Quality of Surface Waters of the United States 1964

Parts 5 and 6. Hudson Bay and Upper Mississippi River Basins, and Missouri River Basin

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1956

Prepared in cooperation with the States of Colorado, Illinois, Iowa, Kansas, Missouri, Minnesota, Montana, Nebraska, South Dakota, Wisconsin, and Wyoming, and with other agencies

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PREFACE

This report was prepared by the Geological Survey in cooperation with the States of Colorado, Illinois, Iowa, Kansas, Missouri, Minnesota, Montana, Nebraska, South Dakota, Wisconsin, and Wyoming, 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 S. M. Lang, chief, Reports Section, and B. A. Anderson, chief, Data Reports Unit.

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[*Symbols after station name designate type of data: c, chemical; t, water temperature; s, sediment*]

MISSOURI RIVER BASIN--Continued

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1964

PARTS 5 and 6

INTRODUCTION

The quality-of-water investigations of the United States Geological Survey are concerned with chemical and physical characteristics 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 suspended solids in some streams may change materially with relatively 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 chemical 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 Geological 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, 1963 to September 30, 1964. The records are

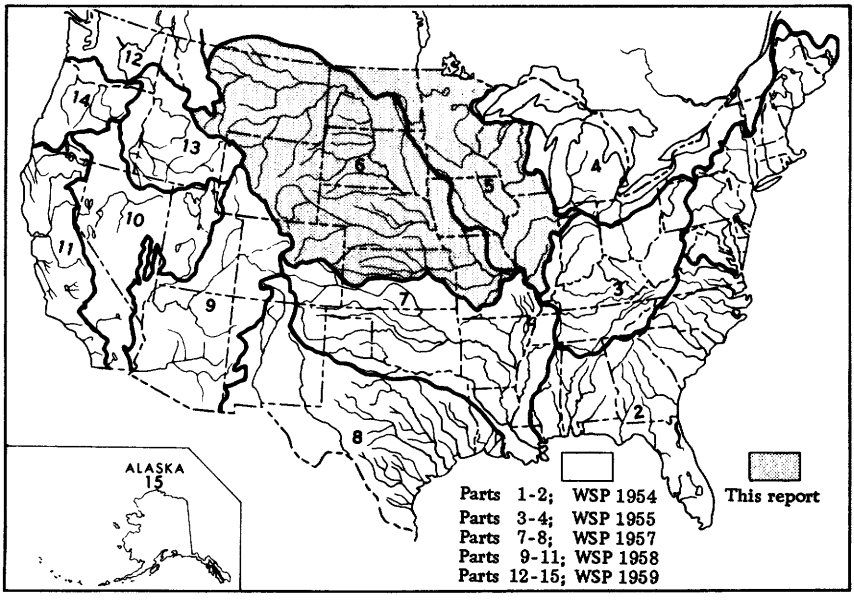

Figure 1.--Map of the United States showing basins covered by the six water-supply papers on quality of surface waters in 1964. The shaded part represents the section of the country covered by this volume; the unshaded part represents the section of the country covered by other water-supply papers.

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 identification 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 number to the right of the hyphen represents the location of the station in the standard downstream order within each of the 15 parts (Fig. 1). The assigned numbers are in numerical order but are

not consecutive. They are so selected from the complete 6-digit-number scale that intervening numbers will be available for future assignments to new locations. The identification number for each station in this report is printed to the left of the station name and contains only the essential digits. For example, the number is printed as 4-100 for a station whose complete identification number is 04-0100.00.

Descriptive statements are given for each sampling station where chemical analyses, temperature measurements, or sediment determinations have been made. These statements include location of the station, drainage area, periods of records available, extremes of dissolved solids, hardness, specific conductance, temperature, sediment loads, and other pertinent data. Records of discharge of the streams at or near the sampling station are included in most tables of analyses.

During the water year ending September 30, 1964, the Geological Survey maintained 166 stations on 114 streams for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 122 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 16 and daily at 55 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 28.

Quantities of suspended sediment are reported for 68 stations during the year ending September 30, 1964. 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 39 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

locations in the stream-cross section may vary widely with different 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 especially 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 section concentration of solutes determined from samples is a precise measure of the total solute load. The mean section concentration 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 greatest and because a significant part of the coarser particles in many streams move in essentially continuous contact with the bed and are not represented in the suspended sediment sample. Hence, the computed sediment loads presented in this report are usually less than the total sediment loads. For most streams the 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 applicable 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 indicated by measurements of conductivity of daily samples, supplemented by other information such as chloride content, river stage, weather conditions and other background information of the stream.

TEMPERATURE

Daily water temperatures were measured at most of the stations 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 temperature. The thermometers used for determining water temperature were accurate to plus or minus 0.5°F.

At stations where thermographs are located, the records consist 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 vertical in the cross section. A hand sampler was used at many stations during periods of low flow. Depth-integrated samples were collected periodically at three or more verticals in the cross section to determine the cross sectional distribution of the concentration of suspended sediment with respect to that at the daily sampling vertical. In streams where transverse distribution of sediment concentration ranges widely, samples were taken at two or more verticals to define more accurately the average concentration of the cross section. During periods of high or rapidly changing flow, samples were taken two or more times a day at most sampling stations.

Sediment concentrations were determined by filtration-evaporation method. At many stations the daily mean concentration for some days was obtained by plotting the velocity-weighted instantaneous concentrations on the gage-height chart. The plotted concentrations, adjusted if necessary, for cross-sectional distribution were connected or averaged by continuous curves to obtain a concentration graph. This graph represented the estimated 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 concentration. During extended periods of relatively uniform concentration and flow, samples for a number of days were composited to obtain average concentrations and average daily loads for each period.

For some periods when no samples were collected, daily loads of suspended sediment were estimated on the basis of water 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 suspended sediment for missing days in 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 included. 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).

EXPRESSION OF RESULTS

The quantities of solute concentrations analyzed in the laboratory 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 milligrams 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 constituent in a million unit weights of water. Chemical equivalence in equivalents per million can be obtained by (a) dividing the concentration in parts per million by the 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	Multiply by	Ion	Multiply by
Aluminum (Al^{+3})	0.11119	Iron (Fe^{+3})	0.05372
Barium (Ba^{+2})	.01456	Lead (Pb^{+2})	.00965
Bicarbonate (HCO_3^{-1})	.01639	Lithium (Li^{+1})	.14411
Bromide (Br^{-1})	.01251	Magnesium (Mg^{+2})	.08226
Calcium (Ca^{+2})	.04990	Manganese (Mn^{+2})	.03640
Carbonate (CO_3^{-2})	.03333	Nickel (Ni^{+2})	.03406
Chloride (Cl^{-1})	.02821	Nitrate (NO_3^{-1})	.01613
Chromium (Cr^{+6})	.11539	Nitrite (NO_2^{-1})	.02174
Cobalt (Co^{+2})	.03394	Phosphate (PO_4^{-3})	.03159
Copper (Cu^{+2})	.03148	Potassium (K^{+1})	.02557
Fluoride (F^{-1})	.05264	Sodium (Na^{+1})	.04350
Hydrogen (H^{+1})	.99209	Strontium (Sr^{+2})	.02283
Hydroxide (OH^{-1})	.05880	Sulfate (SO_4^{-2})	.02082
Iodide (I^{-1})	.00788	Zinc (Zn^{+2})	.03060

Results given in parts per million can be converted to grains per United States gallon by dividing by 17.12.

The hardness of water is conventionally expressed in all 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 conventional terms of a property of water. The actual presence of calcium carbonate in the concentration given is not to be assumed. The hardness caused by calcium and magnesium (and other cations if significant) equivalent to the carbonate and bicarbonate is called carbonate hardness; the hardness in excess of this quantity is called noncarbonate hardness. Hardness or alkalinity values 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°C for 1 hour. For some waters, particularly those containing moderately large quantities of soluble salts, the value reported is calculated from the quantities of the various determined constituents using the carbonate equivalent of the reported bicarbonate. The calculated sum of the constituents may be given instead of or in addition to the residue. In the analyses of most waters used for irrigation, the quantity of dissolved solids is given in tons per acre-foot as well as in parts per million.

Specific conductance is given for most analyses and was determined 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. Specific conductance in micromhos is 1 million times the reciprocal of specific resistance at 25°C. Specific resistance is the resistance 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 chloroplatinate ion. Hydrogen-ion concentration is expressed in terms of pH units. By definition the pH value of a solution is the negative logarithm of the concentration of gram ions of hydrogen.

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 missing days, the arithmetical and time-weighted averages are equivalent. 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 composition 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 concentrations of dissolved solids.

A program for computing these averages on an electronic digital computer was instituted in the 1962 water year. This program extended computations to include averages for pH values expressed in terms of hydrogen ion and averages for the concentration of individual constituents expressed in tons per day. Concentrations 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 recommendations 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 representative 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.

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, manganese, color, acidity, dissolved oxygen, and other dissolved constituents and physical properties are reported for certain streams. Phenolic material and minor elements including strontium, chromium, 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 (SiO_2)

Silica is dissolved from practically all rocks. Some natural surface waters contain less than 5 parts per million of silica and few contain more than 50 parts, but the more common range is from 10 to 30 parts per million. Silica affects the usefulness of a water because it contributes to the formation of boiler scale; it

usually is removed from feed water for high-pressure boilers. Silica also forms troublesome deposits on the blades of steam turbines.

Aluminum (Al)

Aluminum is usually present only in negligible quantities in natural waters except in areas where the waters have been in contact 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, manganese in rocks is less abundant than iron. As a result the concentration 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. Concentrations as low as 0.2 part per million may cause a dark-brown or black stain on fabrics and porcelain fixtures. Appreciable quantities of manganese are often found in waters containing objectionable quantities of iron.

Calcium (Ca)

Calcium is dissolved from almost all rocks and soils, but the highest concentrations are usually found in waters that have been in contact with limestone, dolomite, and gypsum. Calcium and magnesium make water hard and are largely responsible for the formation of boiler scale. Most waters associated with granite or silicious sands contain less than 10 parts per million of calcium;

waters in areas where rocks are composed of dolomite and limestone 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 surface 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 mineralized 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 potassium have little effect on the usefulness of the water for most purposes, but waters that carry more than 50 or 100 parts per million of the two may require careful operation of steam boilers to prevent foaming. More highly mineralized waters that contain a large proportion of sodium salts may be unsatisfactory for irrigation.

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

waters. Lithium also occurs in streams where some industries dump their waste water. The scarcity of lithium in rocks is responsible more than other factors for relatively small amounts present in water.

Bicarbonate, carbonate and hydroxide (HCO_3, CO_3, 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 reported 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 fluoride, 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 (SO_4)

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 contain 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-

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 fluoride in natural surface waters is ordinarily very small compared to that of chloride. Investigations have proved that fluoride concentrations of about 0.6 to 1.7 ppm reduced the incidence of dental caries and that concentrations greater than 1.7 ppm also protect 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 optimum 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 (NO_3)

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 NO_3) 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 NO_3) may contribute to methemoglobinemia ("blue babies") (Faucett 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 NO_3) may cause methemoglobinemia (Waring, 1949). A report published by the National Research Council, Maxcy (1950) concludes that a nitrate content in excess of 44 parts per million (as NO_3) should be regarded as unsafe for infant feeding. U.S. Public Health Service (1962) sets 45 ppm as the upper limit.

Phosphate (PO_4)

Phosphorus is an essential element in the growth of plants and animals. Some sources that contribute nitrate, such as organic

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 surface waters analyzed have harmful concentrations of boron.

Dissolved solids

The reported quantity of dissolved solids--the residue on evaporation--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 million 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).

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 bacteriological 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 compounds. 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 pathological effects of copper are controversial, but it is generally believed 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.

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 equivalent 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 solution. Presence of other ions may increase the solubility of lead.

Zinc (Zn)

Zinc is abundant in rocks and ores but is only a minor constituent in natural water because the free metal and 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 containing 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.

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 contain 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 recognized 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, possibility 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 proportions 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.

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 resistant, 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 in ppm)	Hardness description
0-60	Soft
61-120	Moderately hard
121-180	Hard
more than 180	Very hard

For public use, water with hardness above 200 parts per million generally requires softening treatment (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 hydrogen 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 expressing the relative activity of sodium ions in exchange reaction with

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

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

where the concentrations of the ions are expressed in milliequivalents 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 measure 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. Commonly, the amount of dissolved solids (in parts per million) is about 65 percent of the specific conductance (in micromhos). This relation is not constant from stream to stream or from well to well and it may even vary in the same source with changes in the composition of the water (Durfor and Becker, 1964 p. 27-29).

Specific conductance of most waters in the eastern United States is less than 1,000 micromhos, but in the arid western parts of the country, a specific conductance of more than 1,000 micromhos 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.

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 significant color in water may indicate the presence of organic material 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 required to oxidize unstable materials in water and may be correlated 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 required 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 compositions, 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 presence of oxygen and organic material, and their persistence downstream 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.

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 perhaps 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 fluctuation of temperature which is greater in warm seasons than in cold and greater in sunny periods than with a cloud cover. Natural 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 stream bed. 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 noncirculating lower portion. Separating the two is a stratum of water of variable vertical thickness in which the temperature

decreases rapidly with increasing depth. This physical division of the water mass into a circulating and a stagnant portion is the result of density differences in the water column associated with the temperature distribution. Knowledge of the stratification in a body of water may result in increased utility by locating strata of more suitable characteristics. For example, the elevation of an intake pipe may be changed to obtain water of lower temperature, higher pH, less dissolved iron, or other desirable properties.

Temperature is a major factor in determining the effect of pollution on aquatic organisms. The resistance of fish to certain toxin substances has been shown to vary widely with temperature. The quantity of dissolved oxygen which the water can contain is also temperature dependent. Oxygen is more soluble in cold water than in warm water, hence the reduction of oxygen concentrations by pollution is especially serious during periods of high temperature when oxygen levels are already low. Increased temperatures also accelerate biological activity including that of the oxygen-utilizing bacteria which decompose organic wastes. These pollutional effects may be especially serious when low flow conditions 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 reference 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 tolerated 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 related to the consumers acceptance of the water. A level of 5 units of turbidity becomes objectionable to a considerable number of people (U.S. Public Health, 1962).

Sediment

Fluvial sediment is generally regarded as that sediment which is transported by, suspended in, or deposited by water. Suspended

sediment is that part 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 contributed by a number of industrial and construction activities. In certain sections, waste materials from mining, logging, oil-field, and other industrial operations introduce large quantities of suspended as well as dissolved material.

The quantity of sediment, transported or available for transportation, is affected by climatic conditions, form or nature of precipitation, character of the solid mantle, plant cover, topography, and land use. The mode and rate of sediment erosion, transport, and deposition is determined largely by the size distribution 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 characteristics of the transporting flow. The flow characteristics include velocity of water, turbulence, and the depth, width, and roughness of the channel. As a result of these variable characteristics, the size of particles transported, as well as the total sediment load, is in constant adjustment with the characteristics and physical features of the stream and drainage area.

STREAMFLOW

Most of the records of stream discharge, used in conjunction with the chemical analyses and in the computation of sediment loads in this volume, are published in 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

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 5	WSP	Part 6	WSP
Volume 1	1913	Volume 1	1916
Volume 2	1914	Volume 2	1917
Volume 3	1915	Volume 3	1918
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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 5 and 6, 1941-64

Year	WSP	Year	WSP	Year	WSP	Year	WSP
1941	942	1947	1102	1953	1291	1959	1643
1942	950	1948	1132	1954	1351	1960	1743
1943	970	1949	1162	1955	1401	1961	1883
1944	1022	1950	1187	1956	1451	1962	1943
1945	1030	1951	1198	1957	1521	1963	1949
1946	1050	1952	1251	1958	1572	1964	1956

Geological Survey reports containing chemical quality, temperature, and sediment data obtained before 1941 are listed below. Publications dealing largely with the quality of groundwater 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 PAPERS

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

BULLETINS

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

WATER-SUPPLY PAPERS

*108. Quality of water in the Susquehanna River drainage basin, with an introductory chapter on physiographic features. 1904.
*161. Quality of water in the upper Ohio River basin and at Erie, Pa., 1906.
*193. The quality of surface waters in Minnesota, 1907.
*236. The quality of surface waters in the United States, Part 1, Analyses of waters east of the one hundredth meridian, 1909.
*237. The quality of the surface waters of California, 1910.
*239. The quality of surface waters of Illinois, 1910.
*273. Quality of the water supplies of Kansas, with a preliminary 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.

Many of the reports listed are available for consultation in the larger public and institutional libaries. 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 records given in this report were obtained through the cooperation and support of numerous agencies--Federal, State, and local. Most were obtained as the result of investigations made as part of a program of the United States Department of the Interior for development of the Missouri River basin at the request of the Bureau of Reclamation, the Bureau of Sport Fisheries and Wildlife, the Bureau of Land Management, or other agencies of the Department. Financial assistance was provided for some investigations in North Dakota by the United States Department of State and for some investigations in Colorado, Iowa, and Nebraska by the Soil Conservation Service of the United States Department of Agriculture. Also, the Corps of Engineers, U.S. Army, Department of Defense, provided funds for investigations in North and South Dakota.

State and local agencies shared with the Geological Survey in planning and financing some of the investigations and, in some instances, provided technical assistance in sample collection and laboratory analysis. The State and local agencies that cooperated in these quality-of-water investigations together with the addresses of the Geological Survey district office presently administering the water-quality programs in each State are indicated in the table on page 29.

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 Reports and Data Processing, under the general direction of S. M. Lang, 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, district chemists, or engineers

State	Cooperating agency	Drainage basin	District office
Colorado	Colorado Conservation Board, Felix Sparks, director.	Missouri River basin	700 West Alameda Unit 198, Room 260 Denver, Colo. 80226
Illinois	Illinois State Department of Public Works and Buildings, F. S. Lorenz, director through Division of Waterways, J. C. Guillou, chief waterways engineer.	Upper Mississippi River	605 South Neil St. Champaign, Ill. 61820
Iowa	Iowa Geological Survey, H. G. Hershey, director and State geologist.	Upper Mississippi River and Missouri River	1041 Arthur St. Iowa City, Iowa 52240
Kansas	Kansas State Department of Health, Environmental Health Service, J. L. Mayes, chief engineer and director. Kansas Water Resources Board, D. F. Metzler, secretary. State Geological Survey.	Missouri River	P.O. Box 768 U.S.G.S. Bldg. West of 19th and Iowa Sts. Lawrence, Kans. 66044

State	Cooperating agency	Drainage basin	District office
Missouri	Missouri Department of Public Health and Welfare, Missouri Water Pollution Board, J. K. Smith, executive secretary. Department of Agriculture, University of Missouri.	Missouri River	P.O. Box 340 103 West Tenth St. Rolla, Mo. 65401
Minnesota	Minnesota Department of Conservation, Division of Waters, S. A. Frellsen, director.	Hudson Bay and upper Mississippi River	1002 New Post Office Bldg. St. Paul, Minn. 55101
Montana	Montana Fish and Game Commission, Fisheries Division, A. N. Whitney, chief.		P. O. Box 1696 Room 421 Federal Bldg. Helena, Mont. 59601
Nebraska	Nebraska Mid-State Reclamation District, J. R. McKinney, secretary.	Missouri River	Room 127 Nebraska Hall 901 North 17th St. Lincoln, Nebr. 68508

State	Cooperating agency	Drainage basin	District office
North Dakota		Hudson Bay and upper Mississippi River and Missouri River	P.O. Box 778 Room 348 New Federal Bldg. Bismarck, N. Dak. 58501
South Dakota	South Dakota Water Resources Commission, J. W. Grimes, chief engineer and executive officer.	Missouri River	P.O. Box 1412 Room 231 Federal Bldg. Huron, S. Dak. 57350
Wyoming	Wyoming State Engineer, F. A. Bishop. Wyoming Natural Resources Board, E. J. Van Camp, director of Water Resources.		P.O. Box 2087 Cheyenne, Wyo. 82001

as follows: In Colorado, R. H. Langford; Iowa, V. R. Bennion; Kansas, Minnesota, Nebraska, North Dakota, and South Dakota, D. M. Culbertson; Missouri, J. H. Hubble; Montana and Wyoming, T. F. Hanly; and in Wisconsin, G. W. Whetstone succeeded by J. J. Molloy.

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 page 29. Because of reorganization in recent years, the offices now administering water-quality programs in most of the States differ from those that were administering the programs in 1964.

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WATER-QUALITY STATIONS, IN DOWNSTREAM ORDER

PART 5. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS

RED RIVER OF THE NORTH BASIN

5-500. BOI8 DE SIOUX RIVER NEAR WHITE ROCK, S. DAK.

LOCATION.--At gaging station, on left bank just downstream from Big Slough Outlet, 300 feet downstream from White Rock Dam, 4 miles south of White Rock, Roberts County, and 5 miles northwest of Wheaton, Minn.
DRAINAGE AREA.--1,160 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 30, 1963	1.2	20	0.1	0.03	0.01	112	74	55	15	378	0	347	18	0.4	3.5	0.19	892	585	25	1.0	1210	7.9	30
Nov. 20.....	1.1	17	.3	.04	.01	112	82	62	14	342	0	418	19	.3	1.2	.18	970	615	34	1.1	1310	8.0	25
Dec. 19.....	.6	34	--	--	--	217	150	124	10	438	0	955	26	.3	1.7	.29	1730	1160	81	1.6	2200	7.5	35
Feb. 18, 1964	A.2	26	.4	.20	.31	300	212	135	21	478	0	1400	35	.3	7.3	.29	2370	1620	128	1.5	2860	7.8	22
Apr. 7.....	15	18	.4	.11	.19	68	44	25	11	223	0	203	7.6	.3	4.7	.09	529	351	18	.6	754	7.7	30
May 21.....	78	8.7	.2	.06	.08	102	60	48	12	224	0	391	10	.3	1.9	.22	819	503	39	.9	1100	7.6	20
July 8.....	5.6	31	.4	.06	.17	111	77	64	16	254	0	475	16	.3	2.5	.29	994	594	36	1.1	1270	7.6	25
Sept. 29.....	1.0	17	.4	.03	.06	118	91	80	20	236	0	592	19	.3	4.3	.30	1080	620	46	1.3	1440	7.0	30

A Estimated.

RED RIVER OF THE NORTH BASIN--Continued

5-540. RED RIVER OF THE NORTH AT FARGO, N. DAK.

