tons
per

day

A 4.0
5.8
4.5
5.2
4.5

4.
2.

.

1,
1.

1.
1.

.

.:

f
A 3.
3.
A 5.
A 6.2

J 500
484
240
117
81

61
39
27
28
39

1673.8

T
T
0.2
.3
. 3

. 1
. 3
.3
.3
.2

. 1
. 1
.2
0
0

0
0
0
0
0

0
0
0
0
0

0
S 10300
S 53
S 1.0
S .1
0

10356.6

MAY

Mean
dis-

charge
(cfs)

75
76
72
54
50

49
43
30
25
21

14
10
9.5
9.0
9.5

10
11
8.3
7.8
10

13
17
18
21
20

19
17
20
16
15
16

786.1

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

0
14
269
19
10

14
11
9.5
7.8
6.6
5.1

366.0

Suspended sediment

Mean
concen-

tration

(ppm)

84
69
53
45
25

20
17
16
15
57

28
16
16
16
16

16
16
16
48
38

36
35
35
35
35

35
35
35
35
35
35

-

AUGUST

_

_

_

67000
15500
6350

2600
3440
2150
1200
703
611

Tons
per

day

17
14
10
6.6
3.4

2.6
2.0
1.3
1.0
A 3.2

1.1
.4
.4
.4
.4

.4
. 5
4
.0
.0

.3
.6
.7
.0
.9

.8
. 6
.9
.5
.4
.5

85.3

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

0
9700
J 100000
795
171

98
102
55
B 25
13
8.4

110967.4

JUNE

Mean
dis-

charge
(cfs)

13
11
7.8
6.1
5.6

5.6
6.1
4.6
4.2
3.7

3.7
3.7
3.7
5.1
3.7

3.3
4.2
9.0
32
29

24
21
14
9.0
5.6

4.2
3.7
3.3
1.1
.8

251.8

Suspended sediment

Mean
concen-

tration

(ppm)

47
47
4
4
4

4
4
4
4
47

47
47
47
47
47

47
47

80
62

34
26
43

46

_

16

22
- -

-

Tons
per

day

1.6
1.4
1.0
. 8
. 7

. 7
.8

.

,

^

.
.
.

,

t
3.
A 6.
A 4.

2.
1.
1.
1.

B

,

.

,

.

35.6

SEPTEMBER

4.
4.
4.
3.
3.

3.
2.
2.
2.
2.

2.
2.
2.
2.
2.

3.
3.
3.
3.
3.

3.
3.
3.
2.
2.

2.
2.
2.
4.
5.

98.

677
570
378
224
186

153
136
88
73

35
35
35
35
35

65
65
65
65
65

65
65
65
65
65

65
65
65
65
65

980

7.7
6.5
4.3
2.2
1.9

1.5
1.1
. 7
.5
.4

. 2
. 2
. 2
.2
.3

.6
.6
6
6
. 6

. 6
. 6
. 6
.5
.5

.5
.5
.5
.8
.9

36.9

Total discharge for year (cfs-days).
Total load for year (tons)..........

29,078.9
1,717,926.8

S Computed by subdividing day.
T Less than 0.05 ton.
A Computed from partly estimated-concentration graph. B Computed from estimated-concentration graph.

C Composite period.
J Computed from partly estimated-oncentration graph and subdividing day.

WILLOW CREEK BASIN Continued

14-360. WILLOW CREEK NEAR ARLINGTON, OREG. Continued

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water;

Date of collection

Time

(24 hour)

2305
1550
2010
0920
1235
1600

1615
1600
0940
0930
1100
1020

1600
1135
0900
1530
1845

1000
0700
0930
1640
1730

Water
tem-

per-
ature

(°F)

43
39
38
35
37
37

39
35
40
47
50
39

45
63
63
74
79

71
63
66
67
71

Sam-

pling
point

Discharge
(cfs)

902
1240
632
349
135
112

147
390
660
1020
1400
604

254
136
54
35
23

5.1
254
110
49
10

Sediment
concen-

tration

(ppm)

21100
27200
5560
1980
1520
554

17800
22800
43500
13600
31800
6340

1120
710
166000
84200
20800

2790
69400
59100
40600
4100

Sediment

discharge
(tons per day)

51400
91100
9490
1870
554
168

7060
24000
80400
37500
120000
10300

768
261
26900
8250
1290

38
49400
18200
5570
111

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

16
9
8
13
10
15

25
16
11
9
12
9

10
12
20
33
40

62
24
24
37
88

0.004

22
13
11
15
11
15

40
24
15
12
16
9

13
17
33
54
65

86
37
42
59
00

0.008

34
21
17
23
15
23

57
34
23
18
27
15

19
24
53
82
88

97
58
65
85

0.016

48
34
27
40
24
44

82
52
41
28
44
24

29
37
74
100
100

100
84
89
100

0.031

68
57
43
61
49
80

92
71
65
46
66
42

52
59
82

98
100

0.062

84
80
67
85
74
90

93
84
85
73
86
59

70
77
100

100

0.125

95
94
88
96
94
99

95
94
97
93
95
88

91
93

0.250

100
99
100
100
100
100

100
100
100
100
100
99

100
100

0.500

100

100

1.000 2.000

Method
of

analysis

VPWC
VPWC
VPWC
VPWC
VBWC
VPWC

VPWC
VPWC
VPWC
VPWC
VPWC
VPWC

VBWC
VPWC
PWC
PWC
PWC

PWC
VPWC
PWC
PWC
PWC

ROCK CREEK BASIN

14-366. ROCK CREEK NEAR ROOSEVELT, WASH.

LOCATION. At gaging station at bridge on State Highway 12, 3.8 miles downstream from Harrison Creek, 4.2 miles upstream from mouth, and 14 miles west of Roosevelt, Klickitat County.
DRAINAGE AREA. 213 square miles.
RECORDS AVAILABLE. Water temperatures: October 1962 to September 1965.
Sediment records: October 1962 to September 1965.
EXTREMES, 1964-65. Sediment concentrations: Maximum daily, not determined; minimum daily, no flow on many days during October and November.
Sediment loads: Maximum daily, (estimated) 200,000 tons Dec. 22; minimum daily, 0 tons on many days during October and November. EXTREMES, 1962-65. Water temperatures (1962-64): Maximum, 75°F June 10, 18, 1963; minimum, freezing point Jan. 19, 20,
23, 24, 1963.
Sediment concentrations: Maximum daily, 7,500 ppm Feb. 3, 1963; minimum daily, no flow on many days.
Sediment loads: Maximum daily, (estimated) 200,000 tons Dec. 22, 1964; minimum daily,0 tons on many days.
REMARKS. No flow Oct. 1 to Nov. 9.

Temperature (°F) of water, water year October 1964 to September 1965

Month

November .....

January. ....

June ....

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

September .....

Day

1

47

42

51

2

47

40
45

53

70

3

46

46

55
52

4

44

45

54

73

5

46

55

6

40

53
55

7

53
63

8

51

55
58

9

51

55

10

51

57
65

11

43

50

12

49

59
66
65

13

52

58

14

61
60

15

50

54

16

51

39

61

17

45

58

18

50

40

19

45

58
60

20

49

40

48

60

21

61
63

22

50

62

23

43

62

24

45

63

70

25

43

67

26

39

40
44
44

62

27

40
45

62
6«

64

28

42

62

29

44

56

61
68

30

47

55

60

71

31

56

Aver-

age

58

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

ROCK CREEK BASIN Continued

14-366. ROCK CREEK NEAR ROOSEVELT, WASH. Continued

Suspended sediment, water year October 1964 to Se

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cf.)

0

Suspended sediment

Mean

tration

(ppm)

Ton.
per

day

0

JANUARY

300
280
260
240
222

200
200
200
180
180

180
220
260
300
340

350
340
332
330
322

380
436
440
450
460

468
1600
1750
1590
1250
1090

15150

6

4

3

1

_

7

12
1480
1060
370
180
110

-

4.9
4.5
4.2
3.9
3.6

3.2
2.8
2.4
2.1
1.9

2.1
2.4
2.7
3.0
3.4

3.8
3.1
2.7
1.5
.9

2.5
8.2
5.0
3.0
4.5

S 17
S 7930
5010
1590
608
324

15561.3

NOVEMBER

Mean
dis-

charge
(cfs)

0
0
0
0
0

0
0
0
0

. 1

.3
.7
. 7
. 7
. 6

.6
. 7
. 7
. 7
. 7

. 0
.3
.8
.2
.6

. 6
. 1
.8
. 5
.2

52.6

Suspended sediment

Mean

tration

(ppm)

_

__

- -

C 1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

Ton.
per

day

0
0
0
0
0

0
0
0
0
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

0.1

FEBRUARY

847
635
500
440
380

322
300
269
220
196

130
170
160
160
150

160
170
182
180
180

180
170
170
160
150

146
196
180

7103

26
15
12
8
6

7
7
7
7
2

2
2
2
2
2

2
2
2
2
2

2
2
27
8

3
32
10

~

59
26
B 16
B 9.5
B 6.2

6.1
5.7
5.1
4.1
1.1

. 7
.9
.9
.9
.8

.9
.9
1.0
1.0
1.0

1.0
.9
A 12
B 3.5
2.0

1.2
A 17
B 4.9

190.3

rtember 1965

DECEMBER

Mean
dis-

charge
(cfs)

15*
155
73
43
32

2*
19
19
18
18

18
18
17
17
12

8 5
7 0
6 0
5 0
4 0

10
4800
4800
1800
400

400
390
390
388
360
320

14725.5

Suspended sediment

Mean

tration

(ppm)

37
9
3
3
- -

__

2
2
2
2

2
2
2
2
2

_

-_

_

__

950

620
330
94
8
6
6

Ton.
per

day

S 28
3.8
6
. 3
2

tl
. 1
. 1
1
1

. 1
. 1
1
. 1
. 1

. 1
. 1
. 1
. 1
. 1

.2
200000
61000
17000
B 1000

670
B 350
B 99
8.4
8 5.8
B 5.2

280173.0

MARCH

170
158
148
138
126

120
120
116
108
106

102
96
85
75
70

70
70
60
54
42

46
48
53
47
41

59
55
48
43
45
43

2562

_

4
3
10
14

_

5
5
5
5

5
5
8
8
8

8
8
8
8
6

3.5
1.7
1.2
3.7
4>8

2.5
1.6
1.6
1.5
1.4

1.4
1.3
1.8
1.6
1.5

1.5
1.5
1.3
1.2
.7

.7
8
.9
.8
.7

1.0
.9
. 8
.7
.7
.7

46.0

S Computed by subdividing day.
T Less than 0.05 ton.
A Computed from partly estimated-concentration graph.

B Computed from estimated-concentration graph.
C Composite period.

QUALITY OF SURFACE WATERS, 1965

ROCK CREEK BASIN Continued

14-366. ROCK CREEK NEAR ROOSEVELT, WASH. Cont Inued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cf.)

40
38
40
39
38

37
38
35
34
26

30
32
29
29
29

29
25
27
29
29

29
29
28
25
25

25
23
24
23
22

906

Suspended sediment

Mean
concen-

tration

(ppm)

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

-

Tons
per

day

0.3
. 3
.3
.3
. 3

.3
.3
.3
. 3
. 2

.2
.3
. 2
. 2
.2

.2
. 2
. 2
. 2
.2

.2
. 2
.2
.2
.2

. 2
.2
. 2
. 2
.2

7.0

JULY

3.0
2.8
2.6
2.4
2.2

2.1
1.9
1.8
1.9
1.8

1.8
1.8
1.6
1.5
1.3

1.3
1.2
1.2
1.2
1.2

1.5
1.5
1.3
1.2
1.1

1.0
1.0
.9
.8
.7
.7

48.3

1

0.1

MAY

Mean
dis-

charge
(cfs)

22
22
21
20
18

21
20
20
19
19

18
16
16
16
16

16
16
15
16
16

16
15
14
13
13

13
12
11
10
10
10

500

Suspended sediment

Mean
oncen-

ration

(ppm)

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3
3

-

Tons
per

day

0.

,
,
,

t

,

.

,

t

,

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4.0

AUGUST

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17

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6

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2

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3

0.2

JUNE

Mean
dis-

charge
(cfs)

10
9.2
8.8
8.4
8.1

.0
6
. 3
. 3
.7

. 7
.0
. 7
.0
.0

4
.8
.7
.6
0

.4
.0
.8
.5
.2

.5
.2
.0
3.7
3.5

187.1

Suspended sediment

Mean
concen-

tration

(ppm)

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

~

per

day

0.1
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

1.1

SEPTEMBER

0.7
.7
.6
6
.6

6
.5
. 5
. 5
. 5

.5
.5
.5
6
. 6

.7
.7
.7
.7
.7

. 7
. 7
i7
. 7
. 7

. 7
. 7
9
1.0
1.1

19.9

4

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

0.2

Total discharge for year (cf s-days) .... 41 , 271 . 4 Total load for year (tons). 295, 983.3

T Less than 0.05 ton.
C Composite period.

JOHN DAY RIVER BASIN

14-480. JOHN DAY RIVER AT McDQNALD FERRY, OREG.

LOCATION. At gaging station at McDonald Ferry, 0.8 mile downstream from Rock Creek, 10 miles east of Klondike, Sherman County, and at mile 20.9.
DRAINAGE AREA. 7,580 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: August 1911 to August 1912, August 1960 to July 1962.
Water temperatures: October 1962 to September 1965.
Sediment records: October 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 78°F July 2; minimum, freezing point Dec. 17.
Sediment concentrations: Maximum daily, 66,500 ppm Dec. 22; minimum daily, 7 ppm July 23, 24.
Sediment loads: Maximum daily, 3,800,000 tons Dec. 22; minimum daily, 4 tons Oct. 1-5.
EXTREMES, 1962-65. Water temperatures: Maximum (1963-65), 83°F Aug. 22, 23, 1964; minimum, freezing point on many days during December to February.
Sediment concentrations: Maximum daily, 66,500 ppm Dec. 22, 1964; minimum daily, 2 ppm Oct. 11, 1962.
Sediment loads: Maximum daily, 3,800,000 tons Dec. 22, 1964; minimum daily, 1 ton on several days during 1962-64. REMARKS. Stream partly frozen over Dec. 17.

Temperature (°F) of water, water year October 1964 to September 1965

November .....

April ....

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

September .....

1

48

AQ

65

2

47

7 ft

64

3

46

50

57

4

45

i>l

62

5

50
44

64

6

42

61

7

43

58

8

43

68

9

44

CO

10

44

63

11

42

64

12

42

60

13

40

62

14

38

61

15

36

59

Day

16

36

71

51

17

35

37

Aft

54

18

37

a Q

49

19

38

CQ

50

20

38

54

21

38

66

22

36

59

23

35

57

24

45

59

25

44

57

26

41

58

27

37

57

28

39

53

29

41

53

30

40

50

31

Aver-

age

41

58

QUALITY OF SURFACE WATERS, 1965

JOHN DAY RIVER BASIN Continued

14-480. JOHN DAY RIVER AT McDONALD FERRY, OREG. Continued

Suspended sediment, water year October 1964 to September 1965

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

147
140
136
147
154

179
200
223
218
214

209
223
209
214
218

218
214
204
204
218

218
228
223
237
242

242
242
242
256
295
313

6629

Suspended sediment

Mean
concen-

tration

(ppm)

10
10
10
10
10

10
10
10
10
10

10
10
10
10
10

10
10
10
10
10

10
10
10
10
10

10
10
10
10
10
10

~

Tons
per
day

8

183

JANUARY

4980
4040
3560
3540
3340

3140
3440
3640
3160
2900

2880
2880
2790
2620
2620

2580
2510
2480
2530
2700

3030
3260
3280
4550
9560

8670
8880
8600
19400
28600
38300

198460

506
412
338
236
216

177
206
226
173
147

125
220
150
135
512

307
112
84
77
93

363
572
214
547
2840

1320
4830
2680
6120
4870
5980

-

6800
4490
3250
2260
1950

1500
1910
2220
1480
1150

972
1710
1130
955
3620

2140
759
562
526
678

2970
5030
1900
S 7130
S 79400

30900
S 126000
62200
321000
376000
618000

1670592

NOVEMBER

Mean
dis-

charge
(cfs)

337
325
337
414
388

368
368
381
374
388

381
381
381
374
394

394
394
362
362
343

301
307
331
343
355

388
483
597
748
662

11961

35000
20500
14500
11800
10200

9880
9700
7940
7220
6540

5790
5220
4790
5320
5300

4840
4600
4690
5030
5450

5510
5430
5270
5080
4840

4720
4640
4960

224760

Suspended sediment

Mean
concen-

tration

(ppm)

12
12
12
12
12

12
12
12
12
12

12
12
12
12
12

12
12
12
12
12

12
12
12
12
12

C 12
17
20
42
47

-

Tons
per
day

11
11
11
13
13

12
12
12
12
13

12
12
12
12
13

13
13
12
12
11

10
10
11
11
12

13
22
32
85
64

532

FEBRUARY

3650
2670
1600
1180
1470

686
582
362
399
226

175
160
149
169
134

124
121
88
152
186

182
191
125
103
91

90
110
122

345000
148000
62600
37600
40500

18400
15200
7760
7780
3990

2740
2260
1930
2430
1920

1620
1500
1110
2060
2740

2710
2800
1780
1410
1190

1150
1380
1630

721190

DECEMBER

Mean
dis-

charge
(cf.)

589
5B9
637
1010
1240

1050
865
766
645
565

605
766
856
920
722

295
240
248
258
415

1890
20400
25500
39400
35500

26800
18500
13900
9600
7270
5880

217921

Suspended sediment

Mean
concen-

tration

(ppm)

43
36
37
69
110

128
160
92
52
37

39
35
48
60
56

64
50
40
42
100

11000
66500
46500

6100

4460
3400
1600
1610
1070
756

-

Ton.
per
day

68
57
64
188
368

363
374
190
91
56

64
72
A 110
149
109

51
32
B 27
B 29
B 110

J 200000
S 3800000
S 2910000
E 1200000
A 580000

S 336000
170000
60000
41900
21100
12100

9333672

MARCH

5820
5080
4640
4360
4170

4040
3950
3970
4040
4110

4220
4310
4430
4190
3910

3780
3690
3670
3400
2940

2990
3050
2940
2970
2810

2650
2560
2720
2690
2510
2430

113040

184
150
98
107
178

90
75
71
80
76

81
89
78
70
70

81
67
63
49
57

55
49
60
38
28

22
27
29
16
16
24

2690
2060
1230
1260
2000

982
800
761
873
843

923
1040
933
792
739

827
668
624
450
452

444
404
476
305
212

157
187
213
116
108
157

23926

E Estimated.
S Computed by subdividing day.
A Computed from partly estimated-concentration graph. B Computed from estimated-concentration graph.

C Composite period.
J Computed from partly estimated-concentration graph and subdividing day.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

JOHN DAY RIVER BASIN Continued

14-480. JOHN DAY RIVER AT McDONALD FERRY, OREG. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

Day

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

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

11..
12..
13..
14..
IS..

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

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

26..
27..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

2560
2970
4000
4360
4130

4550
4760
4720
4500
4500

4760
4550
4260
4450
5170

6000
6760
7220
6710
7160

11100
13900
14000
13200
12200

12400
12100
11900
12100
13000

223990

Suspended sediment

Mean
concen-

tration

(ppm)

16
27
102
110
79

65
76
70
64
50

57
66
50
50
135

280
310
345
195
277

1520
1610
1260
845
595

530
482
464
488
571

Ton»
per
day

111
217
S 1150
1290
881

799
977
892
778
608

733
811
575
601
1880

4540
5660
6730
3530
5350

45600
60400
47600
30100
19600

17700
15700
14900
15900
20000

325613

JULY

1690
1580
1520
1440
1390

1340
1290
1170
1060
1000

923
840
790
740
710

662
624
568
514
505

496
471
514
662
901

780
700
633
586
523
523

27145

33
23
43
27
20

18
110
64
160
77

27
15
13
29

28
10
11
12
23

9
10
7
7
9

10
11
660
350
175
80

-

151
98
176
105
75

65
A 380
202
A 460
208

67
34
28
58
E 54

50
17
17
17
31

12
13
10
13
22

21
21
1130
554
247
113

4449

MAY

Mean
dis-

charge
(cf«)

13500
12900
11000
9280
8120

7370
6570
5900
5270
4840

4550
4500
4930
5710
6540

6600
6320
6370
6050
5710

5920
5790
5560
5710
5510

5000
4550
4260
4220
4690
5580

198820

Suspended sediment

Mean
concen-

tration

(ppm)

738
541
500
500
400

265
237
192
162
95

103
94
133
200
310

212
168
150
228
104

77
580
300
63
77

60
48
50
38
78
160

-

Tons
per
day

26900-
18800
14900
12500
8770

5270
4200
3060
2310
1240

1270
1140
1770
A 3100
A 5500

3780
2870
2580
3720
1600

1230
A 9100
4500
971
1150

810
590
575
433
988
2410

148037

AUGUST

523
480
454
437
404

614
604
523
454
428

389
358
358
342
299

350
446
350
350
350

299
350
462
586
604

652
652
671
740
690
624

14843

33

27
33
39

27
53
190
35
21

27
17
140
282
173

67
78
36
21
19

20
16
9200
970
520

1440
250
240
240
1110
555

~

47
E 39
33
39
43

45
A 86
A 270
43
24

28
16
A 140
260
140

63
94
34
20
18

16
15
J 12000
1530
848

2530
440
435
480
2070
935

22781

JUNE

Mean
dis-

charge
(cfs)

5530
5030
4640
4450
4550

4480
4330
4280
4110
3890

3670
3500
3440
3480
3160

3090
3070
3440
4310
4190

3460
3090
2810
2560
2370

2300
2380
2220
1990
1810

105630

Suspended sediment

Mean
concen-

tration

(ppm)

136
88
66
51
32

34
22
27
47
50

36
45
29
32
38

33
46
113
332
228

98
54
38
21
32

32
24
33
53
42

~

Tons
per
day

2030
1200
827
613
393

411
257
312
522
525

357
425
269
301
324

275
381
1050
3860
2580

916
451
288
145
205

199
154
198
285
205

19958

SEPTEMBER

577
532
496
462
428

404
373
342
335
335

321
292
278
271
264

264
258
258
258
278

358
350
342
342
335

328
321
321
306
285

10314

352
302
186
120
115

88
58
64
92
83

84
85
60
51
55

43
32
29
32
38

62
44
52
47
36

34
35
32
29
26

548
434
249
150
133

96
58
59
B 83
75

73
67
45
37
39

31
22
20
22
29

60
42
48
43
33

74
30
28
24
20

2672

Total discharge for year (cfs-days).
Total load for year (tons)..........

1,353,513
12,273,605

E Estimated.
S Computed by subdividing day.
A Computed from partly estimated-concentration graph.

B Computed from estimated-concentration graph.

J Computed from partly estimated-concentration graph and subdividing

JOHN DAY RIVER BASIN Continued

14-480. JOHN DAY RIVER AT HcDONALD FERRY, OREG. Continued

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

Jan. 14, 1965.....

Time

(24 hour)

1130
1300
2400
1230
1750

1235
1400
0815
0910
1910

1230
1220
1220
1715
1205

1220
1805
1040
0830
1425

Water
tem-

per-
ature

(°F)

37

37
36
36
40
40

42
46
46
41
44

56
54
52
70
75

Sam-

pling
point

Discharge
(cfs)

1030
1300
10400
37900
12800

9220
5840
2560
10600
10800

9000
21200
21200
40600
10500

6000
13600
11200
642
514

Sediment
concen-

tration

(ppra)

73
107
70200
47500
2300

1880
724
146
4490
2390

5370
7470
7470
5300
1100

294
1260
589
380
13100

Sediment

discharge
(tons per day)

209
376
2040000
5040000
79500

46800
11400
1010
129000
69700

130000
428000
428000
581000
31200

4760
46300
17800
659
18200

Percent finer than size Indicated, in millimeters

0.002

53
50
18
16
18

11
18
64
33
21

12
6
13
6

18
14
9
93
41

0.004

65
67
26
25
18

15
26
67
42
30

15
8
18
9

22
19
13
100
64

0.008

74
78
40
37
25

21
34
77
55
39

20
13
26
16

28
25
20

88

0.016

84
87
64
58
35

31
47
84
72
54

30
20
38
27

42
35
29

100

0.031

91
94
91
86
51

48
65
92
88
71

46
35
51
40

59
47
41

0.062

97
99
99
97
71

71
78
97
97
90

86
71
71
73
66

77
64
53

0.125

99
100
100
100
89

87
90
100
100
98

95
91
91
89
88

90
84
75

0.250

100

98

97
99

100

99
99
99
98
99

98
98
94

0.500

::

100

100
100

100
100
100
100
100

100
100
100

1.000 2.000

Method
of

analysis

VBWC
VBWC
VPWC
VPWC
VPWC

VPWC
VPWC
VBWC
VPWC
VPWC

V
VPWC
VPN
VPWC
VPWC

VPWC
VPWC
VPWC
PWC
PWC

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN 241

[3
0

PS

8
PS

OS

M
OS

i

CO

g

in to

4

i

D rH 1 <H o) a

<H £> >.V
1) 8 rH 0
r, S Rl 0)
P 30

rH 1> Rl bO
t) CQ »-j fj
> -H
rH 0 TJ rH

3 * § §
<H tO r4 01

O O) Q) >*
rH .Q R)

4) rH OrH

A r? Q n

+J 0)
3 - bO >

01 tO -H 01

0) rH

4) TJ O
rH -P
H 01 01 fe

8 g> R?»
O 3 TJ M

tO rH -

O Rl g

M fl> 8
1) O) > TH

0 rH B

S b ° ,o

? (d r*4 lO o* 3001

§ * V
m a -

3 H a rH

t) -H
rH rH 8 j>,

10 J3 - 3

a a t ^

B

S rH
P 1 h

01 CQ to
1> >>
rH O rH «

B 'S 3

IN rH O Rl

Ci 4)

o -g § H a 3 01 p 53 a o

Rl +J -H rH

P O, M 3 01 D d +J

bO rH rH -P

OI'HJ 3
Rl D Rl Rl t)
tO rH rH rH +J

rH 1-1 4) t) Rl

o IN a a i

8

rH +J +J .tO

D Rl in O)
t) rH 3 rH rH tO rH

8 01 +-> +J O) >>
D Rl Rl Ifl rH

3 Rl 0 1 1 H 3

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DESCHUTES RIVER BASIN Continued

14-874. CROOKED RIVER BELOW OPAL SPRINGS, NEAR CULVER, OREG.

LOCATION. Temperature recorder at gaging station, 800 feet below Opal Springs, 4.8 miles southwest of Culver, Jefferson County, and at mile 6.7.
DRAINAGE AREA. 4,300 square miles, approximately, of which 500 square miles is probably noncontributing.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 58°F on several days during June; minimum, 39°F Dec. 29, 30.
EXTREMES, 1963-65. Water temperatures: Maximum, 59°F on many days during June and July 1964; minimum, 39°F Dec. 29, 30, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

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DESCHUTES RIVER BASIN Continued

14-915. METOLIUS RIVER NEAR GRANDVIEff, OREG.

LOCATION. Temperature recorder at gaging station at Monty Forest Camp, 9 miles northwest of Grandview, Jefferson County, and 15 miles northwest of Culver.
DRAINAGE AREA. 316 square miles, hydrologic drainage boundary uncertain owing to ground-water exchange.
RECORDS AVAILABLE. ffater temperatures: July 1952 to September 1965.
EXTREMES, 1964-65. ffater temperatures: Maximum, 53°F on several days during July and August; minimum, 38°F Dec. 20, 22, 23. EXTREMES, 1952-65. ffater temperatures: Maximum, 56°F July 5, 1957; minimum, 37°F Jan. 30, 31, 1963.

Temperature (°F) of water, water year October 1964 to September 1965

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DESCHUTES RIVER BASIN Continued

14-1030. DESCHUTES RIVER AT MOODY, NEAR BIGGS, OREG.

LOCATION. Temperature recorder at gaging station at Moody, Sherman County, 4 miles southwest of Biggs, and at mile 1.4. DRAINAGE AREA. 10,500 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: August 1911 to July 1912, December 1952 to February 1954.
Water temperatures: December 1952 to February 1954, November 1954 to September 1958, June 1962 to September 1965. EXTREMES, 1964-65. Water temperatures: Maximum, 68°F July 28-30; minimum, 35°F Dec. 17, 18.
EXTREMES, 1952-58, 1962-65. Water temperatures: Maximum, 72°F July 12, 13, 1964; minimum, 33°F Dec. 30, 1955. Temperature (°F) of water, water year October 1964 to September 1965

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DESCHUTES RIVER BASIN Continued

14-1030. DESCHUTES RIVER AT MOODY, NEAR BIGGS, OREG. Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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

Time

(24 hour)

1220

Water
tem-
per-
ature
(°F)

41

Sam-

pling
point

Discharge
(cfs)

68900

Sediment
concen-

tration

(ppm)

9780

Sediment

discharge
(tons per day)

1820000

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

23

0.004

28

0.008

37

0.016

49

0.031

64

0.062

73

0.125

85

0.250

95

0.500

100

1.000 2.000

Method
of
analysis

VPWC

COLUMBIA RIVER HA IN STEM

14-1057. COLUMBIA RIVER NEAR THE DALLES, OREG.

LOCATION. At The Dalles Dan, 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 1965.
Water temperatures: December 1950 to September 1965.
EXTREMES, 1964-65. Dissolved solids: Maximum, 152 ppm Dec. 27-29; minimum, 59 ppm May 27 to June 16.
Hardness: Maximum, 85 ppm Dec. 27-29; minimum, 50 ppm May 27 to June 16.
Specific conductance: Maximum daily, 253 micromhos Dec. 27, 28; minimum daily, 105 micromhos June 16, 24.
Water temperatures: Minimum, 35°F Dec. 31.
EXTREMES, 1950-65. Dissolved solids: Maximum, 163 ppm Dec. 2-11, 14, 1955; minimum, 59 ppm May 27 to June 16, 1965. 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, 97 micromhos June 11, 1964.
Water temperatures: Maximum (1950-64), 81°F Aug. 12, 13, 1958; minimum, freezing point on several days during winter months. REMARKS. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff. Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
at
collection

Oct. 1-31, 1964..

Nov. 30-Dec. 9. . .

Dec. 30- Jan. 2,

Jan. 27- Feb. 3...

Feb. 16-Mar. 15. .
Mar. 16- Apr. 12..

Apr. 24-May 17...
May 18-26. ....

Mean

discharge
(cfs)

121000
107400
130500
165600
259000

171200
160800
253800
246000
239100

209200
161200
263600
390400
406600

Silica

(810,)

6.3

13

13

Iron

(Fe)

Cal-

cium

(Ca)

21

21

19

Mag-
ne-

sium

(Mg)

5.3

6.7

5.4

Sodium

(Na)

7.7
11
11
9.3
16

11
10
9.6
7.4
9.7

9.9

7.0
5.7
4.3

Po-
tas-

sium

(K)

1.8

1.9

1.5

Bi-
car-

bon-

ate

(HCOJ

86
92
95
86
101

73
92
87
64
96

76

78
70
63

Car-
bon-
ate

(CO,)

0
0
0
0
0

0
0
0
0
0

0

0
0
0

Sulfate

(S0«)

17

20

15

Chloride

(Cl)

3.0

4.5

3.0

Fluo-

ride

(F)

0.2

.3

.3

Ni-

trate

(NOJ

0.6

1.5

.9

Bo-

ron

(B)

0.04

.00

.00

Dissolved solids

(residue at 180°C)

Parts

per
million

107
115
126
114
152

115
121
118
107
118

120
120
106
95
79

Tons

per
acre-

foot

0.15
. 16
. 17
. 16
.21

. 16
. 16
. 16
. 15
. 16

. 16
. 16
. 14
. 13
. 11

Tons

per

day

34960
33350
44400
51000
106300

53160
52500
80860
71070
76190

67780
52230
75440
100100
86730

Hardness

asCaCO,

Cal-

cium,
Mag-
ne-

sium

74
79
83
74
85

62
80
73
54
72

78
82
70
62
56

Non-
car-

bon-

ate

3
4
5
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16
7
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ratio

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Specific
con-

duct-

ance

(micro-
mhos at

25°C)

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202
213
191
242

172
206
189
142
187

194
199
171
148
132

PH

7.6
8.0
8.0
7.6
7.5

7.3
7.8
7.9
7.5
7.7

7.7
7.7
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7.6
7 ?

June 17-28. 1965.

June 29- July 16. .
July 17- Aug. 2. . .

Sept. 19-30......

Weighted average

Time-weighted
average. .....

Tons per day. . .

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351200
228200

107800

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224450

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3.9
3.9

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9.4

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7.5

7.6

Temperature (°F) of water, water year October 1964 to September 1965

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December .....

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

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

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

September .....

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COLUMBIA RIVER MAIN STEM Continued

14-1057. COLUMBIA RIVER NEAR THE DALLES, OREG. Continued

Specific conductance (micromhos at 25°C), water year October 1964 to September 1965 -1 . r_ . r_ r__ ! . . ! . _ ! . j . j _ f_
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KLICKITAT RIVER BASIN

14-1130. KLICKITAT RIVER NEAR PITT, WASH.

LOCATION. Temperature recorder at gaging station, 3.5 miles south of Pitt, Klickitat County, 5 miles upstream from Silvias Creek, and 7 miles upstream from mouth at Lyle.
DRAINAGE AREA. 1,297 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1959.
Water temperatures: August 1950 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 66°F July 15, 16, 27, 28; minimum, freezing point Dec. 21, 22.
EXTREMES, 1950-65. Water temperatures: Maximum, 69°F July 28, 29, 1958, July 18, 1960; minimum, freezing point Jan. 31 to Feb. 4, 1956, Jan. 3-7, 1959, Dec. 11, 12, 1961, Dec. 21, 22, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

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57
51

Average

49
47

42
40

36
36

38
37

42
40

44
41

48
46

52
48

59
54

63
58

62
57

55
51

COLUMBIA RIVER MAIN STEM

14-1427. COLUMBIA RIVER AT WASHOUGAL, WASH.

LOCATION. Cross-section No. 2, at Washougal, Clark County, on a line perpendicular to stream channel and through navigational light 50, 1.1 miles downstream from Reed Island, and 1.8 miles upstream from the mouth of Washougal River.
RECORDS AVAILABLE. Chemical analyses: October 1964 to September 1965.
REMARKS. Samples for chemical and biological analyses collected at quarters points A (right bank), B (center), and C (left bank). No discharge records available Chemical analyses of water, water year October 1964 to September 1965

Date of
collection

Oct. 14, 1964....

Feb. 10, 1965....

Mar. 24. ....

Time

(24 hr)

0930
0925
0920

0940
0935
0930

0950
0950
0940

0955
0950
0950

1015
1010
1000

0950
0950
0945

1015
1010
1000

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

Tem-

pera-
ture
(°F)

60
60
60

54
54
54

52
52
53

40
40
40

42
42
42

44
44
44

44
45
45

Bi-
car-

bon-
ate

(HC03)

84
84
84

84
84
84

89
88
88

74
75
75

85
84
85

87
87
87

88
88
88

Car-
bon-
ate

(C03)

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-

cal
demand

ppm)

1.5
.8
.7

1.7
1.6
1.5

.8
1.0
1.2

2.9
2.8
2.4

1.2
.6
.7

1.4
.9
. 7

1.8
1.6
1.1

M. P. N.

(most
probable
number
coliform

groups
per

100 ml)

P. B. I.

(Pearl-
Benson
Index
A

0
0
0

2
2
0

0
0
1

7
5
1

2
5
3

4
4
3

1
1
1

Slime solids

Settle-

able

(ml/1)

2
2
2

3
3
3

Trace

Trace

Trace

Trace

Total

(mg/1)

103
103
103

116
116
116

7

13

7

31

Vol-

ume

(ml/1)

32
32
32

38
38
38

2

3

2

16

Chromium

Hexa-
valent

(Cr«)

Total

(Cr)

Cop-
per

(Cu)

Spe-
cific
con-

duc-
tance

(micrc
mhos
at

25°C)

176
178
177

182
182
183

186
193
193

156
161
161

185
185
185

191
191
191

190
189
189

PH

8.1
8.0
8.1

7.7
8.0
7.9

8.0
7.9
7.9

.8
.8
. 8

.7
.5
.5

. 6
. 6
. 6

.8
.7
. 7

Phosphate
(P04)

Ortho

0.02
.02
.02

.04
.04
.04

.23
.20
.22

.20
.20
.21

.24
.24
.24

. 15
. 15
. 18

Total

0.08
.08
.08

. 14
. 11
. 11

. 10
.09
.08

.27
.22
.23

.20
.21
.22

.40
.38
.37

.27
. 26
.26

Total
nitro-

gen
asN

0.4
.2
.0

. 6
.2
.5

5.1
. 1
. 1

. 5
.4
. 5

.7
.7
1.0

.6
. 5
1.0

.7
.6
. 7

Am-
mon-

ium

(NH4)

0.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

May 19

July 14.. ....

0935

0955

1015

0935

0930

0925

0920

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

47
47
47

51
51
52

51
51
51

55
55
55

_

~

58
58
59

62
62
62

65
66
65

89
88
88

76
74
74

64
64
64

68
68
68

60
60
60

54
52
52

60
62
61

66
66
66

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

A Sulfite waste liquor (lignin sulfonate).

1.2
1.0

1.6
1.6
1.0

2.4
. 8

192
191
191

159
158
159

134
134
133

142
142
141

119
119
119

106
106
106

124
124
125

131
130
130

8.1
8.1
8.1

7.8
7.8
7.8

7.8
7.8
7.8

7.8
7.8
7.9

7.9
7.8
7.9

7.6
7.5
7.4

8.1
8.1
8.1

8.2
8.2
8.2

. 12
. 12
. 12

. 11
. 11
. 13

. 12
. 12
. 13

.09
. 10
.09

.04
.04
.04

.05
.05
.05

.03
.03
.03

.01
.01
.01

. 27
.24
.22

.33
.43
.30

.43
.69
.87

.23
. 52
. 58

.77
.37
.87

. 51
.65
. 55

. 33
.35
.70

.20
.20
.20

.3
.3
.3

. 1
.2
.2

. 1
.2
.2

. 1
.0
. 1

.0
.0
.0

.0
.5
. 1

. 0
.0
.0

.0
.2
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

0.0
.0
.0

.0
.0
.0

.0
.0
.0

. 0
. 0
.0

.0
.0
.0

COLUMBIA RIVER MAIN STEM Continued

14-1427. COLUMBIA RIVER AT WASHODGAL, WASH. Continued

Chemical analyses of water, water year October 1964 to September 1965 Continued

Date of
collection

July 28, 1965 ....

Sept. 22. ....

Time

(24 hr)

0940
0930
0930

0930
0925
0920

0940
0935
0930

0935
0930
0925

0935
0936
0925

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

Tem-

pera-
ture

(°F)

67
67
67

71
71
71

69
70
70

65
65
65

65
62
62

Bi-
car-

bon-
ate

(HCOs)

71
71
72

74
74
74

75
75
75

81
82
82

90
91
92

Car-
bon-
ate

(C<>3)

0
0
0

0
0
0

1
0
1

0
0
0

0
0
0

D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-
cal
demand

ppm)

.2
.8
.0

.9
.0
.6

.4
.2
.0

. 6
.2
. 1

.0
. 8
.6

M. P. N.

(most
probable
number
coliform

groups
per

100 ml)

P.B.I.

(Pearl-
Benson
Index

A

3
2
2

0
0
0

0
0
0

2
2
1

0
0
0

Slime solids

Settle -
able

(ml/1)

1

l

1

23

2

Total

(mg/1)

45

39

83

868

136

Vol-

ume

(ml/1)

14

11

26

238

27

Chromium

Hexa-

valent

(Cr«)

Total

(Cr)

Cop-

per

(Cu)

Spe-
cific
con-

duct-

ance

'micro

at
25°C

142
142
142

148
147
147

154
154
154

168
167
168

190
192
190

pH

8.2
8.2
8.2

7.7
7.8
7.8

8.4
8.3
8.4

8.2
8.2
8.2

8.1
8.1
8.1

Phosphate
(P04)

Ortho

0.02
.02
.02

.03
.04
.04

.02
.03
.02

.05
.03
.02

.04
.03
.03

Total

0,22
. 12
. 11

. 13
. 13
. 12

. 16
. 16
. 17

. 15
.22
. 17

.33
. 14
.21

Total
nitro-

gen
as N

0.0
.0
.0

.0

.1
.6

.0
. 1
.0

.0
.0

.1

.2
.1
.4

Am-
mon-

ium

(NH«)

0.0
.0
.0

.0
.0
.0

.0
. 0
.0

.0
.0
.0

.0
.0
.0

A Sulfite waste liquor (lignin sulfonate).

COLUMBIA RIVER MAIN STEM Continued

14-1447. COLUMBIA RIVER AT VANCOUVER, WASH.

LOCATION. At gaging station near right bank in control house of Interstate Highway 5 bridge, at south edge of Vancouver, Clark County, 5.0 miles upstream from Willamette River, and at mile 106.5.
DRAINAGE AREA. 241,000 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: October 1964 to September 1965 (discontinued).
Sediment records: October 1963 to September 1965.
EXTREMES, 1963-65. Sediment concentrations: Maximum daily, 196 ppm June 13, 1964; minimum daily, Sppmon several days during October, 1963.
Sediment loads: Maximum dally, 317,000 tons June 13, 1964; minimum dally, 1,200 tons Oct. 2O, 1963.
EXTREMES, 1964-65. Sediment concentrations: Maximum dally, 2,660 ppm Dec. 25; minimum daily, 6 ppm on many days during October and November. Sediment loads: Maximum daily, 3,510,000 tons Dec. 25; minimum daily, 1,280 tons Nov. 22, 23.
EXTREMES. 1963-65 Sediment concentrations: Maximum daily, 2,660 ppm Dec. 25, 1964; minimum daily, 5 ppm on several days during October 1963. Sediment loads: Maximum daily, 3,510,000 tons Dec. 25, 1964; minimum daily, 1,200 tons Oct. 20, 1963. ., ~ ,..,.. i, v\ REMARKS._Samples of chemical and biological analyses collected at quarter points A (right bank), B (center), and C (left bank;.

Chemical analyses of October 1964 to September 1965

Date of
collection

Oct. 14, 1964....

Feb. 10, 1965....

A Sulfite waste

Time

(24 hr)

1225
1230
1232

1240
1245
1250

1310
1315
1320

1245
1250
1250

1225
1230
1230

1225
1225
1225

liquor

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

(lign

Tem-

pera-
ture
(°F)

60
60
60

55
54
54

52
52
53

41
41
41

42
42
42

44
44
44
In sul

Bl-
car-

bon-
ate

(HC03)

83
83
83

84
84
84

87
89
88

74
74
73

84
85
84

86
88
86

f onate) .

Car-
bon-
ate

(CO;.)

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-

cal
demand

ppm)

0.9
.8
.8

2.3
1.4
1.3

1.1
.6
1.0

1.9
2.3
2.2

.7
.6
1.0

.8
.5
.6

M. P. N.

(most
probable
number
coliform

groups
per

100 ml)

P.B.I.

(Pearl-
Beruon
Index
A

0
0
0

2
1
0

3
0
0

9
15
12

3
0
2

2
1
1

Slime solids

Settle -
able

(ml/1)

3
3
3

2

Total

(mg/1)

95
95
95

103

Vol-

ume

(ml/1)

22
22
22

24

Chromium

Hexa-

valent

(Cr«)

Total

(Cr)

Cop-

per

(Cu)

Spe-
cific
con-

duct-

ance

jnicrO'
mhos
at

25°C)

176
175
174

183
182
180

191
191
182

158
159
156

184
184
183

191
190
190

PH

7.9
8.0
7.8

7.9
7.9
7.9

7.9
8.0
8.0

7.8
7.8
7.8

7.5
7.6
7.5

7.5
7.6
7.5

Phosphate
(PO*)

Ortho

0.02
.02
.02

.03
.03
.03

.21
.23
.20

.20
.20
.20

.22
.23
.22

Total

0.25
.09
. 10

. 10
.11
. 10

.07
.07
.08

.24
.25
.23

.21
.21
.22

.33
.37
.33

Total
nitro-

gen
asN

0.3
.0
. 1

.4
.2
.5

. 1
.0
. 1

.4
. 5
.4

.8
.8
.5

. 5
. 5
.6

Am-
mon-

ium

(NKU)

0.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

COLUMBIA RIVER MAIN STEM--Continued

14-1447. COLUMBIA RIVER AT VANCOUVER, WASH. Continued

Chemical analyses of water, water year October 1964 to September 1965 Continued

Date of
collection

Mar. 24, 1965....

Apr. 21. ....

May 5 ....

May 19. ....

July 14. ....

July 28. ....

July 28. ....

Time

(24 hr)

1330
1336
1330

1300
1305
1310

1230
1235
1240

1300
1305
1310

1210
1215
1220

1210
1215
1220

1210
1215
1220

1230
1230
1240

1225
1230
1235

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

Tem-

pera-
ture

(°F)

45
45
45

52
52
52

51
51
51

55
55
55

60
59
59

63
63
63

66
66
66

69
68
68

Bi-
car-

bon-
ate

(HC03)

88
88
88

74
75
73

64
64
64

68
68
68

62
60
58

53
53
53

62
62
62

65
66
66

70
70
72

Car-
bon-
ate

(C03)

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-
cal
demand

ppm)

0.7
1.1
.8

.8
1.1
1.1

1.0
1.2
1.5

0.3
1.4
.4

1.1
1.0
1.7

.8
.6
.8

1.6
1.3
1.1

.6
1.0
1.1

1.6
1.2
1.3

M. P. N.

(most
probable
number
coliform

groups
per

100 ml)

P.B.I.

(Pearl-
Benson
Index
A

3
2
0

2
2
1

6
5
4

13
12
4

8
5
3

19
7
5

12
8
4

5
8
2

Slime solids

Settle-

able

(ml/1)

Trace

3

1

Total

(mg/1)

12

271

54

Vol-

ume

(ml/1)

4

42

13

Chromium

Hexa-
valent

(Cr»)

Total

(Cr)

Cop-

per

(Cu)

Spe-
cific
con-

duct-

ance

micro-
mhos
at

25°C)

190
190
189

158
160
157

134
134
134

143
142
142

119
118
119

106
106
106

124
124
125

131
131
131

142
141
142

PH

.8
.8
. 8

.8
.8
.8

.7
.8
. 8

.8
.8
.8

.0
.9
.9

.3
.4
.5

8.0
8.2
8.1

8.2
8.2
8.2

8.2
8.2
8.2

Phosphate
(P04)

Ortho

0.15
. 19
. 15

. 11
. 11
. 11

. 12
. 12
. 13

.09
.09
. 10

.06
.04
.04

.05
.06
.05

.02
.03
.03

.01
.01
.01

.02
.02
.02

Total

0.26
.25
.27

.32
.40
.36

.58
. 77
. 75

. 3?
. 52
.33

. 71
.60
.47

.40
.45
.55

.45
.49
.28

.24
.22
.20

. 12
.21
. 12

Total
nitro-

gen
as N

0.4
.3
.3

. 1
.0
.0

.2
. 1
. 2

. 1
.0
. 1

,0
.0

.1

.2
. 1
.3

.0
.0
.0

.0
.3
. 1

.0
.0
.0

Am-
mon-

ium

(NH*)

0.0
.0
.0

.0
.0
.0

.0
.0
.0

. 0
,0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

OOO OOO O <

OOO O iH i

^ iH W t- C- C- tO I

o o o o ooo o*

Ol <J) Ol O

I Tf I I CO

IOO OOO WrHr

OOO OiHiH OOO O O <

rHiHiH OOO tDlPlD m n t

< ffl O < pq O < CQ ^J> <! ffl O

_ OOO Oirt^ OOO
*O NMM COCO^JI MCO^t" P

- - eg oa N
OlO O 00 C

D §* C

QUALITY OF SURFACE WATERS, 1965

COLUMBIA RIVER MAIN STEM Continued

14-1447. COLUMBIA RIVER AT VANCOUVER, WASH. Continued

Suspended sediment, water year October 1963 to September 1964

Day

1..
2..
3..
4..
9..

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

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

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

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

26..
27.
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(K cfs)

93.0
98.0
93.0
95.8
100

101
101
90.8
100
93.0

99.5
90.9
99.5
98.6
104

101
92.9
95.8
93.0
89.1

93.0
107
102
91.8
104

105
104
88.4
101
93.9
104

3024.0

Suspended sediment

Mean
concen-

tration

(ppm)

8
8
8
7
7

6
6
6
*

6

5
5
5
5
5

5
5
5
5
5

5
5
6
7
8

9
10
11
11
11
11

Tons
per
day

2010
2120
2010
1810
1890

1640
1640
1470
1620
1510

1340
1230
1340
1330
1400

1360
1250
1290
1260
1200

1260
1440
1650
1740
2250

2590
2810
2630
3000
2790
3090

55930

JANUARY

98.0
106
104
101
95.8

103
116
112
109
117

116
105
99.5
108
101

105
102
97.6
108
118

117
113
124
117
134

165
141
143
140
139
133

3587.9

14
10
9
9
10

10
11
11
11
10

10
10
10
10
9

9
9
8
8
8

8
10
10
10
16

30
28
24
20
18
15

3700
2860
2530
2450
2590

2780
3450
3330
3240
3160

3130
2830
2690
2920
2450

2550
2480
2110
2330
2550

2530
3050
3350
3160
5790

13400
10700
9270
7560
6760
5390

127090

NOVEMBER

Mean
dis-

charge
(K cfs)

97.6
97.6
92.4
98.6
106

112
101
125
115
100

107
100
92.8
87.0
98.6

104
104
103
104
115

108
101
98.6
103
99.5

88.0
104
100
98.6
93.0

3054.3

135
126
119
123
128

115
112
116
108
109

126
126
127
118
124

123
117
126
139
140

126
122
116
115
120

118
117
104
109

3504

Suspended sediment

Mean
concen-

tration

(ppm)

12
12
13
13
14

15
16
17
16
15

14
12
11
10
9

8

7
7

7
7
8
8
10

~

Tons
per
day

3160
3160
3240
3460
4010

4940
4360
5740
4970
4050

4040
3240
2760
2350
2400

2250
1970
1670
1680
1860

1750
1640
1860
1950
1880

1660
1970
2160
2130
2510

84420

FEBRUARY

15
15
15
20
26

24
22
20
16
12

12
12
11
11
10

10
10
10
10
9

9
8
8
8
8

8
8
8
9
»

5470
5100
4820
6640
8990

7450
6650
6260
4670
3530

4080
4080
3770
3500
3350

3320
3160
3400
3750
3400

3060
2640
2510
2480
2590

2550
2530
2250
2650

118650

DECEMBER

Mean
dis-

charge
(K cfs)

95.8
92.7
105
108
101

104
102
107
102
107

114
106
106
108
101

103
113
113
111
114

115
110
110
112
107

9B.6
98.6
104
106
97.6
93.0

3265.3

114
123
116
116
122

113
104
96.7
99.5
94.9

103
131
130
121
128

134
135
136
132
125

120
121
111
116
133

122
121
126
122
115
119

3700.1

Suspended sediment

Mean

tration

(ppm)

12
18
16
12
10

9
8

10
12
14
16

MARCH

9
9
9
8
8

8
7
7
7
7

8
10
10
10
9

9
8
8
7
7

7
8
8
8
8

9
9
10
10
10
10

Tons
per
day

3100
4510
4540
3500
2730

2530
2200
2020
1650
1730

1850
1720
1720
1750
1640

1670
1830
1830
1800
1850

1860
1780
1780
1810
2020

2130
2400
2810
3430
3690
4020

73900

2770
2990
2820
2510
2640

2440
1970
1830
1880
1790

2220
3940
3910
3270
3110

3260
2920
2940
2490
2360

2270
2610
2400
2910
2870

2960
2940
3400
3290
3100
3210

84820

K Expressed in thousands.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

COLUMBIA RIVER MAIN STEM Continued

14-1447. COLUMBIA RIVER AT VANCOUVER, WASH. Continued

Suspended sediment, water year October 1963 to September 1964 Continued

Day

!
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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(K cfs)

125
138
155
150
145

109
113
124
110
123

120
121
129
138
152

158
159
156
143
130

140
154
172
178
167

158
155
155
158
163

4298

Suspended sediment

Mean
concen-

tration

(ppm)

11
11
12
14
16

15
14
14
13
13

12
12
12
15
20

25
20
18
17
17

18
18
C 18
C 18
C 18

C 18
C 18
C 16
C 16
C 16

Tons

per
day

3710
4100
5020
5670
6260

4410
4270
4690
3860
4320

3890
3920
4180
5590
8210

10700
8590
7580
6560
5970

6800
7480
8360
8650
8120

7680
7530
6700
6830
7040

186690

JULY

563
522
492
456
448

435
421
416
424
434

432
421
408
406
400

396
390
381
368
361

348
344
345
320
296

272
289
274
265
240
191

11758

98
72
70
66
64

60
42
40
46
49

47
44
40
36
50

39
42
42
42
42

34
34
34
34
34

34
34
22
22
22
22

149000
101000
93000
81300
77400

70500
47700
44900
52700
57400

54800
50000
44100
39500
54000

41700
44200
43200
41700
40900

31900
31600
31700
29400
27200

25000
26500
16300
15700
14300
11300

1489900

MAY

Mean
dis-

charge
(K cfs)

173
179
180
190
191

212
195
176
180
182

199
211
240
291
274

288
301
289
313
360

385
411
44?
447
422

386
370
370
368
383
413

9024

Suspended sediment

Mean
concen-

tration

(ppm)

C 16
C 16
C 16
C 16
C 25

C 25
C 25
C 25
C 25
C 25

C 25
28
32
50
50

47
50
52
64
93

106
108
178
150
122

72
77
76
73
84
100

Tons
per
day

7470
7730
7780
8210
12900

14300
13200
11900
12100
12300

13400
16000
20700
39300
37000

36500
40600
40600
54100
90400

110000
120000
214000
181000
139000

75000
76900
75900
72500
86900
112000

1759690

AUGUST

190
224
254
241
219

212
209
185
160
170

180
180
155
160
170

175
175
175
170
165

161
153
154
152
152

160
157
145
130
131
133

5397

C 22
C 22
C 22
21
21

20
20
18
15
C 13

C 13
C 13
C 13
C 13
13

12
12
C 12
C 12
C 12

C 12
10
10
C
C

C
C
C

8
8

11300
13300
15100
13700
12400

11400
11300
8990
6480
5970

6320
6320
5440
5620
5970

5670
5670
5670
5510
5350

5220
4130
4160
3690
3690

3890
3820
3520
3160
2830
2870

208460

JUNE

Mean
dis-

charge
(K cfs)

440
448
461
474
520

522
529
523
564
581

593
580
599
614
611

616
617
649
675
658

654
648
642
638
629

620
625
623
613
598

17564

Suspended sediment

Mean
concen-

tration

(ppm)

158
110
110
110
110

110
110
116
122
132

181
153
196
150
128

132
138
132
155
145

130
123
119
119
119

119
119
119
119
92

Tons pel-
day

188000
133000
137000
141000
154000

155000
157000
164000
186000
207000

290000
240000
317000
249000
211000

220000
230000
231000
282000
258000

230000
215000
206000
205000
202000

199000
201000
200000
197000
149000

6154000

SEPTEMBER

132
121
125
134
132

114
99.5
108
114
134

126
117
118
117
119

118
125
124
98.6
101

101
97.6
107
96.7
106

105
100
107
114
118

3429.4

8
8
10
a
8

8
7
C 7
C 7
C 7

C 7
7
7
C 7
C 7

C 7
C 7
C 7
8
9

10
11
12
10
10

1111

12
12
11

2850
2610
3370
2890
2850

2460
1880
2040
2150
2530

2380
2210
2230
2210
2250

2230
2360
2340
2130
2450

2730
2900
3470
2610
2860

3120
2970
3470
3690
3500

79740

Total discharge for year (K cfs-days). .... 71606.0 Total load for year (tons) .... 10423290 C Composite period.
K Expressed in thousands.

QUALITY OF SURFACE WATERS, 1965

COLUMBIA RIVER MAIN STTEII Continued

14-1447. COLUMBIA RIVER AT VANCOUVER, WASH. Continued

Suspended sediment, water, year October 1964 to September 1965

Day

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

6..
7..
a..
9..
10..

11..
12..
13..
1*..
IS..

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

21..
22..
23..
2*..
25..

26..
27..
28..
29..
30..
31..

Total

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

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

11..
12..
13..
14..
It..

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

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

26..
27..
28..
29..
30..
31..

Total

OCTOBER

Mean
din-

charge
(K cfs)

130
129
126
120
129

130
135
127
123
129

123
116
125
197
118

122
125
128
129
114

127
132
125
122
120

122
121
126
125
120
121

3876

Suspended sediment

Mean
concen-

tration

(ppm)

11
12
12
13
C 13

C 13
C 13
C 13
C 13
12

11
C 10
C 10
C 10
C 10

C 10
10
10
C 10
C 10

C 10
C 10
C 10

C
C
C
C
C

_

Tom
per
day

3860
4180
4080
4210
4S30

4560
4740
4460
4320
4180

3650
3130
3370
3700
3190

3290
3370
3460
3480
3080

3430
3560
3370
2960
2590

1980
1960
2040
2020
1940

mo

104650

JANUARY

219
183
176
188
181

179
180
173
186
184

169
163
174
177
172

160
160
150
145
147

165
165
158
158
155

168
178
256
267
310
373

5119

729
458
280
173
122

105
72
66
70
72

74
92
67
76
124

100
77
C 54
C 54
C 54

C 54
C 54
44
34
24

51
58
196
208
200
322

- .

S 42900O
S 225000
S 129000
87800
59600

50700
35000
30800
35200
35800

33800
40500
31500
36300
57600

43200
33300
21900
21100
21400

24100
24100
18800
14500
10000

23100
27900
135000
150000
167000
324000

2377000

NOVEMBER

Mean
dis-

charge
(K cfs)

124
119
103
118
141

125
127
124
115
110

115
112
112
103
102

104
95.7
90.1
103
105

97.4
78.9
79.1
104
136

121
135
135
139
133

3406.2

Suspended sediment

Mean
concen-

tration

(ppm)

C
C
C
C

C

C
C

C
C
C

C
C
C
C

C
C
C
C 14
C 14

C 14
C 14
C 14
C 14
C 14

Tons
per
day

2010
1930
1670
1910
2280

2020
2060
2010
1*60
1780

1*60
1*10
1810
1670
1650

1680
1550
1460
1670
1700

1580
1280
1280
3930
5140

4570
5100
5100
5250
5030

74650

FEBRUARY

383
357
338
296
240

248
270
268
259
267

260
295
277
266
241

186
204
229
228
241

220
235
236
249
238

220
218
231
w.

7160

417
428
495
417
390

392
J60
305
215
130

110
108
96
85
74

48
34
46
SO
49

48
47
C 47
C 47
C 47

C 47
46
45

_

431000
413000
452000
333000
253000

262000
262000
221000
150000
93700

77200
74400
71100
61000
48200

24100
18700
28400
30800
31900

28500
29800
29900
31600
30200

27900
27100
28100
M

3570300

DECEMBER

Mean
dis-

charge
(K cfs)

146
163
161
165
165

140
140
135
1S7
113

121
127
122
111
114

105
120
125
120
115

115
220
410
422
500

378
336
294
277
22»
221

6057

Suspended sediment

Mean
concen-

tration

(ppm)

C 12
C 12
12
12
12

12
12

23

23
23
23
C 23
C 23

C 23
36
413
473
26*0

1720
7»4
630
714
809
159

Tons
per
day

4730
5280
5220
5350
5350

4540
4540
2920
2960
2440

2760
2740
2640
2400
7080

6520
7450
7760
7450
7140

7140
S 29000
S 457000
S 561000
S 35100OO

S 1780000
S 726000
S 501000
S 532000
S 493000
S 533000

9226410

MARCH

226
217
221
206
202

203
188
188
213
219

207
251
240
212
205

194
214
199
186
203

175
1M
166
199
186

168
173
170
153
155
183

6097

44
44
44
44
44

38
32
27
27
11

10
10
15
20
25

30
36
37
28
30

40
71
46
C 22
C 22

C 22
19
16
C 14
C 14
C 14

. _

26800
25800
27100
24500
24000

20800
16200
13700
15500
10600

5590
6780
9720
11400
13800

15700
20800
19900
14100
16400

18900
32200
20600
11800
11000

99*0
8870
7340
5780
5860
6920

478440

S Computed by subdividing day.
C Composite period.
K Expressed in thousands.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

COLUMBIA RIVER MAIN STEM Continued

14-1447. COLUMBIA RIVER AT VANCOUVER, WASH. Continued

Suspended sediment, water year October 1964 to September 1965 Continued

Day

1..
2..
3..

..

,.
,.
,.

..

10..

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

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

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

26..
27..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(K cfs)

156
162
163
138
142

142
144
179
179
177

187
180
166
183
191

192
208
227
248
273

295
364
432
424
386

391
376
377
371
370

7423

Suspended sediment

Mean

tration

(ppm)

C 14
C 14
14
14
C 14

C 14
C 14
C 14
C 14
18

22
26
C 31
C 31
C 31

C 31
35
39
44
48

64
100
141
160
180

206
196
160
195
176

JULY

432
415
390
369
368

373
353
349
355
350

349
344
350
342
331

331
314
296
282
279

259
252
273
278
273

277
250
236
239
219
197

9727

81
67
65
63
61

59
58
57
56
56

56
55
50
45
48

50
46
43
40
43

46
40
34
31
28

C 24
C 24
C 24
C 24
C 24
22

Tons
per
day

5900
6120
6160
5220
5370

5370
5440
6770
6770
8600

11100
12600
13900
15300
16000

16100
19700
23900
29500
35400

51000
98300
164000
183000
188000

217000
199000
163000
195000
176000
-

1889520

94500
75100
68400
62800
60600

59400
55300
53700
53700
52900

52800
51100
47200
41600
42900

44700
39000
34400
30500
32400

32200
27200
25100
23300
20600

17900
16200
15400
15500
14200
11700

1272300

HAY

Mean
dis-

charge
(K cfs)

374
390
437
444
428

416
416
399
374
373

377
369
355
391
412

431
440
438
436
436

412
406
421
411
409

412
406
403
392
417
460

12685

Suspended sediment

Mean
concen-

tration

(ppm)

190
210
254
221
182

158
150
130
120
97

138
90
65
96
120

140
173
174
130
120

132
125
118
106
150

92
110
112
114
116
118

Tons
per
day

192000
221000
300000
265000
210000

177000
168000
140000
121000
97700

140000
89700
62300
101000
133000

163000
206000
206000
153000
141000

147000
137000
134000
118000
166000

102000
121000
122000
121000
131000
147000

4732700

AUGUST

182
164
159
184
184

192
193
187
201
190

207
205
194
196
190

178
190
185
196
192

193
179
178
166
173

179
192
164
153
157
157

5660

21
20
20
20
20

20
20
20
20
20

20
20
20
20
20

C 20
C 20
C 20
C 20
C 20

19
18
C 17
C 17
C 17

C 17
C 17
19
21
C 22
C 22

10300
8860
8590
9940
9940

10400
10400
10100
10900
10300

11200
11100
10500
10600
10300

9610
10300
9990
10600
10400

9900
8700
8170
7620
7940

8220
8810
8410
8680
9330
9330

299440

JUNE

Mean
dis-

charge
(K cfs)

482
496
498
505
508

510
524
522
525
534

532
525
526
530
533

506
483
487
495
499

501
502
498
502
500

501
499
488
473
449

15133

Suspended sediment

Mean
concen-

tration

(ppm)

121
138
198
144
148

152
135
182
152
158

160
166
172
177
188

140
100
111
108
105

102
109
116
102
89

90
91
92
94
95

Tons
per
day

157000
185000
266000
196000
203000

209000
219000
257000
215000
228000

230000
2350*0
244000
2530OO
271000

191000
130000
146000
144000
141000

138000
146000
156000
138000
120000

122000
123000
121000
120000
115000

5421000

SEPTEMBER

165
160
148
150
157

128
123
133
134
134

132
111
110
116
119

118
115
122
125
134

113
114
117
115
113

108
108
112
110
108

3752

C 22
C 22
C 22
20
18

16
C 14
C 14
C 14
C 14

15
15
C 16
C 16
C 16

C 16
C 16
16
16
C 16

C 16
C 16
C 16
C 16
15

14
C 13
C 13
C 13
C 13
-

__

9800
9500
8790
8100
7630

5530
4650
5030
5070
5070

5350
4500
4750
5010
5140

5100
4970
5270
5400
5790

4880
4920
5050
4970
4580

4080
3790
3930
3860
3790

164300

Total discharge for year (K
Total load for year (tons).

cfs-days). 86795.2 29610710

C Composite period.
K Expressed in thousands.

389-675 O - 70 - 18

COLUMBIA RIVER MAIN STEM Continued

14-1447'. 5. COLUMBIA RIVER NEAR VANCOUVER, WASH.

LOCATION. Cross-section No. 4, on a line through Hathews Point and perpendicular to stream channel, 0.9 mile upstream from the mouth of Willamette River, 3.8 miles west of Vancouver, Clark County, and 4.2 miles downstream from Interstate bridge.
RECORDS AVAILABLE. Chemical analyses: October 1964 to September 1965.
REMARKS. Samples for chemical and biological analyses were collected at quarter points A (right bank), B (center), and C (left bank). No discharge records available.
Chemical analyses of water, water year October 1964 to September 1965

Date of
collection

Oct. 14, 1964....

Feb. 10, 1965....

Apr. 21. ....
Apr. 21.. ....

Hay 5

May 19. ....

Time

(24 hr)

1000
1010
1015

1000
1005
1015

1030
1040
1045

1040
1045
1050

1030
1035
1040

1030
1035
1040

1020
1025
1030

1000
1005
1010

0950
1000
1005

1000
1005
1010

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

Tem-

pera-
ture

CF)

60
61
61

55
55
54

40
40
40

42
42
42

43
43
44

44
44
44

46
46
46

51
51
51

51
51
51

54
54
54

Bi-
car-

bon-
ate

(HC03)

82
83
83

84
84
84

73
72
72

84
85
84

87
87
86

88
88
88

88
89
88

75
75
75

65
64
64

69
68
68

Car-
bon-
ate

(C03)

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-

cal
demand

ppm)

1.3
. 8
.8

1.8
1.8
1.6

2.5
3.5
3.1

.9
.6
1.4

.6
.5
.7

. 8
1.1
.9

1.9
1.2
1.3

.9
1.1
. 7

1.4
1.0
1.2

. 7
. 6

M. P. N.

(most
probable
number
collform

groups
per

100 ml)

P.B.I.

(Pearl-
Benaon
Index

A

3
0
0

2
1
1

13
2
1

1
1
1

1
3
3

1
3
2

15
5
5

9
1
2

22
5
3

4
2
3

Slime solids

Settle-

able

(ml/1)

82
82
82

91
91
91

12

10

8

8

13

Total

294
294
294

833
633
633

982

264

284

223

132

Vol-

ume

(ml/1)

131
131
131

287
287
287

138

82

70

66

47

Chromium

Hexa-

valent

(Cr»)

Total

(Cr)

Cop-

per

(Cu)

Spe-
cific
con-

duct-

ance

micro
mhos
at

25"C)

175
175
174

181
181
180

155
155
153

184
184
183

190
190
190

190
188
188

193
192
191

159
160
159

136
135
136

143
143
143

pH

7.8
7.9
7.9

7.9
8.0
7.9

7.8
7.8
7.8

7.5
7.6
7.5

7.6
7.6
7.5

7.8
7.8
7.8

8.0
8.1
8.1

7.8
7.8
7.8

7.7
.9
.8

.8
.8

Phosphate
(P0«)

Ortho

0.01
.02
.02

.03
.03
. 04

.23
.23
.23

.20
.20
.20

. 23
.22
.23

. 15
. 15
. 15

. 12
. 11
. 11

. 10
. 11
. 11

. 10
. 12
. 12

.09
. 10
. 11

Total

0.09
.09
.09

. 10
. 14
. 10

. 22
.23
. 26

.21
.21
.21

. 33
.34
.33

.25
.25
.27

. 26
. 21
.24

.34
.29
.35

.57
. 71
.62

.34
.32
.41

Total
nitro-

gen
asN

0.2
.5
.0

.6
.4
.3

. 7
. 7
.6

.9
.7
.8

. 6
.9
.6

.3
.3
.2

. 3
. 3
. 3

.0
. 1
. 1

.2
.2
. 2

. 1
.2

Am-
mon-

ium

(NH<)

0.0
. 0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

. 0
.0
.0

.0
.0
.0

.0
.0
. 0

.0
.0
.0

.0
.0

June 2, 1965.... .
June 2 ....

Sept . 22 ....
Sept . 22 ....

1030

1040

A

C

57

66
66
62
62

60

84

89
88

0

0
0

1.1

1.3
1.2

1
1

~

_

_

_

_

49

_

- -

_

_

_

_

790

_

~

_

_

198

_

119

131

154

171

185
187
186

7.9

7.3

8.3

8.2
8.2
8.1
8.1
8.1

. 04

. 05

. 03

. 04

. 02
. 03
. 03

. 58

. 34

. 18

. 16
. 15
. 21
. 19

. 0

. 0

. 4
. 0

. 0

. 0

. 0
. 0

A Sulfite waste liquor (lignin sulfate).

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, 8.8 miles upstream from Hills Creek Dam, 10 miles south of Oakridge, Lane County, and at mile 241.3.
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 1965.
EXTREMES, 1958-64. Water temperatures; Maximum, 66°F Aug. 2, 3, 6, 7, 1961, July 27, 1964; minimum, freezing point on several days during January and February 1962, Jan. 12, 1963.

Temperature (°F) of water, water year October 1964 to September 1965

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

53
48

47
46

46
43

63
51

2

52
45

48
45

44
43

61
50

3

54
47

48
45

43
42

61
50

4

55
47

47
46

43
42

61
48

5

55
47

48
45

42
41

59
50

6

55
48

47
43

42
40

67
54

60
48

7

J3

48

45
42

42
41

67
54

60
47

8

55
49

45
44

43
42

67
54

60
48

9

53
48

46
45

43
42

66
55

60
48

10

52
46

45
44

44
42

67
56

60
47

11

53
46

44
42

43
41

58
56

59
48

12

53
46

43
41

41
39

58
54

59
49

13

52
48

42
40

40
38

64
52

57
50

14

51
48

41
39

41
40

65
52

58
48

15

49
47

40
37

42
40

66
53

56
52

16

49
46

40
38

41
37

67
53

56
49

17

5 0
44

40
37

37
36

67
54

54
42

18

49
43

41
38

39
37

64
55

54
42

19

50
44

40
37

39
37

66
55

55
42

20

50
44

40
37

40
37

56
44

21

50
44

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37

43
39

58
46

22

49
43

41
39

59
48

23

49
43

42
41

60
48

24

48
43

43
42

60
54

59
48

25

47
46

43
42

60
54

59
48

26

47
45

42
39

64
52

56
46

27

47
45

39
38

62
54

51
47

28

49
46

41
39

61
50

29

48
47

42
41

61
48

30

51
47

46
42

62
48

31

48
45

63
49

Average

51
46

43
41

«.

58
46

WILLAMETTE RIVER BASIN -Continued

14-1449. HILLS CREEK ABOVE HILLS CREEK RESERVOIR, NEAR OAKRIDGE, OREG.

LOCATION. Temperature recorder at gaging station, 0.2 mile downstream from Tufti Creek, 0.7 mile upstream from Hills Creek Reser-voir, 6.5 miles southeast of Oakridge, Lane County, and at mile 4.1.
DRAINAGE AREA. 52.7 square miles.
RECORDS AVAILABLE. Water temperatures: October 1958 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 69°F July 30.
EXTREMES, 1958-65. Water temperatures: Maximum, 69°F July 28, 1960, July 30, 1965; minimum (1958-64), freezing point Jan. 19-25, 1962.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....
January

February

March

April

May

June

July

August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

1

51
49

48
47

43
42

68
63

62
56

2

51
47

47
46

43
43

67
61

60
55

3

52
5n

48
47

44
43

65
59

59
55

4

52
49

48
48

44
43

65
57

59
53

5

52
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48
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54

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43
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66
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53

7

52
50

46
44

44
43

66
58

58
52

8

5?
51

46
45

44
44

66
58

58
52

9

5?
51

46
4ft

44
44

66
59

58
52

10

51
4R

46
45

44
44

67
60

57
52

1 1

50
48

45
4?

44
43

65
60

57
52

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51
48

42
39

43
42

62
59

58
54

13

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53

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51
50

39
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43
42

66
57

58
56

16

50
48

38
3fi

42
40

66
58

56
52

17

49
46

38
38

41
39

66
58

5?
47

18

47
45

39
38

41
40

65
59

5?
47

19

47
45

39
38

41
41

64
60

53
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63
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42
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44
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6?
59

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43
4?

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6?
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43
4?

6?
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4?

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5?

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43
4?

- -

69

61
53

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31

48
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-

6?
54

.

Average

49
48

43
42

43
42

64
58

56
52

WILLAMETTE RIVER BASIN Continued

14-1455. MIDDLE FORK WILLAMETTE RIVER ABOVE SALT CREEK, NEAR OAKRIDGE, OREG.

LOCATION. Temperature recorder at gaging station,90 feet upstream from highway bridge, 0.4 mile upstream from Salt Creek, 1.1 miles downstream from Hills Creek Dam, 2.3 miles southeast of Oakridge, Lane County, and at mile 231.4.
DRAINAGE AREA. 392 square miles.
RECORDS AVAILABLE. Water temperatures: October 1960 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 57°F on several days during October and November; minimum, 41°F on many days during January and March.
EXTREMES, 1960-65. Water temperatures: Maximum, 77°F Sept. 4, 1961; minimum (1960-61, 1962-65), 35°F Jan. 4, 1961.

Temperature (°F) of water, water year October 1964 to September 1965

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 ....

1

55
49

57
57

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50

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Day

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WILLAMETTE RIVER BASIN Continued

14-1480. MIDDLE FORK WILLAMETTE RIVER BELOW NORTH FORK, NEAR OAKRIDGE, OREG.

LOCATION. Temperature recorder at gaging station, 0.5 mile downstream from Whitehead Creek, 4.2 miles downstream from North Fork of Middle Fork Willamette River, 7 miles northwest of Oakridge, Lane County, and at mile 220.2
DRAINAGE AREA. 924 square miles.
RECORDS AVAILABLE. Water temperatures: September 1950 to October 1960, June 1961 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 65°F Aug. 17; minimum, 40°F Mar. 18-20.
EXTREMES, 1950-60, 1961-65. Water temperatures: Maximum, 74°F Aug. 3, 1961; minimum, freezing point Jan. 20-22, 1962.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1500. MIDDLE FORK WILLAMETTE RIVER NEAR DEXTER, OREG.

LOCATION. Temperature recorder at gaging station, 0.6 mile upstream from Lost Creek, 2 miles northwest of Dexter, Lane County, 2.6 miles downstream from Dexter Dam, and at mile 201.2.
DRAINAGE AREA. 1,001 square miles.
RECORDS AVAILABLE. Water temperatures: August 1955 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 61°F Sept. 23-25; minimum, 41°F Jan. 19, 20.
EXTREMES, 1955-65. Water temperatures: Maximum, 65°F on several days during September 1961; minimum, 38°F several days during January and February 1957.
REMARKS. Recorder stopped Nov. 11-25; temperature range, 51 C F to 55°F.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN -Continued

14-1503. FALL CREEK NEAR LOWELL, OREG.

LOCATION. Temperature recorder at gaging station,280 feet downstream from North Fork, 8 miles northeast of Lowell, Lane County, and at mile 14.4.

DRAINAGE AREA. 118 square miles.
RECORDS AVAILABLE. Water temperatures: August 1963 to September 1965.
EXTREMES, 1964-65. ffater temperatures: Maximum, 71°F July 16, 17, 31; minimum, 37°F Nov. 20, 21.
EXTREMES, 1963-65.--ffater temperatures: Maximum, 7l°F July 16, 17, 31, 1965; minimum, 37°F Nov. 20, 21, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

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QUALITY OF SURFACE WATERS, 1965

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WILLAMETTE RIVER BASIN Continued

14-1510. FALL CREEK BELOW WINBERRY CREEK, NEAR FALL CREEK, OREG.

LOCATION. Temperature recorder at gaging station,10 feet upstream from highway bridge, 1.6 miles downstream from Winberry Creek, 2.3 miles southeast of town of Fall Creek, Lane County, and at mile 6.1.
DRAINAGE AREA. 186 square miles.
RECORDS AVAILABLE. Water temperatures: August 1950 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 75°F on several days during July and August; minimum, 36°F Nov. 19, 20. EXTREMES, 1950-65. Water temperatures: Maximum, 79°F July 28, 1958; minimum, 33°F Jan. 23, 24, 1962.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1520. MIDDLE FORK WILLAMETTE RIVER AT JASPER, OREG.

LOCATION. Temperature recorder at gaging station,25 feet downstream from highway bridge at Jasper, Lane County, 650 feet downstream from Hills Creek, and at mile 195.0.
DRAINAGE AREA. 1,340 square miles.
RECORDS AVAILABLE. Water temperatures: October 1953 to December 1962, October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 64°F July 5, 24; minimum, 41°F on several days during December, February, and March.
EXTREMES, 1953-62, 1963-65. Water temperatures: Maximum, 69°F July 27, 28, 1958; minimum, 36°F Feb. 1-3, 16, 1956. Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1525. COAST FORK WILLAMETTE RIVER AT LONDON, OREG.

LOCATION. Temperature recorder at gaging station, 0.6 mile north of London, Lane County, 11 miles south of Cottage Grove, and at mile 35.9.
DRAINAGE AREA. 72.1 square miles.
RECORDS AVAILABLE. Water temperatures: July 1960 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 73°F Aug. 6-10.
EXTREMES, 1960-65. Water temperatures: Maximum, 74°F July 28, 29, 1960, July 12, 1961; minimum (1960-63), 36°F on several days during January and February 1963.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1575. COAST FORK WILLAMETTE RIVER NEAR GOSHEN, OREG.

LOCATION. Temperature recorder at gaging station,2.5 miles southeast of Goshen, Lane County, and at mile 6.4. DRAINAGE AREA. 642 square miles.
RECORDS AVAILABLE. Water temperatures: August 1961 to September 1965.
EXTREMES, 1964-65. Water temperatures: Minimum, 39°F sometime during period Dec. 17-19.
EXTREMES, 1961-65. Water temperatures: Maximum (1961-64), 80°F July 24, 1962; minimum, freezing point, Jan. 12, 1963. REMARKS. Recorder stopped Dec. 17-19, temperature range, 49°F to 39°F.

Temperature (°F) of water, water year October 1964 to September 1965

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December
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February
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WILLAMETTE RIVER BASIN Continued

14-1575. COAST FORK WILLAMETTE RIVER NEAR GOSHEN, OREG. Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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)

1155

Water
tem-
per-
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(°F)

Sam-

pling
point

Discharge
(cfs)

9840

Sediment

concen-

tration

(ppm)

223

Sediment

discharge
(tons per day)

5920

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

51

0.004

68

0.008

74

0.016

79

0.031

84

0.062

90

0.125

97

0.250

100

0.500 1.000 2.000

Method
of
analysis

VBWC

WILLAMETTE RIVER BASIN Continued

14-1591. HORSE CREEK NEAR McKENZIE BRIDGE, OREG.

LOCATION. Temperature recorder at gaging station, 450 feet upstream from bridge on Horse Creek Road, 1 mile southeast of McKenzie Bridge, Lane County, and at mile 3.4.
DRAINAGE AREA. 149 square miles.
February 1963 to September 1965.
Maximum, 56°F on several days during July; minimum, 37°F Dec. 17, 18, 20, 21.
Maximum, 56°F on several days during July in 1963 and 1965; minimum, 37°F on several days

RECORDS AVAILABLE. Water temperatures:
EXTREMES, 1964-65. Water temperatures:
EXTREMES, 1963-65. Water temperatures:
during January and December in 1964.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1592. SOUTH FORK MCKENZIE RIVER ABOVE COUGAR RESERVOIR, NEAR RAINBOW, OREG.

LOCATION. Temperature recorder at gaging station,100 feet upstream from Tipsoo Creek, 8 miles south of Rainbow, Lane County, 9 miles southeast of town of Blue River, and at mile 10.4.
DRAINAGE AREA. 160 square miles at cableway 0.2 mile downstream, where all discharge measurements are made.
RECORDS AVAILABLE. Water temperatures: November 1957 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 60°F July 24, 28-31; minimum, 37°F Dec. 17.
EXTREMES, 1957-65. Water temperatures: Maximum, 60°F July 18, 1960, July 24, 28-31, 1965; minimum, 33°F Mar. 1, 1962.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1595. SOUTH FORK McKENZIE RIVER NEAR RAINBOW, OREG.

LOCATION. Temperature recorder at gaging station, 0.2 mile upstream from Cougar Creek, 0.6 mile downstream from Cougar Dam, 2 miles south of Rainbow, Lane County, and at mile 3.9.
DRAINAGE AREA. 208 square miles.
RECORDS AVAILABLE. Water temperatures: July 1955 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 64°F July 6; minimum, 38°F on several days during April and May.
EXTREMES, 1955-65. Water temperatures: Maximum, 68°F July 28, 1958; minimum, 33°F Jan. 20-23, 1962.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1611. BLUE RIVER BELOW TIDBITS CREEK, NEAR BLUE RIVER, OREG.

LOCATION. Temperature recorder at gaging station, 0.2 mile downstream from Tidbits Creek, 5.5 miles northeast of Blue River, Lane County, and at mile 8.5.
DRAINAGE AREA. 45.8 square miles.
RECORDS AVAILABLE. Water temperatures: September 1963 to September 1965.
EXTREMES, 1963-64. Water temperatures: Maximum, 65°F July 13, 27, 1964; minimum, 34°F Jan. 19, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1625. McKENZIE RIVER NEAR VIDA, OREG.

LOCATION. Temperature recorder at gaging station,! mile upstream from bead of Martin Rapids, 5 miles east of Vida, Lane County, and at mile 47.7.
DRAINAGE AREA. 930 square miles at cableway 0.4 mile downstream, where all discharge measurements are made.
RECORDS AVAILABLE. Water temperatures: June 1961 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 59°F July 5, 6, 24, 31; minimum, 39°F on several days during February. EXTREMES, 1961-65. Water temperatures: Maximum, 59°F on several days during July and August 1962, July 5, 6, 24, 31, 1965; minimum, 36°F Jan. 21-24, 1962.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1650. MOHAWK RIVER NEAR SPRINGFIELD, OREG.

LOCATION. Temperature recorder at gaging station,4 miles northeast of Springfield, Lane County, and at mile 1.59. DRAINAGE AREA. 177 square miles.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 76°F July 16; minimum, 37°F Dec. 17, 18.
EXTREMES, 1963-65. Water temperatures: Maximum, 76°F July 16, 1965; minimum, 37°F Dec. 17, 18, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1655. McKENZIE RIVER NEAR COBURG, OREG.

LOCATION. Temperature recorder 200 feet downstream from gaging station at Armitage Bridge, on opposite bank, 2 miles southeast of Coburg, Lane County, and at mile 7.1.
DRAINAGE AREA. 1,337 square miles.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 67°F July 7, 8, 15; minimum, 35°F Dec. 17, 18.
EXTREMES, 1963-65. Water temperatures: Maximum, 67°F July 13, 25, 27, 28, 1964, July 7, 8, 15, 1965; minimum, 35°F Dec. 17, 18, 1965.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1655. McKENZIE RIVER NEAR COBURG, OREG. Continued

Periodic determinations of suspended-sediment discharge and particle size, water year Octob_ __ . _ ._. (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; O, decantation; N, in native water;
P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

1964 to September 1965

Date of collection

Dec. 28, 1964. .....

Time

(24 hour)

1350

Water
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per-
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(°F)

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Discharge
(cfs)

30300

Sediment
concen-

tration

(ppm)

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Sediment

discharge
(tons per day)

17800

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

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0.004

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Method
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analysis

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WILLAMETTE RIVER BASIN Continued

14-1660. WILLAMETTE RIVER AT HARRISBURG, OREG.

LOCATION. Temperature recorder 600 feet downstream from gaging station at bridge on U.S. Highway 99 at Harrisburg, Linn County, and at mile 161.2.
DRAINAGE AREA. 3,420 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: June 1961 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 69°F July 16, 17; minimum, 41°F sometime during period Dec. 17-20. EXTREMES, 1961-65. Water temperatures: Maximum, 69°F July 12, 13, 1961, July 16, 17, 1965; minimum, 36°F Jan. 21-24, 1962, Jan. 12, 13, 1963.
REMARKS. Recorder stopped Dec. 17-20, Apr. 18-23; temperature ranges, 41°F to 44°F and 51°F to 52°F, respectively. Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1717.5. WILLAMETTE RIVER ABOVE CALAPOOIA RIVER, AT ALBANY, OREG.

LOCATION. Temperature recorder at site on left bank, 0.4 mile upstream from Calapooia River, 0.6 mile upstream from gaging station, and U.S. Highway 20 bridge in Albany, Linn-Benton County, and at mile 119.9.
DRAINAGE AREA. 4,460 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 71°F July 30 to Aug. 1; minimum, 39°F Dec. 18, 19.
EXTREMES, 1963-65. Water temperatures: Maximum, 71°F July 13, 1964, July 30 to Aug. 1, 1965; minimum, 39°F Dec. 18, 19, 1964. REMARKS. Recorder stopped Mar. 9 to Apr. 13; temperature range, 47°F to 52°F.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1720. CALAPOOIA RIVER AT HOLLEY, OREG.

LOCATION. Temperature recorder at gaging station, 200 feet downstream from bridge on State Highway 228, 0.3 mile southwest of Holley, Linn County, 5.0 miles upstream from Brush Creek, and at mile 45.4.
DRAINAGE AREA. 105 square miles.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
EXTREMES, 1963-64. Water temperatures: Maximum, 76°F July 13, 27, 1964; minimum, 38°F Dec. 12, 13, 1963.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1735. CALAPOOIA RIVER AT ALBANY, OREG.

LOCATION. Temperature recorder at gaging station on downstream side of bridge on Riverside Drive in Albany, Linn County, 0.6 mile downstream from Oak Creek, and at mile 3.0.
DRAINAGE AREA. 372 square miles.
RECORDS AVAILABLE. Water temperatures: January 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 80°F July 31; minimum, 35°F Dec. 18-20.
EXTREMES, January 1964 to September 1965. Water temperatures: Maximum, 80°F July 31, 1965; minimum, 35°F Dec. 18-20, 1964. Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1735. CALAPOOIA RIVER AT ALBANY, OREG. Continued

periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, ptpet; S, sieve; V, visual accumulation tube; W, In distilled water)

Date of collection

Time

(24 hour)

1050

Water
tem-
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(°F)

44

Sam-

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point

Discharge
(cfs)

9400

Sediment
concen-

tration

(ppm)

136

Sediment

discharge
(tons per day)

3450

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

64

0.004

84

0.008

95

0.016

98

0.031

99

0.062

99

0.125

100

0.250 0.500 1.000 2.000

Method
Of
analysis

VBWC

WILLAMETTE RIVER BASIN Continued

14-1780. NORTH SANTIAM RIVER BELOW BOULDER CREEK, NEAR DETROIT, OREG.

LOCATION. Temperature recorder at gaging station, 0.5 mile downstream from Boulder Creek, 3.0 miles southeast of Detroit, Marion County, and at mile 70.7.
DRAINAGE AREA. 216 square miles.
RECORDS AVAILABLE. Water temperatures: April 1951 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 61°F July 29, 30, Aug. 7, 8, 10; minimum, 34°F Dec. 16-18, 20.
EXTREMES, 1951-65. Water temperatures: Maximum, 64°F July 28, 1958; minimum, freezing point Dec. 1, 1954, Mar. 5, 1955, Feb. 16, 17, 1956.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1790. BREITENBUSH RIVER ABOVE CANYON CREEK, NEAR DETROIT, OREG.

LOCATION. Temperature recorder at gaging station, 600 feet upstream from Canyon Creek, 1.5 miles northeast of Detroit, Marion County, and at mile 2.0.
DRAINAGE AREA. 106 square miles.
RECORDS AVAILABLE. Water temperatures: December 1950 to July 1961, January 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 60°F July 30; minimum, 33°F Dec. 16-20.
EXTREMES, 1950-61, 1962-65. Water temperatures: Maximum, 60°F July 25, 1962, July 30, 1965; minimum, 33°F Mar. 3-7, 1951, Feb. 17, 1956, on several days during January 1963, and Dec. 16-20, 1965.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1815. NORTH SANTIAM RIVER AT NIAGARA, OREG.

LOCATION. Temperature recorder at gaging station, 0.1 mile downstream from Little Sardine Creek, 0.8 mile downstream from Big Cliff Dam, 2.1 miles east of Niagara, Marion County, and at mile 57.3.
DRAINAGE AREA. 453 square miles.
RECORDS AVAILABLE. Water temperatures: January 1953 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 55°F Oct. 18-20, 22, 23; minimum, 37°F on several days during January. EXTREMES, 1953-65. Water temperatures: Maximum, 62°F July 28, 29, 1958; minimum, 35°F Jan. 30 to Feb. 16, 1957. REMARKS. Recorder stopped Aug. 16-31; temperature range 48"F to 49°F.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1850. SOUTH SANTIAM RIVER BELOW CASCADIA, OREG.

LOCATION. Temperature recorder at gaging station, 100 feet downstream from bridge at Cascadia ranger station, 0.5 'mile down-stream from House Creek, 0.5 mile upstream from Deer Creek, 1.5 miles southwest of Cascadia, Linn County, and at mile 48 5 DRAINAGE AREA. 174 square miles at gaging cable 0.7 mile upstream, above Mouse Creek.
RECORDS AVAILABLE. Water temperatures: June 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 77°F July 30, Aug. 7; minimum, 37°F Nov. 20-22.
EXTREMES, 1962-65. Water temperatures: Maximum, 77°F July 30, Aug. 7, 1965; minimum, 33°F sometime during period Jan. 11-24, 1962. REMARKS. Suspended sediment concentration shows 4,990 tons per day with discharge 4,230 (cfs); time 1600.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIK Continued

14-1850. SOUTH SANTIAM RIVER BELOW CASCADIA, OREG. Continued

Periodic determinations of suspended-sediment discharge, water year October 1964 to September 1965 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water;

Date of collection

Dec. 27, 1964... .. .

Time

(24 hour)

1600

Water
tem-
per-
ature
(°F)

42

Sam-

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point

Discharge
(cfs)

4230

Sediment
concen-

tration

(ppm)

437

Sediment
discharge
(tons per day)

4990

Suspended sediment

Percent finer than size indicated, in millimeters

Method
of
analysis

WILLAMETTE RIVER BASIN Continued

14-1858. MIDDLE SANTIAM RIVER NEAR CASCADIA, OREG.

LOCATION. Temperature recorder at gaging station 5.6 miles downstream from Bear Creek, 10 miles northeast of Cascadia, Linn County, and at mile 17.5.
DRAINAGE AREA. 104 square miles.
RECORDS AVAILABLE. Water temperatures: August 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 70°F July 30; minimum, 36°F Mar. 26.
EXTREMES, 1963-65. Water temperatures: Maximum, 70°F July 30, 1965; minimum, 36°F Feb. 15, 16, 1964, Mar. 26, 1965. Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1859. QUARTZVILLE CREEK NEAR CASCADIA, OREG.

LOCATION. Temperature recorder at gaging station, 80 feet downstream from Panther Creek, 10 miles north of Cascadia, Linn County, and at mile 6.6.
DRAINAGE AREA. 99.2 square miles.
RECORDS AVAILABLE. Water temperatures: August 1963 to November 1964.
EXTREMES, 1963-64. Water temperatures: Maximum, 67°F July 27, 1964; minimum, 38°F Feb. 15, 16, 26, 27, 1964.
REMARKS. Thermograph destroyed during flood; no record obtained for remainder of water year.

Temperature (°F) of water, October to November 1964

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....

Day

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14-1865. MIDDLE SANTIAM RIVER AT MOUTH, NEAR FOSTER, OREG.

LOCATION. Temperature recorder at gaging station,2.7 miles northeast of Foster, Linn County, and at mile 0.7. DRAINAGE AREA. 287 square miles.
RECORDS AVAILABLE. Water temperatures: September 1953 to September 1965.
EXTREMES, 1953-64 . Water temperatures: Maximum, 77°F July 28, 1958; minimum, 33°F Jan. 29, 1963.
REMARKS. Recorder inoperative from Dec. 23, 1964 to Aug. 31, 1965.

Temperature (°F) of water, water year October 1964 to September 1965

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Maximum ....
Minimum ....
November

Minimum ....
December

September

Minimum ....

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Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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

Dec. 27, 1964. .....

Time

(24 hour)

1400

Water
tem-

per-
ature

(°F)

44

Sam-

pling
point

Discharge
(cfs)

8900

Sediment
concen-

tration

(ppm)

579

Sediment

discharge
(tons per day)

13900

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

16

0.004

23

0.008

33

0.016

45

0.031

57

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0.125

81

0.250

93

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Method
of

analysis

VBWC

WILLAMETTE RIVER BASIN Continued

14-1875. SOUTH SANTIAM RIVER AT WATERLOO, OREG.

LOCATION. Temperature recorder at gaging station.600 feet downstream from highway bridge at Waterloo, Linn County, 2 miles upstream from Hamilton Creek, and at mile 23.3.
DRAINAGE AREA. 640 square miles.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 78°F July 30, 31; minimum, 37°F Dec. 17, 18.
EXTREMES, 1963-65. Water temperatures: Maximum, 78°F July 30, 31, 1965; minimum, 37°F Dec. 17, 18, 1964.
REMARKS. Recorder stopped Oct. 16 to Nov. 23; temperature range, 38°F to 55°F.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1888. THOMAS CREEK NEAR SCIO, OREG.

LOCATION. Temperature recorder at gaging station, 0.3 mile upstream from bridge on Highway 226, 1.6 miles upstream from Mill Creek, 4.2 miles east of Scio, Linn County, and at mile 14.6.
DRAINAGE AREA. 109 square miles.
RECORDS AVAILABLE. Water temperatures: October 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 80°F July 30; minimum, 36°F Dec. 17, 18.
EXTREMES, 1962-65. Water temperatures: Maximum, 80°F July 30, 1965; minimum, 33°F Jan. 11-14, 1963.

Temperature (°F) of water, water year October 1964 to September 1965

Month

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Minimum ....
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December
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September
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Day

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Average

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WILLAHETTE RIVER BASIN Continued

14-1890. SANTIAM RIVER AT JEFFERSON, OREG.

LOCATION. Temperature recorder at gaging station, 350 feet upstream from Southern Pacific railroad bridge at Jefferson, Marion County, 2.1 miles downstream from confluence of North and South Santiam Rivers, and at mile 9.62.
DRAINAGE AREA. 1,790 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Minimum, 40°F on several days during January.
EXTREMES. 1963-65. Water temperatures: Maximum (1963-64), 70°F July 12, 13, 27, Aug. 23, 24, 1964; minimum, 40°F on several days during January, 1965.
REMARKS. Recorder stopped Oct. 2-22; temperature range, 52°F to 57°F. Temperature unit buried Feb. 22 to end of water year. Temperature (°F) of water, water year October 1964 to September 1965

October

November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....

Maximum ....
Minimum ....

February
Maximum ....
Minimum ....

1

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Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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)

1715
1220

Water
tem-

per-
ature

(°F)

46
48

Sam-

pling
point

Discharge
(cfs)

77500
107000

Sediment
concen-

tration

(ppm)

1040
884

Sediment

discharge
(tons per day)

218000
255000

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

25
26

0.004

37
38

0.008

49
53

0.016

63
69

0.031

77
81

0.062

84
85

0.125

95
92

0.250

98
98

0.500

100
100

1.000 2.000

Method
of

analysis

VPWC
VPWC

WILLAMETTE RIVER BASIN Continued

14-1900. LUCKIAMUTE RIVER AT PEDEE, OREG.

LOCATION. Temperature recorder at gaging station,0.5 mile downstream from Pedee Creek, 1.0 mile southwest of Pedee, Polk County, and at mile 29.7.
DRAINAGE AREA. 115 square miles.
RECORDS AVAILABLE. Water temperatures: March 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Minimum, 37°F Nov. 21, 22.
EXTREMES, March 1964 to September 1965. Water temperatures: Maximum, 69°F on several days during July and August 1964; minimum, 37°F Nov. 21, 22, 1964.
REMARKS.--Temperature unit out of operation June 10 to end of water year.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....
January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....
April
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Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....
July
Maximum ....
Minimum ....

August
Maximum ....
Minimum ....
September
Maximum ....
Minimuni ....

Day

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WILLAMETTE RIVER BASIN Continued

14-1910. WILLAHETTE 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 1965. Water temperatures: February 1951 to September 1965.
EXTREMES, 1964-65. Dissolved solids: Maximum, 64 ppm Feb. 13 to Mar. 11; minimum, 43 ppm Jan. 27 to Feb. 5.
Hardness: Maximum, 24 ppm July 6 to Sept. 3; minimum, 12 ppm Dec. 24-28.
Specific conductance: Maximum daily, 92 micromhos Dec. 23; minimum daily, 30 micromhos Jan. 29.
Water temperatures: Maximum, 73°F July 4-8; minimum, 36°F Dec. 18, 19.
EXTREMES, 1951-65. Dissolved solids: Maximum, 73 ppm Oct. 18-31, 1962; 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, 12 ppm Dec. 24-28, 1964.
Specific conductance: Maximum daily, 133 micromhos Nov. 7, 1954; minimum daily, 30 micromhos Jan. 29, 1965.
Water temperatures: Maximum, 78°F July 22, 1959; minimum, freezing point on several days during February 1956.
REMARKS. Temperature recorder not functioning properly Dec. 8-30, Jan. 21 to Mar. 11; once-daily temperatures were obtained for these periods and are reported opposite the month on the temperature table.

Chemical analyses, in parts per million, water year October 1964 to Sej

Date
at
collection

Oct. 1-30, 1964. .
Oct. 31- Nov. 22..

Nov. 25- Dec. 22..

Dec. 29- Jan. 26,

Jan. 27-Feb. 5. . .

Feb. 13-Mar. 11..

Mar. 26- Apr. 19. .

Apr. 29-May 6. ...
May 7-June 5. ....
June 6- July 5. ...
July 6- Aug. 5. ...
Aug. 6-Sept. 3...
Sept. 4-30. ......

Time-weighted

Tons per day. . .

Mean

discharge
(cfs)

9299
11870
18500
69O40
285000
254000

88850
138000
50830
20050
11560
11290

23240
14140
12030
7211
5477
5831
6614

30330

Silica

(S10,)

15

13

14

16

Iron

(Fe)

Cal-

cium

(Ca)

5. 5

4.0

5.2

6.0

"

Mag-
ne-

sium

(Mg)

1.6

1.3

2.0

2.1

""

Sodium

(Ma)

4.4
3.9
3.7
3.0
2.6

2.6
2.4
3.2
3.7
3.9
4.0

3.1
3.9
3.7
4.3
4.8
4.8
4.4

3.9

Po-
tas-

sium

(K)

1.4

1.1

.9

.8

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Bl-

car-

bon-

ate

(HCO.)

29
30
28
19
51

18
17
22
23
22
22

19
22
19
29
31
30
28

25

1680

Car-
bon-
ate

(CO,)

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0
0
0

Sulfate

(SO.)

2. 6

3.0

7.2

3.6

Chloride

(Cl)

2. 8

2.2

3.0

3.5

Fluo-
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(F)

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2.6

1.2

Bo-

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(B)

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jtember 1965

Dissolved solids

(residue at 180'C)

Farts

per
million

47
51
56
46

46

44
43
53
64
70
50

57
63
52
51
56
55
55

53

Tons

per
acre-

foot

0.06
.07
.08
.06

.06

.06
.06
.07
.09
. 10
.07

.08
.09
.07
.07
.08
.07
.07

Tons

per
day

1180
1630
2800
8570

31550

10560
16020
7270
3460
2180
1520

3580
2400
1690
993
828
866
982

Hardness

as CaCO,

Cal-

cium,
Mag-
ne-

sium

20
21
20
16
19
12

15
14
17
20
22
21

17
20
19
22
24
24
23

20

Non-
car-

bon

ate

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0
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pH

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6.9
6.8
6.8
6.7
6.5
6.5

6.6
6.6
6.4
6.8
6.9
6.9
6.9

6.7

WILLAMETTE RIVER BASIN Continued

14-1910. WILLAMETTE RIVER AT SALEM, OREG. Continued

Specific conductance (micromhos at 25°C), water year October 1964 to September 1965

Day

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30.....
31.....

Average

October

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56
58
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59

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63

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58
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59

November

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62

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63
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61
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62
56
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51
53
55
51
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58

December

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41
45
47
49

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52

48
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56
57
92
34
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42
44

48

January

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46
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48
45
42
30
33
36

42

February

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42
42
42
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54
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64
61
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WILLAMETTE RIVER BASIN Continued

14-1910. WILLAMETTE RIVER AT SALEM, OREG. Continued

Temperature (°F) of water, water year October 1964 to September 1965

Month

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February
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Maximum ....
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Maximum ....
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Periodic determinations of_ suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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)

1550
1410

Water
tem-

per-
ature

47

Sam-

pling
point

Discharge
(cfs)

303000
248000

Sediment
concen-

tration

(ppm)

892

613

Sediment

discharge
(tons per day)

730000
410000

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

47

0.004

54

0.008

74

0.016

92

0.031

98

0.062

98

0.125

99

0.250

100

0.500 1.000 2.000

Method
of

analysis

VPWC

WILLAMETTE RIVER BASIN Continued

14-1930. WILLAMINA CREEK NEAR WILLAMINA, OREG.

LOCATION. Temperature recorder at gaging station,4.5 miles north of Willamina, Yamhill County, and at mile 6.2. DRAINAGE AREA. 64.7 square miles.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 73°F July 30; minimum, 33°F Nov. 21.
EXTREMES, 1963-65. Water temperatures: Maximum, 73°F July 30, 1965; minimum, 33°F Nov. 21, 1964. REMARKS. Recorder stopped Sept. 27 to Oct. 27; temperature range, 43°F to 57°F.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-1940. SOUTH YAMHILL RIVER NEAR WHITESQN, OREG.

LOCATION. Temperature recorder at gaging station near left bank on downstream side of Whiteson Bridge on U.S. Highway 99W, 1.3 miles northwest of Whiteson, Yamhill County, 1.4 miles downstream from Salt Creek, and at mile 16.71.
DRAINAGE AREA. 502 square miles.
October 1963 to September 1965.
IJaximum, 77"F July 6, 7; minimum, 33°F Dec. 17-20.

RECORDS AVAILABLE. Water temperatures:
EXTREMES, 1964-65. Water temperatures:
EXTREMES, 1963-65. Water temperatures; Maximum, 77°F REMARKS. Recorder stopped Dec. 17, 18; temperature ran

July 6, 7, 1965; mini
ge, 39°F to 33°F.

mum, 33°F Dec. 17-20, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

Month

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Maximum ....
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WILLAMETTE RIVER BASIN Continued

14-1940. SOUTH YAMHILL RIVER NEAR TOITESON, OREG. Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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

Jan. 29, 1965. .....

Time

(24 hour)

0950

Water
tem-
per-
ature

(°F)

46

Sam-

pling
point

Discharge
(cfs)

29100

Sediment
concen-

tration

(ppm)
204

Sediment

discharge
(tons per day)

16000

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

61

0.004

78

0.008

100

0.016 0.031 0.062 0.125 0.250 0.500 1.000 2.000

Method
of
analysis

PWC

WILLAMETTE RIVER BASIN Continued

14-1970. NORTH YAMHILL RIVER AT PIKE, OREG.

LOCATION. Temperature recorder at gaging station, 500 feet downstream from Turner Creek, 0.5 mile southeast of Pike, County, and at mile 20.5.
DRAINAGE AREA. 66.8 square miles.
RECORDS AVAILABLE. Water temperatures: February 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 77°F July 30, 31; minimum, 33°F Dec. 17-20.
EXTREMES, February 1964 to September 1965. Water temperatures: Maximum, 77°F July 30, 31, 1965; minimum, 33°F Dec.

Temperature (°F) of water, water year October 1964 to September 1965

17-20, 1964.

Month

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Maximum ....
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Average

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WILLAMETTE RIVER BASIN Continued

14-1985. MOLALLA RIVER ABOVE PINE CREEK, NEAR WILHOIT, OREG.

LOCATION.--Temperature recorder at gaging station,0.3 mile upstream from Pine Creek, 5 miles southeast of Wilhoit, Clackamas County, and at mile 32.3.
DRAINAGE AREA. 97.0 square miles.
RECORDS AVAILABLE. Water temperatures: January 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 75°F July 30.
EXTREMES, January 1964 to September 1965. Water temperatures: Maximum, 75°F July 30, 1965.
REMARKS. Recorder inoperative Dec. 22, 1964 to July 16, 1965.

Temperature (°F) of water, water year October 1964 to September 1965

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December

January

Minimum ....

February

Minimum ....
March

April

May

June

July

August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

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Day

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WILLAMETTE RIVER BASIN Continued

14-2000. MOLALLA RIVER NEAR CANBY, OREG.

LOCATION. Temperature recorder at gaging station on left bank at upstream side of Good's Bridge, 1.5 miles south of Canby, Clackaraas County, and at mile 6.01.
DRAINAGE AREA. 323 square miles.
RECORDS AVAILABLE. Water temperatures: January 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 80°F July 6, 30, 31; minimum, 34°F Dec. 17-19.
EXTREMES, January 1964 to September 1965. Water temperatures: Maximum, 80 6 F July 6, 30, 31, 1965; minimum, 34°F Dec. 17-19, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
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Average

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WILLAMETTE RIVER BASIN Continued

14-2000. MOLALLA RIVER NEAR CANBY, OREG. Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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

Jan. 29, 1965. .....

Time

(24 hour)

1310
1420

Water
tem-

per-
ature

(°F)

47

Sam-

pling
point

Discharge
(cfs)

17100
12400

Sediment

concen-

tration

(ppm)

1930
1190

Sediment

discharge
(tons per day)

89100
39800

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

13
12

0.004

20
15

0.008

32
22

0.016

46
32

0.031

61
44

0.062

71
55

0.125

87
80

0.250

96
95

0.500

100
99

1.000

100

2.000

Method
of
analysis

VPWC
VBWC

WILLAMETTE RIVER BASIN Continued

14-2003. SILVER CREEK AT SILVERTON, OREG.

LOCATION.--Temperature recorder at gaging station, 300 feet downstream from railroad bridge in Silverton, Marion County, 2.5 miles upstream from Brush Creek, and at mile 3.4.
DRAINAGE AREA. 47.9 square miles.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 79°F July 6; minimum, 33°F Dec. 17, 18.
EXTREMES, 1963-65. Water temperatures: Maximum, 79°F July 6, 1965; minimum, 33°F Dec. 17, 18, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....
January
Maximum ....
Minimum ....
February
Maximum ....
Minimum ....
March
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April
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May
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June
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July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

Day

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WILLAJIETTE RIVER BASIN Continued

14-2035. TUALATIN RIVER NEAR DILLEY, OREG.

LOCATION. Temperature recorder at gaging station, 5 feet upstream from highway bridge, 1.0 mile south of Dilley, Washington County, 1.2 miles downstream from Scoggins Creek, and at mile 58.81.
DRAINAGE AREA. 133 square miles.
RECORDS AVAILABLE. Water temperatures: November 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 83°F July 30; minimum, 36°F Nov. 21, 22, Dec. 21, 22.
EXTREMES, 1963-65. Water temperatures: Maximum, 83°F July 30, 1965; minimum, 36°F Nov. 21, 22, Dec. 21, 22, 1964.