LOCATION.--At gaging station, at city waterplant on 4th St. S. in Fargo, Cass County, 25 miles upstream from mouth of Sheyenne River, and at mile 453.
DRAINAGE AREA.--6,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1955 to September 1964.
  Water temperatures: October 1955 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 494 ppm Apr. 28 to May 7; minimum, 256 ppm July 14.
  Hardness: Maximum, 331 ppm Jan. 28; minimum, 194 ppm July 14.
  Specific conductance: Maximum daily, 890 micromhos Mar. 23; minimum daily, 382 micromhos June 18.
  Water temperatures: Maximum, 82°F July 20, 21; minimum, 34°F on many days during December, January, and March.
EXTREMES, 1955-64.--Dissolved solids (1955-58, 1959-64): Maximum, 650 ppm May 6-9, 1958; minimum, 174 ppm Dec. 1-2, 1955.
  Hardness: Maximum, 420 ppm May 6-9, 1958; minimum, 118 ppm Apr. 6-17, 1962.
  Specific conductance: Maximum daily, 960 micromhos May 6, 1958; minimum daily, 223 micromhos Apr. 11, 1962.
  Water temperatures: Maximum, 82°F on several days in 1957, 1960, and 1964; minimum, 33°F on many days in 1956 and 1959.
REMARKS.--Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C): Parts per million	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
Oct. 1-29, 31, 1963	212	--	--	--	--	12	--	269	0	29	--	--	--	--	278	0.38	159	235	4	.3	468	7.7
Oct. 30	165	4.3	0.01	41	31	9.9	4.1	268	0	26	5.4	0.2	0.0	0.06	259	.35	115	230	0	.3	456	7.6
Nov. 1-30	173	--	--	--	--	12	--	272	0	31	--	--	--	--	287	.39	134	238	5	.3	475	8.0
Dec. 1-30	151	--	--	--	--	14	--	296	6	42	--	--	--	--	345	.47	141	278	25	.4	545	8.3
Dec. 31	119	11	.11	47	42	13	4.8	346	0	35	6.0	.2	.1	.07	348	.47	112	292	8	.3	562	7.6
Jan. 1-27, 1964	137	--	--	--	--	14	--	321	6	39	--	--	--	--	359	.49	133	292	9	.4	570	8.3
Jan. 28	142	15	.09	53	48	14	4.8	370	0	41	8.0	.3	.1	.07	368	.50	141	331	7	.3	596	7.6
Jan. 29-Feb. 29	168	--	--	--	--	13	--	326	0	38	--	--	--	--	338	.46	153	285	8	.3	571	7.6
Mar. 1-19	138	--	--	--	--	14	--	308	0	52	--	--	--	--	350	.48	130	284	1	.4	580	7.4
Mar. 20	275	13	.00	55	35	17	5.6	256	9	81	7.4	.2	2.7	.08	363	.49	270	280	5	.4	576	8.3
Mar. 21-Apr. 4	297	--	--	--	--	24	--	277	0	117	--	--	--	--	432	.59	346	307	0	.6	669	7.5
Apr. 5-12	903	--	--	--	--	14	--	184	0	74	--	--	--	--	287	.39	700	208	7	.4	461	7.4
Apr. 13-17	1400	--	--	--	--	12	--	174	0	78	--	--	--	--	284	.39	1070	206	3	.4	452	7.3
Apr. 18	2330	16	--	52	29	16	6.2	196	0	100	8.0	.2	4.0	.07	364	.50	2290	248	7	.4	545	7.5
Apr. 19-22	1878	--	--	--	--	20	--	168	0	158	--	--	--	--	408	.55	2070	270	12	.5	605	7.3
Apr. 23-27	1360	--	--	--	--	22	--	198	0	160	--	--	--	--	432	.59	1590	290	18	.6	704	7.3
Apr. 28-May 7	1151	--	--	--	--	28	--	240	0	175	--	--	--	--	494	.67	1540	330	13	.7	723	7.5
May 8-10	1887	--	--	--	--	24	--	220	0	162	--	--	--	--	456	.62	2320	304	14	.6	667	7.1
May 11-13	1323	--	--	--	--	29	--	229	0	178	--	--	--	--	493	.67	1760	326	18	.7	718	7.1
May 14-20	1090	--	--	--	--	22	--	247	0	126	--	--	--	--	417	.57	1230	296	3	.6	631	6.8

May 21-31, 1964...	897	--	--	--	--	17	--	250	0	83	--	--	--	--	349	.47	845	263	8	.5	551	7.1
June 1-12.....	747	--	--	--	--	13	--	254	0	49	--	--	--	--	292	.40	589	237	9	.4	488	7.5
June 13-17.....	652	--	--	--	--	11	--	250	0	44	--	--	--	--	278	.38	489	229	4	.3	467	7.2
June 18-22.....	823	--	--	--	--	14	--	228	0	61	--	--	--	--	295	.40	656	224	7	.4	478	7.2
June 23.....	937	6.8	.09	47	29	21	5.6	186	0	114	8.0	.2	2.1	.09	368	.50	931	238	5	.6	538	7.3
June 24-July 1....	663	--	--	--	--	16	--	223	0	75	--	--	--	--	315	.43	564	239	6	.5	499	7.0
July 2-13.....	470	--	--	--	--	14	--	242	0	56	--	--	--	--	297	.40	377	236	7	.4	485	7.4
July 14.....	482	14	.07	38	24	12	4.6	212	0	41	3.5	.3	.0	.05	256	.35	333	194	0	.4	413	7.5
July 15-18.....	394	--	--	--	--	12	--	232	0	41	--	--	--	--	263	.36	280	214	4	.4	438	7.3
July 19-Aug. 8....	252	--	--	--	--	16	--	240	0	--	--	--	--	--	302	.41	205	240	3	.4	504	7.5
Aug. 9-12.....	78.5	--	--	--	--	15	--	256	0	--	--	--	--	--	292	.40	61.9	232	2	.4	482	7.8
Aug. 13-20.....	37.5	--	--	--	--	14	--	256	0	--	--	--	--	--	282	.38	28.6	234	4	.4	478	7.2
Aug. 21-Sept. 14..	62.4	--	--	--	--	15	--	264	0	53	--	--	--	--	313	.43	52.7	247	0	.4	507	7.6
Sept. 15.....	119	12	.08	50	36	16	4.7	283	0	69	8.5	.3	.2	.10	364	.50	117	274	2	.4	557	7.7
Sept. 16-30.....	172	--	--	--	--	14	--	260	0	59	--	--	--	--	314	.43	146	251	8	.4	513	7.6
Weighted average	--	--	--	--	--	17	--	240	--	92	--	--	--	--	356	0.48	375	263	66	0.4	560	7.3
Time-weighted average.....	390	--	--	--	--	15	--	268	--	61	--	--	--	--	332	--	--	261	39	0.4	536	7.4
Tons per day....	--	--	--	--	--	18	--	253	--	97	--	--	--	--	--	--	--	--	--	--	--	--

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RED RIVER OF THE NORTH BASIN--Continued

5-540. RED RIVER OF THE NORTH AT FARGO, N. DAK.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Aver-age
	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	
October	61	61	60	60	60	60	60	60	60	60	59	58	57	59	59	59	59	60	60	59	59	59	59	60	58	58	56	53	52	51	50	58
November	50	48	48	45	45	45	44	45	47	47	44	43	40	40	40	44	43	39	39	38	37	37	37	37	36	35	36	36	35	37	--	41
December	36	36	35	36	35	36	35	36	35	35	35	35	35	35	35	35	35	35	34	34	35	34	34	34	34	34	35	35	34	34	34	35
January	34	34	35	36	35	34	34	35	35	35	35	34	35	35	34	35	35	35	36	34	34	34	34	35	35	35	35	34	34	34	35	35
February	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	--	--	35
March	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	36	35	35	35	35	35	35	35	35	34	34	34	34	35	35	35	35
April	35	35	35	35	36	35	35	35	35	35	36	36	35	35	35	39	44	46	47	46	48	46	46	49	51	52	54	55	54	53	--	42
May	53	53	54	52	55	57	58	59	58	59	59	58	58	59	59	62	64	64	64	66	67	69	70	71	70	69	67	66	65	64	64	62
June	65	63	62	63	64	66	67	68	68	67	68	67	67	67	69	69	67	68	68	68	69	69	67	68	70	73	74	74	78	78	--	68
July	78	78	78	78	77	76	77	78	79	78	78	78	78	79	80	80	81	81	81	82	82	80	80	79	78	78	77	77	76	75	75	78
August	75	76	76	77	77	77	76	74	73	73	69	67	66	66	67	67	68	68	70	71	68	68	66	65	65	65	66	67	67	66	66	70
September	66	67	68	68	68	65	65	64	65	66	64	63	64	61	60	59	61	62	63	62	60	60	59	58	57	56	57	55	55	54	--	62

5-560. SHEYENNE RIVER NEAR WARWICK, N. DAK.

LOCATION.--At gaging station, on left bank on downstream side of highway bridge and 3.3 miles south of Warwick, Benson County.
DRAINAGE AREA.--2,070 square miles, approximately, of which about 1,310 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: January 1951 to September 1964.
Water temperatures: January 1951 to September 1962, October 1963 to September 1964 (discontinued).
EXTREMES, 1963-64.--Dissolved solids: Maximum, 662 ppm May 25-31; minimum, 228 ppm Apr. 8.
Hardness: Maximum, 276 ppm May 25-31; minimum, 102 ppm Apr. 6.
Specific conductance: Maximum daily, 1,010 micromhos Mar. 21, 22; minimum daily, 320 micromhos Apr. 12.
Water temperatures: Maximum, 71°F on several days during July.
EXTREMES, 1951-64.--Dissolved solids: Maximum, 1,230 ppm Mar. 21-23, 1955; minimum, 150 ppm Apr. 5-9, 1960.
Hardness: Maximum, 572 ppm Mar. 20, 1959; minimum, 71 ppm Apr. 5-9, 1960.
Specific conductance: Maximum daily, 1,940 micromhos Feb. 1, 1955; minimum daily, 192 micromhos Mar. 18, 1963.
Water temperatures: Maximum (1951-55, 1956-62, 1963-64), 86°F July 21, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C): Parts per million	Dissolved solids (residue at 180°C): Tons per acre-foot	Dissolved solids (residue at 180°C): Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
Oct. 1-15, 1963...	1.1	--	--	--	--	12	--	248	0	--	--	--	--	--	284	0.39	0.84	223	20	0.3	445	7.8
Oct. 16-31.....	1.2	--	--	--	--	33	--	278	0	--	--	--	--	--	338	.46	1.10	219	0	1.0	539	7.8
Nov. 1-30.....	1.9	--	--	--	--	27	--	271	0	--	--	--	--	--	320	.44	1.64	222	0	.8	511	8.0
Dec. 1-31.....	1.0	25	0.04	64	17	27	3.1	279	0	47	7.0	0.3	1.0	0.05	328	.45	.89	229	0	.8	522	8.2
Jan. 1-Feb. 15, 1964.....	1.1	--	--	--	--	24	--	271	0	--	--	--	--	--	318	.43	.94	222	0	.7	503	7.9
Feb. 16-Mar. 3....	1.5	27	--	51	19	24	7.2	260	0	38	11	.3	.0	.08	314	.43	1.27	205	0	.7	499	7.8
Mar. 4-Apr. 1.....	1.5	--	--	--	--	45	--	351	0	--	--	--	--	--	414	.56	1.68	260	0	1.2	661	7.7
Apr. 2-7.....	25.0	--	--	--	--	48	--	319	0	--	--	--	--	--	408	.55	27.5	233	0	1.4	644	7.6
Apr. 8.....	116	9.8	.04	23	11	26	8.8	133	0	44	8.0	.2	4.8	.10	228	.31	71.4	102	0	1.1	336	7.4
Apr. 9-13.....	205	--	--	--	--	36	--	200	0	--	--	--	--	--	294	.40	163	140	0	1.3	440	7.6
Apr. 14-17.....	164	--	--	--	--	29	--	144	0	--	--	--	--	--	239	.33	106	108	0	1.2	355	7.5
Apr. 18-22.....	76.6	--	--	--	--	54	--	207	0	--	--	--	--	--	344	.47	71.2	140	0	2.0	520	7.5
Apr. 23-30.....	40.6	--	--	--	--	82	--	278	0	--	--	--	--	--	435	.59	47.7	161	0	2.8	667	7.5
May 1-5.....	32.8	--	--	--	--	91	--	329	0	--	--	--	--	--	482	.66	42.7	195	0	2.8	746	7.9
May 6-9.....	72.8	--	--	--	--	84	--	334	0	--	--	--	--	--	492	.67	96.7	213	0	2.5	755	8.1
May 10-17.....	43.8	--	--	--	--	80	--	334	0	--	--	--	--	--	493	.67	58.3	227	0	2.3	753	7.8
May 18.....	34	16	.05	56	28	100	9.8	392	0	123	18	.3	1.5	.22	572	.76	52.5	255	0	2.7	867	8.0
May 19-24.....	21.7	--	--	--	--	109	--	404	0	--	--	--	--	--	611	.83	35.6	264	0	2.9	916	7.9
May 25-31.....	6.9	--	--	--	--	122	--	429	0	--	--	--	--	--	662	.90	12.3	276	0	3.2	991	7.8
June 1-2.....	3.2	--	--	--	--	120	--	430	0	--	--	--	--	--	645	.88	5.57	274	0	3.2	971	7.6

RED RIVER OF THE NORTH BASIN--Continued

5-560. SHEYENNE RIVER NEAR WARWICK, N. DAK.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
June 3-7, 1964....	4.5	--	--	--	--	80	--	363	0	--	--	--	--	--	506	0.69	6.15	248	0	2.2	781	7.6
June 8-12.....	55.8	--	--	--	--	100	--	390	0	--	--	--	--	--	562	.76	84.7	240	0	2.8	852	8.0
June 13.....	104	--	--	--	--	60	--	264	0	--	--	--	--	--	380	.52	107	176	0	2.0	586	7.8
June 14-22.....	37.6	--	--	--	--	61	--	346	0	--	--	--	--	--	446	.61	45.3	236	0	1.7	679	7.8
June 23-24.....	121	--	--	--	--	92	--	364	0	--	--	--	--	--	519	.71	170	220	0	2.7	782	7.6
June 25.....	151	--	--	--	--	116	--	425	0	--	--	--	--	--	625	.85	255	258	0	3.1	932	8.1
June 26-27.....	142	--	--	--	--	112	--	352	0	--	--	--	--	--	540	.73	207	193	0	3.5	818	7.4
June 28-30.....	106	18	--	38	21	93	8.8	329	0	108	12	0.3	2.7	0.23	512	.70	147	182	0	3.0	734	7.7
July 1-4.....	59.0	--	--	--	--	84	--	316	0	--	--	--	--	--	449	.61	71.5	180	0	2.7	683	7.8
July 5-31.....	18.8	--	--	--	--	71	--	317	0	--	--	--	--	--	403	.55	20.5	184	0	2.3	627	7.1
Aug. 1-13.....	5.8	--	--	--	--	29	--	280	0	--	--	--	--	--	329	.45	5.15	222	0	.8	523	7.6
Aug. 14-31.....	5.1	--	--	--	--	80	--	362	0	--	--	--	--	--	436	.59	6.00	196	0	2.5	683	7.5
Sept. 1-9.....	14.6	--	--	--	--	77	--	373	0	--	--	--	--	--	464	.63	18.3	216	0	2.3	707	7.8
Sept. 10-25.....	6.0	--	--	--	--	74	--	374	0	--	--	--	--	--	449	.61	7.27	219	0	2.2	706	7.8
Sept. 26-30.....	24.8	--	--	--	--	82	--	384	0	--	--	--	--	--	461	.63	30.9	217	0	2.4	730	7.8
Weighted average	--	--	--	--	--	67	--	289	--	--	--	--	--	--	413	0.56	21.1	184	0	2.1	628	7.5
Time-weighted average.....	18.9	--	--	--	--	51	--	307	--	--	--	--	--	--	390	--	--	217	1	1.5	608	7.6
Tons per day....	--	--	--	--	--	3.4	--	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--

RED RIVER OF THE NORTH BASIN--Continued

5-560. SHEYENNE RIVER NEAR WARWICK, N. DAK.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	--	58	58	58	58	58	55	55	55	55	55	58	--	59	59	--	59	59	59	--	56	56	58	58	--	--	56	56	--	56	--	--
November	55	55	55	54	52	52	52	52	50	42	42	42	42	42	42	42	42	42	40	40	40	40	40	40	40	40	40	--	--	40	--	45
December	--	40	--	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
January	--	--	--	--	--	34	34	34	34	34	--	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
February	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	35	40	--	35	--	--	--	--	34	--	--	--	--	--	34	34	34	34	34	34	34	34	34	34	34	34	--
April	34	35	35	35	35	34	36	36	36	36	36	36	36	36	36	38	38	38	38	38	38	38	36	38	40	38	39	39	39	38	--	37
May	39	39	39	39	42	42	46	52	54	56	56	54	--	60	62	--	62	62	62	68	--	68	66	68	--	66	66	66	66	66	64	57
June	64	64	64	64	64	--	64	64	64	60	66	--	66	66	66	66	66	--	--	64	--	64	64	66	66	66	66	--	--	66	--	--
July	66	68	68	--	--	68	68	68	68	68	70	--	71	71	71	71	71	--	71	71	70	--	70	70	70	--	70	70	68	66	--	--
August	65	--	--	--	65	65	65	60	--	--	55	55	53	53	53	--	55	55	55	55	55	55	--	55	55	55	--	--	55	63	--	--
September	54	54	54	54	54	--	52	--	--	52	52	--	--	50	50	50	--	--	50	50	49	50	52	52	50	50	50	50	50	50	--	--

RED RIVER OF THE NORTH BASIN--Continued

5-564. BIG COULEE NEAR CHURCHS FERRY, N. DAK.

LOCATION.--At gaging station, on downstream side of right abutment of bridge on U.S. Highway 281, 1 mile downstream from Little Coulee, and 6 miles south of Churchs Ferry, Ramsey County.
DRAINAGE AREA.--2,510 square miles, approximately, of which about 690 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: June 1954 to September 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. No flow during most of the 1964 water year.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
June 18, 1963...	0.1	48		198	76	216	26	495	0	728	101	0.2	0.5	0.32	1690	2.30	0.46	806	400	3.3	2170	8.1	
Apr. 4, 1964....	2.6	7.9		24	6.1	12	12	66	0	59	8.2	.1	1.7	.07	180	.24	1.26	85	31	.6	268	7.2	
June 26.....	.2	44		229	86	237	28	461	38	850	87	.4	1.2	.37	1830	2.49	.99	924	482	3.4	2330	8.5	55

5-587. SHEYENNE RIVER AT LISBON, N. DAK.

LOCATION.--At gaging station, on left bank 150 feet downstream from dam at State fish hatchery at north edge of city of Lisbon, Ransom County, 3 miles upstream from Timber Coulee, and at mile 162.1.
DRAINAGE AREA.--8,190 square miles, approximately, of which about 5,700 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: August 1956 to September 1964.
Water temperatures: August 1956 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 917 ppm May 22 to June 15; minimum, 432 ppm June 16-17.
Hardness: Maximum, 443 ppm May 21; minimum, 209 ppm July 6.
Specific conductance: Maximum daily, 1,370 micromhos June 5-7; minimum daily, 615 micromhos Apr. 13.
Water temperatures: Maximum, 84°F July 16, 17, 19; minimum, freezing point on many days during November to March.
EXTREMES, 1956-64.--Dissolved solids (1956-58, 1959-64): Maximum, 917 ppm May 22 to June 15, 1964; minimum, 185 ppm Apr. 3-5, 1960.
Hardness: Maximum, 458 ppm May 16-31, 1963; minimum, 102 ppm Apr. 3-5, 1960.
Specific conductance: Maximum daily, 1,450 micromhos Jan. 30, 1962; minimum daily, 243 micromhos Apr. 2, 1960.
Water temperatures: Maximum, 90°F Aug. 23, 1959; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance of daily samples and some spectrographic and radiochemical data available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-18, 1963.	9.2	--	--	--	--	103	--	315	0	213	--	--	--	--	703	0.96	17.5	335	77	2.4	1080	7.5	
Oct. 19-31.....	15.1	--	--	--	--	113	--	345	0	233	--	--	--	--	783	1.06	31.9	378	95	2.5	1210	7.6	
Nov. 1-30.....	25.9	--	--	--	--	110	--	361	0	214	--	--	--	--	749	1.02	52.4	373	77	2.5	1160	7.7	
Dec. 1-31.....	36.6	8.9	0.12	76	40	111	12	386	0	193	64	0.5	1.2	0.27	713	.97	70.4	353	36	2.6	1120	7.7	
Jan. 1-24, 1964.	26.2	--	--	--	--	95	--	395	0	166	--	--	--	--	666	.91	47.1	334	10	2.3	1020	7.9	
Jan. 25.....	25	18	.48	80	39	94	12	401	0	177	40	.4	1.8	.24	672	.91	45.4	361	32	2.2	1030	8.1	
Jan. 26-31.....	24.3	--	--	--	--	89	--	386	0	173	--	--	--	--	650	.88	42.6	338	21	2.1	1010	7.8	
Feb. 1-29.....	26.2	--	--	--	--	89	--	379	0	171	--	--	--	--	644	.88	45.6	331	20	2.1	1000	7.6	
Mar. 1-18, 20-27	19.8	--	--	--	--	84	--	342	0	184	--	--	--	--	635	.86	34.0	330	49	2.0	988	7.7	
Mar. 19.....	28	13	.05	67	32	76	9.4	290	0	170	38	.2	1.7	.21	571	.78	43.2	299	61	1.9	888	7.7	
Mar. 28.....	18	13	.10	74	33	78	11	315	0	175	39	.3	1.5	.20	596	.81	29.0	319	61	1.9	915	8.0	
Mar. 29-Apr. 1..	22.0	--	--	--	--	83	--	322	0	185	--	--	--	--	621	.84	36.9	319	55	2.0	967	8.0	
Apr. 2-6.....	74.6	--	--	--	--	72	--	252	0	174	--	--	--	--	560	.76	113	280	73	1.9	870	7.9	
Apr. 7.....	133	12	--	59	24	59	11	213	0	147	38	.3	5.6	.14	480	.65	172	244	69	1.6	749	7.8	
Apr. 8-17.....	100	--	--	--	--	56	--	197	0	144	--	--	--	--	445	.61	120	224	62	1.6	702	7.4	
Apr. 18-30.....	63.3	--	--	--	--	72	--	211	0	216	--	--	--	--	584	.79	99.8	292	119	1.8	890	7.2	
May 1-20.....	39.2	--	--	--	--	95	--	248	0	288	--	--	--	--	740	1.01	78.3	371	168	2.1	1090	7.5	
May 21.....	23.	9.0	.02	103	45	115	12	289	0	350	67	.4	.0	.24	906	1.23	56.3	443	206	2.4	1290	7.4	
May 22-June 15..	16.2	--	--	--	--	125	--	308	0	346	--	--	--	--	917	1.25	40.1	440	187	2.6	1330	7.5	
June 16-21.....	61.0	--	--	--	--	115	--	283	0	289	--	--	--	--	813	1.11	134	384	152	2.6	1210	7.3	

RED RIVER OF THE NORTH BASIN--Continued

5-587. SHEYENNE RIVER AT LISBON, N. DAK.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
June 22-23, 1964	133	--	--	--	--	113	--	285	0	252	--	--	--	--	759	1.03	273	352	118	2.6	1150	7.6	
June 24-26.....	480	--	--	--	--	75	--	263	0	168	--	--	--	--	557	.76	722	274	58	2.0	854	7.4	
June 27.....	602	7.6	0.05	40	30	67	10	304	0	114	21	0.3	0.1	0.16	488	.66	793	224	0	2.0	723	7.5	
June 28-July 5..	608	--	--	--	--	65	--	289	0	104	--	--	--	--	438	.60	719	220	0	1.9	696	7.2	
July 6.....	362	7.8	--	41	26	64	11	281	0	101	17	.3	1.1	.15	448	.61	438	209	0	1.9	682	7.4	
July 7-15.....	258	--	--	--	--	68	--	288	0	108	--	--	--	--	444	.60	309	222	0	1.9	712	7.2	
July 16-17.....	119	--	--	--	--	65	--	280	0	102	--	--	--	--	432	.59	139	213	0	1.9	686	7.1	
July 18-21.....	49.0	--	--	--	--	69	--	286	0	108	--	--	--	--	442	.60	58.5	216	0	2.0	706	7.7	
July 22-31.....	15.5	--	--	--	--	75	--	299	0	122	--	--	--	--	479	.65	20.1	233	0	2.1	760	8.0	
Aug. 1.....	29	1.9	--	49	29	78	10	300	0	124	27	.4	.1	.27	512	.70	40.1	241	0	2.2	770	7.4	
Aug. 2-8.....	13.1	--	--	--	--	80	--	299	0	140	--	--	--	--	526	.72	18.6	257	12	2.2	825	7.6	
Aug. 9-20.....	7.1	--	--	--	--	87	--	303	0	163	--	--	--	--	564	.77	10.8	267	18	2.3	875	7.7	
Aug. 21-25.....	60.8	--	--	--	--	80	--	264	0	169	--	--	--	--	538	.73	88.3	256	39	2.2	837	7.6	
Aug. 26-Sept. 30	33.6	--	--	--	--	82	--	257	0	168	--	--	--	--	542	.74	49.2	254	43	2.2	853	7.6	
Weighted average.....	--	--	--	--	--	79	--	293	--	158	--	--	--	--	553	0.75	83.9	274	41	2.0	859	7.3	
Time-weighted average.....	56.2	--	--	--	--	93	--	317	--	196	--	--	--	--	650	--	--	321	62	2.2	999	7.5	
Tons per day..	--	--	--	--	--	12	--	44	--	24	--	--	--	--	--	--	--	--	--	--	--	--	

RED RIVER OF THE NORTH BASIN--Continued

5-587. SHEYENNE RIVER AT LISBON, N. DAK.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	60	60	59	59	60	59	59	59	58	59	58	58	57	57	57	59	56	56	--	--	--	--	--	57	55	54	51	49	48	48	--	56
November	42	42	44	40	44	44	42	42	42	40	40	39	39	38	38	36	36	36	36	--	35	32	32	--	--	34	33	33	34	32	--	38
December	32	34	32	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	32	32	32	32	32	--
January	35	33	34	34	34	32	32	32	32	32	32	32	32	33	33	33	32	32	34	33	33	32	32	32	32	32	32	32	33	32	32	33
February	33	33	32	32	33	32	32	32	32	32	32	33	33	33	34	33	33	33	32	32	32	32	32	32	32	32	32	34	34	--	--	33
March	35	34	34	34	33	34	36	34	34	34	39	35	38	36	34	35	33	33	34	32	35	34	34	32	32	33	34	34	32	33	35	34
April	37	38	37	40	34	34	33	36	38	42	35	40	35	34	36	36	46	46	50	45	47	45	51	52	52	55	57	57	54	53	--	43
May	52	54	54	60	57	59	62	59	59	59	58	59	56	58	63	67	64	69	71	70	79	75	75	73	74	72	70	69	69	68	69	65
June	68	68	69	65	73	69	69	70	66	67	65	66	67	69	69	67	66	67	69	67	68	67	65	70	63	76	78	78	79	77	--	69
July	78	78	76	74	73	77	78	79	80	78	79	78	80	80	81	84	84	82	84	83	81	79	79	80	80	79	80	77	77	75	74	79
August	74	76	82	80	79	80	79	76	76	74	69	65	65	64	71	74	70	67	70	70	68	66	69	66	64	64	67	67	67	65	64	71
September	67	73	70	67	64	62	61	60	62	63	59	62	63	56	50	56	60	59	59	61	57	57	55	54	55	54	53	52	51	51	--	59

5-825. RED RIVER OF THE NORTH AT GRAND FORKS, N. DAK.

LOCATION.--At gaging station, on left bank 500 feet downstream from dam at Riverside Park in Grand Forks, Grand Forks County, 2 miles downstream from Red Lake River, and at mile 296.0.
DRAINAGE AREA.--30,100 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: September 1956 to September 1964.
Water temperatures: October 1956 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 484 ppm Apr. 7-9; minimum, 236 ppm Oct. 25.
Hardness: Maximum, 322 ppm May 16-23; minimum, 184 ppm Apr. 15.
Specific conductance: Maximum daily, 747 micromhos Apr. 7-9; minimum daily, 389 micromhos June 12.
Water temperatures: Maximum, 82°F July 19; minimum, 34°F on several days during December.
EXTREMES, 1956-64.--Dissolved solids (1956-58, 1959-64): Maximum, 540 ppm Jan. 21, 1962; minimum, 199 ppm Apr. 9-16, 1962.
Hardness: Maximum, 468 ppm Dec. 29-31, 1958; minimum, 140 ppm Apr. 9-16, 1962.
Specific conductance: Maximum daily, 976 micromhos Dec. 29-31, 1958; minimum daily, 298 micromhos Apr. 9, 10, 1962.
Water temperatures: Maximum, 82°F July 19, 1964; minimum, 33°F on several days in 1958-59.
REMARKS.--Records of specific conductance of daily samples and some spectrographic and radiochemical data available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 1-24, 26-30, 1963	1380	--	--	--	--	10	--	229	0	26	--	--	--	--	253	0.34	943	199	11	0.3	417	7.9
Oct. 25	1500	3.3	0.02	45	21	9.1	3.8	229	0	23	5.8	0.2	0.0	0.06	236	.32	956	197	9	.3	399	7.2
Oct. 31-Nov. 16	1089	--	--	--	--	11	--	250	0	26	--	--	--	--	261	.35	767	212	7	.3	444	8.0
Nov. 17	929	4.0	.12	52	22	13	4.0	255	0	34	9.0	.3	.2	.06	292	.40	732	221	12	.4	467	8.1
Nov. 18-30	761	--	--	--	--	16	--	264	0	33	--	--	--	--	302	.41	621	231	14	.5	498	7.9
Dec. 1-31	802	--	--	--	--	19	--	290	0	40	--	--	--	--	335	.46	725	256	18	.5	549	8.2
Jan. 1-25, 1964	761	--	--	--	--	18	--	287	0	38	--	--	--	--	324	.44	666	254	19	.5	529	7.9
Jan. 26	775	7.9	.11	61	24	18	4.2	289	0	38	10	.2	.1	.08	336	.46	703	251	14	.5	530	8.0
Jan. 27-Feb. 29	741	--	--	--	--	17	--	288	0	35	--	--	--	--	327	.44	654	251	15	.5	527	8.1
Mar. 1	620	10	.00	58	27	17	4.0	297	0	35	11	.3	.8	.08	332	.45	556	254	10	.5	537	7.6
Mar. 2-24	655	--	--	--	--	18	--	288	0	40	--	--	--	--	331	.45	585	252	16	.5	545	7.9
Mar. 25-Apr. 6	862	--	--	--	--	25	--	291	0	81	--	--	--	--	403	.55	938	288	49	.6	640	7.8
Apr. 7-9	1143	--	--	--	--	23	--	256	0	86	--	--	--	--	484	.66	1490	272	62	.6	747	8.0
Apr. 10-11	2325	--	--	--	--	29	--	258	0	80	--	--	--	--	392	.53	2460	258	46	.8	616	8.1
Apr. 12-14	5037	--	--	--	--	15	--	187	0	59	--	--	--	--	284	.39	3860	198	45	.5	465	8.1
Apr. 15	7430	10	.05	44	18	12	8.8	153	0	69	8.2	.2	5.5	.06	279	.38	5600	184	58	.4	405	7.0
Apr. 16-26	11340	--	--	--	--	13	--	194	0	89	--	--	--	--	337	.46	10320	237	78	.4	510	7.8
Apr. 27-May 15	5586	--	--	--	--	18	--	227	0	128	--	--	--	--	415	.56	6260	290	104	.5	613	7.9
May 16-23	3474	--	--	--	--	20	--	260	0	132	--	--	--	--	449	.61	4210	322	109	.5	665	7.8
May 24-31	2474	--	--	--	--	17	--	269	0	110	--	--	--	--	397	.54	2650	306	85	.4	624	7.2

June 1-10, 1964...	1817	--	--	--	--	15	--	270	0	86	--	--	--	--	371	.50	1820	285	64	.4	581	7.5
June 11-13.....	5603	--	--	--	--	6.8	--	183	0	69	--	--	--	--	277	.38	4190	209	59	.2	426	7.6
June 14-15.....	5930	--	--	--	--	9.2	--	187	0	90	--	--	--	--	320	.44	5120	231	78	.3	477	7.5
June 16-20.....	4836	--	--	--	--	13	--	196	0	114	--	--	--	--	371	.50	4840	260	99	.4	542	7.6
June 21.....	7350	13	16	69	25	12	4.8	214	0	124	4.3	.3	1.2	.07	396	.54	7860	276	100	.3	571	7.2
June 22-23.....	8580	--	--	--	--	10	--	202	0	100	--	--	--	--	354	.48	8200	252	86	.3	511	7.6
June 24-26.....	6907	--	--	--	--	12	--	212	0	109	--	--	--	--	380	.52	7090	266	92	.3	549	7.6
June 27-July 3....	4517	--	--	--	--	15	--	234	0	116	--	--	--	--	402	.55	4900	289	97	.4	590	7.9
July 4-16.....	2900	--	--	--	--	20	--	239	0	102	--	--	--	--	391	.53	3060	270	74	.5	575	7.7
July 17-Aug. 3....	1461	--	--	--	--	20	--	252	0	94	--	--	--	--	386	.52	1520	271	64	.5	571	8.0
Aug. 4-7.....	2212	--	--	--	--	8.4	--	188	0	84	--	--	--	--	316	.43	1890	237	83	.2	467	7.6
Aug. 8-14.....	1067	--	--	--	--	13	--	198	0	99	--	--	--	--	342	.47	985	245	83	.4	511	7.9
Aug. 15-31.....	644	--	--	--	--	17	--	239	0	104	--	--	--	--	380	.52	661	281	85	.4	579	7.7
Sept. 1-27.....	542	--	--	--	--	28	--	246	0	97	--	--	--	--	367	.50	537	258	56	.8	674	7.8
Sept. 28-30.....	2157	4.2	.04	61	30	21	5.8	243	0	103	15	.2	.4	.10	380	.52	2210	276	77	.6	596	7.7
Weighted average	--	--	--	--	--	16	--	231	--	88	--	--	--	--	358	0.49	1940	258	68	0.4	547	7.7
Time-weighted average.....	2013	--	--	--	--	17	--	254	--	69	--	--	--	--	345	--	--	255	46	0.4	549	7.8
Tons per day....	--	--	--	--	--	85	--	1260	--	478	--	--	--	--	--	--	--	--	--	--	--	--

RED RIVER OF THE NORTH BASIN--Continued

5-825. RED RIVER OF THE NORTH AT GRAND FORKS, N. DAK.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	59	60	59	59	59	59	58	58	58	58	57	56	56	56	58	58	58	59	59	59	58	58	67	57	57	56	56	53	53	50	--	58
November	44	43	43	43	43	43	43	43	43	43	43	42	42	41	40	40	40	40	39	39	38	38	38	37	37	37	37	38	37	37	--	40
December	37	37	37	37	37	37	37	36	36	36	36	36	36	35	35	35	35	35	35	34	34	34	34	34	34	34	34	34	34	34	34	35
January	35	36	36	36	36	36	36	36	35	35	35	35	35	36	36	36	36	36	36	36	36	36	35	35	35	35	35	35	35	35	36	36
February	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	35	35	35	35	35	36	37	--	--	36
March	37	36	36	36	36	36	36	36	36	36	36	36	36	36	35	35	35	35	35	35	35	35	35	--	35	35	35	35	35	35	35	36
April	35	36	36	36	36	37	35	35	35	35	35	35	35	35	35	35	35	35	38	40	43	43	45	45	47	49	50	52	51	50	--	40
May	50	50	51	52	53	55	56	57	57	57	57	56	56	57	58	58	60	62	62	62	64	67	68	68	68	68	68	68	66	64	62	60
June	62	62	62	63	64	64	64	64	63	63	63	63	63	65	65	66	65	64	64	65	65	65	65	65	66	70	72	75	75	76	--	66
July	76	76	76	76	76	76	76	76	76	76	76	77	77	77	77	77	79	80	82	81	81	78	80	79	78	78	77	77	76	76	75	77
August	75	75	75	75	76	76	75	75	74	74	70	67	66	65	65	65	66	68	69	68	68	67	66	65	64	65	64	64	64	64	64	69
September	64	64	65	65	65	65	63	63	63	63	62	62	62	60	60	58	58	58	59	59	59	59	58	58	58	57	54	54	50	50	--	60

5-996. PEMBINA RIVER AT WALHALLA, N. DAK.

LOCATION (revised).--At gaging station, on left bank at downstream side of bridge on State Highway 32, at south edge of Walhalla, Pembina County, and 7 miles downstream from Little Pembina River.
DRAINAGE AREA (revised).--3,350 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: March 1962 to September 1964.
Water temperatures: April 1962 to September 1964.
Sediment records: April 1962 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 679 ppm Dec. 1-10; minimum, 287 ppm Apr. 6.
Hardness: Maximum, 438 ppm Dec. 1-10; minimum, 127 ppm Apr. 4-5.
Specific conductance: Maximum daily, 1,140 micromhos Jan. 13; minimum daily, 347 micromhos Apr. 4.
Water temperatures: Maximum, 84°F July 13; minimum, freezing point on many days during November to April.
Sediment concentrations: Maximum daily, 6,900 ppm Sept. 1; minimum daily, 8 ppm Feb. 20.
Sediment loads: Maximum daily, 4,500 tons Apr. 16, May 6; minimum daily, less than 0.50 ton on many days during December to March.
EXTREMES, 1962-64.--Dissolved solids: Maximum, 822 ppm Jan. 15-31, 1963; minimum, 222 ppm Mar. 20-22, 1963.
Hardness: Maximum, 543 ppm Jan. 15-31, 1963; minimum, 116 ppm Mar. 20-22, 1963.
Specific conductance: Maximum daily, 1,240 micromhos Jan. 18, 19, 21, 22, 1963; minimum daily, 273 micromhos Mar. 22, 1963.
Water temperatures: Maximum, 87°F July 24, 1963; minimum, freezing point on many days during winter months each year.
Sediment concentrations: Maximum daily, 13,000 ppm July 26, 1963; minimum daily, 5 ppm Feb. 27, 1963.
Sediment loads: Maximum daily, 65,400 tons Apr. 19, 1962; minimum daily, less than 0.50 ton on many days each year.
REMARKS.--Records of specific conductance of daily samples and some spectrographic and radiochemical data available in district office at Lincoln, Nebr. Flow affected by ice Nov. 13 to Apr. 10.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-25, 27-31, 1963..	29.3	19	0.03	74	36	53	9.2	310	0	170	15	0.3	0.6	0.16	558	0.76	44.1	331	77	1.3	838	8.0	--
Oct. 26.....	25	18	.01	86	30	53	8.8	312	0	184	14	.3	.0	.15	548	.75	37.0	338	82	1.3	822	7.7	3
Nov. 1-30.....	18.8	20	.04	80	36	53	7.8	329	0	178	16	.2	.5	.15	561	.76	28.5	349	79	1.2	856	7.8	--
Dec. 1-10.....	11.0	20	.04	110	40	59	8.4	398	0	207	17	.3	.3	.15	679	.92	20.2	438	112	1.2	1010	8.0	--
Dec. 11-Jan. 14, 1964.....	5.9	23	.04	114	36	48	7.4	398	0	184	17	.3	.9	.13	645	.88	10.3	434	108	1.0	953	8.0	--
Jan. 15-31.....	3.4	24	.05	116	31	32	5.6	404	0	136	12	.3	.9	.10	574	.78	5.27	418	87	.7	886	8.1	--
Feb. 1-29.....	2.6	24	.02	110	27	30	5.3	365	0	132	13	.4	.3	.10	538	.73	3.78	384	85	.7	814	7.8	--
Mar. 1-Apr. 3..	3.4	23	.11	113	27	30	6.7	364	0	140	16	.4	.9	.13	546	.74	5.01	392	93	.7	829	7.8	--
Apr. 4-5.....	100	--	--	36	9.0	24	5.6	100	0	86	7.0	--	--	--	293	.40	79.1	127	45	.9	379	7.3	--
Apr. 6.....	115	14	.12	40	10	27	5.9	112	0	93	7.2	.3	5.3	.09	287	.39	89.1	141	49	1.0	411	7.1	22
Apr. 7.....	100	13	.09	41	13	27	5.9	122	0	99	7.6	.3	4.8	.06	303	.41	81.8	156	56	.9	438	7.2	22
Apr. 8.....	65	14	.04	47	12	28	5.9	129	0	107	7.8	.2	3.6	.06	321	.44	56.3	168	62	.9	463	7.2	15
Apr. 9.....	260	17	.06	59	12	31	5.9	164	0	111	9.2	.3	4.7	.07	366	.50	257	198	63	1.0	525	7.2	17
Apr. 10.....	400	19	.06	62	12	28	5.5	170	0	104	7.2	.3	8.6	.08	364	.50	393	202	63	.9	516	7.5	22

RED RIVER OF THE NORTH BASIN--Continued

5-996. PEMBINA RIVER AT WALHALLA, N. DAK.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Apr. 11-13, 1964.....	539	19	--	56	11	27	5.5	154	0	103	9.0	0.3	6.0	0.10	352	0.48	512	184	58	0.9	494	7.5	--
Apr. 14.....	506	19	0.07	52	12	27	5.5	152	0	99	7.2	.2	5.9	.07	337	.46	460	179	54	.9	476	7.6	22
Apr. 15.....	532	17	.07	46	13	30	5.8	131	0	112	8.0	.3	4.8	.08	339	.46	487	170	63	1.0	472	7.3	--
Apr. 16.....	615	20	--	63	14	32	6.2	163	0	126	8.5	.3	7.2	.13	396	.54	658	214	80	.9	560	7.4	--
Apr. 17.....	509	22	--	71	15	37	6.8	190	0	138	9.5	.3	5.2	.09	428	.58	588	239	83	1.0	627	7.6	--
Apr. 18-30.....	356	23	.10	65	22	45	8.8	212	0	154	11	.3	3.6	.18	462	.63	444	254	80	1.2	683	7.6	--
May 1-19.....	370	21	.13	61	24	42	8.0	202	0	158	11	.2	1.6	.15	450	.61	450	249	83	1.2	667	7.6	--
May 20.....	288	21	.06	61	28	43	8.6	220	0	160	11	.2	.2	.14	469	.64	365	266	86	1.1	691	7.7	--
May 21-31.....	265	21	--	62	29	45	9.0	234	0	162	12	.2	.3	.17	483	.66	346	274	82	1.2	716	7.7	--
June 1-13.....	165	22	--	69	32	50	9.0	249	0	187	13	.3	.5	.16	530	.72	236	302	98	1.2	771	7.4	20
June 14-18.....	122	20	.16	70	31	51	8.8	256	0	190	14	.3	.0	.15	533	.72	176	304	94	1.3	780	7.2	20
June 19-20.....	418	23	--	63	19	48	7.4	187	0	176	10	.4	.6	.16	480	.65	542	237	84	1.4	663	7.4	--
June 21-24.....	171	24	--	75	26	56	8.6	245	0	198	14	.3	.2	.17	550	.75	254	295	94	1.4	787	7.5	--
June 25-July 31	61.2	27	.08	80	32	57	9.6	289	0	201	14	.4	1.0	.17	584	.79	96.5	331	94	1.4	851	7.9	15
Aug. 1-31.....	46.2	24	.08	73	32	57	9.2	276	0	183	14	.3	.2	.18	549	.75	68.5	313	87	1.4	800	7.8	--
Sept. 1-3.....	95.0	26	--	65	20	46	8.0	216	0	149	9.0	.4	.7	.16	468	.64	120	244	67	1.3	653	7.5	--
Sept. 4-27.....	44.7	20	--	76	32	57	9.3	276	0	185	15	.3	.2	.16	551	.75	66.5	320	94	1.4	807	7.8	--
Sept. 28.....	60	21	.07	73	24	57	8.6	239	0	191	14	.4	.5	.15	525	.71	85.1	280	84	1.5	764	7.7	--
Sept. 29-30....	50.5	19	--	82	30	61	9.1	277	0	198	16	.4	.5	.17	580	.79	79.1	326	99	1.5	838	7.5	--
Weighted average.....	--	22	0.10	66	25	45	8.2	225	--	160	12	0.3	2.0	0.15	477	0.65	110	267	82	1.2	698	7.5	--
Time-weighted average....	85.5	22	0.07	86	30	47	8.0	305	--	168	14	0.3	0.9	0.15	547	--	--	339	89	1.1	811	7.7	--
Tons per day.	--	5.0	0.02	15	5.7	10	1.9	52	--	37	2.7	0.1	0.5	0.04	--	--	--	--	--	--	--	--	--

RED RIVER OF THE NORTH BASIN--Continued

5-996. PEMBINA RIVER AT WALHALLA, N. DAK.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	60	60	62	64	60	59	54	57	57	57	56	59	62	60	60	60	58	58	54	51	54	58	60	48	50	51	44	46	47	47	44	55
November	40	42	44	42	42	38	40	40	41	38	38	32	32	32	32	39	47	36	33	32	32	32	32	32	32	38	37	33	32	32	--	36
December	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	34	36	32	32	32	32	32	32	32	34	32
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
April	32	32	32	32	32	32	32	32	32	32	32	32	32	37	40	47	43	45	44	47	46	49	48	55	56	51	53	50	42	47	--	41
May	50	52	49	53	61	59	60	53	50	60	58	59	60	60	59	65	67	70	67	71	75	72	70	69	68	66	62	60	62	63	61	62
June	60	58	64	68	70	69	65	64	64	65	63	65	63	65	64	60	62	60	56	59	65	66	68	70	71	72	--	--	81	77	--	66
July	81	82	80	78	76	76	77	78	76	77	80	81	84	82	80	83	80	74	79	82	75	74	73	77	76	74	76	74	75	72	69	77
August	80	76	79	80	77	74	68	67	65	64	59	59	60	66	79	72	71	75	65	64	56	59	58	60	65	65	66	61	59	57	60	67
September	62	69	62	64	65	67	66	61	61	59	57	59	58	55	59	57	59	57	60	61	62	57	59	55	52	46	49	51	53	51	--	58

RED RIVER OF THE NORTH BASIN--Continued

5-996. PEMBINA RIVER AT WALHALLA, N. DAK.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	37	25	2	23	17	1	12	19	1
2	34	20	2	22	21	1	12	17	1
3	34	27	2	25	23	2	12	15	T
4	33	19	2	25	36	2	12	25	1
5	31	26	2	24	19	1	11	45	1
6	31	22	2	24	27	2	11	39	1
7	31	21	2	24	28	2	11	49	1
8	30	21	2	24	24	2	10	47	1
9	30	21	2	24	20	1	10	48	1
10	30	22	2	23	14	1	9.0	35	1
11	30	18	1	22	22	1	9.0	32	1
12	30	20	2	20	21	1	8.5	27	1
13	30	21	2	19	19	1	8.0	23	T
14	30	19	2	20	17	1	7.5	33	1
15	30	36	3	19	17	1	7.5	27	1
16	30	16	1	19	29	1	7.0	42	1
17	30	18	1	18	18	1	6.5	29	1
18	29	21	2	18	22	1	6.5	29	1
19	29	18	1	18	19	1	6.0	58	1
20	29	21	2	17	21	1	6.0	43	1
21	29	21	2	16	18	1	6.0	83	1
22	30	21	2	15	17	1	5.8	31	T
23	29	16	1	14	23	1	5.6	34	1
24	27	14	1	14	15	1	5.6	45	1
25	26	16	1	13	30	1	5.6	29	T
26	25	23	2	13	33	1	5.5	27	T
27	25	21	1	13	15	1	5.5	44	1
28	24	15	1	13	17	1	5.5	50	1
29	24	16	1	12	17	1	5.5	50	1
30	24	13	1	12	17	1	5.5	56	1
31	23	15	1	--	--	--	5.5	29	T
Total	904	--	51	563	--	35	244.1	--	27
	JANUARY			FEBRUARY			MARCH		
1	5.5	21	T	2.8	20	T	3.2	47	T
2	5.5	19	T	2.8	23	T	3.2	71	1
3	5.5	18	T	2.6	13	T	3.2	64	1
4	5.4	20	T	2.6	28	T	3.2	51	T
5	5.4	22	T	2.6	34	T	3.2	60	1
6	5.4	21	T	2.6	39	T	3.0	57	T
7	5.3	37	1	2.6	60	T	3.0	110	1
8	5.3	21	T	2.6	92	1	3.0	96	1
9	5.2	26	T	2.6	80	1	3.0	70 A	1
10	5.2	21	T	2.6	91	1	3.0	50	T
11	5.0	70	1	2.6	10	T	3.0	27	T
12	4.8	50	1	2.6	10	T	3.0	29	T
13	4.6	60	1	2.6	10	T	3.2	26	T
14	4.4	65	1	2.6	30	T	3.2	23	T
15	4.2	65	1	2.6	10	T	3.2	26	T
16	4.0	50	1	2.6	20	T	3.2	20	T
17	3.8	38	T	2.6	9	T	3.2	30	T
18	3.6	29	T	2.6	30	T	3.0	39	T
19	3.6	29	T	2.6	20	T	3.0	27	T
20	3.6	26	T	2.6	8	T	3.0	26	T
21	3.6	45	T	2.6	50	T	3.0	19	T
22	3.4	42	T	2.5	40	T	3.0	30	T
23	3.4	31	T	2.5	30	T	3.0	30	T
24	3.4	29	T	2.5	100 A	1	3.0	20	T
25	3.4	36	T	2.5	80 A	1	3.0	20	T
26	3.4	39	T	2.5	60	T	3.0	22	T
27	3.2	38	T	2.6	60	T	3.0	36	T
28	3.0	63	1	2.9	60	T	3.0	39	T
29	3.0	--	1	3.2	93	1	3.2	26	T
30	3.0	--	T	--	--	--	3.2	70	1
31	2.8	--	T	--	--	--	3.2	82	1
Total	130.9	--	16	76.2	--	11	95.6	--	14

T Less than 0.50 ton.
A Computed from partly estimated-concentration graph.

RED RIVER OF THE NORTH BASIN--Continued

5-996. PEMBINA RIVER AT WALHALLA, N. DAK.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	4.0	88	1	368	400	400	219	190	110
2	5.0	72	1	373	460	460	208	160	90
3	10	82	2	378	430	440	198	130	69
4	90	560	140	392	430	460	185	140	70
5	110	1200	360	380	370	A 380	175	140	66
6	115	450	140	457	3400	S 4500	168	140	64
7	100	230	62	433	1600	1900	154	140	58
8	65	220	39	388	450	470	146	150	59
9	260	420	290	385	410	430	150	140	57
10	400	1800	1900	383	370	380	130	100	A 35
11	519	2300	3200	383	330	340	124	150	A 50
12	561	1800	2700	366	300	300	162	750	330
13	537	1400	2000	359	380	370	130	230	81
14	506	1200	1600	356	310	300	112	90	27
15	532	2300	3300	354	280	270	105	100	28
16	615	2700	4500	337	330	300	105	120	34
17	509	1700	2300	318	290	250	116	180	56
18	373	720	720	315	280	240	171	400	S 350
19	347	600	560	302	290	240	558	1800	2700
20	349	750	710	288	280	220	277	1400	1000
21	378	830	850	286	280	220	206	650	360
22	371	600	600	288	290	220	175	330	160
23	356	500	480	279	270	200	160	260	110
24	349	500	470	272	260	190	144	120	47
25	356	610	590	270	290	210	128	110	38
26	349	470	440	266	280	200	116	110	34
27	347	400	370	257	260	180	107	120	35
28	349	490	460	255	230	160	100	130	35
29	354	710	680	255	240	160	96	84	22
30	356	600	580	250	220	150	91	110	27
31	--	--	--	236	200	130	--	--	--
Total	9572.0	--	30045	10229	--	14670	4916	--	6202

Day	JULY			AUGUST			SEPTEMBER		
1	85	80	18	42	28	3	119	6900	S 2900
2	78	72	15	43	28	3	96	2700	700
3	72	51	10	42	27	3	70	300	57
4	69	53	10	43	28	3	55	250	37
5	65	63	11	42	36	4	48	170	22
6	63	55	9	47	36	4	46	74	9
7	62	58	10	45	37	4	43	50	6
8	65	56	10	43	24	3	43	58	7
9	59	91	14	44	21	2	46	59	7
10	58	70	11	45	27	3	45	54	6
11	55	46	7	46	28	3	44	70	8
12	53	53	8	47	29	4	43	56	6
13	52	--	7	48	26	3	42	40	4
14	51	--	6	48	40	5	41	35	4
15	48	--	5	49	32	4	41	41	4
16	43	--	4	51	33	4	43	44	5
17	52	29	4	51	28	4	42	60	A 7
18	45	57	7	48	31	4	38	70	7
19	42	32	4	46	39	5	38	60	6
20	43	30	3	45	38	5	37	73	7
21	42	32	4	49	38	5	35	63	6
22	43	40	A 5	49	42	6	34	77	7
23	44	60	A 7	47	40	5	40	68	7
24	43	76	9	44	46	5	37	66	6
25	40	50	A 5	44	31	4	36	60	A 6
26	38	29	3	43	34	4	70	230	S 59
27	41	29	3	42	33	4	86	210	49
28	49	39	5	42	33	4	60	100	A 16
29	43	43	5	45	55	7	53	100	14
30	43	31	4	59	64	10	48	100	13
31	42	25	3	53	84	12	--	--	--
Total	1628	--	226	1432	--	139	1519	--	3992

Total discharge for year (cfs-days)..... 31309.8
Total load for year (tons)..... 55428

S Computed by subdividing day.
A Computed from partly estimated-concentration graph.