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-2040. GALES CREEK NEAR GALES CREEK, OREG.

LOCATION. Temperature recorder at gaging station, 0.5 mile downstream from Beaver Creek, 4.6 miles northwest of Gales Creek, Washington County, and at mile 17.5.
DRAINAGE AREA. 33.9 square miles.
October 1963 to September 1965.
Maximum, 68°F July 30, 31; minimum, 36°F Nov. 20, 21, Dec. 17, 19, 20.
Maximum, 68°F July 30, 31, 1965; minimum, 36°F Nov. 20, 21, Dec. 17, 19, 20, 1964.

RECORDS AVAILABLE. Water temperatures:
EXTREMES, 1964-65. Water temperatures:
EXTREMES, 1963-65. Water temperatures:

Temperature (°F) of water, water year October 1964 to September 1965

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WILLAMETTE RIVER BASIN Continued

14-2075. TUALATIN RIVER AT WEST LINN, OREG.

LOCATION. Temperature recorder at gaging station, 300 feet upstream from bridge on State Highway 212, 0.4 mile west of West Linn, Clackamas County, and at mile 1.8.
DRAINAGE AREA. 710 square miles.
October 1963 to September 1965.
Maximum, 83°F July 24, 30, 31; minimum, 34°F Dec. 20, 21.
Maximum, 83°F July 24, 30, 31, 1965; minimum, 34°F Dec. 20, 21, 1964.

RECORDS AVAILABLE. Water temperatures:
EXTREMES, 1964-65. Water temperatures:
EXTREMES, 1963-65. Water temperatures:

Temperature (°F) of water, water year October 1964 to September 1965

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PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

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WILLAMETTE RIVER BASIN Continued

14-2077. WILLAMETTE RIVER AT OREGON CITY, OREG.

LOCATION. Temperature recorder on right bank at Oregon City Marina, 0.6 mile downstream from Tualatin River, 10.7 miles downstream from gaging station at Wilsonville, Clackamas County, and at mile 27.8.
DRAINAGE AREA. 10,000 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE. Water temperatures: March 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 77°F July 31; minimum, 35°F Dec. 19, 20.
EXTREMES, 1963-65. Water temperatures: Maximum, 77°F July 31, 1965; minimum, 35°F Dec. 19, 20, 1964.
REMARKS. Records furnished by Federal Water Pollution Control Adminsitration.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....
January
Maximum ....
Minimum ....

February
Maximum ....
Minimum ....
March
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September
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WILLAMETTE RIVER BASIN Continued

14-2110. CLACKAMAS RIVER NEAR CLACKAMAS, OREG.

LOCATION. Temperature recorder at gaging station, 0.8 mile upstream from Johnson Creek, 2.1 miles southeast of Clackamas, Clackamas County, and at mile 4.8.
DRAINAGE AREA. 936 square miles at Gladstone Bridge 3.6 miles downstream, where all discharge measurements are made. RECORDS AVAILABLE. Water temperatures: May 1963 to September 1965.
EXTREMES, 1963-64. Water temperatures: Maximum, 68°F Aug. 16-18, 1963; minimum, 38°F Dec. 13-16, 1963.

Temperature (°F) of water, water year October 1964 to September 1965

October

Minimum ....
November

Minimum ....
December

July

August

September

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15

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44

Day

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42

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42

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Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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

Time

(24 hour)

1210

Water
tem-
per-
ature

(°F)

Sam-

pling
point

Discharge
(cfs)

D 55000

Sediment

concen-

tration

(ppm)

1820

Sediment

discharge
(tons per day)

270000

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

23

0.004

32

0.008

49

0.016

66

0.031

79

0.062

90

0.125

91

0.250

100

0.500 1.000 2.000

Method
of
analysis

VPWC

D Daily mean discharge.

COLUMBIA RIVER MAIN STEM

14-2118.5. COLUMBIA RIVER NEAR SCAPPOOSE," OREG.'

LOCATION. Cross-section No. 5, on a line between navigational lights 21 and 26, 5.7 miles downstream from the mouth of Willamette River, and 5.8 miles east Scappoose, Columbia County.
RECORDS AVAILABLE. Chemical analyses: February 1964 to September 1965.
REMARKS. Samples lor chemical and biological analyses were collected at quarter points A (right bank), B (center), and C (left bank). No discharge records
available

Chemical analyses of water, water year October 1964 to September 1965

Date of
collection

Oct. 14, 1964. . . .

Feb. 10, 1965. . . .

May 5. ....

May 19. ....

Time

(24 hr)

1205
1210
1215

1155
1200
1205

1150
1155
1200

1145
1150
1155

1155
1200
1205

1145
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1150
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1110
1115

1140
1145
1150

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

Tem-

pera-
ture
(°F)

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60
60

55
55
55

41
41
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42
42
42

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51
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54
54
54

Bi-
car-

bon-
ate

(HC0 3)

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82
82

84
82
80

72
65
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73
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68
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Car-
bon-
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(C0 3)

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0
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D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-

cal
demand

ppm)

0.8
1.0
1.8

1.8
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1.6

2.9
4.0
3.0

.6
1.0
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. 5
1.1

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1.3

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1.7

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1.0

1.4
1.1
1.2

.7
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. 5

M. P. N.

(most
probable
number
coliform

groups
per

100 ml)

P. B. I.

(Pearl-
Benson
Index
A

2
0
0

2
2
6

7
17
22

7
2
5

10
1
2

13
4
3

22
20
20

4
6
16

4
4
3

8
3
2

Slime solids

Settle-

able

(ml/1)

18
24

25
21

10

4

21

4

5

10

2

9

Total

(mg/1)

525
283

520
278

907

105

420

22

541

376

22

212

16

Vol-

ume

(ml/1)

98
80

94
79

107

18

64

7

56

56

7

38

2

Chromium

Hexa-

valent

(Cr«)

Total

(Cr)

Cop-

per

(Cu)

Spe-
cific
con-

duc-
tance

(micro
nhos
it

25«C)

174
174
172

179
176
171

152
139
108

183
181
173

191
190
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Phosphate
(P04)

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Am-
mon-

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(NH«)

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June 2, 1965. ....

June 16. ....

Sept. 22. .... >.

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A Sulfite waste liquor (lignin sulfate).

LEWIS RIVER BASIN

14-2217. LEWIS RIVER AT WOODLAND, WASH.

LOCATION. At bridge on U.S. Highway 99, 1 mile southeast of Woodland, Cowlitz County, and 2 miles upstream from East Fork. RECORDS AVAILABLE. Chemical analyses: October 1962 to September 1965.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 14, 1964

Jan. 13, 1965

Aug. 2.......

Mean

discharge
(cfs)

Silica

(SiOj

13
13
12
13
12
12

14
14
14
14

Alu-
mi-

num

(Al)

Iron

(Fe)

0.08

.21

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

4.0
4.0
3.5
3.6
3.2
3.4

4.0
4.0
4.0
4.0

Mag-
ne-

sium

(Mg)

0.7
.6
1.0
1.0
.5
.6

. 5
. 8
.9
1.1

Sodium

(Na)

2.7
2.8
2.7
2.9
2.5
2.4

2.5
2.9
3.0
2.8

Po-
tas-

sium

(K)

0.2
.4
.8
.2
. 3
.2

. 5
.4
.6
.7

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCOJ

21
21
19
19
16
17

19
21
20
21

Car
ben-

ate
POJ

0
0
0
0
0
0

0
0
0
0

Sulfate

(SO.)

1.0
1.2
1.2
.0
.2
.8

. 8
. 8
1.4
1.0

Chloride

(Cl)

1.2
1.2
1.0

i!o
1.2

. 5
1.8
2.0
1.8

Fluo-
ride

(F)

0.0

.1
.2
.0
.1
.0

.0
.0

.1
.0

Ni-

trate

(NO,)

0.1
.0
.2
.8
.5
.4

.0
. 1
. 3
.3

Phos-

phate
(P0«)

0.01
.01
.02
.02
.02
.01

.02
.01
.04
.01

Dissolved
solids

(residue
it 180°C)

35
32
33
34
30
A 30

31
A 35
37
39

Hardness

asCaCOj

Cal-

cium,
mag-
nesium

13
12
12
13
10
11

12
14
14
14

Non-
car-

bon-

ate

0
0
0
0

To-

tal
icid

ity
as

H+1

Specific
conduct-<

ance

(micro-
mhos at

25"C)

40
39
37
40
32
34

35
41
41
41

PH

6.9
7.1
7.3
6.7
7.1
7.3

7.4
7.1
7.0
7.0

Col-

or

0
0
0
0
5
5

0
0
0
0

D.O.
; dis-
sol-
ved
oxy-
gen
ppm)

9,?1
10.8
12.8
12.4
12.7
12.4

11.5
11.2
9.7
9.7
9.4

MPN

(coli-
form
polo-
nies

per

100 ml)

230
430
930
91
36
91

36
91
36
430
36

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Mar. 10, 1965....
Sept . 14 ....

Time

(24 hr)

1035
1240

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.02
.01

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00

.00

Boron

(B)

0.04
.03

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN 321

a

H
0

c*
o
10
10

<H
0

s

1
o

B

0)

9
IO

s
0)

p
51
B

S

1
<H

1

2 p

ID
§
8
P

0)
0)
<H
O

§1H
Ol
P .
B A

bos
c §

Tnboo s* .

o"t; H
0 ft 0)

0) 0) O1
3-H
P S IO

>>

gS w 3 <
H 0 35

§1

O (t
co

1 5 0)

0) PL,
fc
CO

§ B
e <»

1 2

S 3

> 0)

I-l . -p

i-ICJ> CQ
- 1"1 o

0*"" hO

" PL,

10 S - ft
0) i-im

fc --IN
fl) rH (O ^*
.Q CO CJ)

0) >-3(O i-l
W I « 0>
&,O 10 >
P ^ CJ> | +i

IO > ft
Ol S 5 B
rt g 3 0 0)
0) Tj iH -PL,

g « H co > 3 S 3(0 .PL,

^ SB SB 05 No

B B B * B O

b fc b | (LI
3 3 3i-l PL,
rt rtte H ° t-

.p +j .p » e w

0) 0) 0) O) O
ol ol ol 0)
1 1 1 i-l fto
III 0 t>

5 tOlO O O CO
<Hrt 0
!> * 1 O
< . .CM | 4>

111 S

(O

eni-i

0)

§ p

§

0
p

0)

p
o
Ij
0)

0)

d01

0)

o

i
ol

t

0)

<J

o

.

>q

D
10
U
<

co

o
co
o-

oo
CN

- 0
CN

S

CN
CO
CN

CN
CN

O
CN
0-

oo

£
- 0

in

^

co*~

CN

^
"~

O

0-

oo

o

TT

CN

2

ooo mrg rgM MO II 1

0 00 II 00 II II I

«.n ^rv, cx,^ CM~ cx.0 |

104 CV, rt 4<M rt rt 40J 1

53 33 S3 5 £ S5 !

35 55 53 ££ 53 !

O^U.^JCJOC, |j |

o>^ ~<o «no> -o I 1 ,

r--vo oor- oco r\jr-i I i i

tf-tf <^cn com tf-tf tf-tf 1

^4 °S Sr? 35 5~ !

. 010 OC, 104 J.J Ijr, J

oo^o oo 4p -d- r~t o ^-cn 1

£S ^S 3S 33 3S i
^,^H rncr CM^ ^0 rg^, 1

tN»-, CvJ*-, (\J(NJ *-<O (MO 1

. Nfsj eg- rgrsj ^.o corvj I

- - J5 -J oo , j ,

rg^, <r m <r r^ o o II i
iTk m * -4- ^- n

CsJrH ^ tf in-4" i-l O I I 1

"SII3SSS ! ! !

££ 35 S3 5£ II !
r\j«-< ^-ro (ocg oo II 1

In S 44 44 44 II 1
oo- i-in 4m rt o II 1
44 4444 II

or- co* ,n,n _ o II m

SS 33 33 33 ! i 4

- ,o oo« -o^ or> || CM

gg^gg Sg gg gg g
^gg^gg^gg gggpgg 6

| i.s | i.s g i.s s i.s gi.s-gi

i

i

!

i

i i
i i
i

i i

i
i

i i
i i

i i
i i

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i

i i
i

i i

i i
i i

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i

i
i

i i

c
4
c-

F
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e

ii

t i

C\l 0

*CM

4-.-1
tn in

m o

In 5

C* CO ** ^

<r ^-

0^

4 4
00 00
4 4

4 4
00 J3

£3
rH 0

H r-

O 00

S5

0) ^ 4 4"

4 4

4 4

00 vO
4 4

4 4
00 <£

0>^

1 1

1 1
1 1

S S
6 6

|ll

cn o

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tn co

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oo 4
in in

ss

m -tf

S3

O O

*0

CV, CC

ry o

* r\i

40

S3

S £
4 .-,

S £

vo rj
in

^ S

,0 <NJ

in in

o ,-,

S3

in 4
o in
*

4 4

oo r-

O 1-

o- r~
4 4

S g
66

B.S g-ss

i i

-O J3

^) m
a 4
in ir\

CO ^)

^) m

p-, o

>o -o

m o

mo

*o m

S S

in in

S!n

E£

U-, 4
m

in in
vO 4

SS
rt 00
vO

ss
C3 ^O

S In
m a

m o
>o ^o
(\J O
m

~ «

o r-

S S
r- «

66
66
u S ' S >

3 ~ -> i

4 00

r- vc

r- j;

r- J3

?£

\D vO

\o m

00

(M O

S S

vC vO

o tn

££

S S

ss

ss
o o
vO

3 S

o o

o .c

p~ o

0^

s s

6 S
es
B.s

II oo in

II II
II II

II mo
II in in
1 1 m~
II ,n in

It in in

II in 4

II r- 4
II in if*

II r- 4

I I 03 4

| | E2
1 1 m cn

II m r-i
11 m m
II -JO
II m m

II * O
II tn m

II vO f\J

II in m

i : ss
II O 0)

II in in

II m in
II or-
»n in

II -o m

I I O 0

I I rt 03

II vo in
II m a)

II mo
II vO m

II rj oo

ss ss
0 * <N 0

r- >o II

66 66
66^ 66

s i.s g i.s

COLUMBIA RIVER MAIN STEM

14-2229. COLUMBIA RIVER NEAR ST. HELENS, OREG.

LOCATION. Cross-section No. 6, between navigational lights 69 and 72, 4.5 miles north of St. Helens, Columbia County, and 5. of Lewis River.
RECORDS AVAILABLE. Chemical analyses: February 1964 to September 1965.
REMARKS. Samples for chemical and biological analyses were collected at quarter points A (right bank), B (center), and C (1< available.

Chemical analyses of water, water year October 1964 to September 1965

1 miles do\

ift bank) .

rnstream from

No discharge

Date of
collection

Oct. 14, 1964....

eb. 10, 1965....

Mav 5. ....

Time

(24 hr)

0900
0905
0920

0900
0905
0915

0940
0950
1000

0910
0920
0925

0925
0935
0945

0930
0938
0950

0915
0920
0935

0915
0925
0940

0925
0935
0950

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

Tem-

pera-
ture
(°F)

62
62
62

52
57
56

43
43
44

44

45
45
46

46
46
46

46
48
48

52
52
53

51
51
52

Bi-
car-

ate

(HC03)

76
77
54

77
82
55

61
61
40

73
82
55

81
65

80
81
67

78
77
74

72
70
59

65
63
60

Car-
bon-
ate

(C03)

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-
cal
demand

ppm)

0.9
.7
1.2

1.4
1.2
1.4

1.1
1.4
1.5

2.9
2.8
3.0

1.0
.6
1.1

1.0
1.2
.9

1.4
1.6
1.6

2.0
2.1
1.8

1.1
1.0
1.6

1.4
1.4
1.6

M. P.N.

(most
probable
number
coliform

groups
per

100 ml)

P. B. I.

(Pearl-
Benson
Index

A

12
6
43

7
7
44

9
39
61

12
14
31

11
7
9

5
14
41

10
21
63

36
80
57

8
19
71

10
10
27

Slime solids

Settle-

able

(ml/1)

31

30

6

7

4

8

7

2

8

3

7

4

7

1

Total

(mg/1)

690

950

130

290

1070

780

1380

440

3180

480

130

550

80

210

Vol-

ume

(ml/1)

150

220

40

60

150

120

40

20

170

50

20

80

150

190

Chromium

Hexa-
valent

(Cr«)

Total

(Cr)

Cop-

per

(Cu)

Spe-
cific

duc-
tance

(micr
mhos
at

25°C)

163
166
122

165
176
122

131
135
87

160
178
125

179
178
145

173
177
151

169
171
164

155
151
133

135
135
128

pH

.8
.9
. 1

.7
.8
.2

.5
.6
.2

. 7
.8
.4

.8
. 7
. 5

.9
.8
.5

.5
.4
.4

. 7
.4
.2

.5
. 5
.4

Phosphate
(P04)

Ortho

0.01
.02
.04

.02
.03
.05

. 19
. 22
. 11

. 12
. 17
. 10

. 18
.21
. 14

. 13
. 14
. 11

. 10
. 10

.11

10

.11
.09

. 13
. 14
. 14

Total

0.11
. 17
. 17

.04
.04
.08

.23
.23
. 13

. 19
. 18
.12

.36
. 30
.26

.22
.26
.23

. 17
. 14
. 14

.27
.27
.31

.54
.96
.69

Total
nitro-

gen
as N

0.4
.5
.5

.3
.6
.6

.7
1.1
.6

.7
.3
.4

.2
.4
.2

.6
.7
.7

. 3
. 2
.2

.0
.6
. 1

.4
.4
.6

Am-
mon-

ium

(NH4)

0.0
.0
. 0

.0
.0
.0

.0
.0
.0

.0
. 0
.0

.0
.0
.0

.0
.0
. 0

.0
.0
.0

.0
. 0
. 0

.0
.0
.0

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

ooo ooo ooo ooo ooo ooo

rH rH CM rH rH rH rH rH CM rHCMC

rHrH OOO OOO OOO OOO OOO OOO OOO O O <

H rH rHrHrH SSS MNM M ^ ^ W ^ ^ ^

! P 3!°. oio oio ^10 010 p | o P!P p|o pip

CO I

OIO OIO OIO OIO OIO OfO OIO OIO OIO OIO

COCMCMC-JoCOrHrH <D ^ rHNrHOJCM'^''' rH

H H __________________________________

000 000 000 000 000 000 000 000 000 000

§£3 °)°)O <^<M '-I rHrHOO lOtDCO OO«)

SiOO tO^S 01CT)O OJCMCO lOtDtD OOOOO1 .... __

moo moo 1000 ooo ooo ooo oioo lOmm 101010 ooc

OOrH OOO OOrH OOO OOO OrHrH OOO --- - - - ___

rH.. ... . '. '. til '.'.'. '.'.'. '.'.'.

flTflifli ... tOtDtO OOO ^^"^ 000000 rHHrH

««« 555 333 333 333 333 333 S T " --- - - -

389-675 O - 70 - 22

KALAHA RIVER BASIN

14-2235. KALAHA RIVER BELOW ITALIAN CREEK, NEAR KALAHA, WASH.

LOCATION. Temperature recorder at gaging station, 2.5 miles northeast of Kalama, Cowlitz County, 3 miles upstream from mouth, and 5 miles downstream from Italian Creek. DRAINAGE AREA. 198 square miles.
RECORDS AVAILABLE. Water temperatures: October 1954 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 68°F July 30; minimum, 36°F Dec. 17.
EXTREMES, 1954-65. Water temperatures: Maximum, 69°F July 28, 1958; minimum, freezing point Nov. 19, 20, 1958.

Chemical analyses, in parts per million

Date
of
collection

Oct. 14, 1964
Jan. 13, 1965

July 6.......

Mean

discharge
(cfs)

451
1330
1150
300

Silica

(Si02)

14
14
13
18

Alu-
mi-

num

(Al)

Iron

(Fe)

0.06

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

5.0
4.4
4.0
5.6

Mag-
ne-

sium

(Mg)

1.0
. 7
. 8
1.2

Sodium

(Na)

3.3
3.0
3.1
4.4

Po-
tas-

sium

(K)

0.2
. 1
. 4
.4

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

25
19
20
27

Car
ben-

ate

ICO,)

0
0
0
0

water year October 1964 to September 1965

Sulfate

(S04)

0.0
.0
.4
.6

Chloride

(Cl)

3.5
3.0
2.0
4.0

Fluo-

ride

(F)

0.1
. 0

.1
.1

Ni-

trate

(NO,)

0.3
1.1
.3
.3

Phos-

phate
(PO.)

0.05
.03
.09
.03

Dissolved
solids

(residue
at 180°C)

42
40
38
A 48

Hardness
as CaCO,

Cal-

cium,
mag-
nesium

17
14
14
19

Non-
car-

bon-

ate

0
0
0
0

To-

tal
acid-

ity
as

H+ 1

Specific
conduct-

ance

(micro-
mhos at

25°C)

50
42
40
58

pH

7.3
7.1
6.9
7.2

Col-

or

5
5
0
0

D.O.
[dis-
sol-
ved
oxy-
gen
ppm)

11.5
13.0
11.6
8.4

MPN

(coli-
form
colo-

nies

per

100 ml)

930
36
4600
91

A Calculated from determined constituents.

Analyses, in parts per million, of trac

Date of
collection

Oct. 14, 1964....
Apr. 19, 1965....

Time

(24 hr)

1415
1230

Chromium

Hexa-

valent

(Cr«)

0.00
.00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.01
.03

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.01
.01

KALAMA RIVER BASIN Continued

14-2235. KALAMA RIVER BELOW ITALIAN CREEK, NEAR KALAMA, WASH. Continued

Temperature (°F) of water, water year October 1964 to September 1965

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

51
50

48
48

46
45

40
40

42
42

43
43

49
46

47
46

54
49

63
58

67
65

62
58

2

50
50

48
48

46
46

41
40

42
41

43
42

46
44

47
46

58
52

64
59

65
61

60
56

3

50
49

48
47

46
45

41
41

42
42

44
43

45
43

46
46

58
54

64
60

62
61

58
55

4

49
47

47
47

45
45

41
41

43
42

44
43

47
44

46
46

59
54

64
60

61
59

57
54

5

50
48

47
46

45
45

42
41

43
42

44
44

46
45

46
45

59
54

64
60

63
58

58
55

6

50
48

46
44

45
44

42
42

42
41

44
44

45
44

47
44

59
55

65
60

64
60

58
54

7

50
49

44
44

44
44

42
42

41
41

44
44

46
43

50
46

60
54

64
61

65
61

58
54

8

51
50

44
44

45
44

42
42

42
41

44
44

46
44

51
47

58
53

61
58

66
62

57
54

9

51
51

44
44

45
45

42
41

42
41

44
44

46
45

52
49

57
52

58
56

66
63

56
55

10

51
50

44
44

45
45

42
41

42
42

44
44

46
44

54
50

59
54

56
55

64
62

56
53

11

50
49

44
44

45
43

42
41

43
42

44
44

48
44

54
51

57
55

57
55

63
62

56
54

12

51
50

44
43

43
43

41
41

43
43

44
44

49
45

53
51

55
52

61
55

62
60

56
53

13

51
50

43
40

43
42

41
41

44
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COWLITZ RIVER BASIN

14-2325. CISPUS RIVER NEAR HANDLE, WASH.

LOCATION. Temperature recorder at gaging station,60 feet upstream from bridge to Tower Rock ranger station, 4 miles downstream from North Fork, and 8 miles southeast of Handle, Lewis County.
DRAINAGE AREA. 321 square miles.
RECORDS AVAILABLE. Water temperatures: May 1950 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 61°F Aug. 18; minimum, 36°F Jan. 9, 10, Feb. 27, 28.
EXTREMES, 1950-65. Water temperatures: Maximum, 62°F July 27-29, 1958; minimum, freezing point Jan. 20, 1954, on several days during January and Feb. 1-3, 1963.
REMARKS. Recorder stopped during freeze Dec. 17 to Jan. 7; temperature range, 37°F to 40°F.

Temperature (°F) of water, water year October 1964 to September 1965

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Minimum ....
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January
Maximum ....
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COWLITZ RIVER BASIN Continued

14-2335. COWLITZ RIVER NEAR KOSMOS, WASH.

mwate Creek, 1.5 miles downstream from Cispus River, and 4 miles southeast of Kos LOCATION. Temperature recorder at gaging station, 0.5 mile downstream froi Lewis County.
DRAINAGE AREA. 1,042 square miles.
RECORDS AVAILABLE. Chemical analyses: July 1959 to July 1965.
Water temperatures: November 1952 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 64°F July 29-31; minimum, 37°F Dec. 15, 16.
EXTREMES, 1952-65. Water temperatures: Maximum, (1952-61, 1962-65), 65°F July 11, 12, 1958; minimum, freezing point Jan. 20, 1962.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 27, 1964
Jan. 14, 1965

Mean

discharge
(cfs)

1700
3260
5800
4130

Silica

(S1O2)

14
16
12
11

Alu-
mi-

num

(Al)

Iron

(Fe)

0.07

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

7.0
7.2
5.6
4.8

Mag-
ne-

sium

(Mg)

1.4
1.3
.9
.8

Sodium

(Na)

3.4
3.3
2.9
2.4

Po-
tas-

sium

(K)

0.7
.2
.4
.4

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(SCO,)

34
33
26
23

Can
ton-

ate

py

0
0
0
0

Sulfate

(SOJ

2.6
2.4
2.0
1.4

Chloride

(Cl)

1.5
2.0
.8
1.0

Fluo-

ride

(F)

0.1
.0

.1
.0

Ni-

trate

(N03)

0.1
.3
. 1
. 1

Phos-

phate
(P04)

0.02
. 02
.03
.03

Dissolved
solids

(residue
at 180°C)

A 48
48
37
A 33

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

24
23
18
15

Non-
car -

bon-

ate

0
0
0
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To-

tal
acid

«y
as

H+ 1

Specific
conduct-

ance

(micro-
mhos at

25°C)

64
63
47
41

pH

7.2
7.4
7.0
7.2

Col-

or

5
0
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D.O.
(dis-
sol-
ved
oxy-
gen
ppm)

12.5
12.7
11.4
9.6

MPN

(coli-
forra
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nies
tier

100 ml)

36
23
230
36

constituents.

Analyses, in parts per millic of trace elements

Date of
collection

Oct. 27, 1964....
Apr. 19, 1965....

Time

(24 hr)

1115
1525

Chromium

Hexa-

valent

(Cr»)

0.00
.00

Total

(Cr)

0.00
.00

Cop-

per

(Cu)

0.01
.02

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
. 00

Boron

(B)

0.06
.01

COWLITZ RIVER BASIN Continued

14-2335. COWLITZ RIVER NEAR KOSMOS, WASH. Continued

Temperature (°F) of water, water year October 1964 to September 1965

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COWLITZ RIVER BASIN Continued

14-2355. WEST FORK TILTON RIVER NEAR MORION, WASH.

LOCATION. Temperature recorder at gaging station 0.8 mile upstream from mouth, and 4 miles northeast of Morton, Lewis County. DRAINAGE AREA. 16.4 square miles. '
RECORDS AVAILABLE. Water temperatures: August 1950 to May 1956, July 1957 to September 1959, October 1960 to September 1965. EXTREMES, 1964-65. Water temperatures: Maximum, 73°F July 26, 30, 31, Aug. 7, 8; minimum, 34°F Dec. 17, 18.
EXTREMES, 1950-59, 1960-65. Water temperatures: Maximum (1950-59, 1960-62, 1963-65), 73°F July 26, 30, 31, Aug. 7, 8, 1965; minimum (1950-59, 1960-63, 1964-65), freezing point on several days during February and March 1962, Jan. 27 to Feb. 1, 1963. Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....
Minimum ....
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Minimum ....

February
Maximum ....
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June
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July
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Minimum ....
August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

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COWLITZ RIVER BASIN Continued

14-2362. TILTON RIVER ABOVE BEAR CANYON CREEK, NEAR CINEBAR, WASH.

LOCATION. Temperature recorder at gaging station, 0.8 mile upstream from Bear Canyon Creek, and 1 mile southeast of Cinebar, Lewis County.
DRAINAGE AREA. 141 square miles.
RECORDS AVAILABLE. Water temperatures: May to September 1965.
EXTREMES, May to September 1965. Water temperatures: Maximum, 76°F July 30.

Temperature (°F) of water, May to September 1965

Month

October
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Minimum ....
December
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September
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COWLITZ RIVER BASIN Continued

14-2375. WINSTON CREEK NEAR SILVER CREEK, WASH.

LOCATION. Temperature recorder at gaging station,100 feet downstream from bridge, 3.2 miles upstream from mouth, and 4.5 miles southeast of town of Silver Creek, Lewis County.
DRAINAGE AREA. 37.8 square miles.
RECORDS AVAILABLE. Water temperatures: April to September 1965.
EXTREMES, April to September 1965. Water temperatures: Maximum, 72°F July 30.

Temperature (°F) of water, April to September 1965

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Maximum ....
Minimum ....

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COWLITZ RIVER BASIN Continued

14-2380. COWLITZ RIVER BELOW MAYFIELD DAM, WASH.

LOCATION. Temperature recorder at gaging station,1 mile upstream from Mill Creek, 1.5 miles downstream from Mayfield Dam, Lewis County, and 2 miles downstream from Winston Creek.
DRAINAGE AREA. 1,400 square miles.
RECORDS AVAILABLE. Water temperatures: October 1950 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 67°F Aug. 17; minimum, 37°F Dec. 21-23.
EXTREMES, 1950-65. Water temperatures: Maximum, 70°F July 28, 29, 1958; minimum, 33°F Jan. 28 to Feb. 2, 1956.
REMARKS. Recorder stopped Oct. 1-23; temperature range not determined. Bulb out of water Nov. 23, and on several days during period Sept. 1-30.

Temperature (°F) of water, water year October 1964 to September 1965

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COWLITZ RIVER BASIN Continued

14-2390.5. COWLITZ RIVER HEAR TOLEDO, WASH.

LOCATION. At bridge on U.S. Highway 99, 2.0 miles upstream from Lacamas Creek, 2.4 miles downstream from Salmon Creek, and 2.5 miles southwest of Toledo, Lewis County.
RECORDS AVAILABLE. Chemical analyses: October 1961 to September 1965.
REMARKS. No discharge records available.

Chemical analyses, in parts per million, water year October 1964 to September 1965

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of
collection

Oct 14, 1964

Jan 13, 1965

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Sept. 14.....

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1.0

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1.1

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1.6

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(Na)

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2.8

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2.5

2.6
3.4
4.6

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(Cl)

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Analyses, in parts per million, of trace elements

Date of
collection

Mar. 10, 1965....
Sept. 14. ....

Time

(24 hr)

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1100

Chromium

Hexa-

valent

(Cr«)

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.01

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(Cr)

0.00
.02

Cop-

per

(Cu)

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.02

Zinc

(Zn)

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. 05

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senic

(As)

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Boron

(B)

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.01

COWLITZ RIVER BASIN Continued

14-2425. TOOTLE RIVER NEAR SILVER LAKE, WASH.

LOCATION. Temperature recorder at gaging station just downstream from highway bridge, 0.5 mile downstream from confluence of 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 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 71°F July 30; minimum, 38°F on several days during December and January. EXTREMES, 1950-62, 1963-65. Water temperatures: Maximum, 72°F Aug. 4, 1952; minimum (1950-60, 1961-62, 1963-65), freezing point Jan. 4, 5, 1959.

Temperature (°F) of water, water year October 1964 to September 1965

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COWLITZ RIVER BASIN Continued

14-2430. COWLITZ RIVER AT CASTLE ROCK, WASH.

LOCATION. Temperature recorder at gaging station, 15 feet downstream from highway bridge in Castle Rock, Cowlitz County, 2.i downstream from Toutle River, and 14 miles upstream from mouth.
DRAINAGE AREA. 2,238 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1958 to September 1959.
Water temperatures: August 1950 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 69°F July 30, 31, Aug. 1; minimum, 38°F Dec. 19, 20, 22.
EXTREMES, 1950-65. Water temperatures: Maximum (1950-62, 1963-65), 75°F July 28-30, 1958; minimum, freezing point Jan. 29, 30, 1951.

Temperature (°F) of water, water year October 1964 to September 1965

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COWLITZ RIVER BASIN Continued

14-2450. COWEMAN RIVER NEAR KELSO, WASH.

LOCATION. At bridge on U.S. Highway 99, 0.3 mile east of Kelso, Cowlitz County, 2.6 miles upstream from mouth, and 4.6 miles downstream from gaging station. DRAINAGE AREA. 119 square miles, upstream from gaging station.
RECORDS AVAILABLE. Chemical analyses: October 1961 to September 1965.
Water temperatures: July 1950 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 79°F July 30; minimum, 34°F Dec. 18, 19.
EXTREMES, 1950-65. Water temperatures: Maximum, 82°F July 27, 28, 1958; minimum, freezing point on several days during winter months.
REMARKS. Temperature recorder located at gaging station. Some inflow between gaging station and sampling point.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 14, 1964

Jan. 13, 1965

Sept. 14.....

Mean

discharge
(cfs)

114
167
1700
646
730
284

240
148
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48
35
38

Silica

(Si02)

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Alu-
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(Al)

Iron

(Fe)

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Man-

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(Mn)

Cal-

cium

(Ca)

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5.5
3.5
4.4
4.0
4.5

5.2
6.0

8.8
9.6
10

Mag-
ne-

sium

(Mg)

2.0
1.8
1.1
.9
1.2
1.5

2.0
1.6

2.0
2.2
2.7

Sodium

(Na)

4.0
3.7
3.0
3.3
3.1
3.2

4.5
4.0

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6.1
6.2

Po-
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sium

(K)

0.3
.4
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.3
.2
.2

.4
. 5

. 5
.8
.7

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

32
28
16
20
19
25

28
28

37
40
41

Car-
bon-

ate

p<y

0
0
0
0
0
0

0
0

0
0
0

Sulfate

(SO.)

0.2
.6
1.4
.4
1.2
.6

1.6
.6

. 8
1.2
.2

Chloride

(Cl)

4.5
3.8
1.8
3.0
2.2
2.5

4.0
4.5

7.2
9.5
11

Fluo-

ride

(F)

0.0

.1
.2
.0
. 1
. 1

.0
.0

.0

.1
.1

Ni-

trate

(NO,)

0.7
1.8
3.0
2.8
2.4
1.4

.9
.4

. 7
.9
.5

Phos-

phate
(PO«)

0.03
.02
.04
.01
.03
.01

.01
.02

.05
. 11
.07

Dissolved
solids

(residue
at 180°C)

52
47
39
39
41
A 40

47
A 46

62
70
70

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

24
21
13
15
15
18

21
22

30
33
36

Non-
car-

bon-

ate

0
0
0
0
0
0

0
0

0
0
2

To-

tal
acid-

ity
as

H+ l

Specific
conduct-

ance

(micro -
mhos at

25°C)

70
62
41
47
44
51

61
62

88
98
103

PH

6.9
7.2
7.1
6.9
6.9
7.0

7.0
7.4

7.1
7.0
7.0

Col-

or

10
5
10
5
5
5

5
5

5
5
5

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

9.5
13.1
11.5
13.7
11.8
11.5

10.0
10.3
7.7
7.2
5.7
8.3

MPN

(coli-
form
colo-

nies
per'

100 ml)

1500
230
430
36
30
150

150
230
91
2400
11000
24000

A Calculated from determined constituents.

Analyses, in parts per million, of trace elements

Date of
collection

Mar. 10, 1965....
Sept. 14. ....

Time

(24 hr)

0950
1110

Chromium

Hexa-

valent

(Cr«)

0.00
. 00

Total

(Cr)

0.00
.00

Cop-
per

(Cu)

0.02
.04

Zinc

(Zn)

0.05
.05

Ar-

senic

(As)

0.00
.00

Boron

(B)

0.02
. 00

COWLITZ RIVER BASIN Continued

14-2450. COWEMAN RIVER NEAR KELSO, WASH. Continued

Temperature (°F) of water, water year October 1964 to September 1965

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

53
52

49
49

47
46

39
39

42
41

42
41

50
46

49
47

60
51

72
65

76
72

66
62

2

53
53

49
49

47
46

40
39

41
40

42
40

46
43

48
46

62
55

73
65

73
68

64
61

3

53
50

49
48

46
45

40
40

41
40

42
40

47
41

47
45

62
58

73
66

68
66

63
59

4

51
48

49
48

45
44

40
40

43
41

43

48
43

46
45

63
56

73
66

67
65

62
58

5

52
49

49
47

44
44

40
39

43
42

43
41

48
46

45
43

64
58

74
66

71
63

64
59

6

52
49

47
45

44
43

40
39

42
41

44

46
43

49
43

64
59

76
67

74
65

65
59

7

52
51

45
44

44
43

40
40

41
41

44
42

47
43

50
44

65
58

72
68

75
67

65
58

8

54
52

44
44

45
44

40
39

41
41

44
41

47
44

54
47

63
57

68
63

74
68

63
58

9

54
54

44
44

45
45

39
38

41
39

10

54
53

44
44

45
45

40
38

40
39

45
43

47
46

56
49

61
55

63
61

74
70

61
60

45
43

46
44

58
52

63
57

61
59

73
68

63
57

11

53
51

44
44

45
43

40
40

40
39

46
43

49
43

59
53

62
57

62
61

70
68

61
59

12

54
53

44
43

43
42

40
40

41
40

46
43

51
45

59
55

58
53

68
60

69
65

61
58

13

54
53

43
42

42
42

40
39

41
41

45
41

50
47

57
53

57
54

72
63

68
63

61
59

14

54
53

42
41

42
42

40
39

41
41

44
41

51
45

56
51

55
54

75
66

70
63

60
60

15

54
52

41
40

42
42

40
39

41
41

44
42

53
49

55
52

55
53

74
69

73
65

60
58

16

52
49

40
39

42
37

40
40

42
41

44
43

53
49

54
51

61
52

75
67

74
66

59
56

17

49
48

39
38

37
35

40
39

44
42

43
41

50
46

54
51

61
53

74
67

75
67

57
52

18

48
46

39
39

35
34

39
39

44
43

42
40

49
47

56
50

58
56

71
64

74
69

56
51

19

47
45

39
39

36
34

40
39

43
43

41
3 8

47
47

55
53

60
55

67
63

71
66

56
52

20

47
45

39
38

37
36

41
40

43
41

41
40

50
47

53
51

65
57

65
63

66
64

57
53

21

47

45

38
38

39
37

41
41

41
40

44
41

49
48

52
50

64
58

64
61

69
64

58
56

22

47
46

40
38

42
39

41
40

41
40

45
44

52
47

52
49

66
57

68
61

68
66

60
57

23

47
45

44
40

42
42

40
40

41
41

45
41

50
47

53
48

65
59

73
64

66
65

61
57

24

48
47

45
44

43
42

40
40

41
40

44
40

48
48

52
50

66
59

76
67

67
63

61
56

25

48
47

45
45

43
43

40
39

43
41

42
40

55
48

54
50

63
56

74
70

66
64

59
56

26

47
44

45
43

43
43

41
39

43
43

42
40

58
52

59
51

58
54

73
68

67
64

57
56

27

44
43

43
43

43
42

4?
41

43
42

42
41

57
54

60
55

62
54

75
68

66
62

57
55

28

47
44

43
43

42
41

42
42

42
41

42
42

56
53

60
56

66
58

75
66

62
60

56
55

29

47
47

45
43

41
40

43
42

45
42

54
49

59
56

69
61

77
68

63
57

56
55

30

49
47

46
45

40
39

43
43

49
44

52
49

57
54

72
63

79
70

64
57

58
55

31

49
48

39
39

43
42

51
47

54
52

78
71

66
58

Average

50
49

44
43

42
41

40
40

42
41

44
42

50
47

54
50

62
56

72
65

70
65

60
57

COLUMBIA RIVER MAIN STEM

14-2453. COLUMBIA RIVER AT LONGVIEW, WASH.

LOCATION. Cross-section No. 7, between log-boom walkway and navigational light 26, on downstream side of Longview bridge, 1.0 miles we County, and 2.1 miles downstream from the mouth of Cowlitz River.
RECORDS AVAILABLE. Chemical analyses: February 1964 to September 1965.
REMARKS. Samples for chemical and biological analyses were collected at quarter points A (right bank), B (center), and C (left bank). available.

Chemical analyses of water, water year October 1964 to September 1965

it of Long vie?

No discharge

, Cowlitz

records

Date of
collection

Oct. 14, 1964. . . .

Feb. 10, 1965. . . .

Mar. 10. ....

Time

(24 hr)

0950
0955
1000

1055
1105
1110

0945
0955
1000

1015
1020
1025

0930
0940
0945

0950
1000
1005

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

Tem-

pera-
ture

(°F)

59
56
60

55
55
55

41
41
41

43
42
43

45
45
44

Bi-
car-

bon-
ate

(HC03)

70
78
72

77
77
77

53
57
45

59
76
67

76
80
72

Car-
bon-
ate

(C03)

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-

cal
demand

ppm)

0.9
.6
.9

.3
.6
.4

.6
.4

.3
. 1
.0

.7
.2
.3

1.3
.9
.5

1.3
.4
. 7

M. P. N.

(most
probable
number
collform

groups
per
100 ml)

P. B. I.

(Pearl-
Benson
Index
A

11
8
17

15
15
23

22
22
38

13
16
26

18
12
24

13
13
31

15
9
25

Slime solids

Settle-

able

(ml/1)

36

5

34

25

6

6

1

Total

(mg/1)

898

286

656

207

35

524

10

Vol-

ume

(ml/1)

186

53

177

38

6

68

3

Chromium

Hexa-
valent

(Cr»)

Total

(Cr)

Cop-
per

(Cu)

Spe-
cific

duc-
tance

(micr<
nhos
at

25°C)

153
165
157

167
166
160

120
122
97

129
168
150

170
176
158

PH

7.7
8.0
7.8

7.7
7.7
7.5

.4
.5
.4

.6
. 7
.6

.6
.7
.6

Phosphate
(P04)

Ortho

0.02
.02
.03

.03
.03
.04

. 18
. 18
. 15

. 11
. 17
. 14

. 16
. 19
. 16

Total

0.07
.08
.12

.04
.05
.06

. 18
.23
. 18

. 12
. 17
. 14

.27
.27
. 28

Total
nitro-

gen
asN

0.2
.4
.4

.6
.6
.4

.6
.6
.4

.8
.6
.6

.6
. 1
.3

Am-
mon-

ium

(NH4)

0.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

A Sulfite waste liquor (lignin sulfonate).

COLUMBIA RIVER MAIN STEM

14-2453. COLUMBIA RIVER AT LONGVIEW, WASH. Continued

Chemical analyses of water, water year October 1964 to September 1965 Continued

Date of
collection

Mar. 24, 1965....

Ma v S

June 16... ....

June 30 ....

Time

(24 hr)

0940
0950
0955

0925
0935
0940

0910
0920
0925

1005
1015
1020

1035
0955
1000

0940
0950
0955

0940
0950
0955

0945
0950
0955

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

Tem-

pera-
ture
(°F)

44
45
44

47
48
48

50
51
52

50
52
53

45
52
45

57
58
58

59
59
59

62
63
63

Bi-
car-

bon-
ate

(HC03)

80
82
78

69
78
77

44
72
66

52
64
63

51
69
65

44
60
58

48
53
51

54
61
60

Car-

ate

(C03)

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-

cal
demand

ppm)

2.0
2.3
1.5

1.8
1.4
1.5

1.4
1.5
1.3

1.4
1.2
1.5

0.8
.9
.8

1.2
1.3
1.1

.8
.8
.8

1.2
1.6
1.0

M.P.N.

(most
probable
number
collform

groups
per

100 ml)

P.B.I.

(Pearl-
Benson
Index
A

17
19
34

22
33
33

6
10
45

8
9
18

7
8
17

8
7
11

18
14
11

Slime solids

Settle -
able

(ml/1)

14

1

17

16

1

5

1

4

1

2

1

Trace

Total

(mg/1)

684

30

369

346

16

90

24

174

15

146

42

23

12

Vol-

ume

(ml/1)

99

8

75

59

4

41

1

41

5

38

16

12

in

Chromium

Hexa-

valent

(Cr«)

Total

(Cr)

Cop-
per

(Cu)

Spe-
cific
con-

duc-
tance

(micro
mhos
at

25°C)

178
179
171

162
172
173

95
154
145

110
138
132

112
146
141

86
120
116

96
108
107

114
123
199

PH

. 8
.8
.6

.4
.4
.4

. 2
.2
.4

.3
.3
. 3

.7
. 7
.0

.7
.8
.8

. 5
.5
. 5

.2
.3

Phosphate
(P0«)

Ortho

0.12
. 13
. 13

. 10
. 12
. 11

.07
. 10
.09

. 12
. 14
. 15

.08
. 11
. 11

.02
.03
.03

.04
.05
.05

.06
.05

Total

0.24
.23
.25

. 15
. 16
.25

.24
.32
.34

.35
. 56
.51

.25
.35
.28

. 14
.29
. 31

.20
.43
.31

.22
.39

Total
nitro-

gen
as N

0.6
.7
.8

.6
.2
.6

.2
. 2
. 1

.4
.4
.3

. 1
.3
.2

.0
.0
.3

.0
.0
.9

.0
. 1

Am-
mon-

ium

(NH«)

0.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0

July 14, 1965. . . . 0940

0955

A

^

^

67

67

68

56

64

60
70

74

80

82

0

0

0

1.3

.9

1.4

17 3 58

4

7

_

116

129

123
140

7.8
8.0
8.0

7.9
8.1
8.1

8.1

8.0

.02

.01

.03

. 11

. 16

. 23

. 0
.2
. 1

.0

3

. 1

. 3
. 1

A Sulfite waste liquor (lignin sulfonate).

COLUMBIA RIVER MAIN STEM Continued

14-2454. COLUMBIA RIVER AT FISHER ISLAND, NEAR LONGVIEW, WASH.

LOCATION. Midpoint at Fisher Channel, 0.5 mile south of Fisher Island, 3 miles west of Longview, Cowlitz County, and 3.5 miles upstream fi RECORDS AVAILABLE. Chemical analyses: October 1962 to September 1965.
REMARKS. Samples for biological analyses were collected at cross-section No. 8 in Fisher Channel, between navigational lights 9 and 10, a1 bank), B (center), and C (left bank). No discharge records available. Sampling point for monthly analyses subject to tidal influence.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Coal Creek,

uarter points A (right

Date
of
collection

Oct. 14, 1964
Feb. 10, 1965

May 5

Sept. 8. .....

Mean

discharge
(els)

Silica

(Si02)

5.3
16
15
13
14

8.0
7.6
6.9
8.0

Alu-
mi-

num

(Al)

Iron

(Fe)

0.07

.05

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

18
12
18
17
16

16
17
18
19

Mag-
ne-

sium

(Mg)

5.5
3.9
5.4
6.6
4.1

3.4

4.7
5.5

Sodium

(Na)

6.2
6.0
8.5
6.0
5.6

3.4
3.6
4.1
6.4

Po-
tas-

sium

(K)

. 1
. 5
.6
. 5
.2

. 7
.0
. 1
. 5

Lith-

ium

(Li)

Bl-

ear -

bon-

ate

(Hccg

76
55
78
72
65

60
63
72
76

Car-
ban-

ate

W

0
0
0
0
0

0
0
0
0

Sulfate

(SOJ

15
9.4
16
14
12

10
11
12
15

Chloride

(Cl)

3.0
3.0
4.0

2.2

1.5
1.5
2.0
3.0

Fluo-

ride

(F)

0.2
.2
.2
1
.3

. 2
.2
.2
.3

Ni-

trate

(NO,)

0.6
1.8
1.5

.9

.4
.5
.6
. 7

Phos-

phate
(PO.)

0.07
. 15
.20

. 15

.08
.08
.08
. 11

Dissolved
solids

(residue
at 180°C)

95
87
115
100
A 88

75
78
89
100

Hardness
as CaCO3

Cal-

cium,
mag-
nesium

68
46
67
70
57

54
58
64
70

Non-
car-

bon-

ate

5
1
3
10
4

5
6
6
8

To-

tal
acid

ity
as

H+l

Specific
conduct-
ance

(micro-
mhos at

25"C)

162
122
175
153
139

123
131
145
167

PH

. 1
.4
. 7
.9
. 7

.3
.1
.4
.4

Col-

or

5
20
10
10
5

5
5
5
5

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
form
colo-

nies

per
1QQ ml

2300
2300
910
100
4300

7300
360
4300
100

Analyses, of parts per million af trace elements

Date of
collection

Feb. 10, 1965.

Chromium

Hexa-

valent

(Cr«)

o.oo

Total

(Cr)

0.00

Cop-

per

(Cu)

0.04

Zinc

(Zn)

0.05

Ar-

senic

(As)

0.00

Boron

(B)

0.06

COLUMBIA RIVER MAIN STEM Continued

14-2454. COLUMBIA RIVER AT FISHER ISLAND, NEAR LONGVIEW, WASH. Continued

Chemical analyses of water, water year October 1964 to September 1965

Date of
collection

Oct. 14, 1964....
Oct 14

Nov. 10. ....

Feb. 10, 1965....

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

May 5 ....

Time

(24 hr)

1035
1040
1045

1140
1145
1150

1045
1050
1055

1045
1050
1055

1040
1045
1050

1025
1035
1040

1015
1025
1030

0955
1005
1010

1045
1055
1100

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

Tem-

pera-
ture

(°F)

60
60
60

55
55
55

41
41
41

43
42
43

46
46
46

45
45
45

48
48
48

51
52
52

52
52
52

Bi-
car-

bon-
ate

(HC0 3)

77
76
74

78
76
77

58
56
53

73
74
73

75
79
77

78
82
80

74
79
80

60
70
70

64
64
64

Car-
bon-
ate

(C03)

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-

cal
demand

ppm)

1.0
.9
.9

1.2

1.3
1.2

1.5
1.8
1.7

1.2
.9
1.3

2.9
1.1
1.8

.8
1.3
. 5

1.2
1.0
1.0

2.0
2.0
.9

2.2
1.7
1.7

1.1
1.1
1.4

1.5
1.5
1.3

M. P. N.

(most
probable
number
coliform

groups
per

100 ml)

P. B. I.

(Pearl-
Benson
Index
A

16
13
15

18
20
19

24
25
31

17
21
24

15
12
17

14
16
20

29
10
17

22
17
24

29
27
26

16
14
22

12
10
14

Slime solids

Settle-

able

(ml/1)

32

29

103

10

46

39

6

Total

(mg/1)

511

492

253

130

253

261

234

Vol-

ume

(ml/1)

120

162

47

33

72

76

32

Chromium

Hexa-

valent

(Cr«)

Total

(Cr)

Cop-

per

(Cu)

Spe-
cific

iuc-
tance

(micrc
mhos
at

25°C)
164
164
160

169
167
166

121
120
113

161
165
162

172
174
169

178
179
177

165
175
175

130
153
152

135
138
135

PH

.9
.9
.8

.5
.6
.5

-

.5
.5
.4

.7
. 7
.6

.5
. 7
.7

.6
.8
. 7

.4
.4
.4

.3
.5
.4

. 5
.4
.2

Phosphate
(P04)

Ortho

0.02
.02
.02

.03
.03
.03

-

.20
.20
. 19

. 16
. 17
. 16

. 15
. 18
. 18

. 11
. 15
. 13

.09
. 11
. 11

.08
. 10
. 11

. 14
. 14
. 16

Total

0.07
.09
.09

.04
.04
.04

-

. 27
.20
.21

. 16
. 17
. 16

.27
.28
.31

.20
.23
.27

. 18
.26
. 18

.25
.29
.32

.43
.47
.69

Total
nitro-

gen
as N

0.3
.2
.3

.4
.6
.5

-

.4
.6
.9

.6
. 3
.4

.6
.4
.6

.6
.6
.5

.6
.6
.6

.4
.0
.3

.2
.2
.2

Am-
mon-

ium

(NH4)

0.0
.0
.0

.0
.0
.0

-

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

A Sulfite waste liquor (lignin sulfonate),

COLUMBIA RIVER MAIN STEM Continued

14-2454. COLUMBIA RIVER AT FISHER ISLAND, NEAR LONGVIEW, WASH. Continued

Chemical analyses of water, water year October 1964 to September 1965 Continued

Date of
collection

May 19, 1965.....

June 2 ....

Sept. 22.... .....

Time

(24 hr)

1035
1045
1050

1040
1050
1055

1030
1035
1040

1030
1040
1045

1030
1040
1045

1100
1110
1115

1040
1050
1100

1030
1040
1000

1040
1050
1055

1055
1105
1110

Sta-
tion

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

A
B
C

Tem-

pera-
ture

(°F)

46
55
47

58
58
58

60
60
60

63
63
63

67
67
67

69
68
68

71
71
71

70
70
70

66
66
66

63
63
63

Bi-
car-

bon-
ate

(HC03)

67
70
68

60
60
60

54
53
53

59
61
61

64
65
65

68
70
68

71
71
73

73
74
74

79
80
80

80
82
82

Car-
bon-
ate

(COs)

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

0
0
0

D.O.

(dis-
solved

oxygen
ppm)

B.O.D.