RED RIVER OF THE NORTH BASIN--Continued

5-996. PEMBINA RIVER AT WALHALLA, N. DAK.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 26, 1963.....	0945	44		25	12	0.8	--	--	--	--	--	100	--	--	--			S
Apr. 9, 1964.....	1700	40		275	764	567	53	64	77	84	88	93	97	100	--			VPWC
Apr. 10.....	2350	40		311	2640	2220	48	62	76	87	94	97	98	100	--			VPWC
Apr. 14.....	1340	36		528	905	1290	47	58	65	76	83	90	92	95	100			VPWC
May 6.....	1738	50		522	6080	8570	58	72	86	94	96	100	--	--	--			VPWC
May 20.....	0915	61		308	280	233	69	74	81	88	95	95	96	99	100			VPWC
Sept. 1.....	1719	62		114	12800	3940	58	76	91	98	100	--	--	--	--			PWC

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 26, 1963.....	0945		5	25			2	3	7	24	33	43	53	64	79	95	100	SV
Apr. 14, 1964.....	1340		4	528			--	0	1	32	52	69	82	90	100			SV
May 20.....	0915		9	308			2	3	13	42	55	66	78	89	100			SV

RED RIVER OF THE NORTH BASIN--Continued

5-1200. SOURIS (MOUSE) RIVER NEAR VERENDRYE, N. DAK.

LOCATION.--At gaging station on left bank, 2.7 miles north of Verendrye, McHenry County, 7.5 southwest of and 19 miles upstream from mouth of Wintering River, and at mile 210.5 downstream from Canadian border.
DRAINAGE AREA.--12,000 square miles, approximately, of which about 7,400 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1949 to August 1951, August 1952 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 4, 1963.	2.4	9.4		--		66	32	164	10	460	0	200	63	0.5	0.1	0.30	803	298	0	4.1	1250	7.5	
Nov. 12.....	11	21		--		39	33	324	15	481	0	257	192	--	--	--	1170	234	0	9.2	1820	7.6	
Dec. 26.....	3.1	--		--		60	43	179	--	432	22	261	51	--	--	--	887	326	0	4.3	1350	8.3	
Jan. 23, 1964	2.4	--		--		--	--	200	--	537	0	--	--	--	--	--	1040	384	0	4.4	1540	8.2	
Feb. 20.....	2.4	32		--		108	57	210	11	653	0	346	47	.3	5.7	.36	A1140	502	0	4.1	1700	8.1	
Mar. 14.....	6.4	--		--		118	51	173	--	620	0	322	37	--	--	--	1090	504	0	3.4	1580	7.5	
Apr. 9.....	282	8.7		--		42	25	88	12	284	0	139	19	.2	5.5	.10	505	206	0	2.7	777	7.1	
May 16.....	62	11		0.08		59	26	128	10	366	0	189	33	.5	2.6	.12	664	254	0	3.5	1020	7.7	
June 26.....	148	--		--		49	20	77	--	244	0	158	11	--	--	--	484	205	5	2.3	730	7.6	
July 15.....	33	--		--		87	33	126	--	417	0	200	28	--	--	.20	707	304	0	3.1	1070	7.8	
Sept. 30.....	14	13		.05		65	35	132	11	415	0	171	54	.5	1.6	.29	694	304	0	3.3	1100	7.6	

A Calculated from determined constituents.

RED RIVER OF THE NORTH BASIN--Continued

5-1240. SOURIS (MOUSE) RIVER NEAR WESTHOPE, N. DAK.

LOCATION.--At gaging station, on left bank 1,200 feet upstream from second crossing of international boundary, 1 mile downstream from Fish and Wildlife Service Dam 357, 7 miles northeast of Westhope, Bottineau County, 11 miles downstream from Boundary Creek, and at mile 358.2 downstream from international boundary.
DRAINAGE AREA.--17,600 square miles, approximately, of which about 10,700 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: June 1954 to September 1964 (discontinued).
Water temperatures: October 1954 to September 1955, October 1956 to September 1959, October 1960 to September 1964 (discontinued).
EXTREMES, 1983-64.--Dissolved solids: Maximum, 798 ppm Nov. 1; minimum, 468 ppm May 10-11.
Hardness: Maximum, 326 ppm Nov. 2-5; minimum, 204 ppm May 10-11.
Specific conductance: Maximum daily, 1,330 micromhos Apr. 15; minimum daily, 330 micromhos Apr. 4.
Water temperatures: Maximum, 79°F July 14; minimum, freezing point Apr. 5, 7.
EXTREMES, 1954-55, 1956-64.--Dissolved solids (1954-55, 1956-58, 1959-64): Maximum, 3,650 ppm Feb. 8-28, 1961; minimum, 162 ppm Apr. 13-18, 1957.
Hardness: Maximum, 1,570 ppm Feb. 8-28, 1961; minimum, 85 ppm Apr. 13-18, 1957.
Specific conductance: Maximum daily (1956-64), 4,750 micromhos Feb. 21, 1961; minimum daily, 232 micromhos Apr. 18, 1957.
Water temperatures: Maximum (1959-64), 82°F July 14, 19, 1960; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-31, 1983.	23.1	--	--	--	--	125	--	376	0	164	--	--	--	--	720	0.98	44.9	278	0	3.3	1030	8.2	--
Nov. 1.....	31	27	--	50	48	130	15	423	0	205	46	0.5	15	0.22	798	1.08	66.6	323	0	3.2	1150	8.2	--
Nov. 2-5.....	3.1	--	--	--	--	132	--	399	14	195	--	--	--	--	795	1.08	6.65	326	0	3.2	1140	8.4	--
Mar. 12-14, 21-26, Apr. 1-2, 1964.....	.5	13	--	39	34	75	22	281	0	136	29	.3	13	.14	543	.74	.73	237	6	2.1	810	7.4	50
Apr.3-May 6.....	.6	--	--	--	--	91	--	335	0	162	--	--	--	--	618	.84	1.00	284	9	2.4	921	7.8	--
May 7-9.....	80.7	--	--	--	--	83	--	267	0	138	--	--	--	--	501	.68	82.1	218	0	2.4	771	7.6	--
May 10-11.....	270	--	--	--	--	80	--	261	0	124	--	--	--	--	468	.64	341	204	0	2.4	728	7.6	--
May 12-15.....	426	--	--	--	--	80	--	270	0	128	--	--	--	--	488	.66	561	216	0	2.4	756	7.4	--
May 16.....	518	6.1	0.07	37	31	76	12	281	0	126	26	.3	3.3	.15	496	.67	694	219	0	2.2	763	7.7	19
May 17-18.....	486	--	--	--	--	86	--	294	0	141	--	--	--	--	548	.75	719	240	0	2.4	832	7.7	--
May 19-20.....	184	--	--	--	--	91	--	308	0	154	--	--	--	--	568	.77	282	256	3	2.5	861	8.0	--
May 21.....	82	--	--	--	--	93	--	330	0	158	--	--	--	--	710	.97	157	272	1	2.5	911	7.5	--
May 22-25.....	3.0	--	--	--	--	95	--	358	0	159	--	--	--	--	630	.86	5.10	296	4	2.4	949	7.6	--
May 26-31.....	.6	--	--	--	--	103	--	373	0	168	--	--	--	--	660	.90	1.07	301	0	2.6	1000	7.4	--
June 1-24.....	23.9	19	.05	48	39	98	15	346	0	167	37	.6	7.1	.22	634	.86	40.9	280	0	2.5	955	7.5	25
June 25-July 8..	129	--	--	--	--	102	--	337	0	168	--	--	--	--	636	.86	222	279	3	2.7	959	7.6	--
July 9-15.....	203	--	--	--	--	105	--	349	0	154	--	--	--	--	623	.85	341	263	0	2.8	938	7.6	--
July 16-20.....	115	--	--	--	--	107	--	352	0	150	--	--	--	--	615	.84	191	253	0	2.9	928	7.2	--

July 21-31, 1964	19.7	--	--	--	--	108	--	352	0	148	--	--	--	--	528	.72	28.1	251	0	3.0	929	7.4	--
Aug. 1-31.....	17.0	--	--	--	--	117	--	328	0	157	--	--	--	--	601	.82	27.6	238	0	3.3	938	7.8	--
Sept. 1-11.....	19.6	--	--	--	--	125	--	343	0	157	--	--	--	--	632	.86	33.5	228	0	3.6	964	7.8	--
Sept. 12-29.....	144	--	--	--	--	133	--	379	0	155	--	--	--	--	662	.90	257	245	0	3.7	1000	7.6	--
Sept. 30.....	170	18	0.04	46	40	133	15	450	0	148	40	.4	6.2	.20	699	.95	321	280	0	3.5	1060	7.7	--
Weighted average.....	A36.3	--	--	--	--	105	--	332	--	150	--	--	--	--	600	0.82	94.3	249	1	2.8	909	7.5	--
Tons per day..	--	--	--	--	--	16	--	52	--	24	--	--	--	--	--	--	--	--	--	--	--	--	--

A Mean discharge based on 366 days; mean discharge for 228 days of actual flow, 58.2 cfs.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	59	58	57	60	57	56	55	53	54	55	53	55	55	57	57	58	58	59	54	52	53	54	54	52	50	46	42	40	39	37	37	52
November.....	36	36	35	40	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
December.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
January.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
February.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
March.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April.....	--	--	--	34	32	34	32	33	39	39	42	34	34	38	43	44	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May.....	--	--	--	--	--	--	52	51	52	54	52	55	55	57	59	59	59	62	61	63	66	66	65	62	63	61	60	64	--	60	60	--
June.....	61	58	62	62	68	61	63	62	58	60	62	61	61	63	62	60	58	59	56	57	59	63	65	67	72	73	74	75	76	74	--	64
July.....	75	75	74	72	70	--	75	78	75	74	75	76	77	79	78	76	76	77	74	74	73	74	76	72	74	72	71	71	71	69	70	74
August.....	72	71	73	74	74	69	68	65	--	68	59	58	59	59	60	62	65	65	68	65	--	63	60	60	63	64	64	64	61	55	57	64
September.....	61	65	60	57	56	53	51	55	54	53	51	51	51	51	49	49	53	55	56	54	53	51	51	--	--	--	--	--	--	56	--	54

MISSISSIPPI RIVER MAIN STEM

5-2110. MISSISSIPPI RIVER AT GRAND RAPIDS, MINN.

LOCATION.--At gaging station at bridge on State Highway 189 at Grand Rapids, Itasca County, 2.5 miles upstream from Prairie River, and at mile 1,182 upstream from Ohio River.
DRAINAGE AREA.--3,370 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: April to September 1964.

Chemical analyses, in parts per million, April to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
																		Calcium, magnesium	Noncarbonate				
Oct. 17, 1963	446	10	0.1	0.07	0.01	35	15	5.1	2.0	184	0	4.2	2.8	0.1	0.1	0.03	174	148	--	0.2	290	7.3	6
Apr. 2, 1964.	710	11	.2	.07	.02	43	17	7.3	2.4	220	0	9.2	2.0	.2	.1	.03	216	176	--	.2	358	7.8	3
Apr. 28.....	1740	6.7	.1	.19	.04	30	9.5	4.7	3.1	136	0	7.8	2.2	.2	.6	.03	182	114	2	.2	233	7.2	35
May 19.....	1510	6.0	.2	.12	.03	33	8.9	5.5	1.5	142	0	9.5	1.7	.2	.5	.04	169	119	3	.2	237	7.1	45
July 15.....	1640	6.8	.5	.06	.00	32	13	4.8	1.4	164	0	8.0	1.4	.2	.3	.02	187	133	--	.2	266	6.8	28
Aug. 13.....	760	7.5	.5	.06	.00	32	15	6.1	1.6	171	0	10	1.2	.2	.4	.03	171	140	--	.2	277	7.8	18
Sept. 26.....	970	5.8	.2	.05	.00	32	13	5.2	1.7	164	0	9.2	1.2	.2	.2	.04	168	134	--	.2	268	6.9	25

SWAN RIVER BASIN

5-2168. O'BRIEN CREEK NEAR PENGILLY, MINN.

LOCATION.--At gaging station, on right bank 200 feet upstream from Duluth, Missabe and Iron Range Railroad bridge, 1.0 mile upstream from mouth, and 2 miles southeast of Pengilly, Itasca County.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chlorids (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 24, 1963	15	13	0.0	0.11	0.23	43	15	9.7	3.1	183	0	32	4.6	0.2	0.3	0.04	216	171	21	0.3	352	8.0	18
Dec. 13.....	5.6	19	.2	.11	.30	43	18	9.1	2.5	176	0	44	6.0	.2	3.3	.09	249	181	37	.3	383	7.3	12
Jan. 22, 1964	4.4	23	.1	.06	.69	43	19	11	2.9	172	0	46	6.0	.2	8.4	.05	256	184	43	.4	393	7.3	5
Feb. 29.....	4.2	26	.1	.05	.49	49	17	11	2.8	190	0	45	6.0	.1	8.9	.06	277	192	36	.3	416	7.9	4
Apr. 1.....	8.0	19	.2	.07	.19	45	17	9.5	2.1	188	0	39	6.6	.2	5.8	.04	237	184	30	.3	397	7.6	2
Apr. 24.....	61	9.0	.6	1.0	.21	15	6.0	3.6	1.9	50	0	20	2.7	.2	3.1	.03	119	62	21	.2	148	6.9	48
May 19.....	59	6.3	.0	.28	.15	24	8.0	4.6	1.4	90	0	24	3.0	.3	.8	.05	154	93	19	.2	202	6.9	60
June 15.....	6.0	5.6	.2	.09	.02	35	11	6.0	1.7	131	0	29	3.6	.3	.7	.07	184	132	25	.2	277	7.4	40
July 6.....	8.9	10	.5	.07	.01	25	9.4	4.1	1.0	96	0	23	2.4	.3	.8	.06	156	101	22	.2	207	6.8	90
Aug. 3.....	7.1	7.3	.2	.04	.02	37	14	6.7	1.8	160	0	26	3.6	.3	.8	.04	192	149	18	.2	308	7.0	27
Sept. 9.....	33	13	.2	.25	.16	30	11	5.4	1.7	115	0	31	4.0	.3	.7	.08	183	120	26	.2	254	7.3	48
Sept. 26.....	30	14	.4	.44	.29	33	13	6.0	1.9	128	0	33	4.3	.3	1.8	.04	183	134	29	.2	277	7.5	35

MISSISSIPPI RIVER MAIN STEM

5-2670. MISSISSIPPI RIVER NEAR ROYALTON, MINN.

LOCATION.--At gaging station, at plant of Minnesota Power and Light Co., 4 miles northwest of Royalton, Morrison County, 4.5 miles downstream from Swan River, and at mile 956 upstream from Ohio River.
DRAINAGE AREA.--11,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Some spectrographic and radiochemical data available in district office at St. Paul, Minn.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 23, 1963	3510	8.5	0.0	0.05	0.00	43	15	5.6	1.9	200	0	9.5	2.6	0.2	0.3	0.03	196	168	4	0.2	322	8.1	17
Dec. 18.....	A1720	11	.2	.12	.01	44	15	6.1	2.1	209	0	11	3.2	.2	.3	.01	207	172	1	.2	335	7.7	12
Jan. 25, 1964	2120	12	.1	.08	.06	41	15	5.9	1.9	201	0	8.8	2.8	.2	.3	.00	198	166	1	.2	326	7.4	12
Feb. 18.....	3480	13	.1	.05	.07	42	14	8.0	1.6	198	0	8.2	2.8	.1	.1	.02	196	162	--	.2	327	7.6	11
Mar. 23.....	A2220	12	.2	.05	.01	46	15	5.9	1.8	216	0	8.0	3.0	.2	1.2	.03	213	175	--	.2	354	7.8	5
Apr. 15.....	10900	10	.0	.28	.10	32	9.0	4.1	3.3	140	0	8.2	2.8	.2	.6	.02	159	117	2	.2	245	7.0	30
Apr. 27.....	11700	9.3	.1	.14	.05	38	9.2	4.3	2.5	157	0	11	2.8	.2	.9	.02	181	133	4	.2	271	7.1	45
May 18.....	A13500	6.0	.4	.20	.02	28	8.8	3.4	1.8	122	0	8.8	1.7	.2	.8	.07	152	106	6	.1	208	7.3	90
Aug. 8.....	3560	9.8	.3	.05	.00	34	13	4.9	1.2	167	0	8.5	2.2	.2	.4	.03	172	139	2	.2	274	7.0	26
Sept. 25.....	A6230	8.7	.5	.25	.02	30	9.3	3.8	1.5	131	0	10	2.4	.3	.5	.04	147	113	6	.2	216	7.2	45

A Daily mean discharge.

MISSISSIPPI RIVER MAIN STEM--Continued

5-2865. MISSISSIPPI RIVER NEAR ANOKA, MINN.

LOCATION.--At hydroelectric plant of Northern States Power Co. at Coon Rapids, 1.5 miles upstream from gaging station and 5 miles downstream from Anoka, Anoka County.
DRAINAGE AREA.--19,100 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: August 1960 to September 1964.
Water temperatures: August 1960 to September 1963.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 23, 1963	2310	10	0.0	0.03	0.00	47	17	6.7	2.1	212	0	13	3.7	0.2	0.6	0.03	217	181	7	0.2	357	8.0	13
Nov. 4.....	2860	6.9	.1	.03	.01	46	18	7.1	2.1	217	0	15	5.2	.2	.1	.03	222	188	10	.2	363	7.9	--
Dec. 19.....	2900	8.8	.2	.06	.00	54	18	7.4	2.1	246	0	15	4.6	.2	.8	.03	245	209	7	.2	408	7.4	10
Jan. 26, 1964	2290	14	.1	.04	.10	52	17	7.2	2.1	237	0	14	4.0	.2	1.9	.02	239	201	7	.2	396	7.4	6
Feb. 17.....	2800	12	.2	.04	.06	44	17	7.0	2.0	213	0	12	4.2	.1	.2	.04	212	180	5	.2	360	7.4	12
Mar. 23.....	3440	11	.2	.07	.04	46	15	7.0	2.2	212	0	12	4.9	.2	1.4	.03	215	178	4	.2	363	7.8	6
May 4.....	12500	9.1	.2	.24	.08	40	14	6.1	2.5	173	0	22	3.8	.3	1.0	.03	200	156	14	.2	315	7.6	25
May 18.....	19800	8.2	.2	.14	.07	39	12	5.0	2.3	154	0	22	3.3	.3	1.1	.04	198	146	20	.2	295	7.3	50
July 10.....	4930	9.4	--	--	.07	38	10	4.6	2.1	155	0	9.5	2.8	.2	1.8	.05	189	136	9	.2	274	7.2	50
Aug. 4.....	4890	10	.3	.06	.01	38	14	5.4	1.4	181	0	12	3.0	.3	.2	.02	192	152	4	.2	303	6.9	22
Sept. 25.....	8990	9.4	.4	.20	.02	34	10	4.7	1.9	142	0	15	3.2	.3	.9	.05	165	126	10	.2	250	7.0	50

MINNESOTA RIVER BASIN

5-3045. CHIPPEWA RIVER NEAR MILAN, MINN.

LOCATION.--At gaging station at bridge on State Highway 40, 2.0 miles upstream from small tributary and 5.5 miles east of Milan, Chippewa County.
DRAINAGE AREA.--1,870 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 21, 1963	190	18	0.0	0.02	0.01	89	45	16	5.5	338	0	148	4.8	0.3	1.1	0.08	536	408	131	0.3	778	8.0	16
Oct. 29.....	130	25	.2	.03	.02	103	50	18	6.8	372	0	191	7.6	.2	1.2	.08	601	463	158	.4	860	7.6	20
Nov. 18.....	90	15	.1	.03	.01	96	46	17	5.2	331	0	183	7.2	.2	.1	.07	545	427	155	.4	799	8.0	11
Dec. 21.....	31	30	.1	.17	.47	108	78	29	7.2	430	0	259	12	.3	4.3	.15	800	592	239	.5	1100	7.7	8
Jan. 15, 1964	18	28	.1	.02	.30	149	68	26	6.0	521	0	239	10	.3	11	.12	844	652	225	.4	1170	7.9	8
Feb. 20.....	26	21	.2	.09	.22	98	46	17	4.0	314	0	191	5.8	.2	3.1	.10	566	434	176	.4	825	8.1	7
Mar. 26.....	55	18	.2	.07	.04	92	45	16	7.2	313	0	176	6.8	.4	2.5	.09	549	414	157	.3	810	7.6	8
May 14.....	526	16	.2	.08	.07	92	46	16	7.0	343	0	156	6.3	.3	1.7	.09	572	420	139	.3	796	7.4	45
May 21.....	340	14	.2	.06	.00	87	45	15	6.4	342	0	142	6.2	.3	1.9	.08	522	402	121	.3	781	7.6	25
June 9.....	110	19	.1	.08	.08	98	47	16	7.4	342	0	172	6.3	.3	2.8	.10	569	438	157	.3	833	7.9	13
July 7.....	54	24	.1	.03	.11	86	49	18	6.2	322	0	164	6.6	.3	1.0	.08	540	415	151	.4	797	7.6	14
Aug. 6.....	22	21	.4	.03	.03	84	53	23	6.1	292	0	210	13	.2	1.1	.12	604	428	188	.5	852	7.6	3
Sept. 11.....	44	22	.3	.04	.06	89	45	17	5.6	310	0	172	6.8	.3	.6	.13	518	407	153	.4	774	7.5	10
Sept. 22.....	42	21	.1	.02	.02	92	44	18	5.1	335	0	148	9.2	.2	1.8	.08	531	409	134	.4	790	7.2	11

MINNESOTA RIVER BASIN--Continued

5-3110. MINNESOTA RIVER AT MONTEVIDEO, MINN.

LOCATION.--At gaging station at bridge on U.S. Highway 212 at Montevideo, Chippewa County, 500 feet downstream from Chippewa River.
DRAINAGE AREA.--6,180 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: November 1961 to September 1964.
Water temperatures: November 1961 to September 1963.
REMARKS.--Some spectrographic data available in district office at St. Paul, Minn.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 1, 1963.	392	23	--	0.01	0.01	88	52	24	7.4	287	0	224	7.6	0.3	1.2	0.14	616	434	199	0.5	858	7.8	13
Oct. 21.....	172	21	0.8	.04	.05	105	53	24	6.6	332	0	234	8.8	.4	.9	.13	653	481	209	.5	912	8.0	10
Oct. 30.....	200	25	.2	.04	.04	109	50	23	7.2	350	0	215	9.1	.3	1.4	.15	655	476	189	.5	906	7.6	18
Dec. 3.....	360	22	.1	.03	.04	103	54	28	7.0	322	0	244	9.0	.3	.1	.14	677	478	214	.6	932	7.7	12
Jan. 13, 1964	86	30	.1	.02	.25	129	66	35	7.6	405	0	293	12	.3	6.3	.26	840	595	263	.6	1130	7.5	5
Feb. 18.....	95	24	.2	.09	.12	86	63	32	6.6	280	0	278	15	.2	2.9	.19	688	475	245	.6	967	7.5	15
Mar. 24.....	357	22	.3	.05	.08	105	60	31	8.5	324	0	275	12	.3	3.7	.18	726	510	244	.6	1000	7.8	8
May 5.....	1670	14	.0	.02	.05	88	41	21	7.0	226	0	230	7.1	.3	2.2	.10	581	388	203	.5	798	7.4	25
May 21.....	556	12	.3	.02	.02	92	53	20	7.0	341	0	200	8.4	.3	1.0	.11	598	449	169	.4	887	7.6	27
June 2.....	407	14	.0	.05	.09	102	54	26	8.2	280	0	274	7.6	.4	3.2	.13	675	476	246	.5	940	7.5	20
July 6.....	199	25	.1	.11	.10	99	48	28	8.0	292	0	241	11	.3	2.0	.14	638	445	205	.6	902	7.6	20
Aug. 4.....	58	25	.4	.03	.00	87	59	32	8.6	274	0	266	14	.3	3.9	.21	670	458	233	.6	949	7.6	3
Sept. 3.....	102	18	.6	.03	.02	86	53	29	7.4	257	0	252	10	.2	.7	.15	607	431	220	.6	870	7.0	10
Sept. 22.....	79	19	.1	.01	.01	87	52	30	7.6	272	0	239	10	.3	3.3	.15	618	430	207	.6	883	6.8	10

MINNESOTA RIVER BASIN--Continued

5-3165. REDWOOD RIVER NEAR REDWOOD FALLS, MINN.

LOCATION.--At gaging station at highway bridge, 3 miles west of town of Redwood Falls, Redwood County, and 8.5 miles upstream from mouth.
DRAINAGE AREA.--697 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 21, 1963	76	19	0.0	0.03	0.05	148	75	61	7.2	285	11	483	24	0.4	6.2	0.20	A976	676	424	1.0	1350	8.4	9
Oct. 31.....	67.2	18	.1	.03	.06	186	83	63	7.4	348	0	582	25	.4	6.4	.20	1140	806	521	1.0	1520	7.5	5
Dec. 4.....	37.1	13	.2	.03	.12	156	97	56	6.6	295	0	585	18	.3	5.3	.20	1080	786	544	.9	1480	7.6	10
Jan. 15, 1964	8.6	28	.1	.01	.30	209	110	62	8.2	480	0	622	24	.4	7.5	.32	1310	973	579	.9	1740	7.0	4
Feb. 19.....	19.9	19	.2	.05	.11	144	72	42	5.8	274	0	460	17	.2	3.9	.16	969	655	430	.7	1260	7.7	5
Mar. 25.....	47.9	17	.2	.09	.04	139	55	30	9.4	277	0	364	14	.3	7.6	.13	838	573	346	.5	1120	7.8	11
May 11.....	256	17	.0	.02	.04	171	88	45	6.8	323	0	563	14	.4	11	.15	1080	788	523	.7	1460	7.6	9
May 21.....	125	13	.1	.04	.00	158	86	46	6.8	278	0	562	13	.4	5.8	.16	1030	748	520	.7	1420	7.5	9
June 15.....	30.4	16	.1	.01	.28	138	78	53	7.2	250	0	512	22	.4	1.4	.13	A952	666	461	.9	1340	7.5	9
July 10.....	50.3	25	.1	.13	.06	138	55	27	8.0	246	0	389	10	.4	4.5	.14	855	570	368	.5	1110	7.2	30
Aug. 4.....	7.1	9.0	.4	.02	.06	88	67	40	9.2	192	0	374	19	.2	.6	.21	773	494	336	.8	1040	7.4	6
Sept. 8.....	6.8	14	.3	.02	.12	100	58	44	7.8	251	0	312	30	.2	.3	.20	746	486	280	.9	1040	7.6	5
Sept. 22.....	6.7	15	.1	.01	.02	113	55	36	6.8	274	0	313	20	.3	.7	.12	744	509	284	.7	1030	7.4	7

A Calculated from determined constituents.

5-3170. COTTONWOOD RIVER NEAR NEW ULM, MINN.

LOCATION.--At gaging station at highway bridge, 1.8 miles south of New Ulm, Brown County, and 2 miles upstream from mouth.
DRAINAGE AREA.--1,280 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Mar. 28, 1962	1400	14	--	0.02	0.14	60	13	7.4	6.5	180	0	60	5.2	0.2	6.4	0.03	279	203	55	0.2	429	7.1	15
Oct. 22, 1963	161	20	0.0	.03	.02	138	56	26	5.3	340	0	311	9.0	.4	.5	.13	787	573	294	.5	1070	7.8	7
Nov. 4.....	134	20	.3	.03	.15	169	70	30	5.1	380	0	408	10	.5	4.7	.12	981	710	398	.5	1300	7.6	11
Dec. 9.....	52.5	13	.2	.03	.13	154	69	33	4.5	360	0	388	11	.4	3.7	.12	928	668	373	.6	1240	7.7	7
Jan. 17, 1964	37.0	23	.1	.02	.28	168	61	36	4.6	464	0	313	13	.6	4.2	.20	912	671	290	.6	1240	7.5	4
Feb. 24.....	46.5	19	.1	.03	.10	139	55	34	4.6	344	0	325	16	.2	6.2	.13	810	573	291	.6	1120	7.7	5
Mar. 30.....	141	18	.2	.04	.00	146	51	25	7.3	306	0	336	10	.3	7.4	.12	817	573	322	.5	1100	7.6	5
May 21.....	528	17	.1	.03	.03	176	70	27	4.3	335	0	472	7.8	.5	13	.12	955	733	458	.4	1320	7.7	12
June 16.....	110	11	.0	.01	.12	102	61	27	4.6	226	0	336	9.2	.4	1.5	.11	704	507	322	.5	967	7.4	9
July 13.....	113	18	.1	.03	.23	113	50	24	6.0	197	0	343	9.7	.4	4.2	.10	715	486	324	.5	941	7.2	10
Aug. 10.....	27.6	15	.3	.04	.25	70	49	38	6.7	201	0	244	25	.3	3.3	.18	603	374	209	.9	846	7.6	7
Sept. 13.....	117	21	.4	.05	.37	88	36	32	7.3	267	0	162	30	.3	5.6	.13	546	366	147	.7	806	7.7	8
Sept. 22.....	71	19	.1	.02	.23	103	39	28	6.4	296	0	199	15	.3	5.4	.09	589	419	176	.6	861	7.2	7

MINNESOTA RIVER BASIN--Continued

5-3200. BLUE EARTH RIVER NEAR RAPIDAN, MINN.

LOCATION.--At gaging station, on left bank 0.2 mile downstream from powerplant of Northern States Power Co., 2 miles west of Rapidan, Blue Earth County, 3.5 miles downstream from Watonwan River, and 7.8 miles upstream from Le Sueur River.
DRAINAGE AREA.--2,430 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
																		Calcium, magnesium	Noncarbonate				
Oct. 22, 1963	453	20	0.0	0.02	0.03	90	38	26	4.3	290	11	150	14	0.4	3.3	0.10	527	381	125	0.6	780	8.4	7
Nov. 7.....	357	21	.2	.05	.02	98	41	23	4.1	324	0	159	13	.4	6.0	.09	555	412	146	.5	813	7.7	18
Dec. 10.....	20.4	13	.2	.03	.14	110	45	32	4.1	384	0	168	17	.4	2.2	.09	620	460	145	.6	916	7.9	10
Jan. 16, 1964	19.5	21	.1	.03	.42	144	57	50	5.6	540	0	207	23	.4	5.4	.21	807	592	149	.9	1170	7.7	3
Feb. 25.....	18.3	13	.1	.03	.08	108	39	40	4.2	368	0	175	19	.2	4.0	.15	602	430	128	.8	920	7.8	6
Apr. 3.....	457	9.7	.2	.05	.09	84	32	26	3.8	284	0	142	13	.3	3.2	.08	479	343	110	.6	738	8.1	2
May 13.....	4850	20	.1	.03	.01	90	27	9.8	2.7	256	0	106	8.0	.4	25	.04	470	334	124	.2	667	7.4	15
May 14.....	5190	21	.1	.03	.06	86	29	9.2	3.1	254	0	102	9.4	.5	27	.03	467	334	128	.2	658	7.2	10
June 17.....	484	20	.1	.03	.05	94	32	14	2.9	299	0	110	9.9	.5	18	.07	490	365	120	.3	711	7.3	9
July 15.....	464	17	.1	.09	.12	66	29	23	4.0	220	0	123	14	.4	3.6	.06	416	285	105	.6	632	7.8	7
Aug. 11.....	352	15	.2	.02	.12	57	30	25	4.7	182	0	136	17	.5	4.4	.13	402	265	116	.7	613	7.1	8
Sept. 13.....	2210	27	.3	.04	.00	85	28	11	4.3	256	0	104	11	.6	21	.08	437	328	118	.3	643	7.6	18
Sept. 22.....	2330	26	.1	.03	.01	101	34	12	3.9	308	0	128	9.8	.6	16	.08	508	391	138	.3	748	7.4	15

MINNESOTA RIVER BASIN--Continued

5-3250. MINNESOTA RIVER AT MANKATO, MINN.

LOCATION.--At gaging station, on left bank at downstream side of Main Street Bridge in Mankato, Nicollet County, 1.8 miles downstream from Blue Earth River, and at mile 106.4.
DRAINAGE AREA.--14,900 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Some spectrographic and radiocbemical data available in district office at St. Paul, Minn.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 22, 1963	A962	20	0.0	0.04	0.01	112	49	29	5.7	335	0	237	13	0.4	0.3	0.13	675	480	205	0.6	951	8.1	7
Nov. 7.....	895	21	.2	.02	.06	124	60	30	6.0	340	0	299	12	.4	3.8	.11	785	557	278	.6	1060	7.5	10
Dec. 19.....	674	20	.3	.04	.09	141	67	41	6.6	422	0	319	17	.4	3.6	.18	880	626	280	.7	1200	7.6	8
Jan. 17, 1964	375	24	.1	.03	.30	145	59	43	6.0	487	0	249	18	.3	4.7	.20	838	606	207	.8	1170	7.6	3
Feb. 25.....	366	17	.2	.04	.20	134	55	38	5.2	405	0	276	17	.3	1.6	.12	767	560	228	.7	1090	7.6	5
Apr. 3.....	1180	17	.2	.04	.03	109	48	27	7.0	302	0	250	13	.4	4.6	.12	669	470	222	.5	946	7.5	6
May 15.....	12300	18	.1	.02	.01	114	47	18	3.1	296	0	227	9.5	.5	15	.12	636	476	233	.4	901	7.6	6
May 21.....	A7750	15	.2	.02	.00	116	50	20	5.1	312	0	240	8.6	.4	13	.22	676	495	239	.4	947	7.7	25
June 18.....	1900	18	.0	.01	.04	108	42	22	4.9	309	0	204	10	.5	7.9	.08	598	442	189	.5	871	7.6	9
July 14.....	1330	19	.2	.03	.02	84	39	21	5.0	236	0	185	11	.5	11	.10	521	368	174	.5	763	7.4	11
Aug. 11.....	312	11	.3	.05	.06	72	43	32	6.3	254	0	190	16	.2	.0	.15	518	357	149	.7	784	7.2	6
Sept. 12.....	5420	25	.4	.05	.00	67	25	11	4.9	212	0	86	10	.3	22	.08	394	268	94	.3	561	7.6	5
Sept. 22.....	3110	26	.1	.02	.01	99	35	16	4.5	308	0	133	12	.4	18	.15	514	389	136	.4	752	8.0	17

A Daily mean discharge.

MINNESOTA RIVER BASIN--Continued

5-3300. MINNESOTA RIVER NEAR CARVER, MINN.

LOCATION.--At gaging station, on left bank 2.5 miles south of Carver, Carver County, and at mile 36 upstream from Mississippi River.
DRAINAGE AREA.--16,200 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1962 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 10, 1963	1530	21	0.2	0.04	0.02	118	51	30	6.6	320	0	275	14	0.3	0.1	0.12	705	506	243	0.6	988	7.0	5
Oct. 23.....	1300	20	.0	.01	.02	110	49	32	5.9	348	0	223	15	.3	1.9	.14	668	475	190	.6	948	7.8	9
Nov. 8.....	1260	21	.2	.04	.01	106	52	30	5.6	322	0	248	20	.3	3.6	.12	665	478	214	.6	937	7.8	7
Dec. 18.....	706	19	.2	.04	.09	119	64	41	6.2	412	0	273	22	.3	4.3	.16	792	562	224	.8	1100	7.9	11
Jan. 20, 1964	485	23	.1	.02	.40	132	60	44	6.0	469	0	225	26	.3	5.7	.21	801	576	191	.8	1140	7.4	3
Feb. 27.....	505	16	.2	.03	.12	128	49	43	5.2	424	0	191	27	.3	2.9	.17	718	521	173	.8	1060	7.8	25
Apr. 2.....	1250	18	.2	.04	.04	107	43	29	7.1	308	0	223	15	.3	5.1	.13	639	444	191	.6	919	7.6	5
May 14.....	11500	18	.1	.07	.01	103	37	14	4.3	271	0	176	8.4	.4	24	.06	568	408	186	.3	789	7.5	12
May 18.....	12300	18	.2	.05	.03	111	39	15	4.3	297	0	187	9.2	.6	19	.06	579	439	195	.3	839	7.2	11
June 8.....	2550	19	.0	.01	.03	109	41	20	4.5	323	0	179	13	.5	11	.08	586	441	176	.4	855	7.7	10
July 16.....	1660	17	.0	.02	.03	80	38	24	5.3	243	0	171	15	.4	5.2	.11	477	354	155	.6	749	7.4	10
Aug. 10.....	618	13	.3	.04	.12	70	40	35	5.9	270	0	144	27	.3	2.1	.14	490	337	116	.8	767	7.6	3
Sept. 15.....	4940	28	.4	.05	.02	77	26	12	4.8	240	0	90	11	.4	21	.08	393	298	101	.3	598	7.5	14
Sept. 24.....	4430	26	.1	.03	.01	102	32	15	4.5	312	0	126	13	.5	20	.20	512	388	132	.3	742	7.9	22

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MISSISSIPPI RIVER MAIN STEM

5-3310. MISSISSIPPI RIVER AT ST. PAUL, MINN.

LOCATION.--Temperature recorder at gaging station, on left bank in St. Paul, Ramsey County, 300 feet upstream from Robert Street Bridge, 6 miles downstream from Minnesota River, and at mile 839.3 upstream from Ohio River.
DRAINAGE AREA.--36,800 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: October 1956 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 87°F July 24-28; minimum, 33°F on many days during December and January.
EXTREMES, 1956-64.--Water temperatures: Maximum, 87°F July 24-28, 1964; minimum, freezing point on many days during winter months.

Temperature (°F) of water, water year October 1963 to September 1964
(Recorder with temperature attachment, continuous ethyl alcohol-actuated thermograph)

Month	Day																													Average
	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	
October																																
Maximum	67	67	67	67	67	66	66	66	66	66	65	65	65	65	65	65	65	65	64	64	64	63	62	62	62	61	60	60	59	58	57	64
Minimum	67	67	67	67	66	66	66	66	66	65	65	65	65	65	65	65	65	64	64	64	63	62	62	62	61	60	60	59	58	57	56	64
November																																
Maximum	56	55	54	53	52	51	50	49	48	48	47	47	47	47	47	46	45	45	45	45	44	44	42	42	42	42	42	42	42	41	--	47
Minimum	55	54	53	52	51	50	49	48	48	47	47	47	47	47	46	45	45	45	45	44	44	42	42	42	42	42	42	42	42	40	--	46
December																																
Maximum	40	40	39	39	39	38	37	37	37	37	37	37	37	37	37	36	36	36	35	35	35	35	35	34	34	34	34	34	34	33	33	36
Minimum	40	39	39	39	38	37	37	37	37	37	37	37	37	37	36	36	36	35	35	35	34	35	34	34	34	34	34	34	33	33	33	36
January																																
Maximum	34	33	33	33	33	33	33	33	34	34	34	34	34	34	34	33	33	33	33	33	33	33	34	34	34	34	34	34	34	34	34	34
Minimum	33	33	33	33	33	33	33	33	33	34	34	34	34	33	33	33	33	33	33	33	33	33	33	34	34	34	34	34	34	34	34	33
February																																
Maximum	34	34	34	34	34	34	34	35	35	35	34	34	34	34	34	34	34	35	35	36	36	36	36	36	35	35	35	35	34	--	--	35
Minimum	34	34	34	34	34	34	34	34	35	34	34	34	34	34	34	34	34	34	35	35	36	36	35	35	35	35	35	34	34	--	--	34
March																																
Maximum	34	34	35	35	35	35	35	35	35	35	35	35	35	35	35	35	36	36	36	35	35	35	35	35	35	35	36	36	37	37	37	35
Minimum	34	34	34	35	35	35	35	35	35	35	34	35	35	35	35	35	35	36	35	35	35	35	35	35	35	35	35	36	36	37	37	35
April																																
Maximum	37	38	38	39	39	40	40	41	41	42	42	43	44	45	45	46	47	48	48	49	49	50	50	50	50	51	52	53	53	53	--	45
Minimum	37	37	38	38	39	39	40	40	41	41	42	42	43	44	45	45	46	47	48	48	49	49	50	50	50	50	51	52	53	53	--	45
May																																
Maximum	54	55	55	56	57	58	59	60	63	63	63	64	65	66	66	66	67	68	68	69	70	70	70	70	70	70	70	71	71	71	70	65
Minimum	53	54	55	55	56	57	58	59	60	63	63	63	64	65	66	66	66	67	68	68	69	70	70	70	70	70	70	70	71	70	70	64
June																																
Maximum	70	70	70	70	69	69	69	70	70	70	71	71	71	71	72	72	72	72	72	72	72	73	74	74	74	74	75	76	77	77	--	72
Minimum	70	70	70	69	69	69	69	69	70	70	70	71	71	71	71	72	72	72	72	72	72	72	73	74	74	74	74	75	76	77	--	72
July																																
Maximum	78	78	78	79	80	79	79	79	79	80	80	80	80	80	80	80	81	82	83	84	85	85	86	87	87	87	87	87	86	86	85	82
Minimum	77	78	78	78	79	79	79	79	79	79	80	80	80	80	80	80	80	81	82	83	84	85	85	86	86	87	87	86	86	84	85	82
August																																
Maximum	85	85	84	83	84	84	84	84	83	82	82	81	80	79	78	77	76	76	75	75	74	74	74	74	74	73	72	72	72	71	71	78
Minimum	85	84	83	83	83	84	84	83	82	82	81	80	79	78	77	76	76	75	75	74	74	74	74	74	73	72	72	72	71	71	71	77
September																																
Maximum	71	71	70	70	70	70	70	70	69	69	69	69	69	69	68	68	67	67	67	67	67	67	67	66	66	66	66	65	66	65	--	68
Minimum	71	70	70	70	70	70	70	69	69	69	69	69	69	68	68	65	67	67	66	67	67	67	66	66	66	66	65	65	65	64	--	68

CANNON RIVER BASIN

5-3552. CANNON RIVER AT WELCH, MINN.

LOCATION.--At gaging station on right bank, 0.3 mile downstream from highway bridge at Welch, Goodhue County, and 1.8 miles upstream from Belle Creek.
DRAINAGE AREA.--1,320 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Mar. 21, 1963	840	14	--	0.14	0.14	64	19	10	8.0	235	0	38	15	0.2	14	0.06	314	238	45	0.3	507	7.0	45
Oct. 22.....	308	6.5	0.0	.02	.04	59	25	12	3.3	256	0	35	15	.2	3.7	.04	299	248	38	.3	501	7.7	4
Nov. 19.....	70.7	5.5	.3	.09	.04	62	26	15	3.7	277	0	38	19	.3	4.7	.05	325	262	35	.4	550	7.4	5
Dec. 6.....	95.0	3.5	.1	.01	.00	65	27	17	3.9	283	0	39	22	.3	4.3	.06	336	272	40	.4	570	7.6	9
Jan. 9, 1964.	74.3	11	.2	.03	.04	74	28	15	3.5	315	0	38	19	.2	8.6	.05	359	301	43	.4	609	7.5	5
Feb. 17.....	60.2	11	.2	.05	.10	67	28	9.5	2.8	304	0	30	21	.2	5.8	.03	350	281	32	.2	543	8.2	1
Mar. 20.....	84.8	12	.3	.05	.08	65	24	12	3.8	276	0	31	14	.2	8.3	.04	307	259	33	.3	534	7.6	5
Apr. 17.....	100	11	.2	.03	.05	60	21	10	3.8	244	0	36	13	.2	7.6	.04	287	237	37	.3	495	7.5	7
May 14.....	155	4.9	.0	.02	.06	57	23	10	3.9	232	0	48	13	.2	3.4	.04	299	236	46	.3	490	7.2	15
May 15.....	145	--	--	--	--	60	22	--	--	236	0	--	--	--	--	--	304	241	47	--	493	7.8	--
June 13.....	91.3	4.4	.1	.10	.19	58	24	9.5	3.7	249	0	44	11	.3	4.9	.02	306	245	41	.3	444	7.8	9
July 25.....	76.8	10	.1	.04	.13	56	26	12	3.5	255	0	41	17	.3	4.5	.02	302	248	39	.3	518	7.4	6
Aug. 28.....	84.0	7.9	.3	.05	.00	51	25	12	3.5	238	0	38	15	.3	4.0	.03	283	231	36	.3	493	7.4	6
Sept. 21.....	115	13	.3	.04	.05	58	25	9.2	3.7	247	0	39	12	.3	7.7	.06	304	246	43	.3	493	7.6	15
Sept. 24.....	148	13	.2	.03	.02	59	22	11	4.5	225	0	45	14	.3	10	.04	293	236	51	.3	486	7.3	6

MISSISSIPPI RIVER MAIN STEM

5-3785. MISSISSIPPI RIVER AT WINONA, MINN.

LOCATION.--At gaging station, on right bank at Winona pumping station in Winona, Winona County, 9.5 miles upstream from Trempealeau River, and at mile 725.7 upstream from the Ohio River.
DRAINAGE AREA.--59,200 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Some spectrographic data available in district office at St. Paul, Minn.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Apr. 15, 1963	A33900	9.2	--	0.07	0.01	40	13	6.0	3.7	152	0	29	5.5	0.3	5.5	0.04	203	152	27	0.2	324	7.3	25
Oct. 22.....	A10600	9.6	0.0	.03	.00	44	15	11	2.3	177	0	34	8.2	.2	1.8	.05	227	173	28	.4	365	7.7	19
Nov. 14.....	9520	6.9	.5	.34	.07	43	18	11	2.5	184	0	38	8.7	.3	.3	.05	234	180	29	.4	386	7.3	10
Dec. 4.....	11200	7.4	.2	.08	.02	44	16	11	2.5	177	0	38	9.5	.3	1.5	.05	227	176	31	.4	376	7.4	18
Jan. 7, 1964.	11100	15	.1	.04	.06	62	23	17	3.1	250	0	51	18	.3	4.0	.08	330	249	44	.5	529	7.7	23
Feb. 13.....	10200	12	.3	.10	.11	48	18	14	2.6	197	0	36	16	.2	4.9	.06	258	193	31	.4	419	7.4	17
Mar. 18.....	13700	12	.5	.14	.09	40	15	12	2.8	178	0	24	12	.3	4.3	.06	214	162	16	.4	364	7.8	10
Apr. 15.....	34900	9.8	.9	.07	.07	41	16	12	2.8	176	0	29	11	.3	4.0	.05	212	167	23	.4	373	7.3	25
May 14.....	A60200	7.4	.2	.04	.00	42	16	8.0	3.0	152	0	50	6.4	.1	3.4	.02	232	169	44	.3	369	7.5	25
May 25.....	55800	9.5	.2	.13	.06	42	13	7.1	2.9	142	0	42	6.1	.3	5.8	.04	246	159	43	.2	342	7.1	48
Sept. 4.....	24200	7.7	.8	.07	.01	37	14	10	2.3	164	0	29	8.2	.3	1.1	.06	204	152	17	.4	346	7.2	22
Sept. 23.....	A22300	9.7	.2	.05	.00	37	14	9.4	2.7	161	0	24	8.6	.3	1.5	.04	193	150	18	.3	321	6.8	15
Sept. 30.....	25400	11	.3	.10	.03	35	13	7.6	2.3	144	0	25	7.2	.3	2.7	.07	197	142	24	.3	299	7.2	23

A Daily mean discharge.