(bio-
chemi-

cal
demand

ppm)

.8
1.2
. 7

1.3
1.0
1.0

.8
. 7
.4

1.4
.9
.8

1.0
1.2
.8

1.6
1.2
1.4

1.2
.8
1.0

1.4
1.1
1.2

1.1
. 8
. 7

1.8
1.3
1.3

M. P. N.

(most
probable
number
coliform

groups
per

100 ml)

P. B. I.

(Pearl-
Benson
Index
A

8
8
12

9
9
9

22
15
11

22
13
9

13
9
9

12
9
10

22
13
15

12
4
5

20
15
15

Slime solids

Settle-

able

(ml/1)

7

5

1

Trace

1

3

4

6

6

25

Total

(mg/1)

586

270

80

47

22

229

312

273

206

594

Vol-

ume

(ml/1)

80

49

18

19

4

27

44

57

58

154

Chromium

Hexa-

valent

(Cr«)

Total

(Cr)

Cop-

per

(Cu)

Spe-
cific
con-

duct-

Cm! cro
mhos
at

25°C)

144
146
144

119
120
117

108
108
108

122
123
123

130
130
130

142
139
139

147
147
146

153
153
155

170
167
167

175
174
173

PH

7.7
8.0
7.9

.8
.8
.8

.6
.6
.6

.4
.2
.3

8.0
8.0
8.0

8.0
8.1
8.1

.8
.8
.9

.6
.7
.6

8.0
8.0
8.0

8.0
8.0
8.0

Phosphate
(P04)

Ortho

. 10
. 10
. 11

.03
.04
.03

.05
.06
.06

.07
.07
.11

.01
.01
.01

.03
.02
.03

.03
.03
.04

.02
.02
.02

.03
.04
.04

.02
.02
.02

Total

.32
.37
.33

.28
.27
.28

.34
. 16
.36

.19
.36
.32

.09
. 12
. 12

.22
.24
. 16

.06
. 11
. 11

.29
. 16
.27

.23
.22
.31

.21
.22
.23

Total
nitro-

gen
asN

.4
. 6
.4

.2
.4
.2

.4
. 1
.0

.3
.0
. 1

. 1
. 1
.4

.3
. 7
.3

.1
.3
.3

. 3
.0
.0

.4
.9
. 5

.0
. 1
.6

Am-
mon-

ium

(NH,)

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0
.0
.0

.0

.1
.0

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

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.0
.0

A Sulfite waste liquor (lignin sulf onate).

ELOCHOHAN RIVER BASIN

14-2475. ELOCHOMAN RIVER NEAR CATHLAMET, WASH.

LOCATION. Temperature recorder at gaging station, 125 feet upstream from railroad bridge, 2.5 miles northeast of Cathlamet, Wahkiakum County, and 4.5 miles upstream from mouth.
DRAINAGE AREA. 65.8 square miles.
RECORDS AVAILABLE. Water temperatures: June 1950 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 72°F July 24, 30; minimum, 36°F Dec. 17.
EXTREMES, 1950-65. Water temperatures: Maximum, 75°F July 11, 12, 1961; minimum, freezing point Feb. 17, 1956. Temperature (°F) of water, water year October 1964 to September 1965

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

53
52

49
49

47
47

40
40

43
42

43
41

49
45

49
47

59
50

66
59

69
65

63
60

2

53
52

49
48

47
47

40
39

42
42

44
41

47
43

49
46

62
55

67
59

66
62

61
59

3

52
49

48
48

47
46

40
39

43
42

44
41

48
42

48
47

61
56

64
60

63
61

62
57

4

52
50

49
48

46
45

40
39

43
43

44
41

48
45

48
46

62
55

68
59

66
60

61
56

5

53
51

49
46

46
44

40
39

43
42

45
42

47
45

46
44

63
56

68
60

68
60

63
58

6

53
51

46
45

45
44

40
39

42
41

45
42

45
43

49
43

63
57

70
61

69
61

63
57

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52
52

46
45

45
45

40
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43
42

46
43

46
43

50
46

63
57

65
60

68
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62
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58

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42 43

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62

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69
61

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44

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47

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49

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70
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63
62

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48

47
45

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42

45
42

50
48

54
50

61
53

72
67

65
61

60
56

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43
43

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43
41

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49

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58
52

56
52

68
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65
61

57
56

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67
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70
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62
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56
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47
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41
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43

49
44

52
49

54
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68
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72
64

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58
54

31

50
49

40
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43
42

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50
47

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52
51

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71
64

64
57

Average

51
49

45
44

43
47

41
40

44
42

45
43

50
47

52
49

60
54

67
60

66
61

59
55

BEAR CREEK BASIN

14-2487. BEAR CREEK NEAR SVENSEN, OREG.

LOCATION. Temperature recorder at gaging station, 0.5 mile upstream from Astoria Reservoir Dam, and 3.8 miles southeast of Svensen, Clatsop County.
DRAINAGE AREA. 3.33 square miles.
RECORDS AVAILABLE. Water temperatures: August to September 1965.

Temperature (°F) of water, August to September 1965

Month

August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

Day

1

55
54

2

55
54

3

55
53

4

55
53

5

55
53

6

56
53

7

58
55

55
52

8

57
56

54
52

9

57
55

54
54

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57
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54
52

11

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56

54
54

12

57
56

54
53

13

57
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57
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58
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54

54
53

26

56
55

53
52

27

55
53

52
50

28

54
52

52
50

29

53
50

52
51

30

5/i
52

52
50

31

55
52

Average

56
54

54
52

GRAYS RIVER BASIN

14-2505. WEST FORK GRAYS RIVER NEAR GRAYS RIVER, WASH.

LOCATION. Temperature recorder at gaging station, 1 mile upstream from mouth, and 3.2 miles northeast of town of Grays River, Wahkiakum County.
DRAINAGE AREA. 15.2 square miles.
RECORDS AVAILABLE. Water temperatures: June 1950 to December 1958, August 1961 to September 1965.
EXTREMES, 1964-65. Water temperatures; Maximum, 68°F July 24, 30; minimum, 41°F on several days during January. EXTREMES, 1950-58, 1961-65. Water temperatures: Maximum (1950-58, 1962-65), 69°F July 27, 28, 1958; minimum (1961-65), 33°F Jan. 30, 1963.

Temperature (°F) of water, water year October 1964 to September 1965

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 ....

1

53
53

50
4 9

48
48

42
42

43
43

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44

48
45

46
45

58
48

63
56

64
62

61
5 8

2

53
53

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49

48
48

42
42

43
43

44
44

47
45

46
45

60
51

64
56

63
60

60
5 8

345

53
53

49
49

48
48

42
42

43
43

44
44

49
44

46
46

60
52

63
57

60
60

60
57

53
53

49
49

48
48

42
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43
43

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49
45

47
44

60
52

64
57

62
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60
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48

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47
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42

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53

64
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65
58

6]
57

6 7

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48

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45
45

44
44

49
42

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53

65
57

67
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62
56

53
53

48
46

48
47

41
41

43
43

46
45

45
44

50
43

61
53

62
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65
60

61
55

8

53
53

48
48

47
47

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53
53

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47
47

53
53

47
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TRASK RIVER BASIN

14-3025. TRASK RIVER NEAR TILLAMOOK, OREG.

LOCATION. Temperature recorder at gaging station, 0.6 aile upstream from Gold Creek, and 6.2 miles east of Tillamook, Tillamook County.
DRAINAGE AREA. 145 square miles.
RECORDS AVAILABLE. Water temperatures: April 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Minimum, 36°F Dec. 17, 18.
EXTREMES, 1962-65. Water temperatures: Maximum (1962-64), 70°F July 26, 27, 1962; minimum, 33°F Jan. 11-13, 30, 31, 1963. Temperature (°F) of water, water year October 1964 to September 1965

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NESTUCCA RIVER BASIN

14-3036. NESTUCCA RIVER NEAR BEAVER, OREG.

LOCATION. Temperature recorder at gaging station,150 feet upstream from Saling Creek, and 1.2 miles southwest of Beaver, Tillamook County.
DRAINAGE AREA. 180 square miles.
RECORDS AVAILABLE. Water temperatures; October 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 72°F July 23; minimum, 37°F Dec. 17-19.

Temperature (°F) of water, water year October 1964 to September 1965

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BEAVER CREEK BASIN

14-3060.4. NORTH FORK BEAVER CREEK NEAR SEAL ROCK, OREG.

LOCATION. Temperature recorder at gaging station at bridge 1,100 feet upstream from Peterson Creek, and 4.4 miles northeast of Seal Rock, Lincoln County.
DRAINAGE AREA. 10.0 square miles.
RECORDS AVAILABLE. Water temperatures: July to September 1965.

Temperature (°F) of water, July to September 1965

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>eriodic determinations of suspended-sediment discharge, water year October 1964 to September 1965

(Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water;

Date of collection

Jan. 13, 1965. ....

Time

(24 hour)

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Water
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(°F)

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Sam-

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Discharge
(cfs)

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Sediment
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tration

(ppm)

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Sediment

discharge
(tons per day)

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Percent finer than size indicated, in millimeters

Method
of

analysis

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 1965.
EXTREMES, 1964-65. Water temperatures: Minimum, 35°F Nov. 21.
EXTREMES, 1958-65. Water temperatures: Maximum (1958-64), 76°F July 27, 28, 1958; minimum, 34°F Jan. 21, 1962. REMARKS. Recorder stopped Mar. 7-10, Apr. 9-23; temperature ranges, 43°F to 48°F and 42°F to 53°F, respectively.

Temperature (°F) of water, water year October 1964 to September 1965

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60

1 1

58
54

44
43

45
43

43
4?

44
42

49
44

60
51

12

58
54

43
41

43
43

43
4?

45
44

49
45

59
51

13

57
55

41
40

43
4?

4?
41

45
44

48
43

59
51

14

56
55

41
40

44
43

42
41

44
43

4R
4?

58
49

15

56
53

40
3R

44
43

42
42

44
44

48
47

5ft
51

Day

16

54
50

39
37

43
38

4?
42

46
44

45
4?

5R
5?

17

51
48

39
37

38
36

42
41

46
44

46
4?

58
50

18

51
46

38
37

39
36

42
42

47
44

46
40

59
49

19

52
47

3R
36

39
39

43
4?

45
44

46
39

5ft
5?

20

51
47

37
3fi

41
39

44
43

47
45

47
40

55
51

21

51
47

38
35

45
41

44
43

45
43

49
4?

55
51

22

51
47

41
38

47
45

43
43

44
43

47
43

55
51

23

50
4fi

44
41

47
46

44
43

44
42

47
43

5?
50

24

51
4B

46
44

47
46

44
43

45
42

47
4?

53
4R

25

51
47

46
45

46
46

43
4?

45
4?

44
40

57
4fl

26

47
45

45
44

46
45

44
43

45
44

44
42

60
50

27

47
46

44
43

45
43

45
44

45
44

45
42

61
52

28

49
47

45
44

43
4?

45
45

45
44

46
43

6?
53

29

49
49

46
45

42
41

46
45

4fl
43

60
54

30

50
4fl

47
46

42
40

46
45

50
44

5fl
5?

31

49
4fl

__

41
40

45
44

50
47

55
51

54
50

44
42

44
43

43
42

45
43

47
42

56
49

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 1963, August to September 1965.
EXTREMES, 1958-63. Water temperatures: Maximum, 74°F July 12, 1961; minimum, 34°F Jan. 21, 22, 1962, Jan. 11-13, 30, 1963. Temperature (°F) of water, water year October 1964 to September 1965

Month

August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

Day

1

66
59

2

64
57

3

64
58

4

63
56

5

64
58

6

64
57

7

64
56

8

62
57

9

61
59

10

61
56

11

61
59

12

62
58

13

62
57

14

62
59

15

62
59

16

61
56

17

59
51

18

57
50

19

57
50

20

63
61

58
51

21

65
61

58
53

22

64
61

61
56

23

64
61

62
56

24

66
61

62
56

25

65
62

61
55

26

64
61

60
56

27

64
59

59
56

28

62
56

59
55

29

63
54

59
52

30

64
54

57
51

31

66
61

Average

61
56

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 (revised). 0.27 square mile.
RECORDS AVAILABLE. Water temperatures: October 1958 to September 1965.
Sediment records: November 1958 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 57°F on several days during July and August; minimum, 40°F on several days during November and March.
Sediment concentrations: Maximum daily, 300 ppm Jan. 28; minimum daily, less than 1 ppm on many days during November and April.
Sediment loads: Maximum daily, 33 tons Jan. 28; minimum daily, less than 0.05 ton on many days.
EXTREMES, 1958-65. Water temperatures: Maximum, 61°F Aug. 29, 31, Sept. 1, 1961, Aug. 11, 1963; minimum, 35°F Jan. 30, 1963. Sediment concentrations: Maximum daily, 300 ppm Jan. 28, 1965; minimum daily, (revised) less than 1 ppm on many days during 1958-63, 1965.
Sediment loads: Maximum daily, 33 tons Jan. 28, 1965; minimum daily, (revised) less than 0.05 ton on many days during each year.
REVISIONS. Sediment loads for water years 1964 and 1965 computed on basis of mean discharge published to hundredths below 1 cfs. Figures of mean discharge below 1 cfs for water years 1961-63 and minimum discharge for period of record revised to hundredths in WSP 1935; revision of sediment loads not warranted.

Temperature (°F) of water, water year October 1964 to September 1965

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 ....

1

52
51

49
48

49
49

44
44

45
44

44
42

46
45

47
46

2

51
50

48
48

49
49

45
44

44
44

43
42

45
44

48
45

3

51
50

48
48

49
49

45
44

44
44

43
42

45
44

47
45

4

51
50

48
48

49
49

44
44

45
44

43
42

45
44

47
45

5

51
50

48
46

49
48

45
44

45
44

43
42

45
45

46
44

6

51
50

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7

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43
41

45
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50
47

11

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52

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42
41

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44

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47

12

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52

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41

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13

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14

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47
46

49
47

15

53
52

43
42

49
48

43
43

44
44

41
40

48
47

50
49

Day

16

52
50

43
43

48
47

43
43

45
44

41
41

48
47

50
48

17

50
48

43
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41
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42
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25

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46

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45
45

43
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44
43

50
49

49
47

26

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44

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46
45

44
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44
43

50
50

49
47

27

46
45

48
48

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45
45

44
44

44
43

52
50

50
49

28

47
46

48
48

46
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45
45

44
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44
43

51
49

51
49

29

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48
48

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44

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45

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44
44

51
47

51
50

30

49
48

49
48

44
44

46
45

__
__

45
44

49
47

51
49

31

49
48

__
__

44
43

46
45

_
__

46
45

_
_

50
49

Average

50
49

45
45

48
47

45
44

44
44

43
42

47
46

49
47

ALSEA RIVER BASIN Continued

14-3067. NEEDLE BRANCH NEAR SALADO, OREG. Continued

Temperature (°F) of water, water year October 1964 to September 1965 Continued

Month

June
Max mum ....
Min mum ....
July
Max mum ....
Mm mum ....

Augus
Max mum ....
Min mum ....
September
Max mum ....
Mm mum ....

1

51
48

53

57

53

2

52
49

54

56

53

3

53
51

54

56

54

4

53
50

54

55

52

Day

5

53
51

55

55

53

6

53
51

55

55

53

7

53
51

55

55

52

8

52
50

55

56

52

9

53
51

55
53

56

53

10

53
51

54
53

57

53

11

53
51

54
53

57

54

12

51
49

54
53

57

53

13

50
49

54
53

56

53

14

50
49

55
54

55

54

15

51
50

55
55

55

54

16

52
50

55
55

55

53

17

51
51

55
55

56

51

18

51
51

55
54

56

50

19

53
51

55
54

56

51
49

20

53
51

54
53

56
56

51
49

21

53
51

54
53

56
56

51
50

22

52
50

54
52

56
56

52
50

23

53
51

55
53

56
56

53
51

24

52
51

56
54

56
56

53
52

25

52
51

56
56

57
56

53
51

26

51
51

56
54

56
56

52
52

27

51
49

55
53

56
55

53
52

28

52
50

55
53

55
54

53
51

29

53
51

56
55

54
52

52
50

30

53
52

57
56

54
52

52
50

31

57
56

54
53

Avetage

52
50

55
54

56
55

53
52

Particle-size analyses of suspended sediment, water year October 1964 to September 1.965 (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

Nov. 24, 1964.....

Jan. 27, 1965 A...

Time

(24 hour)

1140
2050
0915
1740

Water
tem-

per-
ature

(°F)

47
49
49
47

Sam-

pling
point

Discharge
(cfs)

10
15
32
39

Sediment
concen-

tration

(ppm)

187
106
177
228

Sediment

discharge
(tons per day)

5.0
4.3
15
24

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

20
9

0.004

29
16

0.008

41
22

0.016

55
29

0.031

69
40

0.062

64
46
80
49

0.125

79
55
90
69

0.250

96
68
96
86

0.500

99
96
100
93

l.QQO

99
100

96

2.000

100

96

4.000

100

Method
of

analysis

SV
V
VBWC
SVBWC

A 100 percent is finer than 4.000 millimeters.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

ALSEA RIVER BASIN Continued

14-3067. NEEDLE BRANCH NEAR SALADO, OREG. Continued

Suspended sediment, water year October 1964 to September 1965
(Less than one < I in the concentration column indicates that concentratic is below the limits of detection)

Day

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

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

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

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

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

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

Total

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

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

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

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

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

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

Total

OCTOBER

Mean
dis-

charge
(cfs)

0.07
.06
.05
.04
.03

.03
.03
.06
.07
.05

.04
.04
.04
. 14
.17

. 10
.06
.06
.05
.04

.04
.04
.04
.04
.03

.03
.06
.05
.06
.07
.06

1.79

Suspended sediment

Mean
concen-

tration

(ppm)

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1
1

~

Tons
per

day

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T
T

T

JANUARY

2.5
5.3
5.5
3.9
4.6

6.3
4.9
3.5
2.9
3.3

4.0
3.2
2.6
2.0
1.6

1.4
1.3
1.2
1.0
.98

1.0
1.0
3.7
7.2
6.0

6.6
28
41
16
7.8
5.3

187.98

4
18
10
4
4

4
4
4
4
4

4
4
4
4
4

4
4
4
4
4

4
4
26
32
29

21
256
300
183
51
19

~

T
A 0.3
B .1
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
A .3
.6
.6

.4
S 23
A 33
S 6.6
1.1
. 3

66.9

NOVEMBER

Mean
dis-

charge
(cfs)

0.20
.43
.20
.59
. 35

.22
. 16
. 13
. 13
.43

1.1
1.5
1.6
1.2
.60

.65
.54
.46
.39
.35

. 33
.54
1.1
9.2
7.4

6.5
4.9
4.4
4.9
8.6

61.30

Suspended sediment

Mean
concen-

tration

(ppm)

5
6
1
5

C (<1)

C (<1)
C (<1)
C (<1)
C (<1)
6

6
13
5
1

C (<1)

C <1)
c <D
c <D
c <D
C (<1)

C (<1)
5
6
115
22

21
16
6
20
66

Tons
per

day

T
T
T
T
T

T
T
T
T
T

T
A 0.1
T
T
T

T
T
T
T
T

T
T
T
S 3.2
S .5

. 5
. 2
. 1
. 3
S 2.6

7.6

FEBRUARY

3.6
2.7
2.0
1.6
2.0

2.3
2.0
2.3
2.5
2.2

1.6
1.6
1.5
1.6
2.0

1.9
1.7
1.5
1.4
1.2

1.2
1.3
1.2
1.2
1.1

1.2
2.1
2.7

51.6

6
7
3
4
12

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3

0.1
. 1

B .1

0.7

DECEMBER

Mean
dis-

charge
(cfs)

15
9.3
6.5
4.5
3.2

2.6
2.1
1.6
1.9
3.0

3.9
3.0
2.5
2.6
3.4

2.9
2.3
1.9
2.0
4.0

16
26
21
22
16

9.1
7.0
5.2
4.0
3.5
2.9

211.3

Suspended sediment

Mean

(ppm)

58
25
13
11
6

6
4
4
7
9

5
2
4
10
6

6
1
3
4
21

92
146
100
100
84

26
17
11
7
9
3

"

Tons
per

day

S 2.5
. 6
B .2
. 1
. 1

T
T
T
T
. 1

B .1
T
T
A .1
. 1

T
T
T
T
B .2

A 4.0
S 11
J 6.1
A 5.9
S 3.6

. 7
. 3
.2
. 1
. 1
T

36.6

MARCH

2.2
1.6
1.5
1.3
1.2

1.0
.91
.60
.74
.66

.62
. 56
. 54
.51
.46

.43
.41
.39
.37
.37

.35
. 35
. 33
.33
.43

.64
. 51
.46
.41
.39
.37

21.58

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2
2

0.1

S Computed by subdividing
T Less than 0.05 ton.
A Computed from partly estimated-concentration graph. B Computed from estimated-concentration graph.

C Composite period.
J Computed from partly estimated-oncentration graph and subdividing day.

389-675 O - 70 - 24

QUALITY OF SURFACE WATERS, 1965

ALSEA RIVER BASIN Continued

14-3067. NEEDLE BRANCH NEAR SALADO, OREG. Centinued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

0.37
. 35
.33
.31
.31

. 29
. 37
.39
.35
.35

.31
.29
. 37
. 37
.33

.46
.41
. 54
2.9
2.7

2.0
1.5
1.3
1.1
.98

.84
. 77
. 71
.65
.68

22.63

Suspended sediment

Mean
concen-

tration

(ppm)

2

(<)
<)
<

<1)
<1)

(<1)
(<l)
(<D
(<1)
(<0

-

Tons
per

day

A .2

0.2

JULY

0.12
. 12
. 10
. 10
. 10

. 10
. 10
.09
.09
. 12

. 10
.09
.08
.08
.08

.08
.08
.07
. 07
.09

.08
.08
.07
. 06
.07

.06
.06
.06
.06
.06
.05

2.57

2
2
2
2
C 2

C 2
C 2
2
2
2

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2
2
2

2
2
2
2
2

2
2
2
2
2
2

T
T
T

T

MAY

Mean
dis-

charge
(cfs)

0.77
.68
. 62
.65
.87

.91
.84
. 74
. 71
.62

. 59
. 56
. 54
.48
. 54

.62
.48
.46
. 56
.65

. 56
. 54
. 51
.48
.46

.43
.41
. 39
. 37
. 35
.35

17.74

Suspended sediment

Mean
oncen-

ration

(ppm)

Tons
per

day

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T
T

T

AUGUST

0.06
.07
.06
.05
.04

.04
.04
.04
.04
.04

.04
.05
.04
. 04
.03

.03
. 04
.04
.09
.07

.05
. 04
. 04
.04
.04

.03
.03
. 03
.02
. 02
.03

1.32

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C Z -.
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
2

2
2
2
2
C 2

2
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T

JUNE

Mean
dis-

charge
(cfs)

0.33
.33
. 31
. 29
. 27

. 27
.25
. 24
. 22
.22

.31
. 24
. 22
. 3'.

.24

.20
.20
. 20
. 19
. 17

. 16
. 16
. 14
. 14
. 14

. 13
. 13
. 13
. 13
. 12

6.39

Suspended sediment

Mean
one en-

ration

(ppm)

C 3
C 3
C 3
3
3

C 3
C 3
C 3
C 3
3

C 3
3
3
C 3
C 3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

Tons
per

day

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

0.1

SEPTEMBER

0.02
.03
.03
. 03
.03

.02
. 02
.02
.02
.02

.02
.02
.02
.02
.03

. 02
.02
.01
.01
.01

.02
.02
. 01
.01
.01

.01
. 01
.01
.01
.01

0.54

C 2
C 2
2
2
2

2
2
2
2
2

2
2
2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

T
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T

Total discharge for year (cfs-days) .... 586.74 Total load for vear (tons). 114.2

T Less than 0.05 ton.
A Computed from partly estimated-concentration graph.
C Composite period.

ALSEA RIVER BASIN Continued

14-3068. FLYNN CREEK NEAR SALADO, OREG.

LOCATION. At gaging station,1,000 feet upstream from mouth, 3.4 miles west of Salado, Lincoln County, and 6.9 miles southeast of Toledo.
DRAINAGE AREA (revised). 0.78 square mile.
RECORDS AVAILABLE. Water temperatures: September 1958 to September 1965.
Sediment records: November 1958 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 58°F on several days during August; minimum, 40"F Mar. 19.
Sediment concentrations: Maximum daily, 1,580 ppm Jan. 28; minimum daily, less than 1 ppm on many days during July. Sediment loads: Maximum dally, 491 tons Jan. 28; minimum daily, less than 0.05 ton on many days.
EXTREMES, 1958-65. Water temperatures: Maximum, 62"F Aug. 3, 20, 21, Sept. 4, 1961; minimum, 36°F Jan. 30, 1963. Sediment concentrations: Maximum daily, 1,580 ppm Jan. 28, 1965; minimum daily, (revised) less than 1 ppm on many days during 1959-65.
Sediment loads: Maximum daily, 491 tons Jan. 28, 1965; minimum dally, less than 0.05 ton on many days each year. REVISIONS. Sediment loads for water years 1964 and 1965 computed on basis of mean discharge published to hundredths below 1 cfs. Figures of mean discharge below 1 cfs for water years 1961-63 and minimum discharge for period of record revised to hundredths in WSP 1935; revision of sediment loads not warranted.

Temperature (°F) of water, water year October 1964 to September 1965

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 ....

Day

1

52
51

48
48

48
48

44
44

46
45

45
44

47
45

48
47

2

51
50

48
48

48
48

44
43

46
45

45
44

45
43

47
45

3

51
50

48
47

48
48

44
43

46
46

46
44

45
42

47
46

4

52
50

48
47

48
48

44
43

46
46

46
44

46
43

47
44

5

52
51

47
46

48
47

44
44

46
45

46
45

47
44

45
44

6

52
51

46
44

47
47

44
44

45
44

47
45

44
42

46
44

7

52
51

45
44

47
47

44
44

45
44

47
45

44
44

47
45

8

53
52

44
44

48
47

44
44

46
45

46
44

46
44

48
45

9

53
52

45
44

48
48

44
44

45
44

46
44

45
44

49
47

10

52
51

45
45

48
47

44
44

45
44

47
45

45
44

50
48

11

52
51

45
44

47
46

44
44

45
44

47
45

46
43

51
48

12

53
52

45
41

46
46

44
44

46
45

46
45

47
44

51
49

13

53
52

44
43

46
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45
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14

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43

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15

53
51

43
42

47
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45
44

45
43

48
47

50
49

16

51
49

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42

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44

47
46

50
49

17

49
46

43
42

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43

18

48
47

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42

44
42

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44

46
45

43
41

49
48

50
47

19

49
48

42
41

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44

46
46

43
40

50
49

49
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20

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21

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50
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23

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43

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24

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42

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49
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25

49
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43
42

51
48

50
47

26

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49

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47

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51
50

28

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51
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__

48
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49
48

50
49

31

49
48

44
43

46
45

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__

49
47

-

49
48

Average

50
49

45
44

46
46

45
44

46
45

45
44

48
46

49
48

ALSEA RIVER BASIN Continued

14-3068. FLYNN CREEK NEAR SALADO, OREG. Continued

Temperature (°F) of water, water year October 1964 to September 1965 Continued

June

Minimum ....

July
Minimum ....
August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

1

50
47

53

55
55

55
53

2

bl
46

52

56
55

53
b2

3

51
49

52

56
54

54
53

4

51
49

53

56
53

b4
50

5

52
50

53

57
53

55
52

6

52
50

52

5/
53

55
51

7

52
50

53

57
53

55
50

8

50
49

52

56
55

54
52

9

51
49

51

58
54

54
53

10

51
49

52

57
56

54
52

11

51
49

52

56
55

53
53

12

50
48

51

56
55

55
53

13

48
48

52

58
54

55
53

14

49
48

53

58
54

55
54

15

49
49

54

58
54

55
55

Day

16

51
48

53

58
55

55
51

17

50
5U

54

58
55

52
48

18

50
49

52

56
56

52
48

19

52
49

52

56
55

52
48

20

52
49

52

56
55

52
48

21

52
50

52

56
54

51
50

22

52
48

50

56
55

55
51

23

52
50

52

56
55

56
53

24

51
49

53

57
55

57
53

25

50
4R

54

57
56

55
51

26

50
49

53

5fi
54

53
52

27

51
4fl

51

56
54

55
53

28

5?
49

51

54
5?

54
52

29

54
51

54

55
50

51
50

30

55
5?

54

56
51

5?
48

31

__

55

56
5?

51
49

52

56
54

54
51

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

Nov. 24, 1964.....

Dec. 21...........

Jan. 27, 1965.....

Time

(24 hour)

1305
2140
1425
0800
2205
1110

Water
tem-

per-
ature

(°F)

48
49
47
47
47
47

Sam-

pling
point

Discharge
(cfs)

22
39
45
83
106
137

Sediment

concen-

tration

(ppm)

172
172
180
714
1030
1860

Sediment

discharge
(tons per day)

10
18
22
160
295
688

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

10
8
9

0.004

-

16
10
13

0.008

22
16
22

0.016

22
29

0.031

40
30
38

0.062

59
50
48
57
39
51

0.125

79
72
68
77
53
69

0.250

92
96
91
91
71
82

0.500

96
100
99
99
85
90

1.000

98

100
100
96
97

2.000

100

100
100

Method
of

analysis

SV
V
V
VBWC
SVBWC
SVPWC

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

ALSEA RIVER BASIN Continued

14-3068. FLYNN CREEK NEAR SALADO, OREG.--Continued

Suspended sediment, water year October 1964 to September 1965
(Less than one< I in the concentration column indicates that concentration is below the limits of detection)

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cf.)

0.27
. 27
. 25
. 23
. 21

. 20
. 21
. 27
. 31
. 25

. 23
. 23
. 23
. 38
. 48

. 38
. 31
. 27
. 25
. 25

23
23
. 21
. 21
. 21

. 20
. 27
. 25
. 29
. 27
. 27

8.12

Suspended sediment

Mean
concen-

tration

(ppm)

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3
3

-

Tons
per
day

0.1

JANUARY

9.2
12
14
12
12

15
14
11
10
11

13
12
10
8.6
7.7

7.0
6.3
5.8
5.4
4.9

4.9
4.7
11
20
24

21
64
115
54
30
22

571.5

9
9
9
9
9

9
9
9
9
9

9
9
9
3
3

3
3
3
3
3

3
3
25
34
39

26
549
1580
466
125
58

"

0.2
. 3
. 3
. 3
. 3

. 4
. 3
. 3
. 2
. 3

. 3
. 3
. 2
. 1
. 1

. 1
. 1

J .9
B 1.8
A 2.5

1.5
A 122
491
S 74
10
3.4

711.4

NOVEMBER

Mean
dis-

charge
(cfs)

0.57
. 80
. 57
1.4
. 92

. 70
. 60
. 54
. 51
1.0

2.0
2.8
3.0
2.3
1.9

. 5
. 3
. 2
. 1
. 0

. 96
. 2
. 9
15
17

20
15
13
15
24

148.77

Suspended sediment

Mean
concen-

tration

(ppm)

4
4
4
4
4

4
4
4
4
4

4
4
4
4
4

4
4
4
4
4

4
4
4
84
24

19
16
6
10
108

~

Tons
per
day

S .3
1

1.0
. 6
. 2
. 4
S 9.7

17.6

FEBRUARY

17
15
12
10
10

9.4
8.6
9.2
8.3
8.6

. 4
. 4
. 7
. 3
. 3

. 3
. 8
4
. 1
. 6

. 6
. 6
. 1
. 0
. 6

. 2
. 9
. 2

206.8

36
18
11
8
13

C 5
C 5
5
5
5

5
3
3
3
3

3
3
3
3
3

3
3
3
3
C 3

8
10
10

1.7
. 7
. 4
. 2
B .4

. 1
. 1
. 1
. 1
. 1

. 1
. 1
T
. 1
. 1

. 1

A .1
A .2
. 2

5.3

DECEMBER

Mean
dis-

charge
(cfs)

38
27
22
17
12

9.9
6.3
7.4
6.9
8.6

11
10
8.6
9.6
11

9.9
8.5
7.4
7.0
9.2

38
75
61
55
43

30
27
22
17
13
11

641.5

Suspended sediment

Mean
concen-

tration

(ppm)

63
37
23
13
8

9
6
5
8
9

4
3

7

3
-

4
7
23

160
520
233
175
102

75
40
32
23
16
10

-

Tons
per
day

6.
2.
1.
B .

.
.
.
.

t

.

E .
B .
E .

,

E .

.

1
B .6

J 18
105
38
26
12

6.1
2.9
1.9
1.1
. 6
B .3

227.7

MARCH

7.0
6.6
5.8
5.1
4.4

3.9
3.4
3.1
2.8
2.6

2.5
2.3
2.2
2.1
2.0

1.9
1.9
1.7
1.6
1.6

1.5
1.5
1.4
1.4
1.7

2.3
1.7
1.6
1.6
1.5
1.4

82.1

6
6
6
6
6

6
6
6
4
4

4
4
4
4
4

4
4
4
4
4

4
4
4
4
4

4
4
4
4
4
4

-

0.

.
.
.

. 1
. 1
. 1

1.3

E Estimated.
S Computed by subdividing day.
T Less than 0.05 ton.

A Computed from partly estimated-c ntration graph.

B Computed from estimated-
concentration graph.
C Composite period.
J Computed from partly estimated-concentration graph and subdividing day.

QUALITY OF SURFACE WATERS, 1965

ALSEA RIVER BASIN Continued

14-3068. FLYNN CREEK NEAR SALADO, OREG.--Continued

Suspended sediment, water year October 1964 to September 1965 Continued

Day

1..
2.i
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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cf.)

.4
.4
.3
.2
.2

.2
.2
. 3
2
. 2

. 1
. 1
. 2
2
. 1

.2
.2
. 5
.4
.0

.3
.6
.0
.6
. 2

.9
. 7
.5
.3
. 3

67.0

Suspended sediment

Mean
oncen-

ration

(ppm)

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
10
26
9

12
4
4
4
4

4
4
4
4
4

-

Tons
per

day

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
A 0.4
. 1

. 2
T
T
T
T

T
T
T
T
T

1.2

JULY

0.48
.48
.46
.43
.43

.43
.43
.41
.41
.43

41
.38
.36
.36
. 34

. 34
. 31
.31
.31
.36

. 34
.31
.29
.27
. 27

.27
.27
.25
.25
.23
.25

10.85

C (<1)
C <1

C <1)
C <1)
C (<1)

C (<1)
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MAY

Mean
dis-

charge
(cfs)

2.4
2.1
2.0
2.1
2.5

2.4
.3
.3
. 2
. 1

.0
.9
.8
. 7
.8

. 1
.7
.6
.8
. 8

.6
.6
.5
.4
.4

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

55.8

Suspended sediment

Mean
concen-

tration

(ppm)

C 2
C 2
C 2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2
2

Tons
per

day

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0.3

AUGUST

0.25
.27
.25
.23
.23

.23
.21
.21
.20
.20

. 20
.21
.20
. 18
. 18

.18
. 16
. 18
.29
. 25

.20
.20
. 18
. 18
. 16

. 16
. 15
. 15
. 15
. 13
. 12

6.09

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
1
1
1
1

1
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JUNE

Mean
dis-

charge
(cfs)

. 1
. 1
.0
.0
.0

.96
.92
.92
.88
.84

1.0
.84
.80
1.0
.80

.77
.77
. 77
.70
.66

.66
.63
. 60
. 57
. 57

. 57
.54
.54
.51
. 51

23.53

Suspended sediment

Mean
concen-

tration

(ppm)

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
C 2

Tons
per

day

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0.1

SEPTEMBER

0.13
. 13
. 15
. 13
. 13

. 13
. 13
. 13
. 13
. 15

. 15
. 15
. 15
. 16
.20

. 16
. 13
. 13
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15
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. 13

. 13
. 13
. 13
. 13
. 12

4.16

C 2
C 2
C 2
C 2
C 2

C 2
C 2
C 2
C 2
2

C 2
C 2
C 2
2
2

2
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Total discharge r year (of s-days) 1 826 22
Total load for y r (tons) 965 0

T Less than 0.05 ton.

A Computed from partly estimated-concentratl.on graph.
C Composite period.

ALSEA RIVER BASIN Continued

14-3068.1. DEER CREEK NEAR SALADO, OREG.

LOCATION (revised). At gaging station, 1,000 feet upstream from mouth, 4.6 miles west of Salado, Lincoln County, and 6.5 miles southeast of Toledo.

DRAINAGE AREA (revised). 1.17 square miles.
RECORDS AVAILABLE. Water temperatures: September 1958 to September 1965.
Sediment records: November 1958 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 59°F sometime during period July 24 to Aug. 31; minimum, 40°F Mar. 19. Sediment concentrations: Maximum daily, 1,220 ppm Jan. 28; minimum daily, 2 ppm on many days during October, November, and March.
Sediment loads: Maximum daily, 583 tons Jan. 28; minimum daily, less than 0.05 ton on many days.
EXTREMES, 1958-65. Water temperatures: Maximum, 61°F Aug. 3, 1961; minimum, 34°F Jan. 30, 1963.
Sediment concentrations: Maximum daily, 1,220 ppm Jan. 28, 1965; minimum daily, (revised) less than 1 ppm on many days during 1959-62.
Sediment loads: Maximum daily, 583 tons Jan. 28, 1965; minimum daily, less than 0.05 ton on many days each year. REMARKS. Temperature recorder stopped Feb. 8-11, July 11-21, July 24 to Aug. 31, Sept. 1-9, 19-30; temperature ranges, 44°F to 46°F, 51°F to 58"F, 51°F to 59°F, 51°F to 56°F, and 48"F to 55°F, respectively.
REVISIONS. Sediment loads for water years 1964 and 1965 computed on basis of mean discharge published to hundredths below 1 cfs. Figures of mean discharge below 1 cfs for water years 1961-63 and minimum discharge for period of record revised to hundredths in WSP 1935; revision of sediment loads not warranted.

Temperature (°F) of water, water year October 1964 to September 1965

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 ....

Day

1

53
51

50
49

48
48

45
45

46
45

46
43

47
44

47
45

2

51
49

49
49

49
48

45
44

46
45

47
43

45
42

47
44

3

51
49

50
49

49
48

45
44

46
46

47
44

48
41

47
44

4

52
50

50
49

49
48

45
44

47
46

48
43

49
42

46
45

5

52
50

49
47

49
48

45
45

47
45

48
44

45
43

45
43

6

52
50

47
45

48
47

45
45

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45

48
44

45
41

46
43

7

51
51

47
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49
44

45
44

49
43

8

52
51

46
45

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48

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45

49
44

47
44

49
43

9

52
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52
46

10

52
51

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44

45
44

53
46

11

52
51

46
45

48
47

45
45

49
44

48
42

53
46

12

52
51

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41

48
47

51
46

19

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40

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49
47

49
48

31

50
49

__
__

45
44

46
46

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__

49
45

__
_

49
47

Average

50
49

46
45

47
46

45
45

46
44

47
43

48
45

49
46

ALSEA RIVER BASIN Continued

14-3068.1. DEER CREEK NEAR SALADO, OREG. Continued

Temperature (°F) of water, water year October 1964 to September 1965 Continued

Month

June

Min mum ....

July
Max mum ....

Augus
Max mum ....

September
Maximum ....
Minimum ....

Day

1

52
47

55
54

2

53
48

57
52

3

53
49

56
52

4

53
49

57
53

5

53
49

57
53

6

53
50

57
53

7

53
49

57
54

8

51
49

56
53

9

53
49

54
51

10

53
49

54
52

52

11

52
50

53

12

50
47

52

13

49
43

52

14

50
43

54

15

49
49

54

16

51
49

51

17

51
50

47

18

50
50

47

19

53
50

47

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54
49

21

54
50

22

53
49

23

53
51

24

53
49

25

51
49

26

50
49

27

51
47

28

53
48

29

56
52

30

57
53

31

"

Average

52
49

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

Time

(24 hour)

1110
2110
0955
1720
2300

Water
tem-

per-
ature

(°F)

49
49
49
46
47

Sam-

pling
point

Discharge
(cfs)

22
63
130
148
184

Sediment
concen-

tration

(ppra)

145
188
671
727
1480

Sediment

discharge
(tons per day)

8.6
32
236
291
735

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

10
6
5

0.004

16
9
9

0.008

24
12
12

0.016

35
16
17

0.031

45
23
23

0.062

67
55
59
34
37

0.125

81
76
76
62
55

0.250

96
92
92
84
69

0.500

100
99
99
95
84

1.000

100
100
100
96

2.000

100

Method
of

analysis

Y
Y
VPWC
VBWC
SVBWC

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

ALSEA RIVER BASIN Continued

14-3068.1. DEER CREEK NEAR BALADO, OREG. Continued Suspended sediment,
(Where no daily co

water year October 1964 to September 1965
itrations are reported, loads are 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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

0.57
. 55
. 52
.48
.43

.43
.45
. 50
. 57
. 52

.48
.45
.45
.69
1.0

. 75
.66
. 55
. 52
. 50

.48
.45
.43
.43
.41

.41
. 50
.45
. 52
. 52
. 50

16.17

Suspended sediment

Mean
concen-

tration

(ppm)

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2
2

-

Tons
per

day

0.1

JANUARY

13
17
21
17
17

23
20
15
13
17

22
17
14
12
11

9.7
8.7
7.9
7.2
6.6

6.6
6.2
18
30
34

29
113
177
82
50
35

869.9

7
13
8
4
11

23
12
7
3
15

19
9
9
13
~

9
9
9
9
9

9
9
52
61
45

22
633
1220
255
72
38

~

0.2
A .6
B .5
B .2
. 5

. 8
. 6
. 3
. 1
A .6

1.1
.4
. 3
.4
. 3

.2
. 2
. 2
. 2
.2

. 2
. 2
J 2.8
A 4.9
A 4.1

1.7
S 245
583
S 62
9.7
3.6

925.1

NOVEMBER

Mean
dis-

charge
(cf.)

0.84
1.4
1.0
2.3
1.7

1.4
1.2
1.0
.96
1.7

3.4
4.7
5.4
4.6
3.8

3.0
2.5
2.2
1.9
1.7

1.6
2.1
3.2
26
31

31
20
17
20
39

237.60

Suspended sediment

Mean
oncen-

ration

(ppm)

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

C 2
5
5
107
28

23
5
4
7
85

-

Tons
per

day

S .3
S .5

J 2.1
3
.2
4
S 12

27.1

FEBRUARY

23
18
14
12
12

12
11
12
12
11

9.
8.
7.
8.
9.

9.
9.
7.
6.
6.

6.
6.
5.
5.
5.

5.
9.
11

275.1

27
14
19
15
21

16

17

8

C 6
8
6

1.7
. 7
. 7
. 5
B .7

. 5
4
. 6
4
. 2

.2
. 1
. 1
. 1
.2

. 2
. 1
. 1
. 1
. 1

. 1
. 1
. 1
. 1
. 1

. 1
A .2
2

-

8.7

DECEMBER

Mean
dis-

charge
(cfs)

59
39
31
22
17

14
12
11
10
1*

18
15
12
14
16

14
12
10
10
13

65
110
83
80
62

46
43
31
23
18
15

939

Suspended sediment

Mean
concen-

tration

(ppm)

86
30
14
11
9

8
7
5
5
12

20
14
6
10
8

_

5
6
17

180
366
147
130
72

38
33
23
15
11
9

-

Tons
per

day

14
3.1
B 1.2
B .7
.4

. 3
. 2
. 1
. 1
. 5

. 9
.6
. 2
B .4
. 3

. 2
. 2
. 2
A .5
.9

A 32
109
33
B 28
12

4.7
3.8
B 1.9
.9
. 5
.4

251.2

MARCH

10
8.7
7.3
6.2
5.3

4.7
4.2
3.8
3.6
3.4

3.1
2.9
2.7
2.6
2.5

2.4
2.3
2.2
2.1
2.1

2.0
2.0
1.8
1.8
2.5

3.6
2.4
2.3
2.1
2.1
2.1

106.8

7
7
7
7
7

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2
2

"

0.2
. 2
. 1
. 1
. 1

1.1

S Computed by subdividing day.
T Less than 0.05 ton.
A Computed from partly estimated-concentration graph. B Computed from estimated-concentration graph.

C Composite period.
J Computed from partly estimated-concentration graph and subdividing day.

QUALITY OF SURFACE WATERS, 1965

ALSEA RIVER BASIN Continued

14-3068.1. DEER CREEK NEAR SALADO, OREG. Continued

Suspended sedi October 1964 to September 1965 Contin

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

2.0
1.9
1.8
1.8
1.7

1.6
1.7
1.7
1.8
1.7

1.5
1.5
1.8
1.7
1.5

2.0
1.8
2.4
9.7
12

9.9
7.3
5.8
4.8
4.0

3.5
3.2
2.9
2.7
2.7

100.4

Suspended sediment

Mean
concen-

tration

(ppm)

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
7
17
19

13
7
6
4
4

4
4
4
4
4

~

Ton.
per

day

A 0.4
. 6

. 3
. 1
. 1
. 1
T

T
T
T
T
T

2.1

JULY

0.72
.69
.66
.63
.63

.60
.60
. 57
. 57
.63

.58
.54
.52
. 52
. 50

.50
.48
.46
. 50
.56

.52
.45
.45
.46
.48

.48
.46
.43
.43
.43
.43

16.48

3
3
3
3
3

3
3
3
3
3

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0.1

MAY

Mean
dis-

charge
(cfs)

2.9
2.6
2.4
2.7
3.2

3.2
3.2
3.1
2.9
2.7

2.5
2.3
2.2
2.1
2.1

2.8
2.1
2.1
2.5
2.5

2.3
2.3
2.3
2.3
2.2

2.1
2.0
1.8
1.8
1.7
1.6

74.5

0.44
.45
.42
.40
.40

.39
.39
.39
.39
.38

.37
.38
.39
.36
.36

.35
.32
.33
.54
.50

.44
.40
. 37
. 37
. 37

.36
. 35
. 34
.34
.33
.31

11.93

Suspended sediment

Mean
oncen-

ration

(ppm)

~

AUGUST

4
4
4
4
4

4
4
4
4
4

4
4
4
4
4

4
4
4
4
4

4
4
4
4
4

4
4
4
4
4
4

"

Tons
per

day

0.8

0.1

JUNE

Mean
dis-

charge
(cfs)

.6
. 5
.4
.4
4

.3
.2
.2
.2
. 1

.5
.2
.2
.5
.2

. 1
. 1
. 1
.0
.0

.96
.92
.88
.84
.84

.81
.78
. 75
.75
. 72

33.45

Suspended sediment

Mean
concen-

tration

(ppm)

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

~

Tons
per

day

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

0.3

SEPTEMBER

0.31
.31
.31
.30
. 30

.30
.29
.27
.29
.29

.27
.27
.26
.29
.33

.29
.27
.26
.26
.26

.27
.26
. 24
.22
.24

.24
. 24
.24
.24
. 24

8.16

3

17
17
17

17
17
17
17
17

17
17
17
17
17

17
17
17
17
17

17
17
17
17
17

17
17
17
17
17

"

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

0.4

Total discharge for year (cfs-days) .... 2,689.49 Total load for year (tons). 1,217.1

T Less than 0.05 ton.

A Computed from partly estimated-concentration graph.
C Composite period.

COOS RIVER BASIN

14-3245. WEST FORK HILL I COMA RIVER NEAR ALLEGANY, OREG.

LOCATION. At gaging station at highway bridge, 40 feet upstream from Daggett Creek, and 3.8 miles north of Allegany, Coos County. DRAINAGE AREA. 46.5 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1963 to September 1965.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Oct. 21, 1964. .. .

Jan. 20, 1965....

Mean

discharge
(cfs)

8.2
62
554
257
192
60

653
70
31
8.7
3.3
2.5

Silica

(sio,)

5.4
7.8
8.2
8.0
7.1
6.8

7.2
6.1
6.5
4.3
3.6
4.8

Iron

(Fe)

0.11

.11
. 13

.04
. 11
. 11
. 11

Cal-

cium

(Ca)

3.5
3.5
2.5
2.0
2.0
2.4

2.4
2.4
2.8
3.2
3.6
3.6

Mag-
ne-

sium

(Mg)

1.2
1.1
.9
.8
.7
.8

. 6
1.0
.8
.9
1.1
1.3

Sodium

(Na)

4.8
4.7
4.0
3.5
3.4
3.8

3.7
4.1
4.2
5.2
5.5
5.7

Po-
tas-
sium

(K)

0.8
.7
. 5
.5
.9
.5

.4
. 6
. 6
.6
.7
1.0

Bl-

car-

bon-

ate

(HCO,)

20
14
10
11
11
11

11
15
14
19
22
23

Car-
bon-

ate

(CO,)

0
0
0
0
0
0

0
0
0
0
0
0

Suifate

(SO.)

0.4
2.0
1.4
1.4
1.2
.8

1.4
1.4
2.0
.4
.4
1.6

Chloride

(Cl)

5.2
4.5
4.2
3.5
4.0
4.8

3.2
3.5
3.8
5.0
6.0
6.2

Fluo-

rlde

(F)

0.0
. 1
. 1
. 1
.0
.0

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

Ni-
trate

(NOJ

0.7
6.8
3.4
2.2
1.8
1.6

2.8
1.3
. 7
.4
. 1
.4

Bo-

ron

(B)

Dissolved solids
(residue at 180°C)

Parts

per
million

35
40
29
27
30
30

32
30
28
29
35
36

Tons

per
acre-

foot

0.05
.05
.04
.04
.04
.04

.04
.04
.04
.04
.05
.05

Tons

per

day

0.77
6.70
43.4
18.7
15.6
4.86

56.4
5.67
2.34
'. .68
.31
.24

Hardness

as CaCOj

Cal-

cium,
Mag-
ne-

sium

14
13
10
8
8
9

8
10
10
12
14
14

Non-
car-

bon-

ate

0
2
2
0
0
0

0
0
0
0
0
0

So-

dium
ad-

sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at

25"C)

55
54
41
36
36
39

36
40
43
50
55
59

pH

6.7
7.1
7.0
7.1
6.8
6.6

6.9
7.1
6.8
6.9
7.2
6.8

QUALITY OF SURFACE WATERS, 1965

COOS RIVER BASIN Continued

14-3245. WEST FORK MILLICOMA RIVER NEAR ALLEGANY, OREG. Continued

Water temperature, turbidity, and color, water year October 1964 to September 1965

Date

Oct. 7, 1964. ....

Nov . 4 ....

Nov. 11. ....
Nov. 18. ....
Nov. 25. ....
Dec . 2 ....
Dec. 9. ....

Dec. 16. ....
Dec . 23 ....

Jan. 13. ....

Jan . 20 ....
Jan. 27. ....

Feb. 17. ....

Feb . 24 ....
Mar . 3 ....
Mar . 10 ....
Mar. 17. ....
Mar. 24. ....

Mar. 31. ....
Apr. 7. ....
Apr. 14. ....
Apr. 21. ....

May 5 ....

Aug. 11. ....
Aug. 18. ....

Aug. 25............ ...
Sept. 1. ....

Time
(24 hr.)

1220

1230

1230
1340

1230

1430
1750

1705

1630

1730
1435

1015
1855
1620

0940

1502
1635
1840
1745
1545

1620
1800
1530
1915
1920

1725
1835
1610
2000

1925
1850
1845
1310
1455
1245

Water
temper-

ature (°F)
59

53

46
39

49

44

44

48

48
53
52
55

49
64
55
64
69

69
60
69
71
71

69
62
71
67
67
67

66
64
63
64
60

Discharge
(cfs)

6.9

46

62

554

574

227

116
66

653
112

112

28
31
19
15
11

10
8.7
7.3
6.9
4.3
3.3

4.3
2.2
1.9
2.5
2.9
2.9

Turbidity

0

20

120
5
35
20

5
40

5

5
5
5

5
5

5
5

5
0
5
5
5

5
5
10
5
10

5
5
5
5
5
5

5
5
5
5
5
5

Color

15

35

20

5

5

5
20

5

5
5

5
5
5
5
5

10
5
5

5

5
10
5
5
5

5
5
5
5
5
5

10
10
10
10
10
5

COQUILLE RIVER BASIN

14-3249. SOUTH FORK COQUILLE RIVER NEAR POWERS, OREG.

LOCATION. Temperature recorder at gaging station,0.8 mile upstream from Hall Creek, and 7 miles southeast of Powers, Coos County. DRAINAGE AREA. 93.2 square miles.
RECORDS AVAILABLE. Water temperatures: November 1956 to September 1965.
EXTREMES, 1956-64. Water temperatures: Maximum, 76°F July 30 to Aug. 1, 1958; minimum, 34°F Jan. 12, 13, 1963. Temperature (°F) of water, water year October 1964 to September 1965

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

59
56

52
52

47
47

68
61

2

58
55

52
50

47
46

65
61

3

60
57

51
50

47
46

66
59

4

60
58

51
50

46
46

76
62

66
57

5

61
59

51
49

46
45

76
63

64
58

6

61
60

50
47

45
44

77
64

66
57

7

60
59

49
48

45
45

76
64

66
57

8

61
59

49
48

47
45

75
61

66
58

9

61
60

49
48

47
46

77
67

65
59

10

61
59

48
46

48
47

76
69

66
58

11

59
57

46
45

47
45

12

59
58

46
42

45
43

i

72
67

63
59

70
66

66
59

13

59
57

42
41

43
42

75
63

66
59

14

57
56

42
41

46
42

75
64

66
58

15

57
56

41
39

45
44

75
64

66
61

16

56
53

40
38

44
42

75
66

64
60

17

53
52

39
38

42
41

72
65

61
54

18

53
51

39
37

43
41

67
65

61
53

19

53
51

38
36

43
41

69
65

62
53

20

53
51

38
36

45
43

68
65

61
54

21

52
51

39
36

48
45

72
63

61
55

22

52
51

42
39

70
62

64
57

23

51
51

44
42

68
64

65
57

24

52
51

46
44

69
64

64
58

25

52
52

46
45

68
64

63
57

26

52
51

45
44

70
64

62
58

27

52
51

45
44

67
63

60
57

28

53
51

46
45

67
58

60
54

29

54
53

47
46

67
58

60
53

30

54
53

47
47

69
57

61
53

31

54
52

69
60

Average

56
55

45
44

72
64

64
57

ROGUE RIVER BASIN

14-3723. ROGUE RIVER NEAR AGNESS, OREG.

LOCATION. Temperature recorder at gaging station, 0.7 mile upstream from Shasta Costa Creek, 1.5 miles north of Agness, Curry County, and 2.4 miles upstream from Illinois River.
DRAINAGE AREA. 3,939 square miles.
RECORDS AVAILABLE. Water temperatures: October 1960 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 76°F on several days during July and August.
EXTREMES, 1960-65. Water temperatures: Maximum, 80°F on several days during July 1962; minimum (1960-64), 34°F Jan. 22-25, 1962. Temperature (°F) of water, water year October 1964 to September 1965

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December

January

Minimum ....
February

March

April

May

June
Maximum ....
Minimum ....
July
Maximum ....
Minimum ....
August
Maximum ....
Minimum ....
September
Maximum ....
Minimum ....