UPPER IOWA RIVER BASIN

5-3875. UPPER IOWA RIVER AT DECORAH, IOWA

LOCATION.--At county highway bridge at Decorah, Winneshiek County, 1.5 miles upstream from Trout Run, and 1.5 miles downstream from gaging station.
DRAINAGE AREA.--511 square miles upstream from gaging station.
RECORDS AVAILABLE.--Water temperatures: October 1962 to September 1964.
Sediment records: October 1962 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 84°F July 20; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 3,700 ppm June 23; minimum daily, 2 ppm Dec. 27, Feb. 8, 9, 14.
Sediment loads: Maximum daily, 25,000 tons Apr. 2; minimum daily, 0.3 ton Dec. 27, Feb. 14.
EXTREMES, 1962-64.--Water temperatures: Maximum, 84°F July 20, 1964; minimum, freezing point on many days each year.
Sediment concentrations: Maximum daily, 3,500 ppm Apr. 2, 1964; minimum daily, 2 ppm on several days in 1963-64.
Sediment loads: Maximum daily, 25,000 tons Apr. 2, 1964; minimum daily, 0.3 ton Dec. 27, 1963, Feb. 14, 1964.
REMARKS.--No appreciable inflow between sampling point and gaging station. Flow affected by ice Dec. 2-5, Dec. 9 to Jan. 19, Jan. 22-29, Feb. 7-11, 14-18, 20-28, Mar. 3-10, 26-31.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	60	60	58	58	58	66	62	66	66	60	64	58	62	64	60	60	64	60	58	60	64	62	62	62	60	60	62	60	56	56	56	60
November	44	38	42	40	46	48	52	54	50	50	44	40	38	42	38	40	44	42	40	42	44	40	40	36	36	34	38	36	36	37	--	42
December	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March	32	32	32	33	32	32	32	32	32	32	--	--	--	--	--	--	--	--	39	--	--	--	--	--	--	--	32	32	32	32	--	--
April	--	--	--	--	--	--	--	--	--	--	50	50	36	36	36	36	36	48	46	50	54	52	60	64	60	58	58	60	56	52	--	--
May	52	50	44	44	70	60	58	60	58	60	60	60	60	64	64	64	64	68	68	70	76	78	80	70	74	74	68	66	64	62	64	66
June	60	64	64	62	68	60	68	72	74	74	64	66	68	72	72	68	66	70	80	80	78	70	72	68	70	78	80	80	80	82	--	71
July	76	72	70	70	80	72	72	78	76	80	72	74	78	72	80	78	74	76	80	84	74	80	78	80	70	76	68	74	70	76	80	76
August	70	76	68	72	76	80	68	72	74	78	68	54	44	46	46	50	--	50	54	64	80	76	56	60	60	74	64	64	60	60	58	64
September	74	64	74	68	64	70	68	--	76	70	72	58	54	60	56	58	66	60	64	64	60	60	60	58	54	60	58	52	50	58	--	62

UPPER IOWA RIVER BASIN--Continued

5-3875. UPPER IOWA RIVER AT DECORAH, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	75	33	7	75	35	7	70	67	13
2	75	40	8	72	22	4	65	24	4
3	70	60	11	77	28	6	63	41	7
4	68	60	11	77	47	10	68	26	5
5	68	66	12	75	53	11	73	22	4
6	68	27	5	72	42	8	77	18	4
7	65	66	12	70	24	5	75	24	5
8	65	29	5	70	29	5	72	19	4
9	63	33	6	70	40	8	70	27	5
10	63	46	8	70	30	6	65	19	3
11	68	66	12	75	20	4	57	31	5
12	68	37	7	68	26	5	52	28	4
13	68	27	5	68	17	3	60	29	5
14	68	42	8	68	16	3	62	22	4
15	68	44	8	65	28	5	58	57	9
16	68	66	12	68	33	6	56	22	3
17	72	41	8	68	43	8	53	16	2
18	107	54	16	68	26	5	52	13	2
19	92	69	17	65	41	7	49	16	2
20	85	50	11	70	52	10	48	24	3
21	82	44	10	70	46	9	47	30	4
22	85	92	21	103	90	25	47	7	.9
23	82	90	20	127	47	16	47	10	1
24	77	110	23	103	31	9	47	11	1
25	103	89	25	99	23	6	47	10	1
26	92	130	32	99	26	7	48	6	.8
27	82	83	18	89	24	6	49	2	.3
28	80	86	19	82	40	9	51	4	.6
29	77	32	7	77	21	4	54	5	.7
30	77	51	11	77	27	6	54	9	1
31	77	37	8	---	---	---	55	6	.9
Total	2358	--	338	2337	--	223	1791	--	105.2
	JANUARY			FEBRUARY			MARCH		
1	56	8	1	70	9	2	70	34	6
2	56	10	2	72	5	1	70	23	4
3	56	-- E	1	80	4	.9	78	11	2
4	57	-- E	1	72	23	4	88	25	6
5	58	5	.8	75	8	2	97	27	7
6	60	6	1	77	13	3	90	27	7
7	62	5	.8	79	10	2	82	15	3
8	64	5	.9	80	2	.4	76	13	3
9	64	3	.5	76	2	.4	78	14	3
10	64	6	1	72	4	.8	80	9	2
11	64	5	.9	69	4	.7	82	11	2
12	64	5	.9	65	3	.5	99	70	19
13	64	5	.9	65	4	.7	322	300	260
14	64	5	.9	63	2	.3	233	110	69
15	64	5	.9	62	3	.5	147	34	13
16	63	5	.9	62	5	.8	127	28	10
17	60	3	.5	64	5	.9	119	12	4
18	58	5	.8	64	13	2	107	12	3
19	56	12	2	70	20	4	92	11	3
20	54	13	2	77	18	4	92	5	1
21	54	11	2	79	47	10	85	8	2
22	57	7	1	78	26	5	80	5	1
23	60	9	1	78	21	4	80	7	2
24	64	9	2	78	9	2	77	9	2
25	70	36	7	78	13	3	72	7	1
26	80	34	7	80	10	2	60	9	1
27	84	18	4	80	21	5	64	7	1
28	80	10	2	80	15	3	66	15	3
29	72	12	2	70	17	3	70	11	2
30	65	8	1	---	---	---	71	14	3
31	65	8	1	---	---	---	73	8	2
Total	1959	--	50.7	2115	--	67.9	3027	--	447

E Estimated.

UPPER IOWA RIVER BASIN--Continued

5-3875. UPPER IOWA RIVER AT DECORAH, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	89	100	24	172	120	56	147	160	64
2	1750	3500 S	25000	180	120	58	144	100	39
3	1960	2700 S	21000	168	110	50	140	94	36
4	573	390	600	168	170	77	133	110	40
5	327	150	130	154	100	42	130	110	39
6	491	110	150	140	100	38	127	100	34
7	378	220	220	133	91	33	125	95	32
8	242	220	140	164	160	71	119	100	32
9	216	45	26	266	1100	790	115	65	20
10	184	46	23	338	1300	1200	107	54	16
11	161	53	23	238	400	260	111	79	24
12	154	55	23	195	230	120	119	70	22
13	154	44	18	199	210	110	115	96	30
14	158	50	21	199	280	150	115	99	31
15	150	39	16	216	130	76	107	71	21
16	161	51	22	459	830 S	1200	99	74	20
17	154	48	20	343	1300	1200	99	93	25
18	140	41	15	349	950	900	99	76	20
19	133	55	20	276	460	340	103	120	33
20	127	120	41	225	260	160	92	160	40
21	150	890	360	199	180	97	89	150	36
22	136	150	55	180	240	120	422	900 S	6000
23	130	68	24	144	220	86	800	3700 S	12000
24	127	42	14	393	640	680	176	410	190
25	122	41	14	271	420	310	144	230	89
26	119	55	18	261	330	230	130	190	67
27	122	52	17	207	250	140	122	160	53
28	130	72	25	184	180	89	111	130	39
29	130	52	18	172	180	84	103	110	31
30	140	59	22	161	190	83	99	92	25
31	--	--	--	154	170	71	--	--	--
Total	9008	--	43099	6908	--	8921	4542	--	19148

Day	JULY			AUGUST			SEPTEMBER		
1	96	110	29	52	69	10	50	43	6
2	96	100	26	46	56	7	50	40	5
3	89	63	15	48	52	7	54	40	6
4	82	72	16	46	54	7	56	31	5
5	80	63	14	44	43	5	52	28	4
6	80	80	17	42	38	4	48	28	4
7	80	85	18	44	43	5	48	32	4
8	77	64	13	42	35	4	63	-- E	9
9	75	58	12	42	39	4	60	60	10
10	75	52	11	42	63	7	92	80	20
11	80	120	26	42	42	5	89	72	17
12	80	100	22	40	57	6	72	51	10
13	75	74	15	40	44	5	70	42	8
14	75	64	13	40	62	7	65	39	7
15	70	91	17	40	62	7	63	45	8
16	68	78	14	39	47	5	60	38	6
17	65	89	16	36	36	3	60	15	2
18	68	84	15	36	41	4	60	19	3
19	65	100	18	39	36	4	60	24	4
20	65	85	15	40	83	9	63	19	3
21	68	87	16	52	73	10	63	36	6
22	68	33	6	52	73	10	58	21	2
23	60	75	12	52	38	5	58	16	3
24	58	55	9	54	32	5	58	15	2
25	56	67	10	72	37	7	56	25	4
26	56	80	12	60	42	7	54	15	2
27	56	68	10	54	48	7	54	23	3
28	54	55	8	56	53	8	52	7	1
29	50	77	10	54	52	8	50	14	2
30	52	90	13	58	120	19	50	9	1
31	52	90	13	54	110	16	--	--	--
Total	2171	--	461	1458	--	217	1788	--	167

Total discharge for year (cfs-days)..... 39462
Total load for year (tons)..... 73244.8

E Estimated.
8 Computed by subdividing day.

UPPER IOWA RIVER BASIN--Continued

5-3875. UPPER IOWA RIVER AT DECORAH, IOWA--Continued

Periodic determinations of suspended-sediment discharge and particle size, March 1963 to June 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Mar. 18, 1963.....	1615	--		2660	380	2700	15	29	28	37	53	79	86	93				SPWC
Apr. 2, 1964.....	1400	--		2320	4600	29000	24	--	44	55	78	94	99	100				VPWC
Apr. 2.....	1400	--		2320	4600	29000	15	18	--	48	--	94	99	100				VPN
Apr. 3.....	0900	32		2260	2000	12000	32	45	--	70	--	99	99	100				VPWC
May 10.....	1100	60		349	1400	1300	--	77	91	95	--	100	--	--				SPWC
May 17.....	0900	64		322	1300	1100	--	66	82	93	--	98	--	--				SPWC
May 24.....	1100	70		491	780	1000	--	46	57	71	--	99	100	--				VPWC
June 23.....	1800	72		238	2100	1300	--	61	77	89	--	100	--	--				SPWC

WISCONSIN RIVER BASIN

5-4037. DELL CREEK NEAR LAKE DELTON, WIS.

LOCATION.--At gaging station at Butterfield Bridge on Town Road, 6 miles southwest of Lake Delton, 7 miles east of Reedsburg, and 7 miles upstream from mouth.
DRAINAGE AREA.--44.9 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1957 to September 1964.
Sediment records: October 1957 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 73°F July 19, 23, 24, 28, and Aug. 2; minimum, freezing point on many days during December to February.
Sediment concentrations: Maximum daily, 214 ppm May 13; minimum daily, 1 ppm on several days in October, December, April, August, and September.
Sediment loads: Maximum daily, 50 tons July 28; minimum daily, less than 0.05 ton Oct. 1, Dec. 31, Aug. 29, 31, Sept. 26.
EXTREMES, 1957-64.--Water temperatures: Maximum, 73°F July 19, 23, 24, 28, and Aug. 2, 1964; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 438 ppm May 11, 1959; minimum daily, 1 ppm on many days during 1958-60, 1962-64.
Sediment loads: Maximum daily, 512 tons May 11, 1959; minimum daily, less than 0.05 ton on several days during 1958-60, 1963-64.
REMARKS.--Flow affected by ice Dec. 3-31, Jan. 1-3, 10-17, 25-31, Feb. 1-24, 26, 27, Mar. 18, 26-28.

Temperature (°F) of water, water year October 1963 to September 1964
(Once-daily measurement, usually between 1200 and 1600)

Month	Day																													Aver-age
	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	
October	55	57	55	58	57	62	57	57	51	54	56	51	51	51	53	57	57	57	56	56	56	59	58	57	61	56	53	46	45	47	47	55
November	43	--	--	44	48	--	--	46	49	46	43	--	--	41	40	44	49	47	44	--	48	52	42	38	41	37	36	--	--	--	--	--
December	33	32	32	32	33	40	41	39	36	34	34	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33
January	32	32	32	32	36	36	34	35	34	32	32	32	32	32	32	32	32	33	36	38	39	41	37	38	--	32	32	32	32	32	32	34
February	37	35	35	38	39	36	33	32	32	32	32	32	32	32	35	35	36	37	36	34	32	32	32	32	32	32	32	33	42	--	--	34
March	45	43	38	41	37	36	40	34	39	39	38	44	41	44	43	44	35	37	39	37	41	41	43	42	35	36	34	38	35	36	41	39
April	44	43	41	41	38	46	41	42	45	49	49	50	47	46	45	53	57	49	50	47	54	53	53	54	56	64	59	55	51	50	--	49
May	49	57	63	67	61	62	66	65	56	62	60	60	59	60	64	65	60	66	66	63	65	70	69	65	64	61	59	58	57	57	60	62
June	56	55	59	60	62	60	64	68	69	64	57	59	65	62	59	58	58	67	68	72	64	61	64	66	69	--	72	71	72	--	--	64
July	66	67	64	60	61	59	61	64	64	62	63	65	57	59	65	64	72	69	73	70	70	68	73	73	69	69	67	73	70	62	--	66
August	70	73	71	68	69	64	66	61	58	63	61	58	59	59	61	63	63	62	62	62	59	61	55	57	--	53	58	61	66	63	57	62
September	56	58	64	61	56	56	60	63	62	62	56	51	49	53	50	48	52	56	58	57	58	56	56	52	48	55	51	50	51	49	--	55

WISCONSIN RIVER BASIN--Continued

5-4037. DELL CREEK NEAR LAKE DELTON, WIS.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	18	1	T	21	22	1.2	21	22	1.2
2	18	4	0.2	20	21	1.1	20	19	1.0
3	18	5	.2	20	23	1.2	19	22	1.1
4	18	5	.2	20	25	1.4	18	16	.8
5	18	3	.1	20	25	1.4	18	15	.7
6	18	2	.1	20	25	1.4	18	20	1.0
7	18	3	.1	20	25	1.4	18	15	.7
8	18	3	.1	20	27	1.4	19	11	.6
9	18	3	.1	21	27	1.5	18	15	.7
10	18	3	.1	22	27	1.6	18	16	.8
11	19	4	.2	21	25	1.4	18	21	.5
12	19	3	.2	20	24	1.3	18	10	.5
13	19	3	.2	20	25	1.4	17	7	.3
14	19	5	.2	20	24	1.3	17	7	.3
15	19	3	.2	20	15	.8	17	3	.1
16	19	3	.2	20	21	1.1	18	10	.5
17	24	6	.4	20	20	1.1	17	12	.6
18	21	5	.3	21	21	1.2	17	4	.2
19	24	5	.3	20	26	1.4	17	4	.2
20	22	5	.3	22	29	1.7	17	3	.1
21	23	5	.3	22	23	1.4	17	4	.2
22	25	3	.2	31	55 B	5	17	2	.1
23	24	4	.2	60	55 A	9	17	2	.1
24	23	5	.3	30	17	1.4	17	6	.3
25	26	5	.4	25	20	1.4	17	5	.2
26	22	6	.4	24	26	1.7	17	3	.1
27	20	6	.3	23	30	1.9	17	2	.1
28	20	8	.4	23	30	1.9	17	2	.1
29	20	30	1.6	22	23	1.4	17	3	.1
30	20	37	2.0	22	26	1.5	17	2	.1
31	20	35	1.9	--	--	--	17	1	T
Total	628	--	11.7	690	--	52.9	547	--	13.3
	JANUARY			FEBRUARY			MARCH		
1	17	2	0.1	16	12	0.5	17	2	0.1
2	17	5	.2	16	6	.2	18	3	.1
3	17	11	.5	16	6	.2	18	3	.1
4	18	8	.4	17	6	.3	18	3	.1
5	18	7	.3	17	7	.3	18	2	.1
6	18	6	.3	17	7	.3	18	3	.1
7	18	9	.4	17	5	.2	18	2	.1
8	18	10	.5	16	6	.2	18	2	.1
9	18	7	.3	16	14	.6	18	2	.1
10	17	6	.3	16	10	.4	18	4	.2
11	17	3	.1	16	10	.4	18	5	.2
12	17	2	.1	16	6	.2	20	6	.3
13	17	2	.1	16	5	.2	21	7	.4
14	17	4	.2	16	2	.1	22	7	.4
15	17	6	.3	16	3	.1	21	7	.4
16	17	4	.2	16	3	.1	21	6	.3
17	17	5	.2	16	6	.2	20	5	.3
18	17	4	.2	16	9	.4	19	7	.4
19	18	4	.2	16	5	.2	19	6	.3
20	18	4	.2	16	2	.1	20	6	.3
21	18	6	.3	16	3	.1	20	4	.2
22	19	7	.4	16	5	.2	20	5	.3
23	20	8	.4	16	3	.1	20	4	.2
24	27	20	1.4	16	3	.1	21	6	.3
25	27	19	1.4	16	3	.1	20	5	.3
26	21	12	.7	16	2	.1	19	7	.4
27	19	6	.3	16	6	.2	19	7	.4
28	18	4	.2	16	5	.2	19	6	.3
29	18	4	.2	16	5	.2	19	4	.2
30	17	5	.2	--	--	--	19	3	.2
31	16	5	.2	--	--	--	19	7	.4
Total	568	--	10.8	468	--	6.5	595	--	7.6

T Less than 0.05 ton.
A Computed from partly estimated-concentration graph.
B Computed from estimated concentration graph.

WISCONSIN RIVER BASIN--Continued

5-4037. DELL CREEK NEAR LAKE DELTON, WIS.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day
1	20	4	0.2	25	8	0.5	19	19	1.0
2	27	-- E	1	36	20	1.9	20	21	1.1
3	50	65 A	9	30	14	1.1	20	19	1.0
4	33	19	1.7	24	10	.6	19	15	.8
5	28	12	.9	47	136 S	19	18	13	.6
6	45	25	3.0	30	37	3.0	18	12	.6
7	36	21	2.0	31	75 A	6	18	16	.8
8	27	11	.8	26	31	2.2	18	19	.9
9	25	7	.5	49	140 A	18	17	15	.7
10	24	7	.4	29	48	3.8	17	16	.7
11	24	9	.6	24	21	1.4	17	33	1.5
12	25	11	.7	29	193 S	21	20	22	1.2
13	29	15	1.2	46	214 S	29	18	18	.9
14	27	15	1.1	28	26	2.0	18	12	.6
15	24	7	.4	25	18	1.2	18	16	.8
16	23	6	.4	69	110 S	22	17	15	.7
17	24	16	1.0	43	80 S	9.9	18	14	.7
18	23	4	.2	28	38	2.9	19	14	.7
19	22	1	.1	25	26	1.8	18	12	.6
20	21	2	.1	23	25	1.6	17	12	.6
21	31	24 S	2.3	22	17	1.0	18	17	.8
22	27	8	.6	21	13	.7	25	45 A	3
23	24	5	.3	21	15	.8	35	-- E	11
24	22	5	.3	35	80 A	8	22	57	3.4
25	21	5	.3	25	32	2.2	18	31	1.5
26	21	2	.1	22	20	1.2	17	22	1.0
27	22	2	.1	21	17	1.0	17	24	1.1
28	31	50 A	4	20	17	.9	17	23	1.0
29	28	14	1.0	20	20	1.1	16	13	.6
30	27	9	.6	20	21	1.1	16	10	.4
31	--	--	--	20	18	1.0	--	--	
Total	811	--	34.9	914	--	167.9	565	--	40.3

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day
1	16	14	0.6	20	14	0.8	15	2	0.1
2	22	57 S	3.6	18	10	.5	15	5	.2
3	17	17	.8	17	10	.4	16	3	.1
4	16	10	.4	16	20	.9	20	8	.4
5	16	10	.4	16	17	.7	16	3	.1
6	16	14	.6	15	10	.4	16	4	.2
7	16	11	.5	15	22	.9	16	2	.1
8	16	14	.6	15	17	.7	16	5	.2
9	16	15	.6	15	11	.4	16	4	.2
10	16	15	.6	15	15	.6	18	-- E	1
11	16	16	.7	15	9	.4	19	14	.7
12	16	23	1.0	15	7	.3	17	10	.4
13	16	8	.3	15	19	.8	16	5	.2
14	16	6	.2	14	7	.3	16	2	.1
15	16	6	.2	14	5	.2	16	4	.2
16	15	7	.3	14	8	.3	15	2	.1
17	14	6	.2	14	9	.3	15	3	.1
18	14	10	.4	14	7	.3	16	3	.1
19	14	7	.3	14	7	.3	18	3	.1
20	14	8	.3	14	7	.3	17	6	.3
21	14	9	.3	24	-- E	4	17	25	1.1
22	14	10	.4	21	31	1.8	17	12	.6
23	22	-- E	6	18	9	.4	17	3	.1
24	16	15	.6	16	7	.3	16	2	.1
25	16	6	.2	16	4	.2	16	2	.1
26	15	10	.4	15	3	.1	16	1	T
27	24	163 S	21	15	2	.1	16	3	.1
28	98	200 B	50	15	4	.2	15	2	.1
29	130	48	17	14	1	T	15	3	.1
30	55	42	6.2	16	3	.1	15	2	.1
31	22	22	1.3	15	1	T	--	--	--
Total	744	--	116.0	490	--	17.1	489	--	7.3

Total discharge for year (cfs-days)..... 7509
Total load for year (tons)..... 486.3

E Estimated.
S Computed by subdividing day.
T Less than 0.05 ton.
A Computed from partly estimated-concentration graph.
B Computed from estimated-concentration graph.

5-4065. BLACK EARTH CREEK AT BLACK EARTH, WIS.

LOCATION.--At gaging station on right bank, 0.7 mile east of Black Earth, Dane County, 2.1 miles upstream from Vermont Creek, and 150 feet south of U.S. Highway 14.
DRAINAGE AREA.--45.9 square miles.
RECORDS AVAILABLE.--Water temperatures: February 1954 to September 1964.
Sediment records: February 1954 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 77°F July 16; minimum, freezing point on several days during December and January.
Sediment concentrations: Maximum daily, 142 ppm Dec. 9; minimum daily, 1 ppm Oct. 28, 29.
Sediment loads: Maximum daily, 7.7 tons Dec. 9; minimum daily, 0.1 ton on many days during October, November, June, August, and September.
EXTREMES, 1954-64.--Water temperatures: Maximum, 78°F on several days during July 1955, June 1956, July 1957, and June 1963.
Sediment concentrations: Maximum daily, 2,010 ppm May 13, 1956; minimum daily, 1 ppm on several days during 1955, 1958, 1961, and 1963.
Sediment loads: Maximum daily, 3,960 tons July 3, 1954; minimum daily, less than 0.05 ton Oct. 19-21, 1958.
REMARKS.--Flow affected by ice Jan. 10-16, 28.

Temperature (°F) of water, water year October 1963 to September 1964
(Once-daily measurement, usually between 1300 and 1700)

Month	Day																													Aver-age
	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	
October	56	63	62	61	63	57	57	55	59	61	62	60	49	53	62	56	57	--	58	58	--	61	62	61	60	60	55	51	--	52	52	58
November	48	--	46	49	--	54	53	--	51	47	--	41	43	43	45	41	54	51	49	--	51	51	--	45	45	45	46	45	--	41	--	--
December	37	36	35	35	--	40	44	42	39	36	40	39	34	35	33	--	32	32	--	32	32	32	--	34	34	33	33	34	32	32	33	35
January	32	34	37	40	41	40	39	37	36	32	32	--	33	33	34	35	34	42	43	44	42	43	42	--	--	32	--	32	34	40	43	37
February	41	35	42	44	39	40	35	36	34	40	41	38	40	40	--	34	42	44	40	40	37	41	34	34	40	36	36	43	47	--	--	39
March	--	50	42	44	41	40	47	41	44	--	46	49	42	43	46	--	36	45	43	40	43	38	48	47	36	41	38	44	--	41	46	43
April	48	42	46	47	43	52	44	48	53	55	--	52	49	51	49	66	62	--	49	53	64	52	58	60	62	52	63	62	62	54	--	54
May	51	63	68	67	--	66	69	--	57	54	56	--	53	64	--	60	60	68	71	61	67	72	73	65	72	71	65	64	66	62	55	64
June	--	56	63	63	64	56	57	65	71	72	65	61	63	64	62	--	63	65	65	--	65	60	66	60	74	64	--	68	75	74	--	65
July	70	75	66	64	61	65	64	68	62	62	--	58	61	62	60	77	--	74	65	72	72	71	74	75	--	65	--	65	65	62	59	66
August	74	67	75	72	65	67	72	--	55	63	62	54	64	65	58	57	66	61	65	66	68	65	60	--	65	66	67	70	72	62	--	65
September	59	63	70	65	65	58	57	67	72	64	62	61	49	--	57	60	61	59	56	57	58	64	--	52	50	55	50	52	50	55	--	59

WISCONSIN RIVER BASIN--Continued

5-4065. BLACK EARTH CREEK AT BLACK EARTH, WIS.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	19	4	0.2	19	2	0.1	20	5	0.3
2	19	4	.2	19	2	.1	20	5	.3
3	19	4	.2	19	2	.1	20	5	.3
4	20	4	.2	19	6	.3	20	8	.4
5	20	5	.3	19	10	.5	20	101	5.4
6	20	5	.3	20	11	.6	20	133	7.2
7	20	5	.3	20	7	.4	20	133	7.2
8	20	5	.3	20	5	.3	20	137	7.4
9	20	5	.3	20	5	.3	20	142	7.7
10	21	4	.2	20	5	.3	20	132	7.1
11	20	3	.2	20	5	.3	20	114	6.2
12	20	3	.2	20	5	.3	20	95	5.1
13	20	3	.2	20	5	.3	18	96	4.7
14	20	4	.2	20	15	.8	19	120	6.2
15	20	5	.3	20	10	.5	18	70	3.4
16	20	11	.6	20	10	.5	18	62	3.0
17	21	6	.3	20	12	.6	18	102	5.0
18	21	2	.1	20	25	1.4	18	41	2.0
19	21	2	.1	20	14	.8	17	-- E	3
20	21	2	.1	21	8	.4	18	114	5.5
21	20	2	.1	21	8	.4	18	114	5.5
22	21	5	.3	23	14	.9	18	104	5.0
23	20	6	.3	29	12	.9	17	100	4.6
24	20	5	.3	23	7	.4	17	117	5.4
25	20	3	.2	22	6	.4	18	81	3.9
26	20	3	.2	21	6	.3	18	109	5.3
27	19	2	.1	21	12	.7	18	61	3.0
28	19	1	.1	21	7	.4	18	40	1.9
29	19	1	.1	20	5	.3	18	43	2.1
30	19	2	.1	20	5	.3	18	20	1.0
31	19	2	.1	--	--	--	18	18	.9
Total	618	--	6.7	617	--	13.9	580	--	126.0
	JANUARY			FEBRUARY			MARCH		
1	18	20	1.0	19	8	0.4	20	7	0.4
2	18	20	1.0	18	7	.3	20	17	.9
3	18	20	1.0	18	5	.2	20	16	.9
4	18	22	1.1	18	4	.2	20	18	1.0
5	18	27	1.3	18	4	.2	21	16	.9
6	19	11	.6	18	5	.2	20	11	.6
7	19	6	.3	18	4	.2	21	15	.8
8	19	11	.6	18	4	.2	22	16	1.0
9	19	12	.6	18	6	.3	20	15	.8
10	18	11	.5	18	7	.3	20	17	.9
11	18	10	.5	18	7	.3	20	20	1.1
12	18	9	.4	18	7	.3	22	23	1.4
13	18	9	.4	18	6	.3	35	48	4.5
14	18	8	.4	18	5	.2	37	45	4.5
15	18	8	.4	18	6	.3	24	22	1.4
16	18	7	.3	18	6	.3	23	12	.7
17	18	16	.8	18	8	.4	23	11	.7
18	19	14	.7	18	13	.6	21	11	.6
19	19	11	.6	18	10	.5	21	20	1.1
20	19	10	.5	18	8	.4	21	17	1.0
21	20	10	.5	18	8	.4	20	14	.8
22	21	10	.6	18	8	.4	20	10	.5
23	22	12	.7	18	10	.5	20	15	.8
24	26	36	2.5	19	8	.4	21	12	.7
25	25	23	1.6	19	8	.4	21	12	.7
26	20	5	.3	19	8	.4	20	13	.7
27	18	6	.3	19	8	.4	20	15	.8
28	18	7	.3	18	11	.5	20	18	1.0
29	19	4	.2	18	5	.2	20	16	.9
30	19	13	.7	--	--	--	20	10	.5
31	19	9	.5	--	--	--	20	10	.5
Total	594	--	21.2	527	--	9.7	673	--	33.1

E Estimated.