1

62
61

53
53

62
61

68
67

76
76

69
67

2

61
60

53
52

62
60

70
68

76
75

69
67

3

62
60

52
52

62
62

71
69

76
75

69
68

4

62
60

52
52

64
62

72
70

76
74

68
67

5

62
60

52
51

64
63

73
71

76
74

68
67

6

62
61

5150'

64
63

74
73

76
74

68
66

7

62
61

51
50

64
64

74
73

75
74

68
66

8

63
61

51
50

64
63

74
73

75
74

67
66

9

63
61

50
50

64
63

74
72

75
74

66
64

10

62
61

50
49

64
63

74
72

74
74

65
64

11

62
61

49
48

63
62

73
71

74
74

65
64

12

61
60

49
48

63
61

73
71

74
72

64
64

13

60
58

48
44

61
61

74
71

72
71

65
64

14

59
58

44
43

61
61

74
71

72
70

65
64

15

59
58

43
42

61
61

74
71

72
70

65
64

Day

16

58
57

42
41

61
59

74
72

72
70

64
63

17

58
56

41
41

61
60

74
73

72
71

63
62

18

56
55

41
40

62
61

75
74

72
71

62
62

19

55
53

40
38

62
61

75
73

72
71

62
60

20

53
52

38
38

40

63
62

74
72

72
71

60
60

21

53
52

38
38

66
62

72
71

72
71

60
60

22

53
52

39
38

67
65

73
71

72
70

60
60

23

53
52

40
39

67
67

74
71

72
70

61
60

24

53
52

43
40

68
67

74
72

72
70

62
60

25

52
52

44
43

67
65

74
73

72
70

62
61

26

52
52

44
43

60

65
65

74
73

72
70

62
60

27

52
52

43
43

65
65

75
72

71
70

61
60

28

53
52

44
43

66
64

75
73

70
68

60
60

29

53
53

44
44

67
65

75
74

68
67

60
60

30

54
53

45
44

68
65

76
75

68
66

60
60

31

53
52

76
76

68
66

58
56

46
45

""'"

64
63

74
72

73
71

64
63

ROGUE RIVER BASIN Continued

14-3780. ILLINOIS RIVER NEAR SELMA, OREG.

LOCATION. Temperature recorder at gaging station,200 feet upstream from Panther Creek, 0.3 mile downstream from Briggs Creek, 12 miles northwest of Selma, Josephine County, and at mile 32 (O.S.W.R.B. map).
DRAINAGE AREA. 665 square miles, including that of Panther Creek.
RECORDS AVAILABLE. Water temperatures: October 1961 to September 1965.
EXTREMES, 1961-64. Water temperatures: Maximum, 76°F on several days during July 1962; minimum, 38°F Jan. 12-15, 1963. REMARKS. Thermograph destroyed in flood; no record Dec. 23 to Aug. 6.

Temperature (°F) of water, water year October 1964 to September 1965

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

62
59

54
54

48
48

68
66

2

62
58

54
53

48
48

68
65

3

62
59

54
53

48
47

68
65

4

62
60

53
52

47
47

68
64

5

63
60

52
52

47
47

67
64

6

63
61

52
52

47
46

67
64

7

62
61

52
52

46
46

74
73

67
63

8

63
61

52
52

47
46

76
71

66
63

9

63
61

52
51

47
47

73
70

67
63

10

62
60

51
49

48
47

73
69

66
63

11

62
60

49
48

48
46

72
68

66
62

12

61
59

48
48

46
44

68
67

66
62

13

60
59

48
47

44
43

70
65

66
64

14

59
58

47
46

44
43

72
67

66
63

15

58
57

46
44

44
44

72
68

67
64

16

58
56

44
44

44
44

72
69

64
62

17

57
55

43
43

44
42

72
69

62
58

18

56
54

43
43

42
42

72
70

60
58

19

56
54

43
43

43
42

71
68

60
57

20

55
53

43
42

44
43

70
68

60
57

21

54
52

42
42

47
44

72
68

60
57

22

54
52

44
42

49
47

71
68

62
58

23

53
52

45
44

72
68

63
60

24

52
52

48
45

70
68

64
60

25

52
52

48
47

68
68

66
64

26

54
52

47
46

_

69
66

64
60

27

52
52

46
44

_

69
65

60
60

28

53
52

46
44

68
64

61
58

29

54
53

48
47

67
63

61
58

30

54
54

48
48

68
63

61
58

31

54
54

68
64

Average

58
56

48
47

71
67

64
61

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Mean

discharge
(els)

Silica

(SiO,)

Alu-
mi-

num

(Al)

Iron

(Fe)

Man-

ga-

nese

(Mn)

Cal-

cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-

sium

(K)

Lith-

ium

(Li)

Bi-
car-

bon-

ate

(HCO,)

Car-
bon-

ate

TO

Sulfate

(S0«)

Chloride

(Cl)

Fluo-

ride

(F)

Ni-

trate

(NO,)

Phos-

phate
(P0«)

Dissolved
solids

(residue
at 180°C)

Hardness

as CaCOj

Cal-

cium,
mag-
nesium

Non-
car -

bon-

ate

To-

tal
acid-

ity
as

H+ l

Specific
conduct-

ance

(micro-
mhos at

25"C)

PH

Col-

or

D.O.

(dis-
sol-
ved
oxy-
gen
ppm)

MPN

(coli-
fonn
colo-

nies

per

100 ml)

WHITE SALMON RIVER BASIN

14-1235. WHITE SALMON RIVER NEAR UNDERWOOD, WASH.

Oct. 14, 1964

Apr. 5, 1965.
July 7.......

658

1260
947

26

23
6.0

0.12 5.5

4.8
5.2

2.7
2.1
2.3
2.6

3.6
3.4
4.1
3.6

1.3
1.3
1.3
1.4

36
30
35
36

0

0
0

4.8

2.0
3.2

0.8
. 5
. 5
. 5

0.0
. 2
. 1
. 0

0.2
. 0
. 2
. 2

0.10
. 06
. 06
. 09

67
57
60
43

24
20
22
24

0

0
0

69
56
60
65

7.4

7.2
7.2

0
5
5
0

WASHOUGAL RIVER BASIN

14-1435. WASHOUGAL RIVER NEAR WASHOUGAL, WASH.

Oct. 14, 1964
Jan. 13, 1965

June 21 ......

264
836

132

9.2
9.0

11

0.11

. 05

3.0
2.0
2.4
3.2

0.5
. 5
. 3
. 6

1.9
1.6
1.7
2.2

0.2
. 1
. 2
. 3

15
11
12
16

0
0
0
0

1.0
. 4
. 8
. 8

1.2
1.5
. 5
1.0

0.0
. 0
. 0
. 1

0.4
. 4
. 3
. 4

0.05
. 02
. 01
. 03

26
22
20
28

10
7
8
10

0
0
0
0

28
23
33
31

7.0
6.7
6.9
7.0

5
0
0
5

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Contin

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Mean

discharge
(cfs)

Silica

(S102)

Iron

(Fe)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Bi-
car-

bon-
ate

(HCO,)

Car-
bon-
ate

(COJ

Sulfate

(S0«)

Chloride

(Cl)

Fluo-
rlde

(F)

Ni-
trate

(NO,)

Bo-

ron

(B)

Dissolved solids

Farts

per
million

Tons

per
acre-

foot

Tons

per

day

Harduess

as CaCOj

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

WILLAMETTE RIVER BASIN

SWIFT CREEK NEAR OAKRIDGE, OREG. (24S/4E-1L)

Oct. 19, 1964. . . .
May 27, 1965. ....

33.4
115

23
16

1.41

.e|

0.2
. 3

0.12
. 05

14
11

41
30

SAROUTE CREEK NEAR BLACK BUTTE, OREG. (23S/3W-8A)

Oct. 19, 1964. . . .
May 27, 1965. ....

Oct. 19, 1964. . . .
May 27, 1965. ....

5.1
16.0

7.4
63.5

13
14

8.7
9.0

0.8
. 5

SHAR

1.1
. 5

PS CRE EK NBiR CULP

2.0
1.8

:REEK, OR
2.0
2.0

EG. (22S/1

0.04
. 08

*T-5B)
0.01
. 04

46
32

28
19

112
83

75
51

QUARTZ CREEK NEAR FINN ROCK, OREG. (17S/4E-8F)

Oct. 20, 1964....
May 28, 1965. ....

12.4
108

12
13

0.7
. 2

0.8
. 8

0.02
. 02

16
11

46
34

SHOTGUN CREEK NEAR MABEL, OREG. (15S/1W-32M)

Oct. 20, 1964. . . .
May 28, 1965. ....

Oct. 16, 1964....
May 28, 1965. ....

3.5
14.7

0.8
2.8

17
16

21
23

Oct. 16, 1964. . . .
May 28, 1965. ....

6.0
14.8

13
13

0.8
.3

WOOD

0.9
.3

PE

0.9

3 CREEK NEAR PHILOM/

DEE CR1:EK N MR PEDE

1.8
1.5

0.02
.02

38
25

86
62

iTH, OREG. (12S/6W-4L)
4.5
3.2

E, OREG. (9S/6
3.0
2.8

W-32H

0.04
.05

0.05
.04

63
48

16
13

154
121

54
46

BATTLE CREEK NEAR SALEM, OREG. (8S/3W-23K)
Oct. 19, 1964. . . .
May 28, 1965. ....

0.6
2.9

14
11 ^

2.0
2.0

0.04
. 04

12 39
29

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASINS Continued

Chemical analyses, in parts per million, water year October 1964 to September 1965 Continued

Date
of
collection

Mean

discharge
(eta)

Silica
(Si02)

Iron

(Fe)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Bi-
car-

bon-
ate

(HCO,)

Car-
bon-
ate

(CO,)

Sulfate
(SO,)

Chloride
(Cl)

Fluo-
ride
(F)

Ni-
trate

(N0»)

Bo-
ron

(B)

Dissolved solids

Parts
per
million

Tons
per
acre-

foot

Tons
per

day

Hardness
as CaCO,

Cal-

cium,
Mag-
ne-

sium

Non-
car-

bon-
ate

So-
ftiiim
ad-
sorp-
tion
ratio

Specific
con-

duct-

ance

(micro-
mhos at
25'C)

PH

WILLAMETTE RIVER BASIN Continued

CHAMPOEG CREEK NEAR CHAMPOEG, OREG. (4S/2W-1)
Oct. 18, 1964....
May 27, 1965. ....

3.9
5.8

39
29

2.7
1.6

4.5
3.8

0.83
. 58

UNNAMED TRIBUTARY TO PUDDING RIVER NEAR MACLEAY, OREG. (7S/2W-25Q)

Oct. 19, 1965....
May 28, 1965. ....

Oct. IS, 1964....
May 28, 1965. ....

0.3
1.4

10.5
38.4

14
12

16
16

1.6
. 2

1.0
. 2

2.8
1.5

'CROVE, OREG.
9.2
3.5

0.04

1.04
0.01
. 01

)

138
120

20
12

31
20

304
265

59
36

88
57

JACKSON CREEK NEAR NORTH PLAINS, OREG. (2N/2W-21G)
Oct. 15, 1964.... 0.1
. 3

29
19

2.4
. 9

2.5

2.2 1

0.07
. 07

47
22

122
65

SCAPPOOSE CREEK BASIN

NORTH SCAPPOOSE CREEK NEAR SPITZENBERG, OREG. (4N/2W-21D)

Oct. 15, 1964. . . .
May 27, 1965.. ...

Oct. 15, 1964....
May 27, 1965. ....

4.3
11.2

6.3
14.9

25
21

26
22

NORTH S

2.1
1.2
CAPPOI

2.1
1.3

OSE CREEK N BAR SCAP

6.0
4.5

POOSE, OS
5.5
4.2

EG. (3N/2W

0.13
. 09

- 2G)

0.14
. 09

29
21

30
22

97
74

98
74

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date
of
collection

Mean

discharge
(cfs)

Silica
(Si02)

Alu-
mi-
num

(Al)

Iron

(Fe)

Man-
ga-

nese

(Mn)

Cal-
cium

(Ca)

Mag-
ne-

sium

(Mg)

Sodium

(Na)

Po-
tas-
sium

(K)

Lith-
ium

(Li)

car-

bon-
ate

(HCO,)

Car-
bon-
ate

pcy

Sulfate
(S04)

Chloride

(Cl)

Fluo-
ride
(F)

Ni-
trate

(NO,)

Phos-

phate
(P04)

Dissolved
solids

(residue
at 180°C)

Cal-

cium,
mag-
nesium

Non-
car-

bon-
ate

To-
tal
acid-

ity
as

H+l

Specific
conduct-

ance

(micro-
mhos at

25'C)

PH

Col-

or

D.O.
r dis-
sol-
ved
oxy-
gen
ppm)

MPN
'vcoli-
form
colo-
nies
per

100 ml)

COWLITZ RIVER BASIN

14-2427. TOUTLE RIVER NEAR CASTLE ROCK, WASH.

Oct. 14, 1964
Jan. 13, 1965

July 6. ......

16
14
16
17

0.12 4.5
3.6
4.4
4.4

1.6
1.2
1.2
1.7

4.6
3.4
4.4
5.2

0.5
. 2
. 5
. 6

28
19
25
28

0
0
0
0

1.6
. 4
1.4
2.2

3.8
3.2
3.2
3.8

0.1
. 0
. 1
. 1

0.1
. 9
. 2
. 2

0.03
. 03
. 02
. 04

49
36
A 43
A 49

18
14
16
18

0
0
0
0

59
44
53
60

7.2
6.9
7 .?,
7.2

5
5
5
5

1.1.1
13.2

__

8.9

91
230
.

23

Analyses, in parts per million, of trace elements

Date of
collection

Oct. 14, 1964....

Time

(24 hr)

1240

Chromium

Hexa-
valent
(Cr»)

0.00

Total

(Cr)

0.00

Cop-
per

(Cu)

0.04

Zinc

(Zn)

0.05

Ar-
senic

(As)

0.00

Boron

(B)

0.02

A Calculated from determined constituents.

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

determinations of suspended-sediment discharge and particle-size analyses, water year October 1964 to September 1965 (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

Time

(24 hour)

Water
tem-

per-
ature

(°F)

Sam-

pling
point

Discharge
(cfs)

Sediment
concen-

tration

(ppm)

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004 0.008 0.016 0.031 0. 062 0. 12 5 0. 250 0.500 1.000 2.000

Method
of
analysis

WALLA WALLA RIVER BASIN

14-12O. WALLA WALLA RIVER AT MILTON, OREG.

Oct. 9, 1964. ......

Dec . 2 ....

Dec. 23. ....

Feb. 23, 1965. .....
Mar. 18. ....
Apr. 20. ....
Apr. 20. ....

Aug. 25.. ....

1050

1350

1140
1620
1310
1515
2150

0810

52

44

*. &.

48
46

58

94

965

2380
410
203
1120
1270

105

4

531

7720
22
304
968
803

4 "
328

18

1

1380

49600
24
167
2930
2750

5

10

13

15

18

20

27

28

43

39

62

59

74

78

92

91

97

99

99

100

100

VPWC

VPWC

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1965

Date Time
(24 hr)

Water
tem-

per-

ature l"F)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

WALLA WALLA RIVER BASIN Continued

14-130. MILL CREEK NEAR WALLA WALLA, WASH.

Dec. 14. ....

Apr. 20. ....

Apr. 21. ....

July 15. ....

1540
2300

1755

0840

1550
1745

39
38

37

46

43
47

58
62

1130

326

161

84

538

502
472
344
73
34

877

52

8

3

345

204
144

18
4

6770

46

3
3

501
309
276
184
35
4
T

14-135. BLUE CREEK NEAR WALLA WALLA, WASH.

Apr. 20. ....

Apr. 22. ....

July 15. ....

1345

2330
0855

1605

1800

34

44

37

44

48
47
46

55

71

0.6
1.0

371

24

56
13

60
56

43
3.5
1.4

19

18000

44

20

196
158
339

442

12

T

18000
836
138

3
54

3

26
26
51
15
51

T

14-144. YELLOWHAWK CREEK NEAR COLLEGE PLACE, WASH.

Apr. 20. ....

July 16. ....

2015
1610
2220
1300
1830
1800
0820

55
51
54
54
58
67

106
188
191
200
190
183
14

818
613
518
936
630
366
17

234
311
267
505
323
181
1

14-160. DRY CREEK NEAR WALLA WALLA, WASH.

Nov. 24. ....

Dec. 23. ....

1445
1625
1450
1825
0240
1040

1905
1335
1520
1700
1105
1430

2220
0945
1340
1650
1030
1545

54
36
46
47
43

42
37
44
43
40
38

36
35
39
42
43
40

2.2
3.2
104
134
207
165

125
58
234
89
57
26

39
34
515
692
597
504

34
17
10900
61900
14600
1980

769
92
3920
540
182
3000

12400
1040
68400
102000
23400
12500

3060
23200
8160
882

259
14
2480
130
28
211

1310
95
98600
205000
37700
17000

T Less than 0.50 ton.

QUALITY OF SURFACE WATERS, 1965

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1965 Continued

Date Time
(24 hr)

Water
tem-

per-

ature (°F)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

WALLA WALLA RIVER BASIN Continued

14-160. DRY CREEK NEAR WALLA WALLA, WASH. Continued

Dec. 24. .... Dec. 26. .... Dec. 31. .... Jan. 3, 1965. ....

Feb. 19. .... Mar. 18. .... Apr. 21. ....

July 15. ....

1500

1555

39

78

07

an

6.6
2.0

EO

9740

40

1 ft

8

4370
214

132

T

14-160.5. DRY CREEK AT LOWDEN, WASH.

Oct. 21, 1964. .... Nov. 16. .... Nov. 24. .... Nov. 25. .... Nov. 25. .... Nov. 25. ....

Nov. 25. .... Nov. 26. .... Nov. 27. ....

Dec. 3. ....

Dec. 14. .... Dec. 15. .... Dec. 15. .... Dec. 15. .... Dec. 16. ....

Dec. 22. .... Dec. 22. .... Dec. 23. ....

Dec. 23. .... Dec. 23. ....

Dec. 23. .... Dec. 24. .... Dec. 26. .... Dec. 28. .... Dec. 29. .... Jan. 3, 1965. ....

Jan. 4. .... Jan. 6 ....

Jan. 7. .... Jan. 24. ....

Jan. 25. ....

Jan. 27. .... Jan. 27. ....

T Less than 0.50 ton.

1215

2050
0345
0730

1 49=1

1245
0945
1540

2140

1840
1610

0200

1735

1900

53

50
45

AK

44
41

38
35

36
36
32
34

33

37

36

37

55
00

220
103

G.1

34

o-l e.

30
OA

310

t)(tA

1 O E

4Q1

240

220
ftft
310
1 4.9

OA

432
CO A.
0^0

6

20

Atz*yf\

213

2120

1 AO

9230

i rjf\f\

2120

o^afifi

OOl f\f\

1 1 on

55800

7300

Q RQA

1 0*7

Ron

QE

Q

3370

824

20

770

a(V7AA

ftftO
o Aft

-I 07
A'TRAA

Qft /I A A

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1965 Continued

Date Time
(24 hr)

Water

per-
ature

(X)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

WALLA WALLA RIVErf BASIN Continued

14-160.5. DRY CREEK AT LOWDEN, WASH. Continued

Jan. 29, 1965. ....

Jan. 31. ....

Feb. 1. .... Feb. 2. .... Feb. 23. .... Mar. 18. .... Apr. 20. .... Apr. 21. ....

July 16. ....

1210
2210
0900
2050

2220

1400
1810

1415
1300
1045

43
44

41
40

41
38
43

56
57
71
68

572
578
342

202

170

58

76
78
1.7
1.7

14800
27200

12400

4020

28

42000

11400

2190

T

14-161. PINE CREEK NEAR TOUCHET, WASH.

Dec. 15, 1964. .... Dec. 15. .... Dec. 15. .... Dec. 16. .... Dec. 22. .... Jan. 3, 1965. ....

Jan. 4. ....

Jan. 7. .... Jan. 24. ....

Jan. 25. .... Jan. 25. ....

Jan. 26. .... Jan. 29. .... Jan. 29. ....

Jan. 31. .... Feb. 1. .... Feb. 2. ....

1030
1600

1125
2200
1550

1100
0425
1000
1640
1140
2005

0105
0945
1700
1100
1100

1200
2115

1340

37
36

32
43
37
37

35
36
37
39
38
36

36
37
39

42
42

44
45
41
41
38

56
60

58
2430
115

76
248
137

117
460

362
268

175
1380
1950

2220
1250

235

5480
4780

716
38500

1480

6000
2770
2480
1170

leeoo
10800

1340

829
774

5860
2000

56600

99500

850

14-166.4. EAST FORK TOUCHET RIVER AT DAYTON, WASH.

Dec. 1. ....

Dec. 2. ....

Dec . 3 .... Dec. 3. .... Dec. 24. .... Jan. 30, 1965. ....

Apr. 21. ....

July 14. ....

1715

0420
1420
1855

0105
1150
2030
1155
1545
1710
0945
1015
1135

43

44
42

42
42
40
39
44
51
45
47
58

308

460
220
224

184
144

888

546
570
516
57

610

472
296

166
79

568
8

507

179

82
31

791
1

T Less than 0.50 ton.

QUALITY OF SURFACE WATERS, 1965

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1965 Continued

Date Time
(24 hr)

Water
tem-
per-

ature (°F)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

WALLA WALLA RIVER BASIN Continued

14-167. SOUTH FORK TOUCHET RIVER NEAR DAYTON, WASH.

Dec. 1, 1964. ....

July 14, 1965. ....

1200

0410
1410

1840

1140

1325

43

43

81

519

8.8

2000

4

2800

2020

T

14-168. PATIT CREEK NEAR DAYTON, WASH.

Dec. 1, 1964.. ....

Dec. 2. ....

Dec. 3. ....

Dec. 24. ....

1120
1730

1820

1125

44

43

37

37

370 2840

484

2840

14-169. WHISKEY CREEK NEAR WAITSBURG, WASH.

Dec. 2. ....

Dec. 2. ....

Dec. 24. ....

0100

1735

1320

43

40 5.4 5700 83

14-169.5. COPPEI CREEK AT WAITSBURG, WASH.

Dec. 1. ....

Dec. 24. ....

Jan. 28. ....

Jan. 30. ....

Feb. 1. ....
Feb. 2. ....
July 14.. ....

1400

1710

1440

1405
1515

2200

0930

1525

39

38

81 1.6

eeo

8 T

14-170. TOUCHET RIVER AT BOLLES, WASH.

Oct. 21, 1964. ....

Nov. 25.. ....
Dec. 1. ....

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

0755

0035
0530 1620 3560

^

15600

T Less than 0.50 ton.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1965 Continued

Date Time
(24 hr)

Water
tem-

per-
ature

(F)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

WALLA WALLA RIVER BASIN Continued

14-170. TOUCHET RIVER AT BOLLES, WASH. Continued

Jan. 27. ....

Jan. 28. ....

Jan. 29. ....

Feb. 19. ....

July 15. ....

1105
1550
2330
1000
1755
0955

1115
1115
1400
1705
1715
0115

0830
1355
1310
1915
0850
1255

1850
0045
1000
1500
2020
0950

1910
0930
1735
1000
1715
2340

1155
1055
1250
1110
1430
0940
1305

43
44
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43
54
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78

1550
1540
1170
877
773
580

265
6110
3090

430
830

606
672
864
1050
1320
1350

1470
1770
2990
4150
4380
5720

6600
5180
4350
3300
2800
2310

1900
1380
886
603
1170
177
54

3440
2280
1320
588
400
180

278
72300
7730
2360
152
16100

1810
1840
2170
8280
5880
3660

3680
6860
16600
15400
11600
19700

15600
9680
7600
4900
1870
3160

2100
921
348
181
1960
20
6

14400
9480
4170
1390
835
282

199
1240000
64500

176
36100

2960
3340
5060
23500
21000
13300

14600
32800
134000
173000
137000
304000

278000
135000
89300
43700
14100
19700

10800
3430
832
295
6190
10
1

14-171. WHETSTONE HOLLOW CREEK AT PRESCOTT, WASH.

Jan. 30. ....

0050
0845
1340
1240
1340

1940
0910
1635
0105
1040

1800
1010
1845
0950
1830

35
34
36
34

47100
8900
6430
546
1210

43000
13300
22200
6080
93400

27600
5180
12000
5080
3770

14-171.2. TOUCHET RIVER NEAR LAMAR, WASH.

Jan. 30. ....

1410
2030
0940
1655
0130

1055
1820
1025
1830
1010

"

810
1700
1820
2010
1840

3260
4450
5000
7600
6900

5000
25200
11700
13400
7180

22400
22100
15200
28200
18400

10900
116000
57500
72700
35700

197000
266000
205000
579000
343000

QUALITY OF SURFACE WATERS, 1965

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1965 Continued

Date Time
(24 hr)

WofaT*
tem-

per-

ature (°F)

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

WALLA WALLA RIVER BASIN Continued

JL4-171.2. TOUCHET RIVER NEAR LAMAR^ WASH. Continued

Jan. 30, 1965. ....

Jan. 31. ....
Feb. 1. ....
Feb. 2. ....
Feb. 4. ....

July 15. ....

1235
0955

0835

40
36

71

1380

42 18 2

14-176. TOUCHET RIVER AT TOUCHET, WASH.

Nov. 26. ....

Dec. 4.. ....

Dec. 15.. ....

Dec. 23. ....

Dec. 23. ....

Dec. 24. ....

Dec. 24. ....

Dec. 26. ....

Dec. 27. ....

Jan. 6. ....

Jan. 24. ....

Jan. 26. ....
Jan. 27. ....

Jan . 27 ....

Jan. 29. ....

2105

1735

1525

QOJC

1425

1915
n-t nf\

1835

1510

1510

1535
1700

1955

2145

1550

1150

41

00

37

_

34

36

45

718

820

3790

4210

qe»»7c\

QOQ
302

75

18100

293

3X5000

10300

72100

20400

206000

T Less than 0.50 ton.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge,
water year October 1964 to September 1965 Continued________

Date Time
(24 hr)

Water
tem-

per-
ature

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

WALLA WALLA RIVER BASIN Continued

14-176. TOUCHET RIVER AT TOUCHET, WASH. Continued

Jan. 29, 1965. ....
Jan. 29................
Jan. 29................
Jan. 30................
Jan. 30................

Jan. 30................
Jan. 31................
Jan. 31................
Feb. 1.................
Feb. 2.................
Feb. 4.................

Feb. 23................
Mar. 18................
Apr. 20.................
Apr. 21................
Apr. 22................
June 4..................

July 16.................
T Less than 0.50 ton.

1200
2140
2325
0820
1220

2045
1420
2240
1610
1500
1715

1250
1530
1120
1400
1250
1740
1210

43
43
43
43
43

45
42
40
41
38
40

41
41
54
57
58
75
79

4120
6190
6100
5800
5600

4800
3700
3020
2100
1460
880

529
234
1040
1330
1250
86
7.7

18900
38400
35800
25600
23100

20700
17400
14500
10400
5470
2460

368
169
4440
4040
2880
27
20

210000
666000
611000
401000
349000

268000
174000
118000
59000
21600
5840

526
107
12500
14500
9720
6
T

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

ic determinations of suspended-sediment discharge and particle-size analyses, water year October 1964 to Septembe (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)

Water
tem-

per-
ature

Sam-

pling
point

Discharge
(cfs)

Sediment

concen-

tration

(ppm)

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004 0.008 0.016 0.031 0.062 O.125 O. 25O 0.5OO l.OOO 2.000 4.000

Of

UMATILLA RIVER BASIN

14-203. MEACHAM CREEK NEAR GIBBON, OREG.

Nov. 18, 1964. .....

Dec. 27. ....
Jan. 19, 1965. .....
Jan. 27. ....

Jan. 28. ....
Mar. 10. ....
Apr. 17. ....
Apr. 22. ....

Aug. 25...... ......

0815
2150
1355
0900
1750

1250
1755
0915
1800

0715

40

41
37
44

38
45
42
49

60

17
255
860
246
330

3120
412
E 650
1350

22

2
26
111
2
45

2220
341
191
454

3

T
18
258
1
40

18700
379
335
1650

T

16 22 32 48 64

26

74

34

86

40

92

45

97

58

99

79

100

100 SV

SVPWC

JOHN DAY RIVER BASIN

14-362. CHINA CREEK AT ARLINGTON, OREG.

Dec . 24 ....

Nov. 16, 1964. .....

Aug. 24. ....

2105
2145
1700

38
38
39

2010
0855
0820

0730
1850
0850
1320
1420

36
36
32
34

38
49
43
71
63

5.7
E 5.7
E 3.8

1

68
412
237
1070

194
634
518
103
103

4470
4180
2660

4-385. JOHN I

12
21
10
617

38
430
70
10
12

69
64
27

52

AY RIVER AT PRAIRIE C

2.2
23
6.4
1780

20
736
98
2.8
3.3

12

75

ITY, C

16

20

84

REG.

32

92

45

97

59

98

42

65

99

51

78

100

60

90

76

99

79

99

90

99

100

100

VPWC

SVPWC

SVPWC

14-395. SOUTH FORK JOHN DAY RIVER NEAR DAYVILLE, OREG.

Nov. 16, 1964. .....

Aug. 24. ....

E Estimated.
T Less than 0 . 50 t

1530

1310

on.

38

66

25

66

2

386

0.1

197

69 44 67 91 96 100 PWC

14-400. SOUTH FORK JOHN DAY RIVER AT DAYVILLE, OREG.

Jan. 25, 1965. 1925
1825
1620
1555

Nov. 16, 1964. .....

Aug. 24. ....

1440
0900
1610
1410
0855

1305
1110
1620
1030

36
43
38
44

39
35
37
41
40

53
51
81
65

Nov. 17, 1964. .....

Mar 11

1455
1140
1640
1650
0830

1300

1610
0705
1840

32
33
33
36
33

47
41
60
67

651
E 3900
1370
468

14-405. J

176
2400
2100
4310
1250

2510
1920
163
222

276
3780
1260
281

485
39800
4660
355

OHN DAY RIVER AT PICTURE GOF

6
617
423
3220
343

1230
235
8
594

3
4000
2400
37500
1160

8340
1220
4
356

14-425. CAMAS CREEK NEAR

D 8
452
165
1330
199

828
256
8.0
6.4

2
12
4
164
3

55
9
4
6

T
15
1.8
589
1.6

123
6.2
. 1
. 1

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15

GE, NI

23
23
13

14

57

URIAH

20
18
20

AR DA'J

32
29
18

20

71

24
28

VILLE,

36
38
24

27

83

OREG.

21

33
37

OREG.

48
48
34

34

89

44
46

59
59
47

50

94

62
57
55

69
72
61

62

95

77

80
69

95
86

99
98

80
80
88

77

100

86

93
97
99

96

92

100
100
100

100

94

100
100
100

94 100

VPWC
VPWC
VPWC

VPWC
VPWC
VPWC

VPWC

VPWC

SVPWC

E Estimated.
T Less than 0.05 ton.

D Daily mean discharge

MISCELLANEOUS ANALYSES OF STREAMS IN PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September (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)

Water
tem-

per-
ature

Sam-

pling
point

Discharge
(cfs)

Sediment

concen-

tration

(ppm)

Sediment

discharge
(tons per day)

Suspended

1965 Contiii ued

sediment

Percent finer than size indicated, in millimeters

0.002J0.004 0.008 0.016

.,...,

0.031 0.062 0.125 0.250 0.500 1.000 2.000

Method
of

analysis

JOHN DAY RIVER BASIN Continued

14-440. MIDDLE FORK JOHN DAY RIVER AT HITTER, OREG.

Nov. 17, 1964. ....

Jan. 26, 1965. ....

Aug. 24. ....

Jan. 26, 1965.....

ug. ....

1230
1440
1440
1450
1020

1115
1430
0840
1610

1645
1230
1220
1130

1230
0900
1250
1030
0850

32
37
33
37
40

49
48
72
68

D 20
970
253
3150
617

2050
1180
73
70

2
64
15
531
33

354
64
9
26

T
168
10
4520
55

1960
204
2
5

13

28

20 30

49

40 52

83

82

61

93

72

99

85

100

96

100

100

V

VPWC

VPWC

14-460. NORTH FORK JOHN DAY RIVER AT MONUMENT, OREG.

36
35
38
36

41
47
48
78
67

63
6230
3580
20400
11200

2680
10200
5380
335
305

368
45
1660
720

16
536
70
4
1120

T
6190
435
91400
21800

116
14800
1020
4
922

8

10

87

11
9

15

96

-

16

22

100

24

32

33

42

40

47
42

55

56

69
61

71

73

91
83

89

96

100
99

100

100

100

-

V

VPWC
VPWC

VPWC

PWC

T Less than 0.50 ton.
D Daily mean discharge.

WILLAMETTE RIVER BASIN
14-2020. PUDDING RIVER AT AURORA, OREG.

98 VPWC

SALMON CREEK BASIN

SLICK ROCK CREEK NEAR ROSE LODGE, OREG.
(Lat. 45°00'05", long. 123°51'40")

Jan. 11, 1965. ..... 1130 40 216 5 3 92 97

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

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II

PART 15. ALASKA

SOUTHEASTERN ALASKA

15-538. LAKE CREEK AT AUKE BAY, ALASKA

LOCATION. Temperature recorder at gaging station, 15 feet upstream from bridge on Mendenhall Loop Road, 700 feet upstream from mouth at Auke Lake, and 0.8 mile northeast of Auke Bay.
DRAINAGE AREA. 2.50 square miles.
RECORDS AVAILABLE. Water temperatures: October 1963 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 60°F Aug. 6-9; minimum, freezing point on many days during winter months. EXTREMES, 1963-65. Water temperatures: Maximum, 60°F Aug. 6-9, 1965; minimum, freezing point on many days during winter months.

Temperature (°F) of water, water year October 1964 to September 1965

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
46

41
41

32
32

32
32

32
32

33
33

33
32

33
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37
35

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Average

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45

37
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34
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36
34

42
41

53
51

5-4
52

48
48

SOUTHEASTERN ALASKA Continued

15-538. LAKE CREEK AT AUKE BAY, ALASKA Continued Periodic determinations of suspended-sediment concentration, water year October 1964 to September 1965

Date

Aug. 30, 1965. ....

Time

(24 hr)

1600

tem-
per-
ature

(*>)

Discharge
(cfs)

165

Suspended sediment

Mean
concen-

tration

(ppm)

50

Discharge
(tons per day)

22.3

SOUTHEASTERN ALASKA Continued

15-540. AUKE CREEK AT AUKE BAY, ALASKA

LOCATION. Temperature recorder at gaging station, 100 feet downstream from bridge on Glacier Highway, 200 feet downstream from Auke Lake, 0.3 mile upstream from mouth at Auke Bay, and 0.5 mile east of Auke Bay.
DRAINAGE AREA. 3.96 square miles.
RECORDS AVAILABLE. Water temperatures: October 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 66" on several days during July and August; minimum, freezing point on many days during January.

Temperature (°F) of water, water year October 1964 to September 1965

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 ....
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SOUTHEASTERN ALASKA Continued

15-564. CHILKAT RIVER AT GORGE NEAR KLUKWAN, ALASKA

LOCATION. Temperature recorder at gaging station, 1.2 miles downstream from unnamed tributary, 2.0 miles upstream from Tahini River, 8.1 miles upstream from Kelsall River, and 16 miles north of Klukwan.
DRAINAGE AREA. 190 square miles, approximately.
RECORDS AVAILABLE. Water temperatures:
EXTREMES, 1964-65. Water temperatures:
during winter months.
EXTREMES, 1962-65. Water temperatures:
many days during winter months.

July 1962 to September 1965.
Maximum, 53°F sometime during period June 5-22; minimum, freezing point on many days

Maximum, 53°F sometime during period June 5-22, 1965; minimum, freezing point on

Temperature (°F) of water, water year October 1964 to September 1965

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Minimum ....
December
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January
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SOUTHEASTERN ALASKA Continued

15-564. CHILKAT RIVER AT GORGE NEAR KLUKWAN, ALASKA Continued Periodic determinations of suspended-sediment discharge, water year October 1964 to September 1965

Date

Aug. 12, 1965. ....

Time

(24 hr)

1300

Water
tem-
per-
ature

(°F)

Discharge
(cfs)

4080

Suspended sediment

Mean
concen-

tration

(ppm)

610

Discharge
(tons per day)

6720

SOUTHEASTERN ALASKA Continued

15-780. GRACE CREEK NEAR KETCHIKAN, ALASKA

LOCATION. Temperature recorder at gaging station on Revillagigedo Island, 0.75 mile upstream from mouth, 1.8 miles downstream from Grace Lake, and 32 miles northeast of Ketchikan.
DRAINAGE AREA. 30.2 square miles.
RECORDS AVAILABLE. Water temperatures: April to September 1965.

Temperature (°F) of water, April to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
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January
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February
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SOUTHEASTERN ALASKA Continued

15-805. TRAITORS RIVER NEAR BELL ISLAND, ALASKA

LOCATION. Temperature recorder at gaging station, on Revillagigedo Island, 0.5 mile upstream from mouth at east end of Traitors Cove, and 14 miles south of Bell Island.
DRAINAGE AREA. 20.8 square miles.
RECORDS AVAILABLE. Water temperatures; April to September 1965.
EXTREMES, April to September 1965. Water temperatures: Maximum, 62°F Aug. 1, 4, 6, 7, 19.

Temperature (°F) of water, April to September 1965

October

November

December

January

February

March

April
Maximum ....

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Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July
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Minimum ....
August
Maximum ....
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September
Maximum ....
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SOUTHEASTERN ALASKA Continued

15-851. OLD TOM CREEK NEAR KASAAN, ALASKA

LOCATION. Temperature recorder at gaging station on Prince of Wales Island, 0.2 mile upstream from mouth, 0.4 mile downstream from unnamed tributary, and 10 miles south of Kasaan.
DRAINAGE AREA. 5.90 square miles.
RECORDS AVAILABLE. Water temperatures: October 1964 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 53°F on several days during August.

Temperature (°F) of water, water year October 1964 to September 1965

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Minimum ....
November
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Minimum ....
December
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January
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February
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SOUTHEASTERN ALASKA Continued

15-866. BIG CREEK NEAR POINT BAKER, ALASKA

LOCATION. Temperature recorder at gaging station,! mile upstream from mouth, at Whale Passage, 2.5 miles downstream from small lake, and 24 miles southeast of Point Baker.
DRAINAGE AREA. 11.2 square miles.
August 1963 to September 1965.
Maximum, 66°F July 9, 10, 31, Aug. 1; minimum, 33°F Jan. 13, 14.
Maximum, 66°F July 9, 10, 31, Aug. 1, 1965; minimum, 33°F on several days during winter

RECORDS AVAILABLE. Water temperatures:
EXTREMES, 1964-65. Water temperatures:
EXTREMES, 1963-65. Water temperatures:
months.

Temperature (°F) of water, water year October 1964 to September 1965

Month

October
Maximum ....
Minimum ....
November
Maximum ....
Minimum ....
December
Maximum ....

January
Maximum ....

February
Maximum ....
Minimum ....
March
Maximum ....
Minimum ....

April
Maximum ....
Minimum ....
May
Maximum ....
Minimum ....
June
Maximum ....
Minimum ....

July

August
Maximum ....
Minimum ....

September
Maximum ....
Minimum ....

1

50
49

42
42

37
36

36
36

39
38

43
42

49

66
60

bb
54

2

49
48

42
42

36
36

36
36

40
37

43
41

49

65
61

b&
53

3456789

4.3 49 49 49 49 49 49
48 48 48 48 48 49 48

42 42 42 42 42 42 41
42 42 42 42 42 41 41

Day
1

"

10 ! 11 12 13

48
4/

42
41

36
36

36
36

39
38

41
41

49

65
57

36 , 36 36
36

36
36

38
37

42
41

48

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64
57

56
53

56
52

36

3/
36

41
38

42

35

3/
36

40
38

42
41 42

48

36 , 36
36 36

38
38

42
38

43
42

48 50

1
65 65 65
58

b6
51

58

b/
54

60

56
54

J O

38

42

36
35

39
38

40
38 1 38

43
42

52

43
40

36
36

39
39

42
39

43
40

53 51

65 65
61 59

55
53

63
59

55| 54
51 51

48 48
47 48

48
48

42 42 41
42 41 41

37 37
36 37

39 39
38 38

39
38

42
42

61
59

54
50

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59
57

54
52

3 /
37

39
38

41
39

43
42

5 /
53

54
52

14 15 16

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48 48
48

41
41

3!
35

39
3 7

42
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43
42

57
53

5b
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47
47 47

41 41
41 41

36 36
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57
55

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54

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57
55

55
53

-- i

17

47
47

42
41

3 /
35

3/
35

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39

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43

58
57

54
53

1 - 1 -T

18.19, 20 21 | 22

47
47

47 47
47 47

42 42
42 42

36
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3/
35

41
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61
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49
43

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36

38
37

43
40

51
44

62 62
57

57
54

58

56
56

1

23 24 15 26 27 28 29

47 |47 47
47

42
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40
40

48
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60
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36
35

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37

40
40

4/
46

60
56

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54

47

47 47
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42 41
41 38

46

46
46

38 35
35 34

36
36

39
3/

40
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49
46

60
55

56
54

36
36

39
37

40
40

49
47

59
55

55
54

36
36

J O

36

40
40

52
48

57
54

55
51

46
4b

45
4b

34 34
34

36
36

38
35

40
40

54
48

55
53

52
48

36
36

3 /
3b

41
40

53
50

56
52

54
52

50
48

34

36
36

3 /
36

40
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51
50

53
51

51
49

45
44

34
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37
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43
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52
50

53
52

30 ! 31

44
43

34
34

- -

37
35

44
42

56
50

52
50

51 50

50 |49

44
42

- -

-

38
36

52
50

55
50

Average

47
47

40
40

. 36
36

38
37

41
39

46
44

60
56

55
52

ALASKA WEST OF LONGITUDE 141°

15-2080. TONSINA RIVER AT TONSINA, ALASKA

LOCATION. At gaging station near left bank on downstream side of bridge on Richardson Highway at Tonsina, 0.4 mile upstream from Bernard Creek, and 0.6 mile upstream from Squirrel Creek.
DRAINAGE AREA. 420 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: August 1950 to September 1954, May to August 1956, October 1957 to September 1965.
Water temperatures: June to October 1953, May 1959 to September 1965.
Sediment records: May 1953 to July 1963 (periodic).
EXTREMES, 1964-65. Water temperatures: Maximum, 54°F July 30.
EXTREMES, 1959-65. Water temperatures: Maximum, 66°F Aug. 18, 1961.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date of collection

Nov. 1-15, 1964. .
May 21-27, 1965..
May 29-June 7. ...
June 8-16, 22, 24

Sept. 1, 2, 8-15.

Mean

discharge
(cfs)

333
390
798
1160
2930
1910
1710

196
1920
953
1270
1460
1410

Silica

(Si02)

5.7
5.8
4.4
4.1
3.5
3.6
4.0

3.7
3.7
4.0
3.3
3.0
3.0

Iron

(Fe)

0.06
.04
.02
.01
.02
.03
. 04

.00
.02
.02
.06
.06
. 06

Cal-

cium

(Ca)

14
8.8
6.0
8.0
6.8
8.0
8.0

8.0
8.0
8.0
8.4
8.4
8.8

Mag-
ne-

sium

(Mg)

2.2
3.9
2.4
1.7
2.9
2.4
2.4

2.4
2.4
2.9
2.2
2.2
2.2

Sodium

(Na)

3.1
2.2
1.6
1.6
1.6
1.4
1.4

1.4
1.4
1.4
3.0
1.4
1.4

Po-
tas-

sium

(K)

0.8
.0
.0
.0
.0
. 0
.0

.0
.0
.0
1.1
1.1
1.1

Bicar-
bonate

(HCO,)

48
48
30
29
28
28
28

28
28
32
33
33
32

Sulfate

(SO,)

7.7
. 7
.7
4.8
8.6
3.4
7.2

6.2
6.2
6.2
7.7
5.8
5.3

Chloride

(Cl)

2.8
1.1
1.1
1.1
3.5
. 7
. 7

. 7
.7
1.1
2.1
1.4
2.1

Fluo-
ride

(F)

0.1
.2
.2
.2
.2
. 2
. 2

.6
.3
. 2
.0
.0
. 0

Ni-

trate

(N03)

0. 2
. 9
. 7
. 5
. 5
. 6
. 5

.6
. 5
.6
. 5
. 0
.0

Dissolved
solids

(residue
at 180°C)

61
47
31
35
41
33
37

37
36
39
44
39
39

Hardness

as CaCO,

Calcium,
magne -
slum

44
44
25
27
29
30
30

30
30
34
30
30
31

Non-
carbon-
ate

5
5
0
3
6
7
7

7
7
8
3
3
5

Specific
conduct-

ance

(micro -
mhos

at25°C)

99
108
69
68
108
69
68

68
69
76
80
71
70

PH

7.5
7.0
7.1
7.1
7.0
7.0
7.0

6.9
7.1
7.3
7. 5
7.7
7.7

Color

10
10
10
10
10
10
10

10
10
10

5

ALASKA WEST OF LONGITUDE 141° Continued

15-2080. TONSINA RIVER AT TONSINA, ALASKA Continued

Specific conductance (micromhos at 25°C) of water, water year October 1964 to September 1965

Day

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

6»» *

7.....
8«. ...
9.....
10.....

11.....
12.....
13.....
1*.....
15.....

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

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

26. ....
27.....
28.....
29.....
30.....
31.....

Average

October November December January

67

February March April

9*

May

_

-

_

_
- -

«

~

99
97
97
97
95

_

96
-

69
66
64

June

63
66
68
73
67

75
73
65
68
67

67

67
65
71

70

~

_

65

73

__

.
.
-

July

__

-

63
63
62
62
63

63
62
62
62
62

64
63

64
63

65
64
65
67
67

67
67
66
67
66
66

64

August

64
66
67
66
66

67
68
67
67
67

66
65
65
67
71

68

__

__

__
__
__

_ _

.

71
71
81
73

September

73
73

__
__

__
__

69

68

69
70
69
69
70

71
72
71
70
70

69
70
70
69
69

69
70
70
72
73

70

ALASKA WEST OF LONGITUDE 141" Continued

15-2080. TONSINA RIVER AT TONSINA, ALASKA Continued

(°F) of water, water year October 1964 to September 1965

Month

October ....
November .....
Decembet .....

February

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

September .....

1

44

53
41

2

47

48

3

47

5?

4

48

52

5

48

5?

6

46

7

46

52

8

46

52
49

9

45

53

10

49
52

1 1

50

12

49

13

51

14

48

15

49

Day

16 17 18 19

n

20 21

44

22

44

23

43

24

43

25

47

26 27

42

45

28

43
43

29

41

43
43

30

45

43

31

45

44

Aver-

age

_

Periodic determinations of suspended-sediment concentration and particle-size analyses, water year October 1964 to September 1965 (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

Time

(24 hour)

0950
1615
1600
1440

Water
tem-

per-
ature

(°F)

42

52
50

Sam-

pling
point

Discharge
(eta)

274
A 3100
1660
1250

Sediment

concen-

tration

(ppm)

14
31
28
35

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004 0.008 0.016 0.031 0.062

86
96
96

0.125

91
98
96

0.250

96
100
96

0.500

99

96

1.000

100

98

2.000

100

Method
Of

analysis

V
V
V

A Daily mean discharge.

al Creek and abandoned Indian

ALASKA WEST OF LONGITUDE 141° Continued

15-2120. COPPER RIVER NEAR CHITINA, ALASKA

LOCATION. At gaging station on right bank at head of Woods Canyon, 0.5 mile downstream frc
Village of Taral, 2.2 miles upstream from Tenas Creek, and 3.5 miles south of Chitina.
DRAINAGE AREA. 20,600 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: June to November 1950, January 1954 to March 1957, June to September 1957. Water temperatures: June to September 1957, June to September 1965.
Sediment records: January to September 1956 (periodic), June to September 1957 (daily), May to July 1963 (weekly), October to September 1965 (daily).
EXTREMES, 1964-65. Sediment concentrations: Maximum daily, 4,100 ppm July 13.
Sediment loads: Maximum daily, 1,500,000 tons Aug. 11.
EXTREMES, 1957, 1963-65. Sediment concentrations: Maximum daily, 4,100 ppm July 13, 1965.
Sediment loads: 1,500,000 tons Aug. 11, 1965.

Temperature (°F) of water, water year October

Month

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

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

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

Joly.. ....
August ....
September .....

1

50

47

2

47

49

3

48

4R

4

49

52

5

49
52
52

6

53
52

7

55
51

8

53
48

9 10

__ -

49
56

48
54

11J12

49
50 50

13

48
48

14

~

46

"l5

48

Day

r,"o]

17~j~18

-

i -

50

196

19

-

4 to

20

48

52

September 1965

21

56

22

52

55

23

56

24

53

25

53

48 49

26 27

51 51

28

50

29

-

47

30

47

31

51

Av

3s of suspended sediment, water year October 1964 to September 1965
ttom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water;

Particle-size analyt.

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

Date of collection

Oct. 13, 1964. ....
June 25, 1965. ....

Time

(24 hour)

1230
1700
1700
0815
1830
1735
1355

Water
tem-

per-
ature

(°F)

36
53
53
52
49
54
46

Sam-

pling
point

Discharge
(cfs)

20800
54900
89900
A 122000
146000
68200
65900

Sediment
concen-

tration

(ppm)

170
1000
3100
1200
3900
1100
960

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

17

15
15
26
21

0.004

28
28
19
20
31
29

0.008

29
36
26
23
36
40

0.016

38
47
35
36
52
46

0.031

48
55
45
45
62
52

0.062

61
53
70
57
54
65
62

0.125

74
64
82
81
80
81
66

0.250

79
81
94
95
96
88
84

0.500

98
98
99
100
100
99
96

1.000

100
100
100

100
99

2.000

100

Method
of

analysis

S
VPWC
SPWC
SPWC
SPWC
SPWC
VPWC

A Daily mean discharge.

ALASKA WEST OF LONGITUDE 141° Continued

15-2120. COPPER RIVER NEAR CHITINA, ALASKA Continued

Suspended Bedim
(Where no cone

it, water year October 1964 to September 1965 ~~l ntrations are reported, loads are estimated)

Day

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

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

OCTOBER

Mean
dis-

charge
(cfs)

21100
22000
21200
21000
?1000

21000
20300
20900
21400
10.. 21700

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

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

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

26..
27..
28..
29..
30..
31..

Total

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

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

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

16..
17..
IB..
19..
20..

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

26..
27..
28..
29..
30..
31..

Total

21400
21100
20600
20000
19400

18800
8000
6800
5500
4800

4900
4600
4700
3600
1700

1200
2000
12200
11200
9280

Suspended sediment

Mean

tration

(ppm)

Tons
per
day

11000
12000
11000
11000
11000

11000
11000
11000
12000
12000

12000
11000
11000

' 11000
10000

100
900
500
200
000

000
900
000
700
200

000
200
300
000
2500

7440 [! 2000

530820 226500

JANUARY

700
700
700
700
700

700
700
700
700
700

700
700
700
700
700

700
700
700
700
700

700
700
700
700
700

700
700
700
700
700
700

145700

250
250
250
250
250

250
250
250
250
250

250
250
250
250
250

250
250

NOVEMBER

Mean
dis-

charge
(cfs)

6800
6800
6800
6800
6800

6800
6800
6800
6800
6800

6800
6800
6800
6800
6800

6800
6800
6800
6800
6800

6800
6800
6800
6800
6800

6800
6800
6800
6800

Suspended sediment

Mean

tratfon"

(ppm)

Tons
per
day

920
920
920
920
920

920
920
920
920
920

920
920
920
920
920

DECEMBER

Suspended sediment Mean
dis-

charge
(cfs)

5500
5500
5500
5500
5500

5500
5500
5500
5500
5500

5500

Mean

(ppm)

5500
5500
5500
5500

920 ' 5500 !