WISCONSIN RIVER BASIN--Continued

5-4065. BLACK EARTH CRREK AT BLACK EARTH, WIS.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE			
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day	
1	21	14	0.8	24	7	0.4	18	5	0.2	
2	27	13	.9	34	18	1.6	18	3	.1	
3	38	35	3.6	26	15	1.0	19	2	.1	
4	28	18	1.4	23	21	1.3	18	5	.2	
5	31	10	.8	22	23	1.4	18	5	.2	
6	41	26	2.9	21	17	1.0	18	5	.2	
7	31	11	.9	20	14	.8	18	5	.2	
8	27	17	1.2	21	13	.7	18	16	.8	
9	25	20	1.4	20	11	.6	18	11	.5	
10	24	17	1.1	20	12	.6	18	10	.5	
11	23	13	.8	19	13	.7	18	10	.5	
12	23	11	.7	20	13	.7	18	10	.5	
13	23	14	.9	37	16	1.6	18	12	.6	
14	20	12	.6	31	42	3.5	18	15	.7	
15	20	16	.9	27	45	3.3	19	13	.7	
16	20	30	1.6	38	35	3.6	18	11	.5	
17	20	43	2.3	28	22	1.7	19	10	.5	
18	20	25	1.4	24	16	1.0	19	13	.7	
19	20	8	.4	23	13	.8	19	23	1.2	
20	20	9	.5	22	17	1.0	18	22	1.1	
21	23	10	.6	20	16	.9	20	20	1.1	
22	21	10	.6	20	13	.7	28	--	E 6	
23	20	10	.5	20	11	.6	31	70	A 6	
24	20	10	.5	22	22	1.3	20	10	.5	
25	19	10	.5	20	9	.5	18	10	.5	
26	20	10	.5	20	7	.4	18	10	.5	
27	21	10	.6	20	8	.4	17	11	.5	
28	20	10	.5	18	7	.3	17	12	.6	
29	23	10	.6	18	7	.3	17	14	.6	
30	25	3	.2	18	8	.4	18	13	.6	
31	--	--	--	18	7	.3	--	--	--	
Total	714	--	30.2	714	--	33.4	569	--	26.9	

Day	JULY			AUGUST			SEPTEMBER		
1	18	11	0.5	18	11	0.5	16	10	0.4
2	21	9	.5	18	13	.6	16	8	.3
3	18	8	.4	18	9	.4	18	7	.3
4	18	8	.4	18	7	.3	19	7	.4
5	18	8	.4	18	7	.3	17	7	.3
6	18	4	.2	18	7	.3	17	6	.3
7	18	6	.3	18	8	.4	18	9	.4
8	18	4	.2	19	8	.4	18	15	.7
9	18	5	.2	19	8	.4	18	16	.8
10	18	8	.4	19	11	.6	18	13	.6
11	18	15	.7	20	15	.8	18	10	.5
12	17	21	1.0	20	16	.9	16	5	.2
13	18	17	.8	20	17	.9	16	3	.1
14	18	12	.6	19	5	.2	16	5	.2
15	17	7	.3	18	2	.1	16	5	.2
16	17	7	.3	18	2	.1	16	3	.1
17	17	7	.3	18	2	.1	16	4	.2
18	17	8	.4	17	3	.1	16	7	.3
19	16	8	.3	16	8	.3	16	12	.5
20	16	7	.3	18	8	.4	16	18	.8
21	18	7	.3	30	19	1.5	17	13	.6
22	18	14	.7	17	9	.4	18	10	.5
23	16	11	.5	16	3	.1	16	9	.4
24	16	10	.4	16	3	.1	16	7	.3
25	21	8	.4	16	4	.2	16	3	.1
26	17	6	.3	16	3	.1	16	3	.1
27	18	8	.4	16	8	.3	18	6	.3
28	23	13	.8	16	5	.2	17	6	.3
29	27	24	1.7	16	4	.2	17	6	.3
30	19	9	.5	18	12	.6	16	11	.5
31	18	8	.4	16	12	.5	--	--	--
Total	565	--	14.9	560	--	12.3	504	--	11.0

Total discharge for year (cfs-days)..... 7235
Total load for year (tons)..... 339.3

E Estimated.
A Computed from partly estimated-concentration graph.

ROCK RIVER BASIN

5-4305. ROCK RIVER AT AFTON, WIS.

LOCATION.--Temperature recorder at gaging station on right bank in Afton, Rock County, 0.3 (revised) mile downstream from highway bridge, and 0.8 mile upstream from Bass Creek.
DRAINAGE AREA.--3,300 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: September 1954 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 89°F July 26, 28; minimum, freezing point Dec. 14-16, 21-26.
EXTREMES, 1954-64.--Water temperatures: Maximum, 89°F July 27-30, Aug. 4, 1955, July 26, 28, 1964; minimum, freezing point on many days during winter months.

Temperature (°F) of water, water year October 1963 to September 1964
(Continuous ethyl alcohol-actuated thermograph)

Month	Day																													Average
	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	
October																																
Maximum	65	65	65	64	65	64	65	65	65	66	65	65	64	63	63	65	66	64	63	63	64	66	67	65	65	65	64	59	58	57	56	64
Minimum	60	61	61	61	59	61	62	61	61	61	61	60	58	58	59	62	63	63	62	61	61	61	63	62	63	60	59	56	55	54	55	60
November																																
Maximum	55	52	52	52	53	52	52	52	52	52	51	50	48	48	47	49	50	51	49	49	51	53	53	47	47	47	46	46	45	43	--	50
Minimum	52	49	49	49	51	51	50	51	51	50	48	47	46	45	45	45	49	49	46	48	49	51	47	45	45	45	44	45	43	42	--	48
December																																
Maximum	42	40	39	39	38	39	39	39	36	36	36	35	34	33	33	33	33	33	33	33	33	33	33	33	33	33	34	34	34	34	34	35
Minimum	40	38	38	38	37	37	37	36	36	35	35	34	33	32	32	32	33	33	33	33	32	32	32	32	32	32	33	34	34	34	34	34
January																																
Maximum	34	34	33	33	33	36	36	37	37	36	35	35	35	35	35	34	34	35	37	39	40	41	41	40	38	35	35	35	35	36	37	36
Minimum	34	33	33	33	33	33	35	36	36	35	34	34	34	34	34	34	34	34	35	37	38	39	39	38	35	35	35	35	35	35	36	35
February																																
Maximum	38	38	38	38	40	40	39	38	38	39	38	37	40	39	37	40	40	40	40	41	39	39	37	37	41	39	37	41	42	--	--	39
Minimum	35	35	37	36	37	37	36	36	36	36	36	36	36	35	36	35	36	37	37	37	36	36	36	35	36	36	36	36	37	--	--	36
March																																
Maximum	43	46	46	44	41	41	42	40	41	43	43	46	45	43	45	47	44	43	41	40	40	41	42	41	41	41	39	43	40	42	43	42
Minimum	39	39	43	39	35	37	39	38	38	38	39	40	41	41	42	43	42	41	39	39	37	38	39	40	37	37	37	38	37	36	39	39
April																																
Maximum	44	43	45	43	42	44	44	45	47	49	51	52	52	54	53	55	56	57	55	55	58	59	57	60	60	59	59	60	59	57	--	52
Minimum	39	41	40	41	40	40	43	43	42	44	47	49	51	49	48	49	52	54	54	53	52	53	54	54	54	55	57	57	57	56	--	49
May																																
Maximum	56	61	63	65	69	67	72	71	68	70	67	68	65	66	67	68	69	71	71	71	71	73	73	74	75	73	73	69	70	70	69	69
Minimum	55	55	56	60	54	65	55	67	64	63	63	63	62	60	61	64	66	67	68	67	67	69	70	70	69	70	68	66	63	63	63	64
June																																
Maximum	70	67	67	71	69	68	72	77	73	71	71	70	77	76	70	71	68	71	77	75	73	75	75	77	79	81	84	84	82	84	--	74
Minimum	63	63	61	61	63	61	63	64	69	65	62	66	68	70	65	61	64	67	67	67	68	69	68	69	70	72	73	75	75	76	--	67
July																																
Maximum	82	81	80	79	79	78	74	80	78	79	77	72	74	77	80	79	85	86	83	80	82	87	87	88	85	89	88	89	85	80	77	81
Minimum	77	74	75	70	73	70	70	73	73	72	72	70	69	69	71	74	75	75	74	76	75	79	80	81	79	79	81	80	79	76	74	75
August																																
Maximum	83	86	86	82	83	81	81	79	76	76	76	74	71	74	74	74	76	75	75	75	76	77	74	75	75	75	76	76	78	78	79	77
Minimum	75	77	78	79	76	75	75	71	71	68	74	69	67	65	67	67	67	71	69	70	73	73	69	66	70	69	71	73	69	74	70	71
September																																
Maximum	76	76	80	80	75	73	77	79	79	79	73	72	71	69	71	69	71	70	70	72	70	73	73	67	65	65	63	65	67	64	--	72
Minimum	72	72	72	75	70	69	69	64	62	64	70	65	64	64	64	64	65	65	65	66	67	68	67	61	61	62	60	57	59	60	--	65

IOWA RIVER BASIN

5-4545. IOWA RIVER AT IOWA CITY, IOWA

LOCATION.--At Benton Street Bridge at Iowa City, Johnson County, 0.5 mile downstream from gaging station, 0.4 mile upstream from Ralston Creek, and 4.1 miles downstream from Clear Creek.
DRAINAGE AREA.--3,271 square miles.
RECORDS AVAILABLE.--Chemical analyses: January 1944 to September 1954.
Water temperatures: January 1944 to September 1964.
Sediment records: October 1943 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 86°F July 22-24, Aug. 1; minimum, freezing point on many days in December and January.
Sediment concentrations: Maximum daily, 820 ppm June 23; minimum daily, 2 ppm Dec. 16, 18, 20, 21, 27.
Sediment loads: Maximum daily, 4,000 tons June 23; minimum daily, 0.9 ton Dec. 16.
EXTREMES, 1943-64.--Water temperatures (1944-64): Maximum, 90°F July 19, 1957, Aug. 24, 25, 1959; minimum, freezing point on many days each year.
Sediment concentrations: Maximum daily, 7,800 ppm June 13, 1953; minimum daily, 2 ppm Dec. 16, 18, 20, 21, 27, 1963.
Sediment loads: Maximum daily, 177,000 tons May 23, 1944; minimum daily, 0.9 ton, Dec. 16, 1963.
REMARKS.--Flow affected by ice Dec. 24-30. Diurnal fluctuation at low stages caused by powerplants upstream from station.
Flow regulated by Coralville Reservoir upstream from Iowa City beginning Sept. 17, 1958 (total capacity, 492,000 acre-feet).

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Aver-age
	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	
October	70	72	70	68	72	71	70	70	70	70	72	69	70	67	69	67	68	69	70	69	68	71	72	70	70	--	--	60	59	62	56	69
November	54	53	53	54	54	54	55	58	58	--	52	48	45	46	49	51	50	50	50	51	52	--	45	47	45	--	44	--	41	42	--	50
December	--	38	36	38	39	47	44	40	33	32	37	32	32	32	32	32	32	32	32	32	32	--	32	34	35	34	32	32	32	32	32	34
January	32	35	36	35	32	36	36	36	32	32	32	32	32	32	34	36	37	38	37	38	40	40	39	35	34	32	32	32	32	35	36	35
February	36	36	38	39	40	36	40	39	38	36	40	40	38	38	37	37	39	39	38	36	37	37	34	36	34	34	37	38	41	--	--	37
March	43	45	44	38	37	39	38	37	37	38	38	39	43	42	42	40	38	39	39	39	39	41	43	38	35	38	36	37	36	37	39	39
April	46	46	44	44	47	48	42	46	48	47	47	50	51	49	57	61	55	54	54	54	58	58	58	61	62	62	65	60	56	55	--	53
May	60	62	66	68	70	71	71	68	67	68	68	64	64	67	68	69	--	75	74	75	76	76	76	74	76	76	71	71	--	71	71	70
June	71	70	71	72	70	70	76	78	75	--	74	74	74	72	72	70	76	77	77	78	--	76	71	75	80	79	81	80	80	80	--	75
July	80	84	78	75	74	82	80	80	80	76	76	74	77	80	80	80	82	82	82	81	84	86	86	86	84	85	85	85	81	80	80	81
August	80	84	84	80	81	82	79	80	79	82	74	72	71	75	76	76	76	75	75	76	76	74	76	74	74	74	75	74	74	74	76	77
September	76	80	80	76	76	74	77	77	76	74	70	71	71	72	70	69	69	69	71	70	69	71	66	65	65	65	63	62	64	65	--	71

IOWA RIVER BASIN--Continued

5-4545. IOWA RIVER AT IOWA CITY, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	152	42	17	149	30	12	184	--	15
2..	145	24	9	149	28	11	164	25	11
3..	143	29	11	149	32	13	164	16	7
4..	143	41	16	152	22	9	161	14	6
5..	143	42	16	152	21	9	159	14	6
6..	145	39	15	149	33	13	159	19	8
7..	138	36	13	149	34	14	161	6	3
8..	136	28	10	149	40	16	171	11	5
9..	136	43	16	152	22	9	164	11	5
10..	138	39	15	152	--	12	164	6	3
11..	138	35	13	159	37	16	161	7	3
12..	136	32	12	143	48	19	161	5	2
13..	138	46	17	147	35	14	159	7	3
14..	138	48	18	147	36	14	152	3	1
15..	140	30	11	145	32	13	145	5	2
16..	143	31	12	152	37	15	161	2	.9
17..	143	42	16	157	32	14	351	4	4
18..	143	46	18	154	34	14	358	2	2
19..	145	29	11	154	39	16	362	5	5
20..	147	40	16	169	37	17	362	2	2
21..	147	39	15	166	26	12	365	2	2
22..	152	44	18	250	--	22	368	--	4
23..	149	51	21	230	38	24	439	7	8
24..	149	52	21	184	45	22	480	4	5
25..	154	38	16	174	49	23	480	4	5
26..	152	--	16	171	--	14	480	4	5
27..	149	--	17	166	18	8	470	2	3
28..	149	44	18	157	--	7	470	5	6
29..	147	37	15	145	15	6	470	5	6
30..	149	37	15	157	12	5	460	3	4
31..	152	31	13	--	--	--	354	4	4
Total	4479	--	467	4829	--	413	8859	--	145.9

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	291	30	24	1040	10	28	192	34	18
2..	282	99	75	1040	6	17	154	35	15
3..	282	65	49	1000	11	30	174	41	19
4..	282	74	56	1000	11	30	479	15	20
5..	282	94	72	1000	68	180	644	20	35
6..	250	27	18	1000	99	270	648	140	240
7..	149	38	15	985	48	130	712	140	270
8..	138	26	10	985	37	98	666	100	180
9..	138	27	10	962	56	150	539	100	160
10..	143	25	10	955	83	210	397	95	100
11..	143	20	8	932	39	98	451	92	110
12..	140	21	8	930	5	13	541	96	140
13..	140	27	10	910	44	110	712	64	160
14..	140	46	17	630	46	78	467	87	110
15..	140	20	8	301	38	31	459	120	150
16..	140	9	3	334	58	52	658	90	170
17..	140	15	6	334	48	43	1040	85	240
18..	138	19	7	337	68	62	720	100	190
19..	136	10	4	334	51	46	653	88	160
20..	134	20	7	327	38	34	351	90	85
21..	136	14	5	331	30	27	397	99	110
22..	166	9	4	331	36	32	397	110	120
23..	187	12	6	334	23	21	401	95	100
24..	169	17	9	397	31	33	412	120	130
25..	143	16	6	563	58	89	404	83	91
26..	145	7	3	541	21	31	393	130	140
27..	140	9	3	532	13	19	376	100	100
28..	138	7	3	499	28	38	307	94	78
29..	140	7	3	143	25	10	320	30	26
30..	187	7	4	--	--	--	327	26	23
31..	544	13	23	--	--	--	320	27	23
Total	5823	--	486	19009	--	2009	14771	--	3916

IOWA RIVER BASIN--Continued

5-4545. IOWA RIVER AT IOWA CITY, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	253	66	45	1640	140	620	872	91	210
2..	181	66	32	1600	120	520	707	81	150
3..	174	51	24	1600	130	560	594	75	120
4..	169	47	21	1600	120	520	594	76	130
5..	179	44	21	1560	140	590	541	83	120
6..	253	44	30	1600	160	690	495	100	130
7..	393	70	74	1520	150	620	532	99	140
8..	1000	55	150	1680	180	820	537	86	120
9..	1340	55	200	1600	150	650	524	90	130
10..	1430	77	300	1520	170	700	524	--	140
11..	1560	74	310	1560	170	720	495	100	130
12..	1520	120	490	1680	190	860	487	110	140
13..	1080	120	350	1760	140	670	483	130	170
14..	689	110	200	1760	140	670	532	100	140
15..	680	130	240	1760	150	710	676	120	220
16..	680	120	220	1760	130	620	648	130	230
17..	662	120	210	1760	--	570	520	140	200
18..	586	120	190	1680	120	540	423	130	150
19..	581	110	170	1520	120	490	459	160	200
20..	648	98	170	1300	140	490	545	150	220
21..	815	150	330	1120	120	360	499	--	200
22..	932	120	300	962	110	290	716	300	580
23..	962	110	290	962	120	310	1800	820	4000
24..	1000	140	380	985	130	350	1840	340	1700
25..	1000	110	300	962	120	310	1250	180	610
26..	992	140	370	948	120	310	2000	300	1600
27..	918	130	320	940	110	280	3000	230	1900
28..	774	130	270	948	130	330	3000	270	2200
29..	1080	140	410	948	--	280	3000	210	1700
30..	1560	140	590	948	110	280	2920	250	2000
31..	--	--	--	948	100	260	--	--	--
Total	24091	--	7007	43131	--	15990	31213	--	19680

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	2920	200	1600	311	240	200	725	110	220
2..	2920	230	1800	227	120	74	720	100	190
3..	2850	110	850	390	110	120	622	100	170
4..	2850	190	1500	720	100	190	451	100	120
5..	2780	190	1400	1000	73	200	459	87	110
6..	1760	120	570	955	92	240	459	84	100
7..	978	130	340	829	120	270	455	87	110
8..	962	150	390	822	75	170	463	81	100
9..	932	120	300	815	69	150	459	86	110
10..	932	160	400	712	63	120	588	80	130
11..	978	120	320	507	80	110	666	69	120
12..	992	130	350	487	60	79	716	70	140
13..	1200	140	450	386	54	56	716	70	140
14..	1430	99	380	288	65	51	716	65	130
15..	1430	98	380	224	49	30	742	66	140
16..	1480	95	380	253	49	33	671	53	96
17..	1430	140	540	253	40	27	720	63	120
18..	1430	140	540	230	42	26	843	44	100
19..	1540	140	620	253	41	28	1000	71	190
20..	1430	120	460	275	54	40	1040	67	190
21..	1680	130	590	314	59	50	1040	63	180
22..	1760	110	520	285	52	40	1080	51	150
23..	1250	110	370	279	61	46	1160	100	310
24..	712	71	140	282	57	43	1080	99	290
25..	662	72	130	304	50	41	595	55	88
26..	668	94	170	334	65	59	194	54	28
27..	622	88	150	401	62	67	194	53	28
28..	491	82	110	390	100	110	187	40	20
29..	334	82	74	397	55	59	184	30	15
30..	250	82	55	479	62	80	184	50	25
31..	285	240	180	617	100	170	--	--	--
Total	42028	--	15060	14019	--	2979	19127	--	5863

Total discharge for year (cfs-days)..... 231379
Total load for year (tons)..... 72617.9

IOWA RIVER BASIN--Continued

5-4550. RALSTON CREEK AT IOWA CITY, IOWA

LOCATION.--At gaging station on left bank at bridge on Rochester Avenue, near east edge of Iowa City, Johnson County, and 2.2 miles upstream from mouth.
DRAINAGE AREA.--3.01 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1960 to September 1964.
Sediment records: April 1952 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 78°F Aug. 2, 3; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 3,800 ppm June 19; minimum daily, no flow on many days during October to February and July to September.
Sediment loads: Maximum daily, 240 tons June 22; minimum daily, 0 tons on many days during October to February and July to September.
EXTREMES, 1952-64.--Water temperatures (1960-64): Maximum, 78°F Aug. 2, 3, 1964; minimum, freezing point on many days each year.
Sediment concentrations: Maximum daily, 8,240 ppm Jan. 12, 1960; minimum daily, no flow on many days in 1953-59, 1963-64.
Sediment loads: Maximum daily, 3,080 tons June 4, 1960, July 14, 1962; minimum daily, 0 tons on many days in 1953-59, 1963-64.
REMARKS.--Flow affected by ice Dec. 12 to Mar. 11.