920] 5500
920
920
920

920
920
920
920
920

920
920
920
920

5500
5500
5500

5500
5500
5500
5500
5500

5500
5500
5500
5500

6800 1 | 920 i 5500

"

204000

i -- ; 5500
27600

FEBRUARY

4400
4400
4400
4400
4400

4400
4400
4400
4400
4400

4400
4400
4430
4430
4400

4400
4400

250 |' 4400
250 - 4400
250 ^ 4400

250
250
250
250
250

250
250
250
250
250
250

7750

4400
4400
4400
4400
4400

4400
4400
4400

123200

240
240
240
240
240

240
240
240
240
240

240
240
240
240
240

240
240
240
240
240

240

Tons
per
day

450
450
450
450
450

450
450
450
450
450

450
450
450
450
450

450
450
450
450
450

450
450
450
450
450

450
450
450
453
450

j 450

170000 i 13950

MARCH

200
200
200
200
2no

200
200
200
200
200

2^0
230
230
230
230

230
230
230
230
230

200 i 230
200
200
200
200

200
200
200
200
200

230
230
230
230

230
230
230
230

200
240 J 200

240 | 200

230

230
230
230
240 ' 200 ' i 230
240

240
240
240

6720

200

200
200
200
200
200
200

130200

1 230

230
230
230
230
230
230

7130

QUALITY OF SURFACE WATERS, 1965

ALASKA WEST OF LONGITUDE 141° Continued

15-2120. COPPER RIVER NEAR CHITINA, ALASKA Continued

Suspended sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

3900
3900
3900
3900
3900

3900
3900
3900
3900
3900

3900
3900
3900
3900
3900

3900
3900
3900
3900
3900

Suspended sediment

Mean

tration

(ppm)

Ton.
per
day

210
210
210
210
210

210
210
210
210
210

210
i 210
210
! 210
210

210
210
210
210
210

3900 420
3900
3900
3900
3900

4200
4200
4200
4200
4200

118500

420
420
420
420

450
450
450
450
450
~

8550

JULY

74600
77400

2200
2^00

440000
420000
76000 1800 . 370000
75600 1900 390000
74600

72400
75700
83800
90500
96800

1600 320000

1500 I 290000
2000 B 410000
2800 630000
3100 B 760000
3100 810000

107000 ; 3500 1000000
117000 ' 3900 B 1200000
12'. 000 ' 4100
133000
139000

129000
122000
118000
115000
112000

113000
110000
102000
96600
94200

94800
93800
94000
97500
104000
113000

3128300

4000
3600

3100
3000
3100
3200

B 1400000

MAY

Mean
dis-

charge
(cfs)

200
200
200
200
200

200
200
200
200
200

15200
15200
15200
15200
15200

15200
15200
15200
15200
15200

15200
26400
26500
25600
27200

31500
34600
37600
45300
59200
54000

607100

Suspended sediment

Mean
concert-

(ppm)

Tons pei-
day

1900
1900
1900
1900
1900
1
1900
1900
1900
1900
1900

8200
8200

JUNE

Mean
dis-

charge
(cfs)

49700
47000
43500
39000
33700

31600
32000
39100
44200
48700

46400

Suspended sediment

Mean
concen-

(ppm)

_
__

_
__
__

_

47900
8200 50600
8200
8200

12000
12000
12000
12000
12000

12000
21000
21000
21000
22000

42000
47000
51000
61000
, 80000
73000

571000

AUGUST

122000] 3300
120000
115000
109000
107000

105000
109000
115000
123000
132000

147000
130000
110000
B 1400000 97700
1300000

1100000
B 990000
B 990000
990000
3200 B 970000

3200 B 980000
3000 B 890000
2600 B 720000
2300
2000

2100
2200
2100
2200
2500
3100

-

600000
510000

540000
B 560000
530000
580000
B 700000
B 950000

23740000

102000

113000

3200
3000
2900
2700

2500
2900
3000
3600
4000

3800
3400
3000

B 1100000

48900
48400

49600
48800
46100

_

43200
42300 580

42400
43600
45800
51100
54200

57800
63500
68900
72200
72400

1452600

550
520
670
950
1300

1600
2000
2200
2300
2200
~

-

Tons
per
day

81000
76000
71000
63000
55000

51000
52000
63000
72000
79000

75000
78000
82000
79000
78000

80000
79000
75000
70000
66000

B 63000
61000
83000
130000
B 180000

B 250000
B 340000
B 410000
B 450000
B 430000

3822000

SEPTEMBER

55100
P 1000000 53800
B 930000 53300
850000 53800
780000

660
560
560
560
54400 600

710000 57500 \ 900
850000 1 63900
930000 67300
1200000
1400000

67100
66000

1500000 66000
B 1200000
890000
2600 B 690000

66500

1200
1200
1100
1100

1200
1000
66500 . 1100
65900 ' 1200
2200 610000 t 63500

2300
134000 ' 2700
139000 2700

126000 , 2400
115000

108000
102000
98200
97600
92000

79900

2100

2000
2000

B 700000 62900
B 980000 ' 63700
1000000 , 72000
820000
650000

580000
550000
1900 B 500000
1800 470000
1600 400000

1600
81000 I 2100
73000
64600
60500
57700

3285200

1400
1300
950
680

"

350000
460000
280000
230000
160000
110000

22880000

83400
90600

1200

__

__
__

97000
95200
87800
87700
80500

71800
66600
62700
58200
54000

_

98000
R1000
81000
81000
88000

B 140000
210000
220000
200000
B 200000

210000
180000
200000
B 210000
B 210000

250000
260000
290000
340000
370000

390000
390000
360000
360000
330000

_
_

__
_

- -

2054700

290000
270000
250000
240000
220000

7019000

Total discharge for year (cfs-days) .... .11,958,820 Total load for year (tons) .... .58,330,200 B Computed from estimated-concentration graph.

ALASKA WEST OF LONGITUDE 141° Continued

15-2190. WEST FORK OLSEN BAY CREEK NEAR CORDOVA, ALASKA

LOCATION. Temperature recorder at gaging station, 600 feet upstream from confluence with East Fork, and 21 miles northwest of Cordova.
DRAINAGE AREA. 4.78 square miles.
RECORDS AVAILABLE. Water temperatures: October 1964 to September 1965.
REMARKS. Recorder stopped Oct. 18 to Nov. 6, Nov. 13 to Apr. 11; temperature ranges, 38°F to 42°F, 32°F to 39°F, respectively. Thermograph not operating Apr. 12 to July 18; temperature estimated to be in range of 35"F to 45°F.

Temperature (°F) of water, water year October 1964 to September 1965

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
44

47
45

46
44

2

44
44

45
45

45
44

3

44
43

45
45

46
44

4

42
42

46
44

46
45

5

43
43

47
44

46
45

6

44
43

47
45

46
45

7

44
44

38
38

47
45

46
44

8

44
44

38
38

47
45

44
44

9

44
44

38
38

46
46

45
44

10

44
44

38
38

46
45

45
44

11

44
44

38
38

46
45

45
44

12

44
43

39
39

44
44

45
44

13

43
43

44
44

44
44

14

43
42

44
44

44
44

15

42
42

44
44

44
44

16

42
42

44
44

45
44

17 18

42
41

45
44

46
44

45
44

46
45

19

45
43

44
44

46
44

20

45
43

44
44

45
44

21

43
43

45
44

44
44

22

44
43

46
44

44
44

23

43
43

45
44

45
45

24

43
43

46
44

44
44

25

45
43

45
44

44
44

26

46
43

44
43

44
44

27

46
44

44
43

44
44

28

45
44

44
43

44
43

29

46
44

44
44

43
43

30

47
45

44
44

43
42

31

46
45

46
44

Average

_

45
44

45
44

ALASKA WEST OF LONGITUDE 141° Continued

15-2400. ANCHOR RIVER AT ANCHOR POINT, ALASKA

LOCATION. At gaging station near right bank on downstream side of Sterling Highway bridge at Anchor Point, 0.1 mile downstream from North Fork, and 1 mile upstream from mouth.
DRAINAGE AREA. 226 square miles.
RECORDS AVAILABLE. Chemical analyses: May 1953 to September 1954, October 1957 to September 1965.
Water temperatures: May 1953 to September 1954, April 1959 to September 1965.
Sediment records: July 1953 to August 1954 (periodic).
EXTREMES, 1964-65. Water temperatures: Maximum, 59°F Aug. 5-7.
EXTREMES, 1959-65. Water temperatures: Maximum, 69°F July 28, 1963.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date of collection

Oct. 1-16, 1964. .

Ap . 25-30, 1965.

July 23-31,

Mean

discharge
(cfs)

392
438
258
419
183

1070
796
716
372

210
150
220
400
829

Silica

(Si08)

27
25
28
28
30

21
19
22
26

28
31
30
29
19

Iron

(Fe)

0.04
. 11
. 10
. 11
. 03

.25
.22
.24
.06

.65
. 11
.00
.02
.04

Cal-
cium

(Ca)

8.4
6.6
7.2
6.4
3.8

4.0
1.6
4.0
7.6

5.6
8.4
6.8
6.4
3.6

Mag-
ne-

sium

(Mg)

2.4
1.8
2.6
1.3
5.2

2.4
3.9
2.7
1.2

4.1
3 9
5.8
3.4
. 5

Sodium

(Na)

5.9
3.9
5.3
4.0
5.2

4.6
3.8
4.2
8.1

5.8
9.1
5.4
4.6
6.8

Po-
tas-
sium

(K)

.7
. 3
.7
.4
.9

.7
.3
.5
.0

.6
.3
.8
.4
. 3

Bicar-
bonate

(HCOS)

44
32
39
30
42

28
24
28
35

47
59
53
42
16

Sulfate

(S04)

0.5
.5
. 5
. 5
1.9

2.9
2.9
2.4
3.4

1.4
4.3
4.3
2.4
3.8

Chloride

(CD

5.7
3.5
4.6
3.2
5.0

5.0
5.0
5.0
3.5

2.1
3.5
4.3
4.3
4.3

Fluo-
ride

(F)

0.1
.1
. 2
. 1
. 2

. 1
. 1
.2
. 3

. 1
.3
.3
. 2
. 3

Ni-

trate

(N03)

0.6
. 9
1.1
. 6
. 8

1.4
.6
.8
. 1

1.5
. 2
. 0
. 1
. 6

Dissolved
solids

(residue
at 180°C)

74
60
70
61
75

57
50
57
69

70
92
85
73
48

Hardness

as CaCO,

Calcium,
magne-
sium

31
24
28
22
31

20
20
21
24

31
37
41
31
11

Non-
carbon-
ate

0
0
0
0
0

0
0
0
0

0
0
0
0
0

Specific
conduct-

ance

(micro -
mhos

at 25°C)

91
63
81
56
85

64
55
60
70

93
100
95
83
44

PH

7.2
8.2
8.2
7.3
7.6

7.5
6.9
7.1
7.7

7.3
7.6
7.4
7.2
7.2

Color

10
20
20
10
5

20
20
20
20

20
10
25
20
10

ALASKA WEST OF LONGITUDE 141° Continued

15-2400. ANCHOR RIVER AT ANCHOR POINT, ALASKA Continued

Specific conductance (micromhos at 25°C) of water, water year October 1964 to September 1965 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.....
28.....
29.....
30.....
31.....

Average

______

October

102
104
108
105
106

104
85
60
70
79

83
86
88
89
92

94
52
67
93
43

63
46
43
38
42

64
54
77
57
85
53

75

November

40
84
82
73
59

85
88
88
43
70

85
90
87
90
90

56
40
78
40
40

56
39
56
48
61

52
51
43
72
92

65

December

92
73
96
59
100

__

-

__

.

__

January February March April

_

_

-

_

__

__

64

63
64
64
64
63

~

May

64
64
64
64
64

64
64
65
65
65

65
68
67
49
48

48
48
48
48
48

48
48
48
46
46

46
43
43
43
43
60

54

June

59
59
59
60
60

60
60
60
60
60

60
70
-

_ -

68

72
71
73
71
70

71

__

__

_ -

. .

"

July
__

_

-

__

_

-

__

- _

_

81
82
82

_

91
92
92
93
96

August

96
97
97
98
100

101
101
95
95
91

91
91
96
85
70

82
86
94
95
95

95
95
97
99
99

97
99
100
98
97
103

94

September

100
104
105
103
103

79
78
78
78

90
90
90
90
75

75
75
75
75
76

75
31
51
35
21

35
50
32
43
58
~

71

ALASKA WEST OF LONGITUDE 141° Continued
15-2400. ANCHOR RIVER AT ANCHOR POINT, ALASKA Continued Temperature (°F) of water, water year October 1964 to September 1965

November .....

April ....

July...........
September .....

1

32

45

2

32

54

3

32

54

4

32

50

5

33

56

6

32

57

7

32

52

8

32

47

9

32

47

10

32

11

32

52

12

32

47

13

32

51

14

32

50

15

32

47

Day
16

32

49

17

33

47

18

33

48

19

32

47

20

32

49

21

32

48

22

32

48

23

32

52
45

24

32

44

25

32

46

26

32

42

27

32

40

28

32

39

29

32

34

30

32

34

31

32

Aver-
age

32

47

ALASKA WEST OF LONGITUDE 141° Continued

15-2416. NINILCHIK RIVER AT NINILCHIK, ALASKA

LOCATION. At gaging station on downstream side of bridge, at mile post 127 Sterling Highway, at Ninilchik, and 1.1 miles upstream from mouth.
DRAINAGE AREA. 131 square miles.
RECORDS AVAILABLE. Water temperatures: May to September 1963, October 1964 to July 1965 (discontinued).
Sediment records: May 1963 to July 1965 (discontinued).
EXTREMES, October 1964 to July 1965. Sediment concentrations: Maximum daily, 298 ppm Oct. 8.
Sediment loads: Maximum daily, 300 tons Apr. 19.
EXTREMES, May 1963 to July 1965. Water temperatures (May to September 1963): Maximum, 62°F July 14, 1963. Sediment concentrations: Maximum daily, 298 ppm Oct. 8, 1964.
Sediment loads: Maximum daily, 300 tons Apr. 19, 1965.

Temperature (°F) of water, October 1964 to July 1965

October ....

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

September .....

1

42

39

2

42

39

f, f.

3

43

3i

4

43

3S

5

42

6

37

7

41

8

41

9

40

10

40

11

38

12

33

13

38

14

39

52

15

Day

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

Aver-
age

__

~*~

QUALITY OF SURFACE WATERS, 1965

ALASKA WEST OF LONGITUDE 141° Continued

15-2415. NINILCHIK RIVER AT NINILCHIK, ALASKA Continued

Suspended sediment, October 1964 to July 1965
(Where no concentrations are reported, loads are estimated)

OCTOBER j| NOVEMBER

Day

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

6..
7..
8..

Suspended sediment | Suspended sediment
Mean
dis-

charge
(cfs)

105
105

Mean Tnnf
concen-

tration

(ppm)

per
day

13 ! 4
13 4
104 14
104
108

137
181
270

4
12 3
10

24

3

9
244 'S 120
29B 220
9.. 217 85
10..

11..
12..
13..

187

152
132
125
14.. i 12?
15.. 118

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

114
114
118
160
20.. 160

38

30
30

50
19

12
11
13 4
13 4
5

5
5
5
7
7

21.. 160 , 7
22..
23..
24..
25..

26..
27..
28..
29..
30..
31..

Total

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

6..
7..
B..
9..

160
160
160

7
7
! 7
160 - 7

160
160
160
160
160

7
7
7
7

Mean

dig- Mean

charge
(cfs)

100
100

ion
ion
100

100
100
100
100
100

100
100
140
140

tration

(ppm)

Tons
per
day

3
3
3
3
3

3
3
3
3
3

3

| 3

140 I

140
140
140
140
140

14n
14n
140
110
110

110

5
5
5

DECEMBER

Mean
dis-

charge
(cfs)

70
70
70
70
70

70
70
70
70
70

70
70
70

Suspended sediment

Mean

tration

(ppm)

70

Tons
per
day

2
2
2
2
2

2
2
2
2
2

2
2
2
2
70 2

5 ! 46 .6

5 48 j
5 48
5 48
5 48

5 48
5 48
5
it

48
48
4 48

! 4
110 !
110

4

^

110 4
7 110
160 7

4593 -- 578

JANUARY

38 0.6
38 .6
38 .6
38 .6
38

38

. 6

. 6

4

3510

48

. 8
. 8
. 6
. 8

. 8
. 8
. 8
. 8
. 8

. 8
48 ' .8
48
48
48
48

. 8
. 8
. 8
. 8

119 1B18 42.8

FEBRUARY ! MARCH

40
40
40

0.5 63
. 5 i 63
. 5 63
40
40

. 5 63
. 5 63

40 .5 63
38 .6 40
38 .6 4C
38 .6 40
10.. . 38

|
11.. i 38
12..
13..

38
38
14.. 38

. 5 63
. 5
! .5
. 6 , 40 .5

. 6
. 6
. 6
. 6

15.. | 38

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

36
38
38
38
20.. 38

. 6

. 6
. 6
. 6
. 6
. 6

40 1 i .5
40
40

. 5
. 5
40 .5
40

40
40
40
40
40

21.. 38 ' .6 40

63
63
63

63
63
63
63

0.9
. 9
9
. 9
. 9

. 9
. 9
. 9
. 9
. 9

9
. 9
9
. 9
. 5 63 .9

. 5 , 110 2
. 5 I 110 2
. 5 110

. 5 110 j
. 5 . 110

. 5
22.. 36 .6 40
23.. 38 : .6 40
24.. 36
25..

26..

38

38

. 6
. 6

. 6
27.. 38 ; .6 28.. 38 , .6
29.. j 38
30.. 38
31.. ! 36

Total 1178

40
40

40
40
40
. 6
. 6
. 6

18.6 1120

. 5
. 5
. 5
. 5

. 5

, 5
5

14.0

110
110

2
2
2

4
4
110 4
110
110

110
110
110
110

4
4

110

4
4
4
4
4
110 , 4

2705 67.5

S Computed by subdividing day.

ALASKA

ALASKA WEST OF LONGITUDE 141° Continued

15-2415. NINILCHIK RIVER AT NINILCHIK, ALASKA Continued

Suspended sediment, October 1964 to July 1965 Continued

APRIL

Day

1 ..
2..
3

Mean
dis-

charge
(cfs)

130
130
130
4.. 130
5..

6..
7..
B..
9..
10..

11..
1?..
13..

14..

15..

16..
17..
IB..
19..
20..

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

26..
27..
28..
29..
30..
31..

Total

130

130
130
130
130
130

270
270
270
270
270

270
?70
?70
469
465

282

20=)
168
153
186

296
296
202
279
255

6810

Suspended sediment

Mean

(ppm)

72
66
57
69
57

59
33
34

per

day

25
23
20
24
20

21
12
12
37 13
53 19

82 i 60
97 71
134 98
166
177

170

120
130

120
117 85
186 S 140
237 300
182

74
57

S 230

56

MAY

Mean
dis-

charge
(cfs)

348
396
306
235
180

177
171
142
147
147

145
145
139
120
118

118
112
110

111
112

lin
32 120

Suspended sediment

Mean

tration

(ppm)

55
49
26
33
26

27
23
25
19
24

14
14
17
22
27

16
24
24
15
16

13
15
42 19 , 130 16
39 16
52 26

66 53
51 41
32 25
31 23
32 22

1856

j JULY
. ^4

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

6..
7..
B..
9..
10..

11..

209
147

34 16
17
20

13n 19
130 24

130
120

120 ien
250
270

5168

19
85
89
39
49
57

"

per
day

852
52
21
21
13

13
11
10
8

JUNE

Mean
dis-

charge
(cfs)

260
200
170
160

Suspended sediment

Mean
concen-

tration

(ppm)

41
32
22
22
150 24

10 18
1 0
1 0
1 0

20
23
21
10 i' 13 lit

5 . 136 15
131 19
118 15
110 21
105 19

150
118

17
18

per
day

29
17
10
10
10

7
8
9
8
5

6
7
5
6
5

7
6
147 ' 14 B k
186 24

7

180

180
150
133
131

36

28
23

12
17

14
9
16 6
17 6
8 120 ' 23

7 93 34

26 85 , 21
28 80 | 9
18 89 j 8

7

9
5
2
2
33 142 47 B 18
42

455

AUGUST

10
8
162 22 10
133 15 5

150
115
96
139
91

102
12.. 102
13..
14..
15..

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

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

26..
27..
28..
29..
30..
31..

Total

105

21 9
24 7
63 16
41 S 15
15 4

23
15

6
4
41 12
105 20 ! 6

|

4227 268

SEPTEMBER

!

j 1

j J!
108 16 5 |

108 12 3 !'
105 36 10
171 56 26
218
177

_ -

42
38

?5
18

.

__

i
- -

2717

~~ I

215

i1

|

Total discharge for period (cfs-days). .... 33,846 Total load for period (tons). .... 3,633.9 S Computed by subdividing day.
B Computed from estimated-concentration graph.

ALASKA WEST OF LONGITUDE 141° Continued

15-2480. TRAIL RIVER NEAR LAWING, ALASKA

LOCATION. At gaging station near center of stream on downstream end of pier at bridge site on old Seward-Anchorage Highway, 0. 2 mile upstream from Falls Creek, 0.2 mile downstream from Lower Trail Lake, 1.9 miles upstream from mouth, and 2.1 miles north of Lawing.
DRAINAGE AREA. 181 square miles.
RECORDS AVAILABLE. Chemical analyses: October 1949 to September 1965.
Water temperatures: April 1959 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 55°F July 22.
EXTREMES, 1959-65. Water temeratures: Maximum, 55°F July 22, 1965.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date of collection

Oct. 1-31, 1964..

Jan. 1-4, 1965. . .

June 11-20. ......

Mean

discharge
(cfs)

612
232
262
215
211

117
160
234
428
394

369
707
1670
1460
1420

1940
2500
1820
2160
1950
1970

Silica

(SiO.)

3.8
3.8
6.6
5.2
5.0

6.8
5.3
5.5
4.9
4.1

4.0
4.0
4.9
5.4
3.9

4.1
4.4
3.8
3.5
3.1
3.1

Iron

(Fe)

0.08
. 11
.03
.04
.04

.04
.04
.06
.02
.02

.02
.02
.02
.02
.02

.02
.02
.02
.06
.03
.04

Cal-
cium

(Ca)

13
14
17
18
18

19
18
18
13
14

14
12
11
12
11

11
11
12
10
8.4
8.8

Mag-
ne-

sium

(Mg)

0.6
1.1
1.3
1.2
1.6

1.7
1.8
1.3
3.0
2.2

1.9
3.2
3.5
2.9
3.3

3.0
2.1
.5
2.2
2.4
2.7

Sodium

(Na)

2.2
1.9
2.1
. 5

.1
.3
.2
.0
.0

.0
.8
.8
.8
.6

. 5
.5
.5
.7
. 1
. 1

Po-
tas-
sium

(K)

. 7
.2
.6
.0
.0

.0
. 1
. 1
.8
.8

.8
.8
.8
.8
. 8

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

Bicar-

bonate

(HCOS)

30
34
44
48
48

50
49
48
45
41

40
39
39
38
37

37
33
29
31
31
31

Sulfate

(S04)

12
12
11
14
14

15
15
13
10
12

13
12
12
12
12

10
9.6
11
8.2
7.2
9.6

Chloride

(CD

.8
.5

. 8

.8
.8

1.

Fluo-

ride

(F)

0.

.2
. 0
.0

Ni-

trate

(N0a)

0.6
.8
.8
.8
1.0

.9
.6
.8
1.6
1.6

1.1
1.3
1.7
1.9
1.9

2.8
1.1
.7
. 1
.4
. 3

Dissolved
solids

(residue
at 180° C)

51
54
64
70
70

74
71
69
60
58

58
56
55
58
54

52
48
46
42
40
42

Hardness

as CaCOj

Calcium,
magne-
sium

35
40
48
50
52

54
52
50
45
44

43
43
42
42
41

40
36
32
34
31
33

Non-
carbon-
ate

10
12
12
11
13

13
12
10
8
10

10
11
10
11
11

10
9
8
9
6
8

Specific
conduct-

ance

(micro -
mhos

at 25°C)

81
86
106
114
114

116
115
111
108
98

99
99
97
98
95

87
82
76
79
79
75

PH

. 1
. 1
.4
. 5
. 5

.5
.4
.4
. 1
. 1

.2
.3
.3
. 1
. 1

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

Color

5
5
5
5
5

5
5
5
5
5

5
5
5
5
5

5
5
5
10
10
10

ALASKA WEST OF LONGITUDE 141° Continued

15-2480. TRAIL RIVER NEAR LAWING, ALASKA Continued

Specific conductance (micromhos at 25°C) of water, water year October 1964 to September 1965 Day

!
2.....
3.....
4.
5*

6.....

7

8*
9.....
10.....

11.....
12.....
13.....
I*.....
19.....

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

21.....
22.. ...
23.. ...
24.«.*«
25.....

26.....
27.. ...
28.....
29.....
30.....
31.....

Average

October

76
77
78
77
78

78
78
77
76
78

79
79
79
80
81

81
81
81
81
81

83
82
82
82

83
83
83
83
85
85

80

November

84
83
84
85
8$

84
85
85
86
86

86
87
87
88
88

87
87
86

86

86
86
86
87
88

89
90
90
91
92

86

December

94
95
95
95
96

96
98
99
102

__

104
105
106
107

108
107

107
110

111
111
110
111
112

111
112
113
114
114
114

105

January

114
114
114
11$

__

- -

__

.

114
114
113
113
113

111
111
112
112
111

113
114
115
115
116
116

February

117
117
117
116
117

117
117
118
117
117

117
116
116
116
117

118
118
117
120
117

117
116
117
117
117

117
117
117
~

117

March

117
117
118
117
117

117
117
116
115
116

116
116
115
115
115

115
115
115
115
115

115
115
115
115
114

114
114
113
114
113
114

115

April

113
113
113
112
112

112
111
111
111
111

111
111
110
110

__

«

104

105
104
101
101
101

May

101
100
100
100
100

100
100
98
99
99

99
98
98
98
98

97
99
102
98
98

98
99
98
98
98

98
93
93
93
97
98

98

June

94
97
98
98
98

98
98
98
96
95

95
95
95
95
96

97
97
96
97
96

96
95
95
93
93

93
93
93
93
92

95

July

91
91
91
90
90

91
89
89
88
88

88
85
84
85
84

83
81
78
77
75

79
82
78
77
76

82
74
75
70
63
75

82

August

76
76
77
79
79

79
74
77
74
72

77
74
77
74
74

75
72
75
75
74

76
76

__
_

September

ALASKA WEST OF LONGITUDE 141° Continued

15-2480. TRAIL RIVER NEAR LAWING, ALASKA Continued

Temperature (°F) of water, water year October 1964 to September

November .....
December .....

April ....

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

September .....

1

36
32

3?

37
43

46

2

36
32

34

3

36
32

33

4

36
32

33

5

36
33

34

6

36

34

7

35
33

37

4">

8

35
32

33

9

35
32

10

34
32

11

35

12

33
32

33

13

33
32

14

33
32

15

33
32

40

Day

16

34
32

40

17

34
32

18

34

19

32

20

34
32

21

33
32

22

33
32

23

32
32

24

32
32

4-8

25

32
32

26

32
32

27

32
32

28

32
32

29

32
32

37

30

32
32

31

32

Aver-

age

34
32

ALASKA WEST OF LONGITUDE 141° Continued

15-2810. KNIK RIVER NEAR PALMER, ALASKA

LOCATION. At gaging station near center of span on downstream side of bridge on Glenn Highway, and 7 miles south of Palmer. DRAINAGE AREA. 1,180 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: October 1957 to August 1958, May to August 1964.
Water temperatures: May to September 1963, April to September 1965.
Sediment records: July 1953 to August 1956, July, August 1961, May 1962 to September 1965.
EXTREMES, 1964-65. Sediment concentrations: Maximum daily, 3,500 ppm July 10.
Sediment loads: Maximum daily, 2,000,000 tons July 10.
EXTREMES, 1962-65. Water temperatures (May to September 1963): Maximum, 46°F May 5, July 30, 1963. Sediment concentrations: Maximum daily, 6,290 ppm June 27, 1962.
Sediment loads: Maximum daily, 2,000,000 tons July 10, 1965.

Temperature (°F) of water, April to September 1965

Month

November .....
December .....

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

May...........

July...........
August........

Day

1

39

51

44

2

46

51
41
43

3

42

40

4

38

44

5

38

37

6

38

7

45

39

8

35
45

9

35
44

42

10

33
48

11

32
47

44

12

48

42

13

46

14 15

50

38

16

48

42

17

51

48

18

55

42

19

49

39
48

20

50

21 22 23 24

50
50

25

50
52

44

26

51
51

27

51
49

28

52

38

29

48

30

52

41

31

39

45
42

Aver-

age

45

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

uly 1............

Sept. 16. ....

Time

(24 hour)

1210
1515
1445
0600
1930
1455
1440

Water
tem-

per-
ature

(°F)

47

47
39
41
46

Sam-

pling
point

Discharge
(cfs)

1820
4760
9220
164000
80900
15100
22100

Sediment
concen-

tration

(ppm)

210
960
2200
1300
1000
390
1300

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

39
30
17
17
28
35
28

0.004

55
41
28
28
39
55
39

0.008

76
56
34
38
49
65
53

0.016

84
69
42
48
61
73
66

0.031

92
75
61
55
71
83
80

0.062

94
92
78
62
74
85
88

0.125

98
97
90
68
83
88
91

0.250

100
99
98
74
88
100
95

0.500

100
100
97
99

97

1.000

100
100

100

2.000

Method
of

analysis

VBWC
VPWC
VPWC

VPWC
VPWC

VPWC VPWC

QUALITY OF SURFACE WATERS, 1965

ALASKA WEST OF LONGITUDE 141° Continued

15-2810. KNIK RIVER NEAR PALMER, ALASKA Continued

Suspended sediment, water ye
(Where no concentrations ar

October 1964 to September 1965
reported, loads are 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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

6960
6920
6680
6470
6310

6780
7590
9400
9880
9200

8280
7310
6540
6010
5710

5440
5400
5400
5400
5500

5600
5700
5800
5700
5600

5500
5400
5300
5200
5200
5100

197280

NOVEMBER

Suspended sediment

Mean
concen-

tration

(ppm)

Tons
per
day

2800
2800
2700
2600
2600

3700
4100
5100
5300
5000

3400
3000
2600
2400
2300

2200
2200
2200
2200
2200

2300
2300
2300
2300
2300

2200
2200
2100
2100
2100
2100

85700

JANUARY

640
630
620
628
610

600
600
600
600
600

600
600
600
600
600

605
610
610
620
620

630
640
650
660
660

670
680
680
690

35
34
33
33
33

32
32

Mean
dis-

charge
(cfs)

5100
5100
5080
5000
5000

5080
5100
5200
5200
5300

5400
5500
5600
5800
5900

6000
6100
6100
6000
6020

5600
5100
4600
4000
3550

3150
2850
2500
2300
2100

145330

Suspended sediment

Mean

tration

(ppm)

~

Tons
per
day

2100
2100
2100
2000
2000

2100
2100
2100
2100
2100

2200
2200
2300
2300
2400

2400
2500
2500
2400
2400

1500
1400
1200
1100
960

850
770
670
620
570

=^-|
540<tO

FEBRUARY

700
700
710
710
710

710
710
32 ' 700
32
32

32
32
32
32
32

33
33
33
33
33

34
35
35
36
36

36
37
37
37
690
700

19535

37
38

1051

700
i90

680
680
680
670
670

670
660
660
660
650

650
650
640
640
630

630
620
620

18800

1
1
1
1
1

1
1
1
1
1

18
18
18
18
18

18
18
18
18
18

18
18
17

DECEMBER

Mean
dis-

charge
(cfs)

1900
1700
1500
1420
1350

1300
1250
1200
1150

Suspended sediment

Mean
concen-

tration

(ppm)

1100

1080
1020
1000
980
950

920
900
860
840
820

800
7BO
760
740
720

710
700
690
680
660
640

31120

Tons
per
day

410
370
320
310
290

280
270
260
250
240

230
220
220
210
210

100
97
93
91
89

86
84
82
80
78

77
76
75
73
71
69

5411

MARCH

610
610
606
600
600

600
590
580
580
570

570
560
560
560
550

550
540
540
530

16
16
16
16
16

16
16
16
16
15

15
15
15
15
15

15
15
15
14
530 ! 14

520
510
500
1 'I 490
1 490

1
1
1

~

508

480
470
460
460
450
450

16716

14
14
14
13
13

13
13
12
12
12
12

449

ALASKA

ALASKA WEST OF LONGITUDE 141° Continued

15-2810. KNIK RIVER NEAR PALMER, ALASKA Continued

Suspended sediment, water year October 1964 to September 1965 Continued

Day

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

6..
7..
8..

9.4

10..

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

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

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

APRIL

Mean
dis-

charge
(cfs)

450
450
460
460
470

490
560
644
680
632

656
560
600
610
610

668
716
7<>2
838
310

810
71*
728
680
680

26.. 852
27..
26..
29..
30..
31..

Total

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

824
782
768
740

19736

Suspended sediment

Mean
concen-

tration

(ppm)

- _

17
20
33
2
4

3
4
1
37
61

T
per
day

7
10
12
15
19

B 22
B 30
57
77
58

110
B 67
51
61
100

150 ! 270
210 410

250 , 530
190
180

120

430
390

260
56 110
71
52
100

250
200
160
140
170

-

140
95
180

580
440
340
290
340
- -

5500

JULY

4480
4600
4480
4120
4120

4400
5320
7000
11600
73300

205000
114000
51100
32100
28500

25200
23400
21600
19800
18000

17300
16500
16000
15600
15100

14600
16500
17500
17700
18600
20400

847920

1100
1000
940
850
730

760
950
1000
2800
3500

1500
1200
1000
860
760

620

13000
12000
11000
9500
8100

9000
14000
19000
S 610000
S 2000000

830000
370000
140000
75000
58000

42000
670 42000
650
550
440

450
460
440
390
380

430
650
700
650

B 38000
29000
21000

B 21000
20000
19000
16000
B 15000

17000
29000
33000
31000

630 |B 32000
760

-

42000

4625500

MAY

Mean
din-

charge
(cf.)

580
704
754
704
704

620
704
704
632
692

704
728
768
If"

796

912
880
928
1010
980

1240
1220
1200
1180
1310

1480
1650
1800
1880
1950
2030

32224

21100
21610
20500
19100
18100

17700
18100
19300
21200
23600

22800
20300
1 200
1 700
1 600

1 400
1 600
1 300
18400
17200

16700
16200
15900
14900
13000

11900
11300
11000
11000
10900
10700

539300

Suspended sediment

Mean
concen-

tration

(ppm)

230
160
120
120
370

230
120
150
110
140

160
180
190
200
190

230
260
290
310
360

63n
570
420
340
490

480
42 n
440
50r
640
780

-

Ton*
per
day

360
300
R 240
?30
700

380
230
290

JUNE

Mean
dis-

charge
(cf.)

2110
1970
1830
2000
2050

2100
2150
2200

190 1] 2200
250

300
^50
390
420
410

570
620
730
850
950

210f
B 1900
B 1400
1100

1920

1600

Suspended sediment

Mean
concen-

tration

(ppm)

800
640
450
330
350

510
590
471
460
370

350
1860 400
'110
2170
2110

26f C
2280
2340

370
370
530

580
480
' 'S"

2560 490

Tons
per
day

4600
B 3400
2200
1800
B 1900

B 2900
3400
2800
2700
1900

1500
B 2000
2100
^ 7 ng
3000

4200
3^00
2000
B 3400

2790 , 44"1 3300

2700
2890

430
480

3150 j 670
3420 ' 880

1700 j 3500 750

1900
1900
2100
R 2500
B 3400
B 4300

33070

AUGUST

820
720
570
480
460

520
640
760
860
870

760
550
490
540
540

490
460
480
430
390

390
390
390
390
390

380
390
410
400
380
350

"

B 47000
42000
32000
25000
22000

B 25000
31000
B 40000
49000
B 55000

47000
30000
B 25000
B 29000
29000

26000
24000
25000
21000
B 18000

B 18000
B 17000
B 17000
B 16000
14000

B 12000
B 12000
12000
B 12000
B 11000
10000

793000

3530
3420
3910
4400
4000

77940

3100
3700
B 5700
8100
7100

730 7000
750 6900
890
1100
1000

-

B °400
13000
11000

130200

SEPTEMBER

10500
10200
10100

350
320
310
10500 400

9900
8800
8500
B 11000
11700 600 19000

14900 770 IB 31000
18000 ' 860
18500 ! 960
19600 1000
20300

20400
18400
17900
18900
20300

1100

B 42000
B 48000
B 53000
B 60000

1100 B 61000
910 ,B 45000
780
730
820

22600 1400
21000
21100
20000
20300

17700
17000
19100
19800
18900

16900
16600

1400
1?00
1000
860

B 38000
B 37000
B 45000

85000
B 79000
B 68000
B 54000
47000

840 B 40000
1000
1200

46000
B 62000

1200 'B 64000
860 44000

720
630
14700 ! 520
11500 430
9880

507280

330
- -

B 33000
B 28TOO
21000
B 13000
B 8800

"

1210000

Total discharge for year (cf s-days) .... 2 , 453 , 181 Total load for year (tons) .... .6.944,529 S Computed by subdividing day.
B Computed from estimated-concentration graph.

ALASKA WEST OF LONGITUDE 141° Continued

15-2840. MATANUSKA RIVER AT PALMER, ALASKA

LOCATION. At gaging station on left bank, 100 feet downstream from bridge on Glenn Highway, and 1 mile east of Palmer. DRAINAGE AREA. 2,070 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: May 1949 to October 1950, April 1951 to July 1953, October 1957 to September 1965. Water temperatures: March to August 1952, April to September 1953, December 1958 to September 1965.
Sediment records: April 1953 to September 1954, April 1958 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 55°F July 7, 10.
Sediment concentrations: Maximum daily, 5,000 ppm July 13.
Sediment loads: Maximum daily, 330,000 tons July 13.
EXTREMES, 1958-65. Water temperatures: Maximum, 58°F Aug. 25, 1964.
Sediment concentrations: Maximum daily, 16,100 ppm Aug. 25, 1959.
Sediment loads; Maximum daily, 1,300,000 tons Aug. 25, 1959.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date of collection

Apr. 1-30, 1965. .

May 18-31.. ......

July 1-31. ....

Aug. 12-15. ......
Aug. 22-25, 28,

Sept. 22, 25, 28.

Mean

discharge
(cfs)

831
857
2340
2880
6190
13110

12200
9950

5830
3850
14100
8300

Silica

(SiO.)

5.7
6.4
5.8
5.5
5.5
4.9

5.8
4.9

4.9
4.8
5.9
5.2

Iron

(Fe)

0.02
.02
. 14
. 12
. 12
. 25

.46
. 16

. 18
. 10
.74
. 16

Cal-
cium

(Ca)

35
36
32
28
28
22

24
23

26
27
22
23

Mag-
ne-

sium

(Mg)

9.1
9.2
7.1
7.0
4.0
5.0

5.1
5.0

4.1
4.7
4.9
6.0

Sodium

(Na)

9.4
9.4
8.4
7.3
6.0
4.4

3.2
3.2

3.8
3.9
12.
3.9

Po-
tas-

sium

(K)

1.2
1.2
1.2
. 9
.7
.8

.5
.5

.5
.5
. 7
. 5

Bicar-
bonate

(HCO,)

98
99
85
82
74
69

76
70

68
70
70
71

Suit ate

(S04)

49
49
40
32
30
24

23
24

29
34
30
30

Chloride

(CD

13
13
7.8
6.4
3.9
2.1

2.8
2.5

3.5
3.2
2.8
3 2

Fluo-

ride

(F)

0.2
. 1
. 1
. 1
. 1
. 1

. 1
.0

.0
. 0
.0
. 0

Ni-

trate

(NO,)

1.7
1.9
2.0
1.5
.9
1.0

.3
. 1

. 1
. 3
. 0
. 1

Dissolved
solids

(residue
at 180°C)

172
175
146
121
115
99

116
98

106
145
113
108

Hardness

as CaCO,

Calcium,
magne-
sium

125
128
109
97
86
75

81
78

81
87
75
82

Non-
carbon-

ate

45
47
39
30
35
18

19
21

25
30
18
24

i Specific
conduct-

ance

(micro-
mhos

at 25°C)

292
295
241
240
195
173

178
177

189
201
170
195

PH

7.5
7.6
7.6
7.6
7.5
7.4

7.9
7.8

7.8
7.8
7.5
7.8

Color

5
5
20
10
5
5

10
10

10
10
5
10

ALASKA WEST OF LONGITUDE 141° Continued

15-2840. MATANTISKA RIVER AT PALMER, ALASKA Continued

Specific conductance (micromhos at 25°C) of water, water year October 1964 to September 1965

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.....
28.....
29.....
30.....
31.....

Average

October November December January February March April

306

__

309
307
311

305
317
313
294
300

283
270
263
250
268

286
286
286
286
293

279
286
280
286
286

289

May

279
290
290
292
298

305
300
297
294
293

293
297
299
.

303

299
290
272
257
254

239

248
243

223
212
198

274

June

234
223
223
231

__

229
197
190
202

201

__
__

_

201
197

__

198

201
206

207
208

203
199
192

188

~

July

178
178
183
180
178

178
168
169
164
164

__

171
178
170
165

173
170

178
179

_

179
182
184

181
181
175
174

164

174

August

_

181
180
177

_

177

174

176
173
__
__

172

172
172
172
__

__

169
169
176
188

_

200

202
201

September

193
202
203
189

_
__
__
_

__

- _

__
__

__
__
_
__

_ ,.

194

.

185

_ _
__

190
-

_ .

ALASKA WEST OF LONGITUDE 141° Continued

15-2840. MATANUSKA RIVER AT PALMER, ALASKA Continued

Temperature (°F) of water, water year October 1964 to September 1965

October ....

December .....

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

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

July...........
August ....

1

38

48

2

44

3

48
47

4

~

49
47

5

33

49
50

6

-

46

7

"

55
53

8

33

51

9

33

50
46

10

32

55

11

32

46

12

32

50
46

13

37

51

14

35

50

15

35

50
44

Day

16

35

50
48

17

34

48
48

18

37

50

19

37

20

33

21

32
42

~

22

35

49

23

35

44

24

39
47

45

25

39
50

47

26

5?

54

27

39
50

53

28

41
51

50
41

29

38

52

30

38

49

46

31

50
47

Aver-

age

44

50

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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)

1835
1410
1600
1215

Water
tem-

per-
ature

(°F)

48
46

Sam-

pling
point

Discharge
<CfB)

3060
A 7550
10500
6920

Sediment
concen-

tration

(ppm)

460
1200
1400
600

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

26
22
12
23

0.004

33
23
23
30

0.008

42
32
29
41

0.016

48
45
38
58

0.031

53
53
44
64

0.062

59
65
50
68

0.125

64
75
58
74

0.250

77
91
71
87

0.500

98
99
91
97

1.000

100
100
99
99

2.000

100
100

Method
of

analysis

SBWC
VBWC
SPWC
SBWC

A Daily mean discharge.

ALASKA WEST OF LONGITUDE 141° Continued

15-2840. MATANUSKA RIVER AT PALMER, ALASKA Continued

Suspended sediment, water
(Where no concentrations

yea October 1964 to September 1965

j OCTOBER

| ! Suspended sediment

Day

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

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

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

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

21..
22..

mean
dis-

charge
(cfs)

2250
2240
2200
2120
2070

2060
2020
2120
2060
2020

1940
1880
1860
1820
1800

1760
1730
1530
1520
1490

1580
1690
23.. 1560
24.. 1420
25..

26..
27..
28..
29..
30..
31..

Total

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

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

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

16..
17..
IB..
19..
20..

21..

1420

1420
1460
1440
1420
1400

colcen- Ton8

(ppm)

per
day

300
300
300
290
280

280
270
290
280
270

260
' 250
250
250
240

190
190
170
160
160

170
180
170
150
150

150
160
160
150
150
1380 150

54680 ' 6720

JANUARY

790
800
790
790
800

791
80
80
80
80

80
80

53
54
53
53
54

53
53
53
53
53

53
53
80 53
800 54
780 53

760
740
780
820
840

800
22.. 780
23.. 760
24.. 740
25.. 720

26..
27..
28..
29..
30..
31..

Total

51
50
53
55

57 |

54
53
51
50
49

700 47
680 ' 46
660
640
620
600

23440

45
43
42
41

1585

NOVEMBER || DECEMBER

Mean
dis-

charge
(cfs)

1350
1320
1300
1280
1270

1250
1220
1210
1200
1180

1160
1110
1060

loon
970

970
1090
1200
1150
1380

1320
1280
1250
1200
1150

1100
900
720
690
690

33970

Suspended sediment

Mean

tration

(ppm)

Tons
per
day

110
110
110
100
100

lor
100
100
100
100

94
90
86
81
65

65
74
81

Suspended sediment
Mean !

di._ Mean T<jng

Vfs)"

690
680
690
720
730

760
740
720
700
680

640
620
640
660

Nation" "J"

(ppm) da"

47
46
47
! 49
49

; 51
50
49
47
46

43
42
43

660

680
700
720
78 740 ;
93 | 760

45
45

46
47
49
50
51

89 780 j 53
86 : 800 54
84 ! 760 i 51
81 740 50
78

74
61
49
47
47

2533

FEBRUARY

590
600
610
610
600

580
580
580
580
600

620
640
620
600
560

540
520
500
490

32
32
33
33
32

31

480

480
480
480
480
480

48n
480
480

- -

15340

31
31

760

760
750
760
780
790
780

22390

51

51
51
51
53
53

i 53

1513

MARCH

480
490
510
520

39
40
41
42
530 43

540
550
560

31 ;: 570
32 ; 580 !

73
74
76
77
78

33 i. 590 j 130
35 600 ' 130
33
32
30

29
28
27
26
26

26
26
26
26
26

26
26
26

1
825

580 130
560 120
540 , 120

520
520
520
540
560

580

110
110
110
120
120

130
600
580
600
620

620
620
640

160
160
160
170

170
170
1 70
660
680
680

17740

180
180
180

3613

QUALITY OF SURFACE WATERS, 1965

ALASKA WEST OF LATITUDE 141° Continued

15-2840. MATANUSKA RIVER AT PALMER, ALASKA Continued

nded sediment, year October 1964 to September 1965 Continued

[APRIL

Suspended sediment
Mean

Day dis_ Mean T(_ charge concen-

(cfs)

i

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..
28..
29..
30..
31..

Total

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

6.4

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

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

700
690
690
685
679

685
685
679
724
730

655
631
625
692
813

990
1150
1270
1420
1270

900
820
820
813
792

860
860
884
884
836

24932

cration

(ppm)

110
130
150
150
150

130
110
100
64
51

64
47
110
180

per
day

B 210
B 240
B 280
B 280
270

B 240
B 200
B 180
130
100

110
80
190
340
150 330

290 780
250 780
2?0 750
390
320

160

1500
1100

390
130 290
120 B 270

MAY

Mean
dis-

charge
(cfs)

828
852
936
828
778

771
836
876
876
828

836
820
860
844
868

927
1010
1200
1400
1520

1800
2000
2200

55 120 l| 2400
55 B 120

77
110
180
190
110

"

B 180
260
430
450
250

10850

JULY

8350
7550
8150
7850
7600

10100
11600
11900
13300
14800

15500
20900
?4800

1100 25000
1200 24000
1000 22000
1000
890

P70
1400
1600
1800
1900

21000
18000

26000
44000
51000
65000
76000

2100 B 88000
2800 160000
5000 330000

2500

270n
2800
3000
3100
3100
3000

47294

Suspended sediment

Mean
concen-

torn"

120
75
200
140
120

74
72
88
150
77

68
73
77
88
99

150
260
300
510
240

730
700
420
320
560

1200
1400
1600
2000
1800
1400

Tons
per
day

270
170
510
310
250

150
160
210
350
170

150
160
180
B 200
230

380
710
970
1900
980

3500
B 3800
B 2500
2100
3800

8700
11000
13000
B 17000
B 15000
B 11000

99810

AUGUST

14300
14500
13900
11300
10600

10600
9850
10000
12100
17000

12100
9700
9800
22500 3500 210000 10000
15.. 20100 2400 130000

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

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

26..
27..

17500 2200 100000
15500 , 2000 84000
14000
13100
11500

13000
12400
11200
9400
8650

8850
10300
28.. ' 10400
29.. , 11000
30.. 11900

2000 .B 76000
1800
1600

1700
1600
1400
1100

64000
50000

B 60000
54000
42000
28000
860 IB 20000

880 21000
920 26000
960 27000
1000 30000
1100
31.. 12800 1400

Total 396500 i

1800
1600
1300
1100
100C

1000
1200
1300
1600

B 69000
63000
49000
34000
29000

B 29000
32000

JUNE

Mean
dis-

charge
(cfs)

3000
3050
3320
2550
2510

2730
2950
5030
5420
4880

4820
4650
4450
4370
4610

5580
5000
4400
3850
4280

4790
6740
6620
6660
8000

7800
10000
11100
10800
8500
- -

162460

Suspended sediment

Mean
concen-

(ppm)

900
730
380
370
380

440
640
1200
1100
640

600
570
480
430
540

640
410
340
370
370

480
760
890
800
1100

1200
1800
2200
1900
1200

-

Tons
per
day

7300
6000
3400
2500
2600

3200
5100
16000
16000
8400

7800
B 7200
5800
5100
6700

9600
5500
4000
B 3800
4300

6200
14000
B 16000
14000
24000

25000
49000
B 66000
55000
28000

427500

SEPTEMBER

3500
3480
3500

230
220
280
3700 470
5060 720

7000
9000
B 35000 , 11000
52000 j 10000
1900 B 87000 | 9500

1500
1200
1200
1200
10300 1200

10600 1100
11000 1100
10700 1000
9700
9200

8800
8400
7950
7200
6140

5500
5000
4020
3700
B 35000 ;: 3580
48000

2055000

3500

291040

920
900

840
740
670
640
520

410
350
320
280
240
240

"

49000
31000

9000
8500

970
1100
1100
1000
950

870
810
B 32000 8000 760
B 32000 7650 730
33000

31000
33000
29000
24000
22000

20000
17000
14000
12000
8700

6100
4700
3500
B 2800
2300
2300

888400

7000 , 690

6660
6460
8900
10100
14100

11200
9450
10100
9700
8850

8050
8450

680

2200
2100
2600
B 4700
9800

B 18000
B 27000
B 33000
B 27000
B 24000

B 21000
B 19000
B 16000
B 15000
13000

B 12000
770 B 13000
1200 B 29000
1600 B 44000
1800

1200
860
750
660
580

510
420
6580 360
5180 310
4610 280

234280

69000

B 36000
22000
B 20000
B 17000
14000

B 11000
B 9600
6400
B 4300
B 3500

| 545200

discharge
load for

ar (cfs-days). .1,324,066 . 4,043,549

B Computed from estimated-concentration graph.

ALASKA WEST OF LONGITUDE 141° Continued

15-3040. KUSKOKWIM RIVER AT CROOKED CREEK, ALASKA

LOCATION. At gaging station on right bank at village of Crooked Creek, 0.2 mile upstream from Crooked Creek. DRAINAGE AREA. 31,OOO square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: May 1957 to September 1965.
Water temperatures: May 1957 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 63°F Aug. 1.
EXTREMES, 1957-65. Water temperatures: Maximum, 68°F June 28, 1959, June 22, I960, July 15, 1961. Chemical analyses, in parts per million, water year October 1964 to September 1965

Date of collection

Oct. 1-10, 1964..

Apr. 1-5, 1965...

Mean

discharge
(cfs)

36890
31690
11800
123500
109800
73100

751OO
72300
13OOOO
11O18O
782600
106100
1515OO

Silica

(SiO,)

8.4
7.6
6.5
5.4
6.5
7.1

6.7
7.8
7.3
7.5
8.6
7.5
7.8

Iron

(Fe)

0.02

.00
.04
.24
. 14
. 12

.08
.02
.02
.04
.02
.02
.04

Cal-

cium

(Ca)

32
14
18
13
13
22

20
25
24
29
28
28
20

Mag-
ne-

sium

(Mg)

5.4
5.2
3.9
4.9
6.3
6.1

9.0
6.4
4.9
6.0
5.8
5.1
3.6

Sodium

(Na)

.6
.5
.0
.0
.3
.8

!4
. 1
. 1
.5
.2
. 1

Po-
tas-
sium

(K)

0.8
.5
. 7
.8
.7
.8

.4
.5
. 5
. 5
.9
.9
.8

Bicar-

bonate

(HCOS)

105
48
62
45
61
82

80
93
82
101
101
92
68

Sulfate

(SOJ

17
13
14
9.6
9.1
15

24
17
15
17
17
19
9.6

Chloride

(CD

.8

1.

1.

1.

Fluo-

ride

(F)

0.1
.2
. 2
. 2
.1
.2

.3
. 3
. 3
. 3
.3
.3
.3

Ni-

trate

(NO,)

0.8
1.1
.9
3.4
. 6
1.1

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

Dissolved
solids

(residue
at 180° C)

123
70
78
62
69
96

104
105
94
112
113
108
77

Hardness

as CaCOj

Calcium,
magne-
sium

102
56
61
52
58
80

92
89
80
97
94
91
65

Non-
carbon-

ate

16
13
10
15
8
13

26
13
13
14
11
16
9

Specific
conduct-

ance

(micro -
mhos

at 25°C)

202
102
115
91
115
159

180
180
157
187
178
168
139

PH

7.7
8.6
8.0
7.1
7.3
7.5

7.6
7.6
7.5
7.4
7.4
7.9
7.2

Color

10
10
30
50
20
15

10
20
20
20
20
25
30

Temperature (°t) of water, water vear October 1964 to September 1965

Month

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

May...........

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

Day

1

43

32

60
63
48

2

41

33

60
60
50

3

38

32

58
58
50

4

41

32

58
54
50

5

40

32

57
54
51

6

39

56
53
51

7

39

56

50

8

39

56
55
49

9

40

54
55
49

10

39

54
54
53

11

38

55
52

12

38

55
50
50

13

37

56
49
50

14

36

56
49
50

15

35

55
49
50

16

34

55
49
49

17

32

54
49
48

18

52
48

19

50
50
48

20

40

50
49
48

21

39

51

46

22

39

52
49
46

23

44

52
49
50

24

39

52
49
45

25

40

54

45

26

41

55
48
44

27

42

55
48
42

28

42

58

42

29

43

50
39

30

44
57

61
48
38

31

43

60
48

Aver-

age

50

55
51
48

ALASKA WEST OF LONGITUDE 141° Continued

15-3040. KUSKOKWIM RIVER AT CROOKED CREEK, ALASKA Continued

Specific conductance (micromhos at 25°C) of water, water year October 1964 to September 1965 Day

1.....
2.....
3*
*.....
5** *

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

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

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

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

26.....
27.....
28.....
29.....
30.....
31.....

Average

October

203
204
205
208
210

210
205
199
190
188

126
59
64
133
85

137
94

-

~

November December January February March April

136
152
60
136
88

__

.

__

__

__

- -

__

May

_

- -

__

_

-

_

128

96
89
85
86
89

88
86
86
86
85
85

June

87
94
97
102
102

103
105
110
115
116

120
123
124
123
129

133
136
138
142
147

152
152
150
158
158

157
159
165
168
174

131

July

176
178
180
184
184

184
179
177
175
174

174
180
185
196
193

193
182
177
168
173

177
181
180
182
182

180
178
179
- _

185
185

180

August

186
191
189
186
174

183
178
179
185
183

173
159
154
157
183

172
149
149
144
229

_

206
191
179

178
189

187
199
184

179

September

185
230
197
191
218

184
193
165
152
178

___

219
185
178
184

175
175

__

172
165

161
160
149
153
150

136
136
166
145
154

173

ALASKA WEST OF LONGITUDE 141° Continued

15-3560. YUKON RIVER AT EAGLE, ALASKA

LOCATION. At gaging station at Eagle on left bank, 0.1 mile upstream from Mission Creek, 1.1 miles downstream from Castalia Creak, and 11 miles downstream from the international bordar.
DRAINAGE AREA.--113,500 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: April to October 1951, June to September 1952, July 1953 to November 1957, October 1961 to September 1962.
Water temperatures: May to October 1951, June to August 1952, October 1961 to September 1963, June to September 1965. Sediment records: October 1961 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 63°F July 13, 14, Aup. 1.
Sediment concentrations: Maximum daily, 1,200 ppm July 17.
Sediment loads: Maximum daily, 680,000 tons July 17.
EXTREMES, 1951-52, 1961-65. Water temperatures (1951-52, 1961-63, June to September 1965): Maximum, 65°F Aug. 1, 2, 1962. Sediment concentrations (1961-65): Maximum daily, 2,480 ppm July 15, 1963.
Sediment loads (1961-65): Maximum daily, 1,850,000 tons July 15, 1963.

Temperature (°F) of water, June to September 1965

January........

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

1

63
50

2

62
50

3

62
50

4

61

5

60
50

6

60
50

7

60
50

8

60
50

9

61
51

10

62
51

11

61
51

12

59
51

13

52
50

14

52
50

15

53
50

Day

16

56
49

17

56
49

18

56
49

19

56

20

56
48

21

56

22

52
45

23

57

24

56
46

25

5*

26

53
*5

27

53
<»5

28

51
<»<»

29

50
43

30

50

31

50

Aver-
age

56
49

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water;
TD «~t- G oimin- V Triouol o/»/Mimiil itinn fiihu* W in HistillpH watprl

Date of collection

July 22, 1965. ....

Sept. 23. ....

Time

(24 hour)

1215
1330
1045

Water
tem-

per-
ature

(°F)

58

44

Sam-

pling
point

Discharge
(cfs)

186000
130000
111000

Sediment
concen-

tration

(ppm)

580
2000
380

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

29
38

0.004

44
48

0.008

57
66

0.016

70
81

0.031

79
89

0. 062

86
93
97

0.125

92
95
99

0.250

99
99
100

0.500

100
100

1.000 2.000

Method
of

analysis

VBWC
VBWC
V

QUALITY OF SURFACE WATERS, 1965

ALASKA WEST OF LONGITUDE 141° Continued

15-3560. YUKON RIVER AT EAGLE, ALASKA Continued

Suspended sediment, water year October 1964 to September 1965 (Where no concentrations are reported, loads are estimated)

Day

1..
2..
?..
4.

5,,

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

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

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

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

26..
27..
28..
29..
30..
31..

Total

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

6..
7..

OCTOBER

Mean
dis-

charge
(cfs)

94800
92800
91100
89400
87800

86300
84400
83000
82700
82000

81800
81600
79800
79400
78700

79100
78900
77800
76700
74100

73000
71300
70000
68800
64900

62000

Suspended sediment

Mean

tration

(ppm)

Tons
per
day

7700
7500
7400
7200
7100

7000
6800
6700
6700
6600

6600
6600
6500
6400
6400

4300
4300
4200

60000
57000
54000
51000 1

48000 j

2342800

4100
4000

3900
3800
3800
3700
3500

3300
3200
3100
2900
2800
2600

160700

JANUARY

20000
20000
20000
?0000
20000

20000
20000
8.. 20000
9.. ' 20000
10..

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

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

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

26..
27..
28..
29..
30..
31..

Total

?oono

20000
20000
?0000
20000
20000

20000
20000
20000
20000
20000

20000
70000
20000
?0000
20000

20000
20000
?0000
20000
20000
20000

620000

540
540
540
540
540

540
540
540
540
540

540
540
540
540
540

540
540
540
540
540

540
540

NOVEMBER

Mean
dis-

charge
(cfs)

38000
38000
38000
38000
38POO

38000
38POO
38000
38000
38000

38000
38000
38000
38000
38000

30000
30000
30000
30000
30000

30000
30000
30000
30000
3000"

30000
30000
30000
30000
30000

1020000

19000
19000
19000
19000
19000

19000
19000
19000
19000
1900"

19000
19000
19000
19000
19000

19000
19000
19000
19000
19000

19000
19000
540 19000
540
540

540
540
540
540
540
540

16740

19000
19000

19000
19000
19000

532000

Suspended sediment

Mean

tration

(ppm)

Tons
per
day

2100
2100
2100
2100
2100

2100
2100
2100
2100
2100

2100
2100
2100
2100
2100

810
810
810
810
810

810

DECEMBER

Mean
dis-

charge
(Cf»)

24000
24000
24000
24000
24000

24000
24000
24000
24000
24000

24000
24000
24000
24000
24000

24000
24000
24000
24000
240CO

24000
810 240CO
810 24000
810
810

24000
24000

810 | 24000
810 | 24000
810
810
810

24000
24000
240CO
24000

43650 744000

Suspended sediment

Mean
concen-

tration

(ppm)

Tons
per
day

650
650
650
650
650

650
650
650
650
650

650
650
650
650
650

650
650
650
650
650

650
650
650
650
650

650
650
650
650
650
650

20150

FEBRUARY fARCH

260 j 18000
260
260

18000
18000
260 i 18000
260 18000

260 i 18000
260 18000
260 ' 18000
260
26 r

18000
18000

260 ; 18000
260
260
260

18000
18000
18000
260 18000

260 ' 18000
260 18000
260
260
260

260
260
260
260
260

260
260
260

~

7280

18000
18000
18000

18000
18000
18000
18000
18000

18000
18000

240
240
240
240
240

1 240
240
240
?40
240

240
240
240
240
240

240
240
240
240
240

240
240

18000
18000
18000
18000

558000

240
240
240

240
?40
240
240
240
240

7440

ALASKA WEST OF LONGITUDE 141° Continued

15-3560. YUKON RIVER AT EAGLE, ALASKA Continued

Suspended sediment, water year October 1964 to September 1965 Continued 1

i Mean
Day ! dis-

charge
(cfs)

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

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

poooo
20000
?0000
70000
20000

20000
20000
20000
20000

poooo

11.. ?0000
12.. 20000
13..
14..
15..

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

21..
?2..
23..
24..
25..

26..

20000
20000
20000

20000
20000
20000
20000
20000

20000
20000
20000
'0000
?0000

20000
27.. ?0000
28.. 20000
29.. 20000
30.. 20000
31..

Total 600000

APRIL

Suspen

Mean

tration

(ppm)

ded sediment

Tons
per
day

270
270
270
270
270

270
270
270
270
270

270
270

MAY

| Suspended sediment

Mean p di8- Mean
charge
(cfs)

26000
26000
26000
26000
26000

26000
26000
26000
26000
2600C

26000
26000
270 26000

270 j| 26000
770

270
270
270
270
270

270
270
270
270
270

270
270
270
270
270

26000

59000
59000
59000

tration

(ppm)

59000
59000

59000
59000
59000
210000
210000

210000
210000
210000
210000
210000
210000

8100 ' 2542000

JULY

1.. . 160000
2.. 159000
3.. 170000
4.. 197000
5.. 260000

6.. 257000

7.. , 237000
8.. 2?5000
9.. 219000
10.. 191000

11.. 180000
12.. 172000
13.. 169000
14.. 172000
15.. 1B4000

16.. 206000
17.. 211000
18.. 197000
19..
20..

21..

183000
174000

175000
22.. 187000
23.. 202000
24.. 204000
25.. 195000

26.. 193000
27.. 1°"000
28.. 1B4000
29.. 173000
30.. 166000
31.. 162000

Total 1 5957000

Total discharge ___ _

120
140
160
200
360

610
590
410
280
240

240
270
350
440
730

1100
1200
980
760
650

570
580
630
700
530

370
290
260
220
190
190

"

for v«a

Total load for year (to

B Computed from estim

Tons
per
day

5600
5600
5600
5600
5600

5600
5600
5600
5600
5600

5600

JUNE

Suspended sediment
Mean
dis-

charge
(cfs)

220000
300000
35300Q
347000
330000

260000
220000
195300
193000
191000

Mean

tration

(ppm)

_

_

_ -

Tons
per
day

89000
120000
140000
140000
130000

1 10^00
89000
79000
78000
77000

189000 i MOOO
5600 196000
5600 212000
5600 215000
5600 , 729000

13000 233000
13000 229000
13000 226000
13000 228000
16000 211000

16000 188000
16000 175000 94

53000
57000
58000
620QO

63000
62000
61000
62000
57000

51000
44000
16000 176000 84 40000

57000 160000 | 83 36"00
57000 150000 ' 68 28000

57000 150000 58 23000 57000
57000
57000
57000
57000

656000

155000 65 B 27TOO
159000 82 35000
158000 94 40000
152000 120 49000

6400000 2011000

AUGUST SEPTEMREP

52000 1 160000
60000
73000

260
156000 290
155000 400
110000 151000 550

250000 148000 (600

420000 143000 520
380000 135000 440
250000 . 129000 430
170000 127000
120000 125000

120000 ' 133000
130000 185000
160000 197000
200000 176000
360000 160000

B 610000
B 680000
520000
380000
310000

270000
280000

147000

380
430

110000
120000
170000
220000
240000

200000
160000
150000
130000
140000

540 190000
850 420000

109000
114000
117000
120000
115000

113000
113000

100
92
95
110
96

29030
28COO
30000
B 36000
30000

76 23000
87 27000
114000 63 19000
114000 57 18000
112000 92 28000

109000 93
107000 92
970 , 52000C 110000
900 430000 ; 110000
570 250000 107000

410
141000 310
145000 240
144000 260
140000 360

133000 380
129000 360
340000 126000 i 300
390000 . 129000
280000

190000
150000
130000
100000
85000
83000

7653000

133000

137000
134000
121000
116000
111000
109000

4375000

310
410

160000
120000
94000
100000
140000

140000
130000
100000

105000
102000
98300
96400
96400

103000

99
98
92

100
110
88
62
72

92

27000
27000
29000
29POO
27000

28000
30000
23000
R. 16000
19000

26000
114000 230 71000
116000 370 120000
110000 118000 330 110000
150000 ' 118000 280

460 B 170000 118000 220
430 B 160000 115000 220
370 B 120000 111000 190
300 B 94000 109000 160
230 B 69000
150 B 44000

- -

106000 120

5351000 3310100

89000

70000
68000
57000
47000
B 34000

1215000

r (cfs-days) .... .29,000,900 ns) .... .17,150,060 ated-concentration graph.

ALASKA WEST OF LONGITUDE 141° Continued

15-4680. YUKON RIVER AT RAMPART, ALASKA

LOCATION. At gaging station on left bank at Rampart, 0.8 mile downstream from Squaw Creek, 1.2 miles downstream from Minook Creek, and 3.5 miles upstream from Russian Creek.
DRAINAGE AREA. 199,400 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: June 1954 to September 1965.
Water temperatures: June 1954 to September 1964.
Sediment records: June 1962 to September 1963.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date of collection

Oct. 1-31, 1964..
Sept. 28, 1965...

Mean

discharge
(cfs)

103800
201000

Silica
(SiO.)

6.2
6.6

Iron

(Fe)

0.00
.04

Cal-
cium

(Ca)

36
24

Mag-
ne-

sium

(Mg)

9.7
8.0

Sodium

(Na)

3.0
6.0

Po-
tas-
sium

(K)

1.0
1.4

Bicar-
bonate
(HCO,)

121
92

Sulfate

(S04)

30
29

Chloride
(CD

2.5
.4

Fluo-
ride
(F)

0.2
. 3

Ni-
trate

(NO,)

. 3
. 5

Dissolved
solids
(residue
at 180°C)

149
121

Hardness
as CaCO,

Calcium,
magne-
sium

130
93

Non-
carbon-
ate

29
18

Specific
conduct-

ance

(micro -
mhos

at25"C)

249
190

PH

7.7
8.3

Color

10
25

Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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

July 19, 1965... . .

Time

(24 hour)

1800
1000

Water
tem-
per-
ature

(°F)

38

Sam-

pling
point

Discharge
(cfs)

266000
195000

Sediment

concen-

tration

(ppm)

220
170

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

24

0.004

37

0.008

48

0.016

56

0.031

63

0.062

69
54

0.125

86
68

0.250

99
94

0.500

100
98

1.000

100

2.000

Method
of
analysis

SBWC
V

ALASKA WEST OF LONGITUDE 141° Continued

15-4760. TANANA RIVER NEAR TANACROSS, ALASKA

LOCATION. At gaging station on right bank, 0.2 mile downstream from unnamed tributary, 0.2 mile north of Cathedral Rapids, 9 miles upstream from Robertson River, and 13 miles west of Tanacross.
DRAINAGE AREA. 8,550 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: December 1953 to October 1954, January to September 1955, May 1956, March 1957 to September 1965. Water temperatures: June to September 1954, May 1957 to September 1965.
Sediment records: October 1953 to September 1956 (periodic), May 1957 to September 1965 (daily).
EXTREMES, 1964-65. Water temperatures; Maximum, 62°F July 14.
Sediment concentrations: Maximum daily, 3,300 ppm July 17.
Sediment loads: Maximum daily, 240,000 tons July 17.
EXTREMES, 1956-65. Water temperatures (1954, 1957-65): Maximum, 65°F June 2, 7, July 3, 1958. Sediment concentrations: Maximum daily, 5,370 ppm June 17, 1961.
Sediment loads: Maximum daily, 340,000 tons Aug. 28, 1963.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date of collection

Apr. 5-30, 1965. ,

Mean

discharge
(cfs)

2000
5210
9920
11350
22280
21400
25720

20660
13550
9240
9500
11180

Silica

(S10.)

14
LI
9.7
10
11
11
11

10
11
11
11
11

Iron

(Fe)

0.00
.02
. 12
.33
. 32
.38

.22
.26
.32
.40
.24
.28

Cal-
cium

(Ca)

38
38
34
28
25
27

24
24
26
28
30
29

Mag-
ne-

sium

(Mg)

10
7.3
7.3
9.0
9.0
8.6

8.5
7.5
9.5
11
7.3
8.5

Sodium

(Na)

5.0
5.7
7,0
9.4
8.8
8.8

9.8
9.8
10
10
10
11

Po-
tas-
sium

(K)

1.9
2.1
2.1
2.0
2.3
1.8

2.3
2.3
2.3
2.0
2.0
2.4

Bicar-
bonate

(HCO,)

157
140
129
122
120
116

110
106
114
124
122
120

SuUate

(S04)

21
22
22
21
21
24

24
21
24
26
23
26

Chloride

(CD

3.2
2.8
2.8
5.0
2.8
2.8

2.8
3.9
3.2
2.8
3.5
4.3

Fluo-

ride

(F)

0.1
.1
. 1
.4
.3
.3

.3
. 3
. 3
. 3
. 3
. 3

Ni-

trate

(NO,)

0.5
. 5
. 5
. 3
.2
.3

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

Dissolved
solids

(residue
at 180"C)

171
158
149
146
139
142

137
132
143
153
147
152

Hardness

as CaCOj

Calcium,
magne-
sium

138
125
115
107
103
103

95
91
99
93
105
109

Non-
carbon-
ate

9
10
9
7
5
8

5
4
6
0
5
11

Specific
conduct-

ance

(micro -
mhos

at 25°C)

292
262
252
230
220
215

210
200
220
240
240
235

pH

8.0
7.7
7.7
8 . 2
8.2
8.3

8.4
8.2
8.2
8.0
8.1
8.0

Color

5
10
10
10
10
10

10
10
10
10
10
10

ALASKA WEST OF LONGITUDE 141° Continued

15-4760. TANANA RIVER NEAR TANACROSS, ALASKA Continued

Specific conductance (micromhos at 25°C) of water, water year October 1964 to September 1965 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.....
28.....
29.....
30.....
31.....

Average

October November December January February March April

238

242
257

173
258
320
322
320

322
306
306
307
305

307
308
307
306
307

304
304
300
299
295

May

286
286
277
277
280

279
281
275
267
268

268
268
266
265
265

265
259
261
263
268

261
255
252
252
245

242
233
240
243
236
233

261

June

247
243
240

241

242
247
248
251
258

253
250
251
251
259

250
251
252
257
257

260
258
257
259
259

249
253
255
250
243

251

July

__

246
240
227
222

242
254
254
248
229

233
219
214
218
225

224
233
223
212
211

211

211
210
210

220
220
223
223
217

225

August

215
219
210
-

202

202

215
212

200
200
202
- -

210

214

193
200
195

194
207

210
210

203
205

__

231
244
251

210

September

249
249
249
241
235

__

237
250
246
248

245
245
237
240
244

254
250
243
237
248

246
248
243
239
~

236
237
244
255
243

244

ALASKA WEST OF LONGITUDE 141° Continued

15-4760. TANANA RIVER NEAR TANACROSS, ALASKA Continued

Temperature (°F) of water, water year October 1964 to Septerabe

Month

November .....
December .....

January........

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

July...........
August ....

Day

1

50

2

50

58

3

49

58
56

4

58

5

35

55

6

39

50

57
57

7

32

54

58

8

55

59
59

9

56

58

10

54

59

1 1

33

61

12

3?

55

61
54

13

3?

53

61

14

33

52

62

15

55

59
52

16

53

59
51

17

33

54

58

18

3?

56

57
52

19

34

52

55
52

20

33

53

53
51

21

34

55

53

22

53

23

38

53

24

3S

55

52

25

37

57

54

26

38

54

55

27

38

58

55

28

38

59

56

29

50
59

56

30

55
57

59

31

52

Aver-

age

44
54

57

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 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)

1000
1500
1145
1300

Water
tem-

per-
ature

(°F)

48

45

Sam-

pling
point

Discharge
(cfs)

6000
22100
10200
12600

Sediment
concen-

tration

(ppm)

270
1500
650
860

Sediment

discharge
(tons per Hay)

Suspended sediment

Percent finer than size indicated, in millimeters

o.oo;

8
27
22
34

0.004

11
35
30
38

0.008

19
43
39
45

0.016

28
53
41
49

0.031

35
60
49
54

0.062

53
75
57
59

0.125

73
87
73
70

0.250

93
96
95
89

0.500

99
100
100
99

1.000

100

100

2.000

Method
of

analysis

VBWC
VPWC
VPWC
VPWC

QUALITY OF SURFACE WATERS, 1965

ALASKA WEST OP LONGITUDE 141° Continued

15-4760. TANANA RIVER NEAR TANACROSS, ALASKA Continued

Suspended sediment, water
(Where no concentrations

October 1964 to September 1965
reported, loads are estimated)

OCTOBER

i Mean
Day di8_

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

charge
(cfs)

800
720
550
820
920

6780
6550
6420
6350
6220

6300
6620
6850
6700
6480

6300
6100
5950
5480
4680

4100
3640
3500
3400
3300

3200
3200
3100
3100
3000
3000

164130

Suspended sediment

Mean

tration

(ppm)

210
260
240

Tons
per
day

3900
4700
4200
4600
4700

4600
4400
4300
4300
4200

3400
3600
3700

! NOVEMBER

Mean
dis-

charge
(cfs)

3000
3000
3000
3000
3000

3000
3000
3000
3000
3000

3000
3000
3000
3600 ; 3000
3500

3400
3300
3200

__

- -

3000
2500

1700
1500
1400
1400
1300

1300
1300
1300
1300
1200
1200

92000

JANUARY

2600
2600
2600
2600
2600

2600
2600
2600
2600
2600

2600
2600
2600
2600
2600

140
140
140
140
140

140
140
140
1 140

| 140

j 140

i 140! 140
140
! 140

2600 140
2600
2600

140
140
2600 ' 140
2530

2500
2500

140

140
140
2500
2500
2500

2500
2500
2500
2500
2500
2500

79430

140
140
140

140
140
140
140
140
140

4340

3000

3000
3000
3000
3000
3000

3000
3000
3000
3000
3000

3000
3000
3000
3000
3000

90000

Suspended sediment

Mean Ton>

tration

(ppm)

FEBRUARY

2300
2300
2300
2300
2300

2300
2300
2300
2300
2300

2300
2300
2300
2300
2300

2300
2300
2300
2300
2300

2300
2300

per
day

810
810
810
810
810

810
810
810
810
810

810
810
810
810
810

10
10
10
10
10

10

DECEMBER

Mean
dis-

charge
(cfs)

2850
2700
2700
2700
2700

2700
2700
2700
2700
2700

2700
2700
2700
2700
2700

2700
2700
2700
2700
2700

2700

10 |. 2700
10 ji 2700
10 |i 2700

Suspended sediment

Mean Tmx

(ppm)

21

10 ji 2700

10 'j 2700
10
10
10
10

2700
2700

per
day

160
150
150
150
150

150
150
150
150
150

150
150
150
150
150

150
150
150
150
150

150
150
150
150
150

150
150
150
2700 150
2700 150
2700

18300 ! 83850
= '

120
120
120
120
120

1 120
120
120
, 120
120

120
120
120
120
120

120

2300
2300
2300

2300
2300
2300

64400

120
120
120
120

120
120
120
120
120

120
120
120

3360

150

4660

MARCH

2100
2100
2100
2100
2100

2100
2100
2100
2100
2100

2100
2100
2100
2100
2100

2100
2100
2100
2100

110
110
110
110
110

110
110
110
110
110

110
110
110
110
110

110
110
110
110
2100 t 110

2100
2100
2100
2100
2100

2100
2100
2100
2100
2100
2100

65100

110
110
110
110
110

110
110
110
110
110
110

3410

ALASKA WEST OF LONGITUDE 141° Continued

15-4760. TANANA RIVER NEAR TANACROSS, ALASKA Continued

Suspended sediment, water year October 1964 to September 1965 Continued

Day

1..

APRIL

Mean
dis-

charge
(cfs)

2000
2.. 2000
3.. 1 2000
4..
5..

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

2000
7000

2000
2000
2000
2000
10.. 2000

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

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

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

26..
27..
28..
29..
30..

2000
2000
2000
2000
2000

2000
2000
2000
2000
2000

2000
2000
2000
2000
2000

2000
2000
2000
2000
2000
31..

Total 60000

Suspended sediment

Mean

(ppm)

__

Tons
per
day

270
270
270
270
270

?70
270
47 250
56 300
110 590

^ 350
55 ! 360

57 j 310
38 j 210
17 | 92
|
22 120
37 ; 20P
50 270
52 280
10 160

35 190
27 150
25
?'
23

22
33
29
25
28

140
140
120

120
180
160
130
150

6862

JULY

1.. 10700
2..
3..

10900
11400
4.. ' 11900
5.. 12400

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

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

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

760
700
740

MAY

Mean
dis-

charge
(cfs)

2500
2500
2600
2500
2600

2500
2611
2600
2500
2500

3800
3800
3800
3800
3800

3800
3800
3800
3800
3800

5200
5500
6000
5700
7500

8250

Suspended sediment

Mean
concen-

tration

(ppm)

52
75
90
90
110

130
150
170
200
200

190
240
l^n
150
! "?1

270
?4i
340
350
350

280

Tons
per
day

360
530
B 630
630
770

910
1100
120"
1400
1400

1900
2500
1900
1500
1700

2800
2500
3500
3500
3600

3900
240 3600
280 4500
360 6500
400

470

8100

10000
9000 530 13000
10200 580 16000
12000
13000
14000

161350

710 23010

JUNE

Mean
dis-

charge
(cfs)

14200
14300
13400

Suspended sediment

Mean
concen-

tration

(ppm)

1400
750
530
11700 550
10300 540

9280
8110

450
360
7580 330
7580 300
9100 590

10700
11200
10200
9970
10500

10300
10100
10400
10100
9640

8950
7590
7900
8250
8020

8960

880

Tons
per
day

54000
29000
19000
18000
15000

11000
7900
6700
6100
14000

B 25000
<!00 24000
710 20000
550 15000
450

410
420
390
390
310

290
290
190
260
250

310
9160 350
8800 420

13000

11000
11000
' 1000
11000
fllOO

7000
5100
4100
5801
5500

7500
8900
10000
10600 750 21000

880 31000 |' 10600 j 760 22000

1300 4900" < i 1

203130 297600 |

AUGUST

22000 i 21800
21000
23000
840 27000
790 25000

13600 1300 48000

2200
25800 2400

130000
170000
27800 2400 180000
27900
28000

25900
14000 1100 42000 21900
13700 , 44000
14900
16000

17000
17900
18200
19100

56000
65000

' 83000
92000
; 100000
110000
21400 150000

25200
25500
24700
23200
20.. 23100

3100
3300

210000
240000
2300 150000
1500 100000
1500

21.. 23400 1600
22.. 22800 1500
23.. 22500 1300
24..
25..

20000
20400
21000

200000
2500 190000

2100 150000
1700
1400
1400
1400

22400 1400
23800 1600
23400
21400
19400

18600

100000
76000
77000
79000

85000
100000
1600 100000
1400 fe 81000
1200 63000

1100
18200 1200

477700

SEPTEMBER

8860 480 11000
8920 460 linOO
9040 480
8960 470
9130 590

8770
8170
8320
8740
9730

580

12000
11000
15000

B 14000
450 9900
460 10000
670 16000
960

10800
11400
10900 1000

10100 j 760
9850 j 600

25000

38000
40000
29000
21000
15000

55000 9370 ! 580 15000
B 59000 ' 8960 480 12000
19000 1400 72000 8770 460 11 100
21200 1500 85000 8770 420 9900
94000 21600

B 100000 20000
92000 16400
79000 15100

1400 82000 9280 450 12000

1400
1300
1200
22700 1300 80000 15300 940
21900 1200 71000

26.. 21700 j lino 64000
27.. 22000 ' 990 59000
28.. 21600 ' 990 58000
29..
30..
31..

Total

20300 990 | 54000
17900 990 JB 48000
20500 1100 i 61000

583300 2479000

15800 1300

15100
14500
12400
10800
9850

76000 ;i 10000
58000 10900
B 49000 11900
39000
55000

1100 1 48000
940
720
580
650
9280 510

37000
24000
20000
17000
13000

11500
11700

550 15000
700 21000
880 ?8100
880 27000
880 28000

11500 780
11400 740
11000 700
10500 560
10200 440

297440

24000
23100
21000
16100
12000

553800

Total discharge fo
Total load for yea

year (<
(tons),

:fs-days) . .2,551,630
. 6,367,562

B Computed from estimated-concentration graph.

ALASKA WEST OF LONGITUDE 141° Continued

15-5140. CHENA RIVER AT FAIRBANKS, ALASKA

LOCATION. At gaging station near center on downstream side of bridge on Steese Highway (U.S. Highway 97) in Fairbanks, 0.15 mile upstream from Noyes Slough, 11 miles upstream from mouth, and 11 miles downstream from Chena Slough.
DRAINAGE AREA. 1,980 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses; May to September 1953, January 1954 to September 1955, October 1957 to May 1958, June to September 1964.
Water temperatures: May to September 1953, May 1962 to September 1963, October 1964 to September 1965.
Sediment records: January 1954 to September 1955, May 1962 to September 1965.
EXTREMES, 1964-65. Water temperatures; Maximum, 61°F July 13.
Sediment concentrations: Maximum daily, 260 ppm May 21, Sept. 8.

Sediment loads: Maximum daily, 4,100 tons Sept. 8. . , ... ,-- .. . -_, .. . 66°F June 17, 1962.

Temperature (°F) of water, water year October 1964 to September 1965

Month

November .....
December .....

April..........

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

Day

1

38
32

34
36
48

56
58
47

2

37
32

34
38
49

56
53
4R

3

36
32

35
32
49

57
53
4ft

4

36
32

32
32
49

55
53
4ft

5

35
32

34
34
51

56
53
47

6

35
32

33
38
50

57
56
4ft

7

36
32

34
39
51

58
56
46

8

37

34
41
54

58
57
/i 7

9

36

33
38
52

57
56
4ft

10

36

34
39
53

54
55
in

11

37

31
39
55

58
51

12

38

32
38
51

51
52

13

35

33
39
49

61
50

14

34

34
41
48

58
50

15

34

36
42
49

55
49

16

33

35
44
51

56
49

17

33

35
45
50

55
50

18

33

36
46
51

52
50

19

33

33
45
51

57
53

20

34

32
46
51

51
51

21

33

32
45
52

49
53

22

32

32
44
52

51
51

23

32

34
45
54

53
49

24

33

35
45
54

51
49

25

32

36
46
57

51
47

26

32

34

36
47
55

55
48

27

32

33

36

55

58
48
in

28

33

33

34
49
55

56
48

29

32

33

35
50
57

57
46

30

32

34

34
50
57

58
47

31

32

35

47

58
42

Aver-

age

34

34
42
52

55
51

ALASKA WEST OF LONGITUDE 141°--Continued

15-5140. CHENA RIVER AT FAIRBANKS, ALASKA Continued

Suspended sediment,
(Where no concentr*

ater year October 1964 to September 1965
ions are reported, loads are estimated)

Day

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

5..
7..

OCTOBER NOVEMBER j DECEMBER - - | !
Suspended sediment Mean T

dig- Mean
charge concen-

^ (S

1520
1500
1460
1420
1360

1340
1330
8.. 1320
9.<
10..

11..
12..
13..
lit..
15..

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

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

1300
1280

1280
1210
1170
1150
1140

1120
1110
1050
932
932

956
980
508
8?5
25.. 818

25.. 685
27.. 566
28.. 559
29.. 552
30.. 520
31.. 510

Total

1..
2. .
3..

32793

8
12
11
15
12

9
12
10
10

Tons
per
day

33
49
43
58
44

33
43
35
35
14 48

13
15

45
49
18 57
14 44
28 86

22
12
15
17
35

69
38
48
74
10

15
14
11
10
20
20

67
36
43
43
91

180
100
120
160
S 60

30
21
17
15
28
28

1742

JANUARY

310
310 '
310
4.. 320
5.. 320

5.. 320
7.. 1 320 !
8..
9..
10..

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

16..
17..

320
7-0

320

<? :

4
4

Mean
dis-

charge
(cfs)

490
470
460
450
440

430
420
410
400
390

380
380
370
370
360

350
350
350
350
350

340
340
330
330
330

330
320
320
310
310
~

11250

310
310
4 310
4 310
4 310

Suspended sediment

Mean
concen-

tration

(ppm)

18
46
34
35
60

18
20
17
13
15

8
6
7
7
4

5
4
4
5
4

3
5
7
8

_

~

Tons
per
day

24
58
S 50
43
8 71

21
23

Mean
dis-

charge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

310
305
305 ,
304 9
300

300 '
300

19 , 300
14
15

8
5
7
7
4

5
4
B 4
5
4

3
6
6
7
7

7
7
7
7
7

457

FEBRUARY

__ 3
3
; 3
' 3
~

4 300
4 300
4 300
4 300
4

' 4
330 4
330 4
330
330

330
335
18.. 340

19.. [340
20..

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

26..
27..
28..

330

330
330

4
4

4
4
4
4
4

4
4
330
330
330

320
320
320

29.. , 320
30.. 320
31..

Total

4
4
4

3
3
3
3
3
320 3

10065 118

300

290

290."0
280
280

270

__

_

270
270
260
250

260
250

~

_

250
250
240

240
240
240

~

7780

3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3
3
3

844

300
300

300
300
300
300
300

300
300
300
300
300

300
300
300
310
310

310
310
310
310
310
310 ,

9404

Tons
per
day

8
7
7
7
6

5
6
6
6
5

5
6
6
5
5

6
6
6
6
5

5
6
6
5
5

5
5
5
5
5
5

183

MARCH

230
230
230
220
220

220

_

~

210
210
210
220

220
225
234
259
249

239
220
220
220
220

_

_
_
__
_

18

6
6
6
6
6

6
5
5
5
5

5
5
5
7
12

13 8
19
11

11
7
13 ' 8
14 8

220 15 9
220 15 , 9
244
259
279

279
289
331
341

12 B
15
17

14
15
15
8
395 8
462 15

7825

50
13

11
12
13
7
9
19

259

S C
B C

mputed by subdividing day.
mputed from estimated-concentration graph.

QUALITY OF SURFACE WATERS, 1965

ALASKA WEST OF LONGITUDE 141° Continued

15-5140. CHENA RIVER AT FAIRBANKS, ALASKA Continued

Suspended sediment, water year October 1964 to September 1965 Continued

Day

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

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

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

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

21..

APRIL

Mean
dis-

charge
(cfs)

546
552
582
618
624

570
644
552
552
588

510
558
462
456
492

546
630
875
1080
1150

1170
22.. 952
23.. I 812
24..
25..

26..
27..
28..
29..
30..
31..

Total

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..

742
784

742
770
1020

Suspended sediment

Mean

tration

(ppm)

11
12
8
10
8

10
11
9
11
14

14
11
10
8
7

7

Tons
per
day

16
18
13
17
13

15
19
13
16
22

19
17
12
10
9

10
8 i 14
8
10
20

21
10
11
12
13

10

19
29
62

66
26
24
24
28

20
10 21
10 28
1560 20 ' 84
1520 18 74

22659 758

JULY

2610
2310
2330
3310
2820

2640
2620
2260
1990
1810

1670
1590
1500
1480
1588

2280
3370
2890
2470
2210

3630
3640
3130
2630
2400

2710

27.. | 3300
28.. j 3130
29..
30..
31..

Total

2690
2390
2160

77550

40 280
15 94
16 100
40 IS 350
34 260

31 220
15 ' 110
15 92
11 59
9 44

33 150
51 220
60 B 240
61 B 240
69

92
110
39

B 300

B 570
1000
300
27 180
12 72

65 640
58
28
20
19

570
240
B 140
120

21 150

34 | 300
24
15
11
11

-

?00
110
71
B 64

7486

MAY

Mean
dis-

charge
(cfs)

1380
1330
1540
1920
1850

150^
1390
1610
2100
2400

2260
2020
1920
1810
1650

1590
1640
1960
2800
3880

4830
5070
5210
4590
4000

3830
4050
4490
4470
4440
4200

87730

Suspended sediment

Mean

tration

(ppm)

16
16
27
32
25

16
13
18
38
70

50
34
29
19
20

16
12
18
54
170

260
220
180
120
78

65
88
129
106
120
110

-

Tons
per
day

60
57
110
170
120

65
49
78
220
450

310
190
150
93
fl9

69
53
95
410
1800

3400
3000
2500
1500
840

670
960
1600
1300
1400
1200

23008

AUGUST

1980
1900
1850
1810
1780

1730
1670
1610
1540
1500

1520
2670
5390
4830
3960

3*30
3070
2890
2760
2590

2430
2280
2150
2050
2030

2090
2040
1970
1900
1850
1830

73100

12
20
8
11
8

9

64
100
40
54
38

42
11 50
9
6
13

19
33
122
88
69

27
20
13
17
16

28
12
12
8
6

7
8
9
10
32
24

-

39
25
53

78
240
1800
1100
740

250
170
100
130
110

180
74
70
44
33

40
44
48
51
160
120

6087

JUNE

Mean
dis-

charge
(cfs)

3520
2890
2830
2790
2430

2030
I860
1730
1710
1780

1810
1770
1770
3790
4410

3230
2670
2470
3710
4230

3230
3350
3250
3040

Suspended sediment

Mean
concen-

tration

(ppm)

68
34
41
34
33

33
17
14
13
14

Tons
per
day

650
270
310
260
220

180
85
65
60
67

10 1 49
19
12
250
210

66
24
18
84
110

41
46
32
21
2790 14

2910 21
2930 27
3290 37
3270 30
2880 22

84370

91
57
S 2900
2500

580
170
120
S 1000
1300

360
420
280
170
110

160
210
330
260
170

13404

SEPTEMBER

1780
1750
1780
2070
2270

2500
4490
5790
5650
4830

4110
3700
3390
3100
2860

2690
2560
2450
2370
2390

2650
2930
2940
3290
3490

3310
3120
3030
3180
3000

93470

20
30
46
19
27

33
160
260
140
100

_
_
__
__

_
_

_

_ -

~

_

__

_

96
140
220
110
170

220
S 2100
4100
2100
1300

690
400
280
230
220

190
170
170
160
180

230
390
440
600
780

- - I 490
34 i 290
35 290
34 , 290
26 ' 210 "

17256

Total discharge for year (cfs-days).
Total load for year (tons)..........

517,996
71,602

S Computed by subdividing day.
B Computed from estimated concc ration graph.

ALASKA WEST OF LONGITUDE 141° Continued

15-5180. NENANA RIVER NEAR HEALY, ALASKA

LOCATION. At gaging station on right bank. 0.5 mile upstream from Healy Creek, 1.1 miles southeast of Healy, and 1.2 miles upstream from railroad bridge. DRAINAGE AREA. 1,910 square miles, approximately.
RECORDS AVAILABLE. Chemical analyses: June to December 1949, October 1953 to October 1954, May to September 1955, May to October 1956, January 1957 to September 1965.
Water temperatures: June to October 1949, August 1957 to September 1965.
Sediment records: June 1953 to September 1965.
EXTREMES, 1964-65. Water temperatures: Maximum, 52°F July 10, Aug. 6.
Sediment concentrations: Maximum daily, 4,900 ppm June 28.
Sediment loads: Maximum daily, 260,000 tons June 28.
EXTREMES, 1953-65. Water temperatures (1957-65)): Maximum, 56°F Aug. 9, 1957. Sediment concentrations: Maximum daily, 8,330 ppm July 11, 1963.
Sediment loads: Maximum daily, 585,000 tons June 25, 1953.

Chemical analyses, in parts per million, water year October 1964 to September 1965

Date of collection

Oct. 1-15, 1964. .
May 16-20, 1965. .

July 14, 15, 19-

Aug. 3, 6, 8-12..

Sept. 2, 3, 5, 7,

Sept. 19-30. .....

Mean

discharge
(cfs)

3150
3420
8510
10630
12160

10940
7460
5700

5870
8490

Silica

(Si02)

6.3
5.2
4.0
5.0
4.4

4.6
4.8
5.6

5.1
5.8

Iron

(Fe)

0.00
.02
.06
.04
.02

.00
.02
.02

.02
.02

Cal-
cium

(Ca)

33
20
14
19
22

22
26
27

27
25

Mag-
ne-

sium

(Mg)

7.2
13
7.3
5.0
4.4

6.8
5.1
6.9

6.9
6.4

Sodium

(Na)

4.6
4.5
2.6
2.7
1.7

3.1
1.7
5.5

5.5
2.3

Po-
tas-

sium

(K)

1.6
1.3
1.1
.9
1.3

1.8
1.8
o 3

2.3
1.3

Bicar-
bonate

(HCOS)

90
95
61
60
61

65
70
79

79
70

Sulfate

(S04)

47
32
18
24
28

38
33
47

41
36

Chloride

(CD

3.5
2.1
1.4
1.4
. 7

. 7
. 7
.7

1.4
1.8

Fluo-

ride

(F)

0.1
.2
.2
. 2
. 3

.3
.3
.2

. 2
.2

Ni-

trate

(NOS)

0.3
1.2
.4
.5
. 3

.2
.2
.3

.0
. 2

Dissolved
solids

(residue
at 180° C)

148
127
79
89
93

110
108
128

128
113

Hardness

as CaCOj

Calcium,
magne-
sium

112
102
65
68
73

83
86
96

96
89

Non-
carbon-
ate

38
24
15
19
23

30
29
31

31
32

Specific
conduct-

ance

(micro -
mhos

at 25°C)

238
218
138
146
157

171
187
200

205
190

PH

7.7
7.8
7.4
7.4
7.2

7.4
7.3
7.4

7.4
7.3

Color

5
20
30
10
10

10
5
10

10
15

ALASKA WEST OF LONGITUDE 141° Continued

15-5180. NENANA RIVER NEAR HEALY, ALASKA Continued

Specific conductance (micromhos at 25°C) of water, water year October 1964 to September 1965 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.....
28.....
29.....
30.....
31.....

Average

October November December January February March April May

_

_

_

244
235
228
210
194

181
163
142
143
137

129
123
155

113
114

June

117
118
131
141

158
168
138
126
132

145

147
153

156
153
159
162

146
148
151

154
150
161
150
154

146

July

144
147
156
156
155

160
157
155
158
158

157
160

155
164

__

- _

165
174

175
172
176
175

__

_
_
__

August

_ _

189
184
192

190

__

183
179
175

183

__

184
182
186
186
190

192
195
200
200
213

220
223
223
225
227

September

_ _

219
231

~

.__

206
188

__

_ _

__

193
197
199

198
191
202
197
203

209
206
193
172
175

180
178
179
190
199

- -

ALASKA WEST OF LONGITUDE 141° Continued

15-5180. NENANA RIVER NEAR HEALY, ALASKA Continued

Temperature (°F) of water, water year October 1964 to September 1965

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

June ....

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

1

39

2

42

44

3

42

50

4

44

48

5

48

6

44

52

7

50

8

47

51

9

43

49

10

46

48

1 1

45

46

12

46

13

~

~

14

45

15

48

Day

16

47

47

17

46

46

18

*7

48

19

49

48

20

49

21

50

22

49

23

48

4B

24

48

45

25

48

45

26

45

41

27

45

43

28

46

44

29

-

45

30

47

44

31

_

Aver-
age

-

_

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

July 28, 1965. ....

Time

(24 hour)

0950

1100

Water
tem-

per-
ature

(°F)

51
43
41

Sam-

pling
point

Discharge
(cfs)

8380
3230
8010

Sediment
concen-

tration

(ppra)

350
84
290

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004 0.008 0.016 0.031 0.062

54
17
13

0.125

63
43
16

D.250

78
67
30

0.500

97
100
79

1.000

100

100

2.000

Method
of

analysis

V
V
V

QUALITY OF SURFACE WATERS, 1965

ALASKA WEST OF LONGITUDE 141° Continued

15-5180. NKNANA RIVER NEAR HEALY, ALASKA Continued

Suspended sediment, water year October 1964 to September 1965 (Where no concentrations ate reported, loads are 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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

Mean
dis-

charge
(cf«)

2700
2COO
2800
2800
2800

2800
2900
3300
3700
4100

3800
3500
3200
3100
3000

2300
2300
2300
2300
2300

2300
2300
2300
2300
2300

2300
2300
2300
2300
2300
2300

84100

520
520
520
520
520

520
520
520
520
520

520
520
520
520
520

520
520
520
520
520

520
520
520
520
520

520
520
520
520
520
520

16120

OCTOBEF

Suspen

Mean
concen-

tration

(ppm)

200
140
74
64
60

63
170
270
370
380

290
190
120
84
50

__

__

-

JANUAR

ded sediment

Tom
per
day

1500
1100
560
470
450

510
1300
2400
B 3700
4200

3000
B 1800
1000
700
400

310
310
310
310
310

310
310
310
310
310

310
310
310
310
310
310

26360

28
28
28
28
28

28
28
28
28
28

28
28
28
28
28

28
28
28
28
28

28
28
28
28
28

28
28
28
28
28
28

868

Mean
dis-

charge
(cf.)

1200
1200
1200
1200
1200

1200
1200
1200
1200
1200

1200
1200
1200
1200
1200

1200
12DO
1200
1200
1200

1200
1200
1200
1200
1200

1200
1200
1200
1200
1200

36000

40
40
40
40
40

40
40
40
40
40

40
40
40
40
40

40
40
40
40
40

40
40
40
40
40

40
40
40

12320

NOVEMBEF

Suspen

Mean

tration

(ppm)

FEBRUARY

ded sediment

Tons
per
day

130
130
130
130
130

130
130
130
130
130

130
130
130
130
130

130
130
130
130
130

130
130
130
130
130

130
130
130
130
130

3900

12
12
12
12
12

12
12
12
12
12

12
12
12
12
12

12
12
12
12
12

12
12
12
12
12

12
12
12
- -

336

C

Mean
dis-

charge
(cf«)

40
40
40
40
40

40
40
40
40
40

40
40
40
40
40

40
40
40
40
40

40
40
40
40
40

40
40
40
40
40
40

22940

430
430
430
430
430

430
430
430
430
430

430
430
430
430
430

430
430
430
430
430

430
430
430
430
430

430
430
430
430
430
430

13330

ECEMBER

Suspen

Mean
concen-

tration

(ppm)

HMARCH

ded sediment

Tons
per
day

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0

0
0
0
0
0
0

1240

12
12
12
12
12

12
12
12
12
12

12
12
12
12
12

12
12
12
12
12

12
12
12
12
12

12
12
12
12
12
12

372

B Computed fi estimated-concentration graph.

ALASKA

ALASKA WEST OF LONGITUDE 141° Continued

15-5180. NENANA RIVER NEAR HEALY, ALASKA Continued

Suspended sediment, water year October 1964 to September 1965 Continued

APRIL | MAY | JUNE

Day

Mean
dis-

charge
(cfs)

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

6.. 87::
9..
10..

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

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

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

26..
27..
28..
29..
30..
31..

Total
=1

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..
28..
29..
30..
31..

Total

480
480
480
480
480

480
480
480
480
480

480
480
480
480
480

710
710
710
710
710

710
710
710
710
710

710
710

Suspended sediment

Mean
concen-

tration

(ppm)

Tons
per
day

26
26
26
26
26

26
26
26
26
26

26
26
26
25
26

58
58
58
58
58

58
58

710 |
710
710 1
~

1-850

58
58
58

58
58
58
58
58

1260

JULY

13300
13500
12000
11600
11100

10300
10600
11500
13200
12800

12800
13200
14000
14700
16000

14000
12400
11600
11200
9970

9640
9360
8580
8100
7700

8220
8580
8380
8130
7970
9150

343580

2800
1300

100000
47000
1800 58000

1800 j 56000
1700 51000

1600
1300
1400
1900
2100

44000
37000
43000
68000
73000

1900 IB 66000

2000 |B 71000
2100 ,8 70000
2400
2900

2600
2300
1800
1300
1000

670
560
500
440
420

490
570

95000
130000

B 98000
B 77000
B 56000
39000
27000

17000

Mean
dis-

charge
(cfs)

1050
1050
1050
1050
1050

1050
1050
1050
1050
1050

1050
1050
1050
1050
2600

2800
3100
3400
3700
4100

4500
5100
5800
6600
7200

8000
9200
10500
11400
12200
13100

128000

Suspended sediment j j Suspended sediment

Mean
concen-

tration

(Ppm)

_

__

~

_

120

130
190
260
310
310

470
640
550
1000
1700

2900
4400
4400
3000
2000
1800

- -

; Mean
Tons dis- Mean TnnE

per charge

day

170
170

(cfs)

14200
10200
170 9930
170 6550

170 |l 6600

170
170
170
170
170

170
170
170
170
840

980
1600
2400
3100
3400

6680
6080
8580
11300
9750

8190

. ner tration

(ppm)

1800
1800
1300
840
490

240
400
1300
1900
2400

2400
8000 2600
12000
11200
10000

10000
9500
8640
8320

3300
3500
3200

2900
2500
1800
2200
9000 2600

5700 11000
8800
8600
18000
33000

63000
110000
120000
B 92000
foOOO

3000
13000 3400
12800
12200

3300
3000
11800 2600

11500
15400

2500
3700
19600 4900

14600] 3900
12300
64000

603800

AUG^T

8950
8510
7640
7180
6380

6220
6200
6380
7060
8810

8840
7260
6300
6000
6800

7580
8190
8000
6980
6480

6020
14000 ' 5780
12000
B 9600
8700

11000
13000
530 B 12000
470
520
690

-

10000
11000
B 12000

1450300

6320
5660
4900

4500
4100
3900
3600
3500
3400

197440

690
650

B 17000
B 15000
590 B 12000
510
420

350
340
440
570
560

380
240
250
340
520

700
840
840
690
530

450
420
590
430
290

_

~

-

9900
7200

318920

3000

-

day

69000
50000
35000
15000
8700

4300
6600
B 30000
58000
B 63000

B 53000
B 56000
B 110000
B 110000
B 86000

B 78000
B 64000
42000
49000
B 63000

B 89000
B 120000
B 110000
99000
B 83000

78000
150000
260000
B 150000
B 100000

2289600

SEPTEMBER

3300
3160

_

110
3160 59
3250 i 67
5000 550

B 5900 : 9000 1200
B 5700 1 11000 1300
7600
B 11000
B 13300

9100
B 4700
B 4300
B 5500
B 9500

14000
B 19000
B 18000
13000
9300

B 7300

9800
8600
7600

1300
1200
1000

6800 830

1400
940
500
B 590
B 740

B 29000
B 39000
34000
B 28000
B 21000

B 15000
6100 ! 710 B 12000
5900 600 9600
5930
6100

6220
6350
5850
6220
6350

520 . 8300
430 B 7100

480 , 8100
550
380

9400
6000
430 7200
470 B 8100

5900 j 290 !B 4600
66CO ' 6350 410 7000
B 10000 10300
6600 10800
3800

2600
2700
2500
2300
2100
1700

258900

10100

11100
11300
9500
7550
6450

215040

1300
1600
1300

1300
1300
1100
780
590

B 36000
B 47000
B 35000

39000
B 40000
B 28000
B 16000
10000

508570

Total discharge for year (cfs-days). .... .1,405,640 Total load for year (tons) .... 5, 145,506 B Computed fr Btimated-concentration graph.

438 QUALITY OF SURFACE WATERS, 1965

MISCELLANEOUS ANALYSES OF STREAMS IN ALASKA

SOUTHEASTERN ALASKA

Periodic determinations of suspended-sediment discharge, water year October 1964 to September 1965

Date Time
(24 hr)

Water
tem-
per-

Discharge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Discharge
(tons per day)

15-115. RED RIVER NEAR METLAKATLA

Oct. 22, 1964..... ....

Apr. 14........................ 1840 292 5 3.94

15-220. HARDING RIVER NEAR WRANGELL

Dec. 7, 1964...... ....
Feb. 11, 1965..................
Apr. 12........................

Aug. 14........................

1200
1520
1520
1045

36
44
60

101
337
1350
615

3
4
8

2.18
2.73
14.6
13.3

15-562. WEST CREEK NEAR SKAGWAY

Apr. 15, 1965.................. 1540 40

39
449

15-870. MILL CREEK AT WRANGELL

Oct. 12, 1964.................. Apr. 12, 1965..................

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

1000
0900

49
35

55

8.8
3.0

. 1

0
2

3

0.00
.02
.01
.00

15-872. HAMMER SLOUGH AT PETERSBURG

1400
1800 46

3.9
60

4

MISCELLANEOUS ANALYSES OF STREAMS IN ALASKA Continued

ALASKA WEST OF LONGITUDE 141°

determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 (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)

Water
tem-

per-
ature

(°F)

Sam-

pling
point

Discharge
(cfs)

Sediment
concen-

tration

(ppm)

Sediment

discharge
(tons per day)

15-2004. GULKANA RIVE

1540
1815

41
54

3950
975

580
35

6190
92.1

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

1 AT GULKANA

22 30 37

15-2020. TAZLINA RIVER NEAR GLENNALLEN

July 17............

Sept . 16 ....

1515
2030
1200
1245

45

51
48

950
A9800
39900
812

86
240
2800
110

221
6350
301600
241

21
19

25
26

33
39

41
53

45 56 72 87 97 99 100 VPWC

55
62

74
68
95

86
74
97

95
86
98

99
98
99

100
100
100

VBWC
VBWC
V

15-2383. RESURRECTION RIVER NEAR SEWARD

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

1525
1005
1045
1450
1308

39
43
42
49
41

A275
1660
2300
1230
2270

12
30
97
42
350

8.91
134
602
139
2150 21

37

26

49

33

52

38

58

43

64
52
50

71
59
61

79
67
73

94
85
88

100
100
97

VBWC
V
VBWC

15-2415. DEEP CREEK NEAR NINILCHIK

June 10............

1035
1520
1150
1620
1440

34
44
50
54
48

277
498
276
153
318

21
40
11
6
27

15.7
53.8
8.20
2.48
23.2

15-2722. PLACER RIVER NEAR PORTAGE

1025
1640

40
42

3520
4930

150
240

1430
3190 39 47 57 69 81

66
98

69
99

78
99

92
99

98
100

100 V
SWBC

15-2723. PORTAGE CREEK AT PORTAGE

July 25............

1220
0940

33
41

114
1470

24
370

7.39
1470 99 99 100 V

MISCELLANEOUS ANALYSES OF STREAMS IN ALASKA Continued

ALASKA WEST OF LONGITUDE 141° Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1964 to September 1965 Continued (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)

1200
1030
1515
1245

Water
tem-

per-
ature

(°F)

32
34
57
46

Sam-

pling
point

Discharge
(cfs)

112
A376
429
367

Sediment
concen-

tration

(ppm)

15-2820

47
380
310
230

Sediment

discharge
(tons per day)

CARIBOU CREEK

14.2
386
359
228

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

NEAR BUTTON

37

36

47

51

59

64

74

72

83

81

90
96
87

95
98
90

99
99
95

100
100
98 100

VBWC
V
VBWC

15-2910. SUSITNA RIVER NEAR DENALI

1315
1600
0900

44
50

4140
7320
A7000

570
1400
3600

6370
27690
68040

12
12

16
15

20
21

29
30

37
47

32
46
66

58
52
80

90
62
95

99
73
100

100
83 97

V
SVPWC

SPWC

15-2912. MACLAREN RIVER NEAR PAXSON

1030
1200

0900
1515
1230

45
43

34

2640
A2810

550
740

15-2915.

A4150
18900
22300

140
970
1200

3920
5590

24
26

30
36

37
45

45
57

54
67

63
74

72
82

81
89

94
97

99
100

100 SBWC

VPWC

SUSITNA RIVER NEAR CANTWELL

1570
49500
72250 17 22 32 38 49

43
60

58
73

78
84

94
96

100
100

V

VPWC

15-4700. CHISANA RIVER AT NORTHWAY JUNCTION

July 24.. ....

1140
1030
1145
1120

46

46
43

2880
6980
3310
3160

1100
1000
480
600

8550
18850
4290
5120

26
24

31
28
15

38
34
16

45
42
20

52
53
25

38
64
66
39

60
83
77
62

93
98
98
99

99
100
100
100

100 V
VBWC
VBWC
VBWC

15-5160. NENANA RIVER NEAR WINDY

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

1030
1040
1150

46
44

6030
2330
1260

430
170
26

7000
1070
88.5

46
82
59

64
83
69

80
86
82

97
88
89

100
99
93

100
100

V
V
V

15-6210. SNAKE RIVER NEAR NOME

July 24, 1965......
Sept. 9............

0900
1015

45
46

497
1700

15
56

20.1
257

PART 16. HAWAII AND OTHER PACIFIC AREAS

ISLAND OF OKINAWA

16-8755. YONA-GAWA AT YONA, OKINAWA

LOCATION. At gaging .station, 0.9 mile southeast of Yona, and 2.7 miles east of Hentona School.
DRAINAGE AREA. 1.7 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: May 1964 to September 1965.
Sediment records: May 1964 to September 1965.
EXTREMES, May 1964 to September 1965. Water temperatures: Maximum, 83°F July 15, Aug. 10, 1964, Aug. 23, 1965; Jan. 16, 1965.
Sediment concentrations: Maximum daily, 215 ppm June 23, 1965; minimum daily, 1 ppm on many days. Sediment loads: Maximum daily, 435 tons June 23, 1965; minimum daily, less than 0.05 ton on many days.

Temperature (°F) of water, May 1964 to September 1965

ninimum, 51°F

May 1964.....

July.........

October. .....

December. ....

January 1965.
February. ....
March.. ......

April.. ......

June ....

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

1

69
70

77

Tt

60
58
57

61

70

76
81
76

2

69
70

58
57
61

71

70
76
75

3

70
67

59
52
60

69

75
7ft
76

4

70
67

59
54
60

76
76
77

5

72
66

58
55
b/

76
75
80

6

71
66

58

5/

75

80

7

71
70

-

61

76

8

69
70

56

5B

74

9

67

53

56

74

10

70
71

54

55

76

11

70
73

53

56

79

12

65
74

5

75

13

65
7?!

^

2

5

14

67
73

52

59

76

15

66
70

52

55

77

Day

16

67
69

51

55

78

17

68
70

53

53

79

18

70
69

53

57

76

19

69
71

56

58

76

20

69
7?!

56

60

76
78

21

69
76

56

58

77
75

22

70
74

55

59

78
78

23

71
72

6

76
83

24

74
71

58

61

76
78

25

73
77

57

60

80
75

26

71
76

55

60

77
79

27

71
75

57

59

78
79

28

70
72

73

63

56
5 1
60

65

73

77
79

29

70
78

68

60

56

60

68

78

77
76

30

70
75

6

60

58

60

65

78

76
75

31

70

62

69

61

56

60

77
77

Aver-
age

70
71

78

77

73

61

56
58
58

63

71

76
77

Particle-size analyses of bed material, water year October 1964 to September 1965
(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)

1400

Water
tem-

per-
ature

(°F)

69

Sam-

pling
point

6

Discharge
(cfs)

25

Sediment

concen-

tration

(ppm)

Sediment

discharge
(tons per day)

Bed material

Percent finer than size indicated, in millimeters

0.062 0.125

l

0.250

2

0.500

6

1.000

15

2.000

37

4.000

48

8.000

65

16.000

80

32.000

95

64.000

100

Method
of

analysis

S

QUALITY OF SURFACE WATERS, 1965

ISLAND OF OKINAWA Continued

16-8755. YONA-GAWA AT YONA, OKINAWA Continued

Suspended sediment, Hay to September 1964

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

Suspended sediment

Mean

tration

(ppm)

Tons
pei-

day

JULY

.
.

. >

.
.

t

.

; . ,
: .

i .

.

5 .

.

.

218.7

1

1

2
2
2

. 1

S : .5

. 1
S .2

5.3

MAY

Mean

dig-
charge
(cfs)

2.1
2.1
2.1
2.1
2.2

5.7
12.2
6.1
77.4
10.3

21.0
13.0
7.4
5.8
5.0

4.4
4.2
4.0
38.0
15.5

10.8
8.1
7.0
6.0
6.0

6.4
5.8
11.2
7.4
78.9
40.9

429.1

Suspended sediment

Mean

tration

(ppm)

2
2
2
2
2

8
10
4
58
3

6
2
1
1
1

1
1
1
22
2

2
2
2
2
3

3
2
4
3
16
4

per

day

. 1
S .8
. 1
K 54
. 1

. 3
. 1

S .2
. 1

. 1

. 1
T
. 1
. 1
S 6.6
.4

67.5

AUGUST

4.4
4.2
4.8
4.7
3.8

3.8
3.6
3.6
3.4
3.4

3.2
3.4
3.8
3.0
2.8

3.2
29.1
8.2
5.2
4.7

12.0
53.4
29.9
13.2
10.0

8.3
7.2
6.8
6.2
5.9
5.6

264.8

2
2
3
2
2

1
1
1
1
1

1
1
1
1
1

2
13
3
2
2

7
49
5
2
2

2
1
1
1
1
1

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
S 1.8
. 1
T
T

.2
K 30
.4
. 1
. 1

T
T
T
T
T
T

33.2

JUNE

Mean
dis-

charge
(cfs)

45.4
108
39.9
21.8
18.5

15.0
15.8
54.2
22.6
16.4

17.7
15.0
14.3
15.7
145

162
62.7
49.8
39.0
25.6

20.1
85.6
46.4
25.6
18.5

15.7
13.0
11.3
9.8
8.9

1159.3

Suspended sediment

Mean
concen-

tration

(ppm)

4
22
3
2
2

2
4
15
2
2

3
2
2
4
171

195
7
8
3
2

2
106
5
2
2

1
1
1
1
1

per

day

0.5
11
. 3
. 1
. 1

. 1
.2
S 3.6
. 1
. 1

. 1
. 1
. 1
.2
K 260

K 420
1.2
1.1
.3
. 1

. 1
S 144
.6
. 1
. 1

T
T
T
T
T

844.4

SEPTEMBER

5.3
5.0
5.0
4.4
4.2

4.0
3.8
3.6
3.6
16.4

5.0
3.8
3.6
3.4
3.6

3.4
3.4
3.2
3.2
3.2

3.2
3.2
3.0
3.0
2.8

3.6
4.2
3.0
10.2
7.2

134.5

6

8

T
T
T
T

T
T
T
T
S 12

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
.2
.2

12.8

Total for discharge for year (cfs-days) 2206.4
Total load for year (tons) .... 963 . 2

S Computed by subdividing day.
T Less than 0.05 ton.
K Computed from estimated-soncentration graph and subdividing day.

HAWAII AND OTHER PACIFIC AREAS

ISLAND OF OKINAWA Continued

16-8755. YONA-GAWA AT YONA, OKINAWA Continued

Suspended sediment, water year October 1964 to September 1965

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

OCTOBER

Mean
dis-

charge
(cfs)

3.8
3.2
3.0
3.2
3.2

3.6
3.6
19.7
10.1
5.3

4.2
3.8
7.5
5.0
4.0

4.0
3.8
3.4
3.2
3.2

3.4
3.0
3.2
3.2
3.0

2.8
3.0
2.8
2.7
2.7
2.7

133.3

Suspended sediment

Mean
concen-

tration

(ppm)

1

Tons
per

day

T
T
T
T
T

T
T
K 2
. 1
T

T
T
. 1

-

T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T
T

2.5

JANUARY

2.7
2.6
28.0
37.3
8.8

7.2
6.8
6.5
5.3
4.7

4.2
4.0
3.8
3.6
3.6

3.4
3.2
3.2
3.2
3.0

3.0
2.8
2.8
2.7
2.7

2.7
2.7
2.7
2.7
2.8
2.6

175.3

1

-

T
T
K 4
S 1.4
. 1

T
. 1
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T
T

6.0

NOVEMBER

Mean
dis-

charge
(cfs)

2.
2.
2.
3 .
6.

2.
2.
2.
2.
2.

2.
2.
2.
2.
2.

2.
2.
2.
2.
2.

2.
2.
2.
2 .
2.

2.
2 .
2 .
2.
2.

73.8

Suspended sediment

Mean
concen-

tration

(ppm)

1
1
2
4
11

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

1
1
1
1
1

1
1
1
2
2
~

-

Tons
per

day

T
T
T
T
S .3

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
T
T
T

T
T
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T
T

0.6

FEBRUARY

2.
2.
2.
2.
2.

4.
2.
2.
2.
2.

2.
2.
2.
2.
2.

2.
2.
2.
2.
71.

11.
5.
5 .
4.
3.

3.
3.
3.

158.8

4

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S 14

. 1
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. 1
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T

14.6

DECEMBER

Mean
dis-

charge
(cfs)

2,1
2.0
2.2
2.2
2.0

2.0
2.0
3.2
3.3
7.0

7.7
3.2
2.6
2.2
2.1

7.2
33.7
10.0
5.0
3.8

3.4
3.2
3.0
2.8
2.8

3.8
6.2
3.6
3.0
2.8
3.0

143.1

Suspended sediment

Mean
concen-

tration

(ppm)

i:

~

Tons
per

day

T
T
T
T
T

T
T
T
T
.2

. 1
T
T
T
T

. 1
1.0
. 1
T
T

T
T
T
T
T

T
. 1
T
T
T
T

2.0

MARCH

3.2
3.4
3.2
3.0
2.9

3.4
8.1
4.7
4.4
3.8

3.4
3.2
3.2
3.0
3.0

3.6
3.0
2.8
2.8
2.8

2.7
2.8
3.0
3.5
3.0

3.0
2.8
2.7
3.0
6.2
3.4

106.9

2
2
2
1
1

3
8
2
2
2

1
1
1
1
1

3
1
1
1
2

2
2
2
3
2

2
2
2
2
7
2

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.2
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T
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. 1
T

0.8

S Computed by subdividing day.
T Less than 0.05 ton.
K Computed from estimated-concentration graph and subdividing day.

QUALITY OF SURFACE WATERS, 1965

ISLAND OF OKINAWA Continued

16-8755. YONA-GAWA AT YONA, OKINAWA Continued

Suspended-sediment, water year October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

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..
28. .
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

3.0
3.2
7.6
12.6
6.5

5.0
4.2
4.0
3.8
8.3

5.6
4.2
18.9
8.3
6.2

5.3
5.0
10.7
7.9
6.2

5.3
5.0
4.7
4.4
4.2

4.0
4.0
3.8
6.7
5.3

183.9

Suspended sediment

Mean
concen-

tration

(ppm)

2
3
5
8
2

I
1
1
1
7

2
2
22
3
2

2
2
9
3
2

2
1
1
1
1

1
1
1
5
3

Tons
per

day

T
T
. 1
.3
T

T
T
T
T
.2

T
T
S 3.0
. 1
T

T
T
. 3
. 1
T

T
T
T
T
T

T
T
T
.1
T

4.6

JULY

13
12
11
10
9.1

8.3
7.9
7.5
6.8
6.5

6.2
6.2
5.9
5.6
5.3

5.3
5.0
4.7
4.4
4.2

4.2
4.0
3.8
3.6
3.8

3.6
3.6
3.6
3.4
3.4
3.2

185.1

3
3
3
5
3

3
2
2
2
2

2
2
2
2
2

2
2

0.
.;

. 1
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1
1

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1.1

MAY

Mean
dis-

charge
(cfs)

4.0
17.9
51.0
10.5
8.3

7.5
7.5
7.2
13.1
51.1

20.3
13.2
13.2
13.4
24.4

34.7
18.9
15.1
15.7
13.2

61.8
79.9
58.3
39.4
25.0

20.3
16.9
13.8
12.0
11.0
9.5

708.1

Suspended sediment

Mean
concen-

tration

(ppm)

2
11
23
3
3

2
2
3
7
13

4
2
2
7
8

11
4
5
5
3

17
16
13
6
5

3
3
3
2
2
2

Tons
per

day

T
S 1.4
S 8.7
. 1
. 1

T
T
. 1
.2
S 7.5

.2
.1
. 1
.3
.5

S 1.8
. 2
. 2
.2
. 1

K 6
K 7
K 3
.6
.3

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

39.5

AUGUST

3.2
3.2
3.6
38
216

19
15
16
10
8.3

7.2
6.5
5.9
5.6
5.3

5.0
4.7
6.4
6.2
4.2

4.0
3.8
3.6
3.6
3.4

3.4
3.4
3.4
5.2
3.6
4.0

430.7

12
29

1

-

T
T
T
S 94
K 320

.2
.2
. 6
. 1
. 1

. 1
. 1
. 1
. 1
. 1

T
T
. 1
. 1
T

. 1

416.3

JUNE

Mean
dis-

charge
(cfs)

10.0
26.0
47.1
18.9
26.0

67.8
32.0
21.8
17.5
15.1

12.6
17.8
13.8
11.5
56.1

21.0
14.4
11.5
10.0
12.6

176
33.0
166
55.2
30.0

23.4
20.3
23.4
17.5
15.1

1023.4

Suspended sediment

Mean

tration

(ppm)

3
12
11
4
4

12
3
2
2
2

2
4
2
2
23

5
2
2
2
5

105
18
215
12
7

5
3
5
3
3

Tons
per

day

0.1
K 4
K 3
.2
. 3

K 2
.3
.1
. 1
. 1

. 1
. 2
. 1
. 1
S 14

.3
. 1
. 1
.1
.2

S 290
1.6
S 535
1.8
.6

. 3
. 2
.3
. 1
. 1

855.5

SEPTEMBER

3.4
3.0
3.0
3.0
2.8

2.8
3.0
2.7
2.7
2.7

2.6
2.6
5.4
24
7.9

6.8
5.9
4.0
3.6
3.4

3.2
3.6
4.7
4.2
25

43
13
8.3

2
1
1
1
1

1
2
2
1
1

1
1
8
11
5

4
4
3
3
3

3
3
5
4
145

180
8
6
6.5 5
5.9 4

212.7

. 1
S 1.2
. 1

. 1
. 1
T
T
T

T
T
. 1
T
S 34

K 50
. 3
. 1
. 1
. 1
~~

86.6

Total load for year (tons) 1430.1

S Computed by subdividing day.
T Less than 0.05 ton.
K Computed from estimated-concentration graph and subdividing day.

ISLAND OF OKIAWA Continued

16-8775. GENKA-KAWA NEAR GENKA, OKINAWA

LOCATION. At gaging station, 1.2 miles south of Genka, and 2.1 miles southeast of Nakaoshi.
DRAINAGE AREA. 3.9 square miles, approsimately.
RECORDS AVAILABLE. Water temperatures: May 1964 to September 1965.
Sediment records: May 1964 to September 1965.
EXTREMES, May 1964 to September 1965. Water temperatures: Maximum 84°F Sept. 2, 9, 1964; minimum, 52°F Jan. 26, 27, 1965. Sediment concentrations: Maximum daily, 3,180 ppm Feb. 20, 1965; minimum daily, 1 ppm on many days.
Sediment loads: Maximum daily, 13,000 tons Aug. 5, 1965; minimum daily, less than 0.05 ton on many days.

Temperature (°F) of water, May 1964 to September 1965

September. . . .

January 1965.

September. . . .

1

71

_

7H
76

76
74
65

61

62

61
71
70

79

2

71

_

79
84

76
7?
63

62
57
64

62

69

76

79

3

71
70

__

7ft
76

76
73
ft?

60
57
64

60
67
71

78

4

75
69

75
78
78

78
7?
60

57
61

62
67
72

80

5

/6
69

75
7H
78

76
7?
61

57
60

60
63
7<J

82

6

72
70

75
78
81

79
71
59

61
58
59

61
66
71

77

78

7

71
70

70
7d
80

76
71
60

60
57
59

66
68
7<J

79

8

71
69

76
79
81

76
71
60

58
57
59

67

7J

79

9

70

7H
78
b4

74
7?

53
63
60

68
72
70

"TO

79

10

76
65

Ib
au
79

72
69
65

55
63
61

66
69
70

78

11

71
70..

76
80
77

73
69
65

53
6?
58

62
69
75

77

12

75

75
HO
77

73
67
64

53
62
58

63

74

77

13

74

75
8u
77

73
66

__

53
6?
56

66
72
74

76

14

66
75

7h
78
73

76
66

54
60
55

66
71
74

76

15

73
70

76
79
78

77
60

55
58
56

67
71
74

76

Day

16

73
70

75
78
79

76
66
64

56
6^
57

64
72
71

77

17

7?
70

75
77
79

76
66
66

53
63
57

64
67
74

76

18

1?
71

75
79
79

77
66
61

5'*
60
57

67
6<3
77

76

19

70
70

76
RO
78

77
64
60

54
60
63

69
69
75

75

20

70
75

75
79
78

76
64
6?

59
64
60

66
70
74

75

21

70
75

7ft
76
77

79
64
6?

59
ft5
62

65
70
74

75

22

7?
71

75
77
77

78
65
ft?

54
6?
62

64
69
72

7fl

76

23

74
72

76
77
79

75
65
60

55
60
65

65
65
74

fl?

79

24

74
72

75
78
78

75
65
59

54
60
62

69
72
74

79

76

25

71
76

7ft
78

74
6?
6?

5~-<
60
62

69

73

79

75

26

73
73

__

79
78

74
65
64

52
67
62

71
72
74

76

27

71
76

75
75
78

75
fil
64

52
57
61

70
72
75

79

75

28

74
74

75
74
78

76
61
64

54
59
61

71
72
76

81

74

29

73
76

76
74
77

73
63
63

61

71
71
77

7*

30

70
76

75
75
76

71
65
61

60

70
71
81

74

31

70

77
75

74

64

64

7 a

Aver-
age

72
72

75
78
78

75
67
62

56
60
60

66
70
73

78
77

QUALITY OF SURFACE WATERS, 1965

ISLAND OF OKINAWA Continued

16-8775. GENKA-KAWA NEAR GENKA, OKINAWA Contir

Suspended sediment, May to September 1964

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..
28..
29..
30..
31..

Total

1..
2..
3..

APRIL

Mean
dis-

charge
(cfs)

Suspended sediment

Mean
concen-

tration

(ppm)

Per

day

JULY

14.3
13.4
12.9
4.. 12.9
5..

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

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

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

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

26..
27..
28..
29..
30..
31..

Total

12.4

11.9
11.4
11.4
11.0
10.5

10.0
9.7
9.3
9.0
9.0

9.0
11.2
8.7
8.0
24.6

9.3
8.0
11.2
8.4
8.7

19.6
219
34.0
19.1
14.8
12.9

595.6

1
1
1
1
1

1
2
2
2
2

2
2
1
1
1

1
4
2
2
47

2
2
3
2
2

31
129

T
."

.

.
.

T
T
T

T
. 1
T
T
K 6

. 1
T
. 1
T
T

K 6
K 220
12 1.1
5
3
3

-

. 3
. 1
. 1

235.0

MAY

Mean
dis-

charge
(cfs)

3. LI
2.8
3.U
2.8
3.2

8.5
10. U
7.8
36.5
10.3

24.6
14.9
7.3
5.3
4.8

4.2
4.2
4.2
64.6
21.2

12.2
8.5
B.I
6.6
6.6

5.9
5.5
5.6
5.3
154
98.1

559.7

Suspended sediment

Mean
concen-

tration

(ppm)

1
1
1
1
4

12
14
7
103
12

90
a
2
2
2

2
2
2
58
4

3
3
3
2
2

2
2
2
2
150
60

Tons
per

day

.3
.4
. 1
K 10
. 3

K 10
. 3
T
T
T

T
T
T
S 25
. 2

. 1
. 1
. 1

K 130
K 30

207.3

AUGUST

11.4
11.0
11.4
10.5
9.3

9.0
8.7
9.3
9.0
B.O

7.4
7.0
7.4
6.4
6.4

7.0
28.0
11.0
B.4
7.7

8.0
8.0
7.0
6.7
6.2

6.0
6.0
5.8
5.8
5.8
5.6

265.2

3
3
3
3
3

3
3
3
3
3

3
3
3
3
3

3

2
2
2

9
6
2
2
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. 1
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82.3

JUNE

Mean
dis-

charge
(cfs)

80.0
164
58.6
33.8
34.7

28.2
24.3
60.7
32.8
25.1

24.3
23.1
33.5
29.0
221

388
99.7
100
64.9
41.6

33.8
39.7
58.2
37.6
30.0

25.9
22.8
19.8
18.5
16.4

1870.0

Suspended sediment

Mean
concen-

tration

(ppm)

38
132
12
9
12

9
9
52
7
3

3
5
16
5
144

_

40
80
9
3

3
25
40
2
1

1
1
1
I
1
- "

~

Tons
per

day

S 11
B 90
1.9
. 8
1.1

t

.

S 16

.

t

.

1.

.

S 156

E 100UO
11
22
1.6
. 3

. 3
2.7
6.3
. 2
. 1

. 1
. 1
. 1
T
T

10326.1

SEPTEMBER

. 6
.4
.4
.4
. 2

. 2
.2
. 1
. 1
. 1

.9
. 9
. 9
. 9
. 9

. 9
. 9
. 7
. 7
.6

.9
. 6
. 6
. 6
.4

. 9
.4
, 7
11.5
12.9

163.5

3
3
3
3
3

3
2
2
2
2

2
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2
2
2

3
3
3
3
3

3
3
3
3
3

4
6
3
30
20

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S 1.4
. 7

3.3

Total discharge for period (cfs-days) .... 3454.0 Total load for period (tons) 10854.0

E Estimated.
S Computed by subdividing day.
T Less than 0.05 ton.
K Computed from estimated-concentration graph and subdividing day.

HAWAII AND OTHER PACIFIC AREAS

ISLAND OF OKINAWA Continued

16-8775. GENKA-KAWA NEAR GENKA, OKINAWA Continued

Suspended sediment, water year October 1964 to September 19,65

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..
28..
29..
30..
31..

Total

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

OClOBER

Mean
dis-

charge
(cfs)

5.
4.
4.
4.
4.

4.
4.
49.
21.
8.

6.
6.
10.
12.
6.

Suspended sediment

Mean
concen-

(ppm)

7
1

1

*

5.
5.
5.
5.

5.
5.
5.
5.

4.
4.
4.
4.
4.
4.

233.8

per

day

T
T
T
T
T

T
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S 19
. 7
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S .8
. 3
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T
T

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T
T
T
T
T

21.4

JANU RY !

4.6
4.4
29.6
55.8
12.6

11.0
10.5
10.0
8.0
7.7

7.0
6.7
6.7
6.2
6.0

6.2
6.0
6.0
6.0
5.8

4.9
4.9
4.7
4.7
4.7

4.6
4.6
4.4
4.4
5.6
4.3

268.6

6
8

T
T
K 10
K. 30
.2

. 1
. 1
. 1
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T

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T

T
T
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T
T

T
T
T
T
T

T
T
T
T
T
T

41.0

NOVEMBER

Mean
dis-

charge
(cfs)

4.9
5.8
4.7
4.7
21.5

4.6
4.2
4.0
4.0
4.2

3.9
3.6
3.5
3.4
3.4

3.4
3.4
3.4
3.4
3.4

3.4
3.4
3.4
3.4
3.3

3.3
3.3
3.3
3.9
4.4

132.5

Suspended sediment

Mean

tration

(ppm)

5

-

per

day

0.1
. 1
T
T
S 8.8

T
T
T
T
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T

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T

T
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T
T
T

T
T
T
T
T

9.4

FEBRUARY

4.4
4.3
3.6
3.6
4.3

5.6
3.9
3.4
3.4
5.6

4.4
3.9
3.4
3.2
3.2

3.4
3.9
3.6
3.6
246

43.2
19.8
19.8
14.8
11.0

8.7
8.4
8.4

- -

454.8

318

-

T i T |

T
T
T

. 1
T
T
T
. 1

T
T
T
T
T

T
T
T
T
S 9150

.8
.2
.4
.2
. I

T
T
T

9152.3

DECEMBER

Mean
dis-

charge
(cfs)

3.6
3.6
3.9
4.4
3.5

3.4
3.4
14.8
7.2
13.7

8.0
5.2
4.4
4.7
4.3

26.7
106
30.3
12.9
9.0

8.0
7.0
7.4
6.7
6.0

6.2
6.0
5.8
4.9
4.9
6.0

341.9

Suspended sediment

Mean
"aST

(ppm)

2
2
2
2
2

2
2
80
15
20

5
3
2
2
2

90
200
10
4
3

2
2
3
1
1

1
1
1
1
1
1

"

Tons
per

day

K. 10
.3
. 7

. 1
T
T
T
T

K 40
K. 90
.8
. 1
. 1

T
T
. 1
T
T

T
T
T
T
T
T

142.7

MARCH

8.0
8.0
6.7
6.7
6.4

8.0
12.9
8.4
8.0
5.2

. 1
.9
.9
. 3
'

1 .6
. 3
.8
.8
.4

2
2
2
2
2

3
5
2
2
1

1
1
1
1
2

5
2
2
2
2

.4 | 2
.4
.4
1 .8
. 0

.4
.9
.8
.9
20.2
8.7

215.8

3
3
12
5

5
4
4
4
12
3

"

T
T
T
T
T

. 1
.2
T
T
T

T
T
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T
T

. 1
T
T
T
T

T
. 1
. 1
. 5
. 1

. 1
. 1
T
. 1
. 7
. 1

2.B

E Estimated.
S Computed by sbudividing day.
T Less than 0.05 ton.

K Computed from estimated-concentration graph and subdividing day.

QUALITY OF SURFACE WATERS, 1965

ISLAND OF OKINAWA Continued

16-8775. GENKA-KAWA NEAR GENKA, OKINAWA Continued

Suspended sediment, water year October 1964 to September 1965 Continued

I APRIL

| Suspended sediment

Day

Mean
dis- Mean .^
charge concen-
(cfs) tratl°"

(ppm)

1.. | 6.7 2
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..
28..
29..
30..
31..

Total

1..
7..
3..
4..
5..

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

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

16..
17..
18..
19..
70..

21..
??..
73..
24..
25..

76..
27..
78..
79..
30..
31..

Total

6.7 2
12.9 4
14.8 4
12.9 3

8.7
6.7
6.7
6.4
15.7

11.0
8.0
27.2
12.9
8.4

7.7
7.4
21.7
1'.3
9.7

9.0
8.0
6.7
6.7
6.0

6.0
6.7
5.1
8.2
8.0

296.4

3
2
2
2
17

4
3
258
7
4

4
3
46
8
4

3
2
2
2
2

3
3
2
10
4

per

day

T
T
. 1
. 2
. 1

. 1
T
T
T
S .9

. 1
. 1
S 50
. 2
. 1

. 1
. 1
S 4.5
. 3
. 1

. 1
T
T
T
T

T
. 1
T
. 2
. 1

JULY

27
7?
72
70
18

17
16
16
1*
1*

12
12
1?
11
11

11
11
11
10
10

9.3
9.0
8.7
8.7
9.0

8.4
8.7
8.0

4
4
3
3
3

3
3
3
2
2

2
2
2
2
2

2
2
2

0.3
.3
.2
.2
. 1

. 1
. 1
. 1
. 1
. 1

. 1
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2 .1
2 .1

2
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2
2
3

3
3
2
10 4

. 1
7
7
7
. 1

. 1
. 1
7
. 1
8.0 3 .1
7.7

395.5

2 , T

3.4

MAY

Mean
dis-

charge
(cfs)

Suspended sediment

Mean

tration

(ppm)

5.1 3
9.4
42.5
8.7
6.7

6.7
10.5
8.0
40.6
32.5

24.7
12.9
8.4
5.9
14.3

61.0
39.0
33.0
34.0
29.2

106
283
164
88.5
53.2

41.0
33.0
27.4
24.7
22.0
20.6

12
794
5
3

5
5
5
745
247

40
6
3
12
14

612
13
7
7
8

714
2770
667
35
17

11
7
5
5
5
4

Tons
per

day

T
. 3
S 304
. 1
. 1

. 1
. 1
. 1
S 272
S 47

2.7
.2
. 1
. 2
. 5

S 317
1.4
. 6
. 6
. 6

S 608
S 11000
S 803
8.4
2.4

1.2
. 6
.4
. 3
. 3
. 2

AUGUST

7.4
7.4
8.7
42
705

41
30
23
19
16

14
12
12
11
11

10
10
11
10
9.0

8.4
7.8
7.8
7.
7.

7.
6.
6.
12
7.
7.

1095.4

2
2
3
207
2700

14
11
4
2
1

1
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t
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2
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8
2
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. 1
S 137
K 13000

1.$
. 9
. 2
. 1
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T
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T
T
T

JUNE

Mean
dis-

charge
(cfs)

22.9
34.9
50.0
31.1
71.2

92.0
49.8
40.0

Suspended sediment

Mean

tration

(ppm)

18
188
104
50
160

385
11
8
32.0 4
28.3

25.6
30.5
33.0
26.5
155

64.6
44.3
37.0
32.0
72.0

302
73.4
62.2
54.0
44.3

40.0
40.3
54.7
37.0
32.0

1712.6

3

2
8
8
3
997

45
20
12
8
546

1660
40
54
40
8

5
10
40
6
4

Tons
per

day

1.1
S 59
S 31
4.2
31

S 128
1.5
.9
. 3
. 2

. 1
. 7
. 7
. 2
S 1590

7.8
2.4
1.2
. 7
S 294

S 3820
7.9
S 12
5.8
1.0

. 5
1.1
5.9
. 6
. 3

6010.1

SEPTEMBER

6.7
. 2
.2
.7
. 7

. 7

2
2
1
1
1

1
7 ! 1
. 2
.2
.7

,2
. 2
.4

1
.8

T 1 .0
. 1 .3

. 1 l| .7
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13141.2

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209.1

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12
11
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4
3
3

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0.2
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15 IS 2.2
3 .1
3
2
_2

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y
T__

3.9

Total discharge for year (cfs-days) 6652.9
Total load for year (tons) .... 41958.6 S Computed by
T Less than 0.
K Computed fro

bdividing day.
ton.

estimated-concentration graph md subdividing day.

ISLAND OF OKINAWA Continued

16-8775. GENKA-KAWA NEAR GENKA, OKINAWA Continued

Particle-size analyses of suspended sediment, water year October 1964 to September 1965 (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

May 22. ....

Time

(24 hour)

1260
1530

Water
tem-
per-
ature

(°F)

70
69

Sam-

pling
point

Discharge
(cfs)

1260
425

Sediment

concen-

tration

(ppm)

3250
1050

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002

17

0.004

23

0.008

29

0.016

39

0.031

45

0.062

51
56

0.125

68
65

0.250

82
77

0.500

90
92

1.000

98
96

2.000

100
100

Method
of
analysis

VPWC
V

Particle-size analyses of bed material, water year October 1964 to September 1965 (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

May 24. 1965... ....

Time

(24 hour)

1430

Water
tem-
per-
ature

(°F)

Sam-

pling
point

6

Discharge
(cfs)

85

Sediment
concen-

tration

(ppm)

Sediment

discharge
(tons per day)

Bed material

Percent finer than size indicated, in millimeters

0.062 0.125

1

0.250

2

0.500

4

1.000

9

2.000

17

4.000

29

8.000

50

L6.000

73

32.000

94

64 . 000

100

Method
of
analysis

S

ISLAND OF OKINAWA Continued

40-8842. FUKUJI-GAWA AT FUKUJ1, OKINAWA

LOCATION. At gaging station at Fukuji, 0.9 mile north of Kawata, and 1.3 miles northeast of Taira.
DRAINAGE AREA. 12 square miles, approximately.
RECORDS AVAILABLE. Water temperatures: Hay 1964 to September 1965.
Sediment records: Hay 1964 to September 1965.
EXTREMES, Hay 1964 to June 1965. Water temperatures: Haximum, 83°F July 13-16, 1964; minimum, 51°F Jan. 16, 1965. Sediment concentrations: Haximum daily, 4,500 ppm June 23, 1965; minimum daily, 1 ppm on many days.
Sediment loads: Haximum daily, 23,000 tons June 21, 1965; minimum daily, less than 0.05 ton on many days. Temperature (°F) of water, May to June 1964

May 1964.....
June ....

August. ......
September. . . .

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

January. 1965.
February. ....
March. ....

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

September.. . .

1

70

80

/9

76

60
58
58

61
65
63

80

2

70

79
IB

58
58
60

63
68
70

80

3

80
80

59
54
61

61
67
70

80

4

76
80

59
55
61

61

72

81

5

78

81)

59
56
60

62

71

81

6

80
79

58
57
59

62

69

81

7

80
80

59
55
59

60

81

8

81
80

59
57
60

64

79

9

82
81

54
61

}/

65

80

10

80
80

54
62
5 /

66

79

11

81
/9

54
61
57

63

78

12

82
80

53
59
59

63

77

13

82
81

53
58
bl

66

78

14

80
«0

52
58
56

62

77

15

79
81

52
57
55

63

78

Day

16

80
81

51
57
58

63

77

17

80
81

52
6U
55

65

76

18

77
81

52
61
56

68

75

19

78
81

57
60
58

65

75

20

79
80

57
63
60

68

75

21

79
80

57
62
59

67

75

22

77

?y

56
64
62

65

77

23

76
80

56
61
62

68

78

24

76
79

58
59
65

70

78

25

76
79

60

58
58
62

71

78

26

76
79

60

57
58
62

71

75

27

78

76
78

62

58
57
60

72
70

7*

28

78

76
IH

61

57
57
60

68
68

73

29

79

75
77

60

57

61

75

f,9

73

30

80

75
76

70

61

6U

61

68
68
75

72

31

70

76

71

62

57

62

68

Aver-
age

72
72

78
80

75

61

56
59
59

66
68
73

77

Particle-size analyses of bed material, water year October 1964 to September 1965

(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)

1100

Water
tem-

per-
ature

(°F)

70

Sam-

pling
point

6

Discharge
(cfs)

100

Sediment
concen-

tration

(ppm)

Sediment

discharge
(tons per day)

Bed material

Percent finer than size indicated, in millimeters

0.062 0.125 0.250

2

0.500

6

1.000

11

2.000

21

4.000

45

8.000

58

L6.00C

78

32.000

96

64.000

100

Method
of

analysis

S

HAWAII AND OTHER PACIFIC AREAS

ISLAND OF OKINAWA Continued

16-8842. FUKUJI-GAWA AT FUKUJI, OKINAWA Continued

Suspended sediment, May to September 1964

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..
28..
29..
30..
31..

Total

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

42.1
40.3
39.5
35.8
34.6

33.5
31.2
31.2
30.0
29.0

29.0
27.0
26.0
25.0
24.1

24.1
24.1
23.3
21.6
44.0

25.0
21.6
26.5
22.5
24.1

23.7
337
42.1
26.0
22.5
21.6

1208.0

Suspended sediment

Mean
concen-

tration

(ppm)

JULY

13

Tons
per

day

0.2
. 2
.2
.2
. 1

. 1
. 1
. 1
. 1
. 1

. 1
. 1
. 1
. 1
. 1

. 1
. 1
. 1
. 1
S 1.6

. 1
. 1
. 1
. 1
. 1

. 1
S 214
. 6
. 1
. 1
. 1

219.4

MAY

Mean
dis-

charge
(cfs)

7.7
7.0
7.4
7.4
7.7

16.9
364
72.8
456
64.8

40.
41.
27.
21.
18.

16.
15.
14.
95.
65.

37.
27.
23.
21.
28.

22.
18.
19.
19.
885
414

2884.9

20.0
20.0
221
110
37.0

30.
27.
25.
23.
22.

21.
22.
25.
21.
20.8

21.0
371
73.8
34.6
29.0

187
97.8
208
61.2
45.0

37.0
32.2
30.0
27.0
26.0
24.1

1952.4

Suspended sediment

Mean
concen-

tration

(ppm)

2
2
3
3
3

23
185
40
181
6

4
4
2
2
2

1
1
1
54
3

3
3
2
2
2

2
2
2
2
210
130

Tons
per

day

T
T
. 1
. 1
. 1

1.0
S 603
S 8
S 707
1.0

.4
.4
. 1
. 1
. 1

T
T
T
S 19
. 5

.3
. 2
. 1
. 1
.2

. 1
. 1
. 1
. 1
K 1200
K 310

2852.4

AUGUST

2
2
750
110
6

3
2
2
2
1

1
1
1
1
1

3
891
11
3
3

51
36
42
4
2

2
2
2
2
2
1

-

0.1
. 1
K 2700
S 53
.6

.2
. 1
. 1
. 1
. 1

. 1
. 1
. 1
. 1
. 1

. 2
S 2380
S 2.2
. 3
.2

S 68
S 27
K 47
. 7
. 2

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

5281.6

JUNE

Mean
dis-

charge
(cfs)

256
509
153
88.1
79.4

75.4
56.3
283
95.4
65.9

61.1
61.1
80.9
85.2
940

1650
356
407
264
155

120
144
192
104
86.5

73.2
67.5
62.7
56.3
53.1

6681.1

Suspended sediment

Mean
concen-

tration

(ppm)

20
230
5
3
5

3
3
100
5
3

3
3
8
6
1400

715
40
99
20
10

10
30
33
6
3

3
2
2
2
2

Tons
per

day

14 ~~
K. 780
2.

.

1.

.
.

K 190
1.

.
.

1.
1.
K 10000

S 9810
S 40
S 183
14
4.2

3.2
K 20
S 24
1.7
. 7

. 6
.4
. 3
. 3
. 3

21097.6

SEPTEMBER

25.0
22.5
21.6
20.8
20.0

18.5
18.5
17.8
17.1
33.3

24.3
17.8
17.1
15.8
15.8

15.2
15.2
14.5
14.5
13.4

13.4
12.8
12.8
12.8
12.2

15.8
24.7
16.4
117
42.6

659.2

3
6
4
133
60

0.1
. 1
. 1
. 1
. 1

T
T
T
T
S .8

. 3
. 1
. 1
. 1
. 1

. 1
. 1
. 1
T
T

. 1
.4
. 2
S 56
6.9

66.3

Total discharge for period (cfs-days) 13385.6
Total load for period (tons) 29517.3
mputed by subdividing day.
T Less than 0.05 ton.

K Computed from estimated :entration graph and subdividing day.

389-675 O - 70 - 30

QUALITY OF SURFACE WATERS, 1965

ISLAND OF OKINAWA Continued

16-8842. FUKUJI-GAWA AT FUKUJI, OKINAWA Continued

Suspended sediment, water year October 1964 to September 1965

Day

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

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

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

16..
17..
IB..
19..
20..

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

26..
27..
28..
29..
30..
31..

Total

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

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

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

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

OCTOBER

Mean
dis-

charge
(cfs)

18.1
15.2
13.4
14.5
13.4

13.9
19.3
74.3
46.0
19.3

15.8
15.2
102
64.8
23.3

25.0
18.5
17.1
15.8
15.2

14.5
14.5
14.5
14.5
13.9

12.8
12.8
12.8
12.2
12.2
12.2

707.0

Suspended sediment

Mean

tration

(ppm)

15
3
3
3
3

5
9
65
20
7

2
2
86
50
6

6
3
3
3
3

3
3
3
2
2

2
2
2
2
2
2

~

Tons
per

day

0.

.
.
.

t

.

S 19
2.

.
.

S 74
8.

.

.

,

.
.
.
.

,

.

,

.
.

108.9

JANUARY

11.7
10.6
93.7
212
30.3

23.3
22.5
23.3
18.5
17.1

15.8
15.2
14.5
13.9
12.8

12.8
12.8
12.2
12.2
12.2

21.. 11.7
22.. 11.2
23.. 11.2
24.. 11.2
25.. 11.2

26.. 11.2
27.. 10.6
28.. 10.6
29..
30..
31..

Total

11.2
11.7
10.6

719.8

1
1
30
40
3

2
2
2
2
2

2
2
2
2
1

1
1
1
1
1

1
1
1
1
1

1
1
1

T
r
S 17
S 47
.2

.
.
.
.

a

.
.

,

T

1
1
1

- 65.7

NOVEMBER

Mean
dis-

charge
(cfs)

12.2
11.7
11.2
11.7
51.5

13.9
11.7
11.2
11.2
10.6

10.2
9.7
9.2
9.2
9.2

9.2
9.2
9.2
9.7
9i2

9.2
9.2
9.2
9.2
8.8

8.8
8.3
8.3
9.7
15.2

346.8

Suspended sediment

Mean

tration

(ppm)

6

8

Tons
per

day

T
T
T
T
S 9.2

.2
. 1
. 1
. 1
. 1

. 1
. 1

. 1
.3

10.9

FEBRUARY

10.6
10.6
10.2
10.2
10.6

11.7
10.6
9.7
9.7
12.2

12.2
9.7
9.2
9.2
9.2

9.2
10.5
10.2
9.7
471

73.5
26.8
21.6
9.8
6.3

4.8
5.5
6.3

- -

~

870.8

120

2

~

~

K 6100

S 5.4
. 1
. 1
. 1
T

T
T
T

~

6106.4

DECEMBER

Mean
dis-

charge
(cfs)

9.7
9.2
9.7
12.2
9.2

8.8
8.8
13.4
16.1
26.8

52.1
16.4
11.2
10.2
9.2

101
326
60.6
23.3
17.8

15.2
13.9
13.9
12.2
11.7

13.9
22.5
14.5
12.2
11.7
13.9

907.3

Suspended sediment

Mean

tration

(ppm)

1
1
1
2
1

1
1
10
4
12

35
3
2
1
1

270

Ton,
per

day

T
T
T
. 1
T

T
T
.4
. 2
. 9

4.9
. 1
. 1
T
T

K. 780

720 |K. 780
10
2
1

1
1
1
1
1

1
2
1
1
1
1

1.6
. 1
T

T
T
T
T
T

T
. 1
T
T
T
T

1569.1

MARCH

14.0
15.5
14.0
13.3
12.1

15.0
33.1
18.8
16.3
14.0

12.7
12.7
12.7
12.1
11.5

14.0
11.5
10.9
10.9
10.4

10.4
14.7
18.8
15.5
15.5

13.3
12.1
10.9
10.9
32.6
17.9

458.1

10
2

~

T
T
T
T
T

. 1
.4
. 1
T
T

T
T
T
T
T

T
T
T
T
T

T
. 1
. 1
. 1
. 1

T
T
T
T
.9
. 1

2.7

S Computed by subdividing day
T Less than 0.05 ton.

K Computed from estimated-concentrati graph and subdividing day.

HAWAII AND OTHER PACIFIC AREAS

ISLAND OF OKINAWA Continued

16-8842. FUKUJI-GAWA AT FUKUJI, OKINAWA Continued

Suspended sediment, wate October 1964 to September 1965 Continued

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..
28..
29..
30..
31..

Total

APRIL

Mean
dis-

charge
(cfs)

15.5
14.8
42.0
74.3
37.3

22.5
17.9
17.2
16.3
26.9

22.5
17.2
79.7
38.6
22.5

19.8
17.9
72.5
52.1
28.0

24.5
21.6
21.6
20.7
19.8

20.7
22.5
17.9
32.3
37.8

894.9

Suspended sediment

Mean

tration

(ppm)

2
2
5
12
2

!
1

Tons
per

day

0.1
. 1
. 6
2.4
.2

. 1
T

1 , T
1
5

3
2
62
20
2

2
1
50
8
2

2
1

}1
1

2
2
1
10
5

T
.4

.2
. 1
S 25
2.1
. 1

. 1
T
S 15
1.1
.2

. 1
. 1
. 1
. 1
. 1

. 1
. 1
T
'

. 5

50.1

JULY

1.. 76
2.. 68
3..

4.. 5..

6..
7«.
8..
'

10..

11*.
12..
13..
14..
19..

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

21..
?2.«
2?..
24..
25..

26..
77..
?B..
?<>..

62
58
5*

51
44
44
41

to

37
35
34
32
32

31
30
?7
77
26

24
72
?1
?0
70

18
18
17
16
30.. 1 16

31.. | 16

Total 1 1060

3
3
3
3
3

3
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2
2
2
2

2
2

0.6
. 6
. 5
. 5
.4

.4
.2
. 2
. 2
. 2

.2
.2
.2
.2
. 2

.2
.2
. 1
. 1
. 1

. 1
. 1
. 1
. 1
. 1

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

. 1
. 1

6.6

MAY

Mean
dis-

charge
(cfs)

22.5
32.2
184
36.5
28.0

27.8
43.9
32.5
92.9
215

132
67.2
53.8
48.5
85.3

345
102
77.2
94.8
75.9

583
911
566
272
133

132
102
77.2
69.2
59.4
53.8

4755.6

Suspended sediment

Mean
concen-

(ppm)

2
5
146
3
2

2
15
10
20
92

11

per

day

0.1
.4
S 210
.3
.2

.2
1.8
.9
5.0
S 140

3.9
4 i .7
4 .6
4
6

924
8
2
4
2

443
1500
174
20
3

15
8
2
2
1
1

. 5
1.4

S 1740
2.2
.4
1.0
.4

S 2010
S 5580
S 837
15
1.1

5.3
2.2
.4
.4
.2
. 1

10561.7

AUGUST

16
15
17
51
3670

136
99
87
45
36

32
31
29
28
27

25
28
40
37
26

23
22
21
20
19

21
19
18
18
17
17

4690

2
2
2
92
3600

19
13
13
4
3

0.1
. 1
. 1
S 141

K 64000 j

S 8.3
S 3«7
S 3.1
.5
. 3

. 3
.2
.2
.2
. 1

. 1
. 3
.9
6
.2

.2
.2
. 2
. 1
. 1

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

64162.0

JUNE

Mean
dis-

charge
(cfs)

67.2
134
279
93.0
210

298
138
99.6
82.0
72.4

6B.6
90.6

Suspended sediment

Mean
concen-

tration

(ppm)

1
38
61
6
33

45
6
2
2
2

2
7
94.4 ; 6
64.7
363

237
93.0
76.2
68.6
B8.3

1290
176
718
198
127

109
108
298
103
B4.2
~

5928.8

2
1220

20
8
5

Tons
per

day

0.2
S 43
S 88
1.5
S 17

S 39
2.2
. 5
.4
.4

. 4
1.7
1.5
. 3
S 3420

13
2.0
1.0
2 .4
15

3700
20
4500
40
15

12
15
790
7
3
~

3.6

K. 23000
9.5
K. 17000
21
5.1

3.i
4.4
S 1880
1.9
. 7

45562.2

SEPTEMBER

17
18
16
16
15

14
14
14
14
14

13
12
12
37
21

22

3
6
4
3
3

3
3
2
2
2

2
2
3
7
3

2
24 4
14
12
12

12
11
13
14
110

289
108
30
22
19

959

2
2
1

1
1
3
1
182

238
59
6
3
3

0.1
. 3
.2
. 1
. 1

. 1
. 1
1
. 1
. 1

. 1
. 1
. 1
S .8
.2

. 1
. 3
. 1
. 1
T

T
T
. 1
T
S 90

S 343
S 33
.5
.2
.2

470.3

Total discharge for year (cfs-days) 22298. 1
Total load for year (tons) .... 128676.6 S Computed by subdividing day.
T Less than 0.05 ton.
K Computed from estimated-concentratlon graph and subdividing day.

MISCELLANEOUS ANALYSES OF STREAKS IN OKINAWA

Periodic determinations of suspended-sediment discharge and particle size, May 1964 to September 1965 (Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water;

Date of collection

Time

(24 hour)

Water
tem-

per-
ature

(°F)

Sam-

pling
point

Discharge
(cfs)

Sediment
concen-

tration

(ppm)

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004 0.008 0.016 |o. 031 |o .062 |o .125 0.250 0.500J1.000 2.000

Method
of

analysis

16-8752. BENOKI-GAWA AT BENOKI

Aug. 26............

1405
1310

77
77

11.9
15.2

4
4

. 1
. 1

16-8762. TAKAZATO-GAWA NEAR HAMA

May 13, 1964. ......

Aug. 28............

June 29, J964. .....

Dec. 17. ....

1105
1415
1200
1000

1130
1140
1200
1140

1150
1200
1120
1515

66
79
76
72

4.8
4.3
4.3
4.3

1
1
7
2

T
T
. 1
T

16-8770. RIGHT BRANCH OF SOUTH FORK HENAN-GAWA NEAR TSUHA

76
79
79
79

76
76
66
66

3.4
1.4
25
1.1

28
31
15
24

1
1
119
1

222
179
28
49

T
T
8.0
T

17
15
1.1
3.2

16-8782. HANECHT-OKAWA AT KAWAKAMI

June 6. ....
June IT ....

1235

1330

1540

1100

85

65
64

73

76

6.1

35

85

42

3

164

29

T

420

21

38

3.3

53

_

_

_

_

_

_

92

_

_
_

_

_

97

_

_

_
_ _

96

_

100

_
_

_

- -

_
__

98

_
_

_

_

_

_

_

100

_
_

_
_

T Less than 0.05 ton.

16-8785. OI-KAWA AT JINGUSUKU

June 21. ....

June 6. ....

1300
1400
1110
1040

1200
1040
1200
1300
1330
1430

1340
1425
1550

75
76
77
77

82
74
74
74
74
74

9.1
7.4
1.8
1.9

. 6
. 3
150
140
130
150

70
70
70

1050
930
310

11
10
3
74

45
68
685
420
380
1700

16-8809.

780
650
340

. 3
.2
T
.4

. 1
. 1
280
160
130
690

MACHINATO-GAWA

1600
280

NEAR OJANA

16-8820. TENGAN-GAWA AT YAMASHIRO

Sept. 7. ....

1055
1530
1235
1520

1050

1425

1500

1345

67
76
76
76

84

86

87

87

4.2
3.3
12.4
2.0

1.5
1.8
1.4
2.1

1.3
1.1

. 8

10
12
19
8

4
27
48
17

10
31
6

6

0.1
. 1
. 6
T

T
. 1
. 2
. 1

T
. 1
T
T
T

T Less than 0.05 ton.

MISCELLANEOUS ANALYSES OF STREAMS IN OKINAWA Continued

Periodic determinations of suspended-sediment discharge and particle size, May 1954 to September 1965 Co (Methods ot 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

Time

(24 hour)

Water
tem-

per-
ature

(°F)

Sam-

pling
point

Discharge
(cfs)

Sediment
concen-

tration

(ppm)

Sediment

discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 JO. 004 JO. 008 b.016 JO. 031 0.062 B.125 b.250 0.500 1.000 2.000

Method
of

analysis

16-8828. KANNA-GAWA NEAR KANNA

1350
1400
1435
1435
1320

1340
1315
1340
1330
1330

1355
1330
1330
1410
1300
1430

67
76
77
78
78

83
81
84
82
82

85
81
80
82
83
81

5.4
2.8
9.5
4.5
2.9

2.2
3.9
2.0
3.2
2.3

2.0
1.7
1.4
1.3
1.4
26

5
52
4
4
2

1
17
8
8
5

5
5
5
4
13
A20

0.1

.4
.1
T
T

T
.2
T
. 1
T

T
T
T
T
T
1.4

16-8830. UFU-KA1W NEAR GINOZA

Aug. 7, 1965.......

June 26. ....

1305] 82 42 A121 14

16-8833. LEFT FORK 0-KAWA NEAR KUSHI

1020
1030
1250
1025
1025

1030
1045
1005
1000
1005

1000
0955
1015
0940
1020

65
75
74
75
74

77
77
77
76
79

77
70
71
77
77

.8
. 7
4.0
1.4
.8

.6
.6
.4
.8
.6

.5
.4
.4
. 3
. 3

2
2
3
2
2

2
2
2
2
2

4
2
2
2
4

T
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T
T

T
T
T
T
T

T
T
T
T
T

T Less than 0.05 ton.
A Mean concentration.

16-8841. FUKUJI-GAWA NEAR YUBARU

Sept . 11 ....

1255
1305
1225
1055
1125
1120

1405
1600
1335
1330
1115
1235

1055
1420
0200
0210

1050

2320
1650
1700
0830
0945
1000
1010

2330
2400
0330
0430
0805
1110

75
84
84
82
79
79

67
69
69
71
78
87

76
58

69

21.0
12.5
10.5
9.2
26.8
10.6

45.0
140
190
230
38.8
26.4

34.1
17
500
1440
2860
123

500
1440
2860
500
1440
2860
4700

495
1440
2860
4700
495
1440

4
3
1
1
4
4

. 2
. 1
T
T
. 3
. 1

16-8846. AHA-GAWA AT AHA

2
3
31
10
2
2

3
4
630
560
370
3

440
430
730
960
920
2200
2500

A1815
A3100
A2860
A2680
A469
A 832

0.2
1.1
16
6.2
. 2
. 1

. 3
. 2
850
2180
2750
1.0

590
1670
5640
1300
3570
17000
33800

2430
12100
22100
34000
627
3230

T Less than 0.05 ton.
A Mean concentration.

MISCELLANEOUS ANALYSES OF STREAMS IN OKINAWA Continued

Periodic determinations of suspended-sediment discharge and particle size, May 1964 to September 1965 Continued (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)

Water
tem-
per-
ature

(°F)

Sam-

pling
point

Discharge
(cfs)

Sediment
concen-

tration

(ppm)

Sediment
discharge
(tons per day)

Suspended sediment

Percent finer than size indicated, in millimeters

0.002 0.004|o.008 0.016 0.031 0.062 0.125 0.25o|o.500 1.000
16-8848. FUN-GAWA NEAR AHA

Jan. 7, 1965. ......

1540
1605
1310
1120
1015
1410
1330

"

13.6
10.1
44.9
14.7
8.1
9.7
14.8

3
3
7
3
3
4
16

0.

'.6

2.000

Method
of
analysis

T Less than 0.05 ton.

Particle-size of bed material, May 1964 to September 1965

(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)

Water
tem-

per-
ature

Sam-

pling
point

Discharge
(cfs)

Sediment
concen-

tration

(ppm)

Sediment
discharge
(tons per day)

Bed material

Percent finer than size indicated, in millimeters

0.062 0.125 0.250 0.500

16-8782. HANECHI-OKAWA AT KAWAKAMI

May 24, 1965. ...... 1600 Yd 6 90 1 2 7

1.000 2.000 4.000 8.000

18 35 59 70

L6.00ob2.000

96 100

54 . 000

Method
of
analysis

S

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271
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3-6
21

96-100
95

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269
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82
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96-100
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U. S. GOVERNMENT PRINTING OFFICE : 1970 O - 389-675