Temperature (°F) of water, November 1963 to September 1964

Month	Day																													Aver-age
	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	
October																																
November	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50	--	54	36	36	36	36	36	36	36	34	--	--
December	32	32	32	32	32	32	34	32	32	--	--	--	--	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	34	--	--	36	34	36	36	36	38	38	38	32	32	32	34	32	32	32	32	32	32	32	32	32	32	--	--
April	32	40	40	40	40	40	40	34	34	36	48	48	46	46	38	46	46	46	46	46	54	48	48	46	44	46	54	54	--	50	--	44
May	52	54	56	56	64	64	64	64	58	56	54	58	56	54	56	62	62	62	64	54	54	64	64	60	58	60	60	56	56	58	58	59
June	54	64	54	56	60	60	60	62	70	64	64	62	62	62	64	60	62	64	64	68	68	68	64	62	64	64	64	64	64	68	--	63
July	68	68	68	66	64	64	70	70	68	68	64	62	58	62	64	72	72	72	72	--	--	--	--	74	--	--	--	--	--	66	--	64	--
August	68	78	78	76	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	61	--	--	--	--	65	61	--
September	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	65	60	60	--	--	--	--	--	--	--	--	--

IOWA RIVER BASIN--Continued

5-4550. RALSTON CREEK AT IOWA CITY, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0			0	--	0	0.1	100	T
2	0			0	--	0	.1	65	T
3	0			0	--	0	.1	110	T
4	0			0	--	0	.1	55	T
5	0			0	--	0	.1	58	T
6	0			0	--	0	.1	47	T
7	0			0	--	0	.1	64	T
8	0			0	--	0	.1	58	T
9	0			0	--	0	.1	71	T
10	0			0	--	0	0	--	0
11	0			0	--	0	0	--	0
12	0			0	--	0	0	--	0
13	0			0	--	0	0	--	0
14	0			0	--	0	.1	70	T
15	0			0	--	0	0	--	0
16	0			0	--	0	0	--	0
17	0			0	--	0	0	--	0
18	0			0	--	0	0	--	0
19	0			0	--	0	0	--	0
20	0			.2	690	.4	0	--	0
21	0			.2	110	B .1	0	--	0
22	0			4.6	1200	S 23	0	--	0
23	0			.5	90	.1	0	--	0
24	0			.2	75	T	0	--	0
25	0			.2	63	T	0	--	0
26	0			.1	62	T	0	--	0
27	0			.1	53	T	0	--	0
28	0			.2	75	T	0	--	0
29	0			.2	72	T	0	--	0
30	0			.1	51	T	0	--	0
31	0			--	--	--	0	--	0
Total	0	--	0	6.6	--	23.8	1.0	--	0.2

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0		0	0		0	0.9	--	0.1
2	0		0	0		0	.5	--	.1
3	.1		T	0		0	.4	--	T
4	.1		T	.1		T	.4	--	T
5	0		0	.2		T	.4	--	T
6	0		0	.2		T	1.6	--	.2
7	0		0	.2		T	1.2	--	.1
8	0		0	.2		T	1.0	--	.1
9	0		0	.2		T	1.7	95	.4
10	0		0	.2		T	1.1	43	.1
11	0		0	.1		T	.9	25	.1
12	0		0	.1		T	.8	36	.1
13	0		0	.1		T	.7	57	.1
14	0		0	.1		T	1.0	150	.4
15	0		0	.1		T	.6	43	.1
16	0		0	.1		T	.5	35	T
17	0		0	.2		T	.4	23	T
18	0		0	.3		T	.4	24	T
19	0		0	.2		T	.4	19	T
20	.2		T	.1		T	.4	21	T
21	.6		.1	.1		T	.4	14	T
22	.4		.1	.1		T	.4	21	T
23	.2		T	.1		T	.4	22	T
24	.1		T	.1		T	.4	13	T
25	.1		T	.1		T	.3	34	T
26	.1		T	.1		T	.4	55	.1
27	.1		T	.1		T	.4	52	.1
28	0		0	.1		T	.5	16	T
29	0		0	2.0		.2	.3	50	T
30	0		0	--		--	.3	61	T
31	0		0	--		--	.3	21	T
Total	2.0	--	.3	5.5	--	.6	19.4	--	2.6

S Computed by subdividing day.
T Less than 0.05 ton.
B Computed from estimated-concentration graph.

IOWA RIVER BASIN--Continued

5-4550. RALSTON CREEK AT IOWA CITY, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0.5	21	T	2.2	110	0.7	0.3	44	T
2	1.4	890 S	5	3.0	110	.9	.2	26	T
3	1.5	260	1	1.8	19	.1	.2	23	T
4	.8	160	.3	1.4	24	.1	.3	29	T
5	3.2	840 S	9	1.2	67	.2	.2	41	T
6	2.4	130	.8	1.0	54	.1	.3	21	T
7	1.6	32	.1	1.0	62	.2	.3	28	T
8	1.5	17	.1	4.8	260 S	5	.2	43	T
9	1.2	8	T	1.3	71	.2	.2	47	T
10	.9	14	T	1.0	61	.2	.2	33	T
11	.8	28	.1	.9	75	.2	.2	38	T
12	.8	22	T	2.5	520 S	6	.6	68	0.1
13	.7	41	.1	2.3	150	.9	.4	20	T
14	.7	20	T	1.5	66	.3	2.6	1500 S	20
15	.7	30	.1	1.4	66	.2	3.4	480	4
16	.6	15	T	1.1	82	.2	.8	79	.2
17	.6	16	T	.9	74	.2	.6	55	.1
18	.5	18	T	.7	70	.1	.9	530 S	5
19	.8	350 S	1	.9	71	.2	7.0	3800 S	110
20	6.6	810 S	16	.9	120	.3	8.9	3000	72
21	3.0	140	1	.9	47	.1	1.6	130	.6
22	1.5	36	.1	.8	78	.2	9.6	3400 S	240
23	1.2	31	.1	.7	55	.1	6.0	1600 A	26
24	.9	17	T	.7	100	.2	1.5	120	.5
25	.8	30	.1	.5	46	.1	1.0	75	.2
26	1.2	23	.1	.5	79	.1	.7	87	.2
27	4.2	470 S	6	.5	54	.1	.6	60	.1
28	1.7	88	.4	.6	59	.1	.5	60	.1
29	2.2	140	.8	.4	61	.1	.4	71	.1
30	1.8	42	.2	.3	36	T	.4	71	.1
31	--	--	--	.3	30	T	--	--	--
Total	46.4	--	42.7	38.0	--	17.4	50.1	--	479.8

Day	JULY			AUGUST			SEPTEMBER		
1	0.4	67	0.1	0.2	110	0.1	0	--	0
2	.4	71	.1	.2	120	.1	0	--	0
3	.5	69	.1	.1	200	.1	0	--	0
4	.4	61	.1	.1	110	T	0	--	0
5	.3	57	T	.1	51	T	0	--	0
6	.3	80	.1	0	--	0	0	--	0
7	.8	1800 S	12	0	--	0	0	--	0
8	.5	79	.1	0	--	0	0	--	0
9	.3	53	T	0	--	0	0	--	0
10	.4	110	.1	0	--	0	0	--	0
11	.6	550	.9	0	--	0	0	--	0
12	.6	180	.3	0	--	0	0	--	0
13	.4	78	.1	0	--	0	0	--	0
14	.4	97	.1	0	--	0	0	--	0
15	.3	110	.1	0	--	0	0	--	0
16	.2	110	.1	0	--	0	0	--	0
17	.2	160	.1	0	--	0	0	--	0
18	.1	150	T	0	--	0	0	--	0
19	.2	100	.1	0	--	0	0	--	0
20	0	--	0	.2	380	.2	0	--	0
21	0	--	0	1.1	310 S	4	.1	260	.1
22	0	--	0	0	--	0	.4	690 S	3
23	.2	95	.1	0	--	0	.9	550 S	3
24	.2	--	.1	.1	330 S	.6	0	--	0
25	.2	--	.1	.2	100	.1	0	--	0
26	.1	--	T	0	--	0	0	--	0
27	.1	--	T	0	--	0	0	--	0
28	0	--	0	0	--	0	0	--	0
29	.2	100	.1	.1	340 S	1	0	--	0
30	0	--	0	.6	360	.6	0	--	0
31	.3	1200	1	.1	130	T	--	--	--
Total	8.6	--	16.1	3.1	--	6.9	1.4	--	6.1

Total discharge for year (cfs-days)..... 182.1
Total load for year (tons)..... 596.3

S Computed by subdividing day.
T Less than 0.05 ton.
A Computed from partly estimated-concentration graph.

IOWA RIVER BASIN--Continued

5-4550. RALSTON CREEK AT IOWA CITY, IOWA--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Nov. 22, 1963.....	0815	54		4.0	6900	75	53	60	74	90	--	100						SPWC
Nov. 22.....	0815	54		4.0	6900	75	10	26	62	84	95	100						SPN
Apr. 20, 1964.....	0900	46		7.7	3300	69	--	55	71	90	--	100						SPWC
June 19.....	1800	64		26	16000	1100	43	58	--	86	--	100						VPWC
June 22.....	1420	68		12	7800	250	34	38	48	67	91	100						VPWC
June 22.....	1420	68		12	7800	250	11	20	--	56	--	100						VPN

IOWA RIVER BASIN--Continued

5-4620. SHELL ROCK RIVER AT SHELL ROCK, IOWA

LOCATION.--Temperature recorder at gaging station on right bank 400 feet upstream from bridge on State Highway 3 in Shell Rock, Butler County, and 11 miles upstream from mouth.
DRAINAGE AREA.--1,746 square miles.
RECORDS AVAILABLE.--Water temperatures: June 1953 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 77°F July 23-25; minimum, freezing point on many days during winter months.
EXTREMES, 1953-64.--Water temperatures: Maximum, 88°F June 19, 1953; minimum, freezing point on several days in 1954, 1956, 1963 and many days in 1964.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October																																
Maximum	56	56	56	55	56	56	56	56	56	56	56	56	54	54	56	56	55	55	55	55	56	56	58	58	57	57	55	53	50	47	48	55
Minimum	54	54	54	53	54	55	55	54	54	54	55	54	52	52	54	54	54	54	54	54	55	55	56	56	56	55	53	49	46	46	47	53
November																																
Maximum	46	43	41	42	43	43	43	43	45	45	44	42	39	37	37	38	40	40	39	39	39	42	42	37	35	35	36	36	36	35	--	40
Minimum	43	40	40	41	42	43	43	43	44	44	42	39	37	37	37	37	38	39	39	39	39	39	37	35	35	35	35	36	35	34	--	39
December																																
Maximum	34	33	32	32	32	32	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Minimum	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
January																																
Maximum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February																																
Maximum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March																																
Maximum	32	33	34	34	34	34	33	33	33	34	33	33	34	36	36	37	36	36	35	34	34	35	35	36	35	34	33	33	34	33	33	34
Minimum	32	32	33	34	33	33	33	33	32	33	33	33	33	34	36	36	36	34	34	34	34	34	35	35	34	33	32	32	33	33	33	34
April																																
Maximum	34	36	36	36	36	36	36	36	38	39	40	40	42	43	44	44	45	45	45	45	45	46	47	47	47	48	49	50	50	50	--	42
Minimum	33	34	36	36	36	36	36	36	38	39	40	40	41	43	44	44	44	45	45	45	44	45	46	47	47	47	48	49	50	48	--	42
May																																
Maximum	48	49	50	52	54	54	55	56	56	56	55	55	53	54	56	57	58	60	62	62	64	66	68	68	68	68	67	64	62	62	61	59
Minimum	48	48	49	50	52	54	54	55	56	55	55	53	53	53	54	56	57	58	60	62	62	64	65	64	67	66	64	62	62	61	59	57
June																																
Maximum	60	59	57	60	62	62	62	65	66	66	64	63	64	64	64	64	63	66	64	66	68	69	67	66	66	69	71	71	72	72	--	65
Minimum	59	57	56	57	60	62	61	62	65	64	63	61	62	64	64	63	60	63	64	64	66	67	66	66	66	66	68	69	70	70	--	64
July																																
Maximum	72	72	71	71	70	70	69	68	69	70	69	68	70	70	72	72	72	74	75	76	76	76	77	77	77	76	75	74	74	74	71	72
Minimum	70	71	71	70	70	68	68	68	68	69	68	68	68	70	70	72	72	72	74	75	75	75	76	76	76	75	74	74	74	71	67	71
August																																
Maximum	70	73	74	74	71	72	72	71	69	65	66	66	61	61	62	64	64	65	66	66	66	67	67	66	64	64	65	66	66	67	67	67
Minimum	68	70	73	71	71	71	71	69	65	64	64	61	60	60	60	62	64	64	65	66	66	66	66	64	64	63	64	65	66	66	67	66
September																																
Maximum	67	67	68	69	68	67	66	68	70	70	69	67	65	63	63	62	61	61	62	63	63	63	62	60	58	58	58	56	56	56	--	64
Minimum	67	67	67	68	67	66	66	66	68	69	67	65	63	63	62	61	61	61	61	62	63	62	60	58	57	58	56	54	54	56	--	62

DES MOINES RIVER BASIN

5-4816.5. DES MOINES RIVER NEAR SAYLORVILLE, IOWA

LOCATION.--At gaging station at bridge on County Road W, 2.0 miles west of Saylorville, Polk County, 2.0 miles downstream from Rock Creek, 2.2 miles upstream from Beaver Creek, and at mile 211.4.
DRAINAGE AREA.--5,841 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1961 to September 1964.
Sediment records: October 1961 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 93°F July 22; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 4,600 ppm June 23; minimum daily, not determined.
Sediment loads: Maximum daily, 66,000 tons June 23; minimum daily, 6 tons Dec. 26.
EXTREMES, 1961-64.--Water temperatures: Maximum, 93°F July 22, 1964; minimum, freezing point on many days each year.
Sediment concentrations: Maximum daily, 4,600 ppm June 23, 1964; minimum daily, 5 ppm Feb. 14, 1963.
Sediment loads: Maximum daily, 66,000 tons June 23, 1964; minimum daily, 3 tons Feb. 14, 1963.
REMARKS.--Flow affected by ice Dec. 1 to Mar. 9, Mar. 25,30.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	70	71	72	68	68	70	70	70	--	68	70	69	65	66	71	68	69	68	70	68	69	72	72	70	69	68	60	58	56	57	56	67
November	51	49	48	49	54	55	50	54	55	51	50	40	39	42	47	50	47	50	46	46	49	47	40	42	43	42	46	42	40	37	--	47
December	36	34	35	38	38	40	39	32	32	32	37	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	34	32	32	32	32	32	32	32	32	32	32
February	32	32	32	32	32	32	32	32	32	33	32	32	34	34	32	32	34	34	33	32	32	32	32	34	32	32	34	32	36	--	--	33
March	36	40	44	36	39	36	36	34	36	39	39	44	50	50	43	46	43	40	33	36	40	46	44	36	32	32	34	40	32	39	46	40
April	48	50	44	42	42	46	42	44	41	34	52	50	55	55	58	60	57	60	58	58	56	58	59	54	56	60	62	59	54	52	--	52
May	59	60	62	--	66	69	69	67	63	62	64	62	64	60	68	70	70	74	74	75	78	76	70	73	70	74	71	72	72	69	65	69
June	68	68	70	66	70	70	70	80	75	74	69	74	74	--	74	74	74	80	79	80	80	79	72	76	80	79	81	84	84	79	--	75
July	79	67	84	79	80	87	87	80	85	83	74	74	77	79	84	82	87	90	90	87	92	93	90	90	88	89	87	89	85	75	82	84
August	80	78	80	80	81	70	82	80	75	82	72	68	63	70	74	76	75	82	84	76	80	73	68	70	74	73	76	77	78	76	78	77
September	78	80	80	80	72	74	80	82	83	74	73	70	60	60	64	65	64	64	68	66	66	65	64	62	64	62	58	58	59	62	--	69

DES MOINES RIVER BASIN--Continued

5-4816.5. DES MOINES RIVER NEAR SAYLORVILLE, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	443	50	60	356	43	41	260	35	25
2..	452	57	70	331	44	39	230	30	19
3..	438	49	58	347	49	46	180	43	21
4..	457	44	54	331	53	47	210	41	23
5..	443	48	57	327	65	57	220	66	39
6..	443	58	69	310	76	64	230	54	34
7..	425	56	64	356	78	75	250	39	26
8..	411	49	54	322	69	60	260	73	33
9..	405	43	47	302	73	60	214	45	26
10..	399	37	40	302	72	59	140	46	17
11..	377	41	42	302	52	42	170	27	12
12..	364	35	34	302	34	28	205	38	21
13..	360	30	29	306	31	26	200	--	22
14..	343	30	28	237	29	19	190	--	23
15..	327	29	26	282	43	33	170	52	24
16..	322	32	28	318	47	40	160	46	20
17..	351	40	38	302	54	44	150	32	13
18..	356	40	38	290	45	35	140	27	10
19..	331	44	39	249	39	26	130	28	10
20..	339	41	38	249	52	35	124	34	11
21..	339	48	44	294	54	43	120	30	10
22..	356	64	62	339	74	68	110	28	8
23..	347	68	64	343	48	44	104	36	10
24..	372	80	80	318	34	29	100	33	9
25..	403	84	91	416	65	73	100	42	11
26..	403	91	99	360	60	58	100	22	6
27..	403	79	86	302	52	42	100	25	7
28..	381	63	65	385	81	84	110	42	12
29..	385	44	46	322	43	37	110	56	17
30..	356	50	48	310	42	35	105	70	20
31..	356	62	60	--	--	--	100	98	26
Total	11886	--	1658	9510	--	1389	4992	--	565

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	96	33	9	170	37	17	190	41	21
2..	100	41	11	180	33	16	190	51	26
3..	110	36	11	190	41	21	210	53	30
4..	120	46	15	200	30	16	240	55	36
5..	130	53	19	210	18	10	220	46	27
6..	140	60	23	220	23	14	200	56	30
7..	140	47	18	230	23	14	190	53	27
8..	140	87	33	240	31	20	180	64	31
9..	140	52	20	230	44	27	180	55	27
10..	140	28	11	210	42	24	294	43	34
11..	135	40	15	210	28	16	372	54	54
12..	130	30	11	210	42	24	331	42	30
13..	130	25	9	210	25	14	300	73	60
14..	120	--	9	220	14	8	347	66	61
15..	115	--	8	220	14	8	343	38	35
16..	110	--	7	220	19	11	443	100	120
17..	110	22	7	210	19	11	489	93	120
18..	115	--	9	200	19	10	466	58	73
19..	120	34	11	200	25	14	466	55	69
20..	130	--	10	190	18	9	434	36	42
21..	140	25	9	190	37	19	466	42	53
22..	160	32	14	190	50	26	443	39	47
23..	170	17	8	180	31	15	407	39	43
24..	190	19	10	180	32	16	368	39	39
25..	210	--	9	180	86	42	300	47	38
26..	230	11	7	180	31	15	210	54	31
27..	250	18	12	185	59	29	250	60	40
28..	270	--	15	190	16	8	260	38	27
29..	190	--	14	190	28	14	270	40	29
30..	170	--	14	--	--	--	290	72	56
31..	160	30	13	--	--	--	389	50	53
Total	4611	--	391	5835	--	486	9744	--	1435

DES MOINES RIVER BASIN--Continued

5-4816.5. DES MOINES RIVER NEAR SAYLORVILLE, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE			
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)		Tons per day
1..	443	79	94	5010	680	9200	2040	280		1500
2..	499	120	160	4570	550	6800	1920	250		1300
3..	920	140	350	4260	540	6200	1800	240		1200
4..	1010	680	1900	4160	480	5400	1730	210		980
5..	1450	540	2100	4360	440	5200	1590	220		940
6..	2800	1200	9100	5120	660	9100	1480	200		800
7..	2200	480	2900	5120	610	8400	1420	210		810
8..	1920	370	1900	6430	1300	23000	1340	170		620
9..	1660	310	1400	6820	1700	31000	1280	150		520
10..	1520	260	1100	6430	990	17000	1280	190		660
11..	1380	210	780	5930	720	12000	1240	140		470
12..	1240	160	540	5230	580	8200	1200	130		420
13..	1200	200	650	4790	520	6700	1380	260	S	1100
14..	1340	200	720	4570	510	6300	2710	1200		8600
15..	2790	1000	S 9700	4680	430	5400	2280	630		3900
16..	3860	1070	11000	5010	420	5700	1680	380		1800
17..	3560	750	7200	4900	470	6200	1700	270		1200
18..	3070	560	4600	4570	380	4700	1560	220		930
19..	2620	420	3000	4260	400	4600	1450	360		1400
20..	2360	370	2400	4160	350	3900	2040	1300		7200
21..	2200	360	2100	3960	500	5300	1700	380		1700
22..	2040	270	1500	3560	320	3100	1920	1500		7800
23..	1920	220	1100	3360	410	3700	5010	4600	b	66000
24..	1920	210	1100	3560	380	3700	2800	1300		9800
25..	2000	210	1100	4160	580	6500	2040	630		3500
26..	1920	200	1000	4260	660	7600	1680	430		2200
27..	3260	2400	S 24000	3560	500	4800	1700	340		1600
28..	4160	1500	17000	3160	380	3200	1520	400		1600
29..	5230	1000	14000	2800	320	2400	1380	300		1100
30..	5450	850	13000	2530	320	2200	1240	260		870
31..	--	--	--	2280	330	2000	--	--		--
Total	67942	--	137494	137570	--	229500	54870	--		132720

Day	JULY			AUGUST			SEPTEMBER			
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)		Tons per day
1..	1140	200	620	381	110	110	1560	670		2800
2..	1040	170	480	5690	1400	22000	1700	500		2300
3..	950	150	380	7520	900	18000	1380	330		1200
4..	980	160	420	5690	820	13000	1200	350		1100
5..	890	170	410	4060	770	8400	1140	230		710
6..	830	140	310	3070	580	4800	1140	110		340
7..	920	200	500	2360	460	2900	1070	230		660
8..	1340	1400	5100	2000	370	2000	980	180		480
9..	950	450	1200	1840	330	1600	980	180		480
10..	695	210	390	1760	260	1200	1010	180		490
11..	890	400	960	1520	250	1000	3280	1000	S	10000
12..	980	310	820	1340	180	650	5930	1200		19000
13..	980	310	820	1170	120	380	7240	890		17000
14..	890	220	490	1070	150	430	7950	710		15000
15..	950	340	870	920	170	420	6100	530		12000
16..	890	500	1200	920	150	370	6820	490		9000
17..	830	140	310	800	130	280	5810	360		5600
18..	770	160	330	734	100	200	5120	400		5500
19..	658	110	200	686	91	170	4570	370		4600
20..	594	120	190	647	77	130	4160	350		3900
21..	518	90	130	599	82	130	3960	350		3700
22..	475	69	88	528	87	120	4060	350		3800
23..	443	74	89	604	110	180	4790	550		7100
24..	457	99	120	652	110	190	5340	480		6900
25..	411	110	120	573	97	150	5690	390		6000
26..	420	99	110	609	87	140	5690	410		6300
27..	420	90	100	558	84	130	6300	390		6600
28..	420	90	100	543	80	120	5450	320		4700
29..	407	86	94	589	160	250	4680	300		3800
30..	327	87	77	920	350	870	4160	270		3300
31..	356	59	57	1280	610	2100	--	--		--
Total	22662	--	16885	51633	--	82420	121260	--		164360

Total discharge for year (cfs-days)..... 502515
Total load for year (tons)..... 769325

S Computed by subdividing day.

DES MOINES RIVER BASIN--Continued

5-4816.5 DES MOINES RIVER NEAR SAYLORVILLE, IOWA--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Apr. 3, 1964.....	1915	44		980	4400	12000	49	72	85	93	95	99	100	---	---			VPWC
Apr. 15.....	1600	58		3760	2200	22000	--	43	57	76		92	96	100	---			VPWC
Apr. 27.....	1300	62		3460	3200	30000	36	50	---	81		98	99	100	---			VPWC
Apr. 27.....	1300	62		3460	3200	30000	18	35	---	78		98	99	100	---			VPN
Apr. 30.....	1130	52		5570	--	--	30	35	---	59		88	95	100	---			VPWC
May 7.....	1430	69		5120	540	7500	--	40	47	62		81	92	99	100			VPWC
May 8.....	1245	68		6500	1000	18000	--	38	50	64		89	95	100	---			VPWC
June 23.....	1430	72		6820	5000	92000	50	58	---	86		97	99	100	---			VPWC
July 8.....	1615	85		1170	1500	4700	55	63	---	94		99	---	---	---			SPWC
Aug. 2.....	1950	80		7660	1100	23000	--	41	45	60		89	95	100	---			VPWC
Sept. 13.....	1700	68		7380	770	15000	--	36	---	55		80	91	99	100			VPWC

DES MOINES RIVER BASIN--Continued

5-4864.9. MIDDLE RIVER NEAR INDIANOLA, IOWA

LOCATION.--At gaging station on right bank at county highway bridge, 0.5 mile upstream from Cavitt Creek, and 4.3 miles northeast of Indianola, Warren County.
DRAINAGE AREA.--503 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1962 to September 1964.
Sediment Records: October 1962 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 86°F July 31, Aug. 3; minimum, freezing point on many days in January and February.
Sediment concentrations: Maximum daily, 10,000 ppm Apr. 4; minimum daily, 4 ppm on several days during December, February, and March.
Sediment loads: Maximum daily, 110,000 tons June 23; minimum daily, less than 0.05 ton Dec. 22.
EXTREMES, 1962-64.--Water temperatures: Maximum, 90°F July 1, 1962; minimum, freezing point on many days each year.
Sediment concentrations: Maximum daily, 10,000 ppm Apr. 4, 1964; minimum daily, 4 ppm on several days in 1963-64.
Sediment loads: Maximum daily, 120,000 tons Apr. 29, 1963; minumum daily, less than 0.05 tons Dec. 22, 1963.
REMARKS.--Flow affected by ice Dec. 2-4, Dec. 8 to Mar. 4, Mar. 25-30.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Aver-age
	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	
October	61	62	59	60	66	76	70	64	65	60	62	58	53	59	62	64	63	62	62	70	67	66	66	66	64	62	58	48	42	56	55	62
November	--	37	46	40	50	41	48	50	52	42	45	40	40	40	38	48	50	46	50	48	56	56	42	44	46	46	44	40	42	39	--	46
December	39	34	34	38	36	37	40	34	36	34	36	35	34	34	34	34	35	34	34	35	34	35	34	34	35	37	36	34	35	34	35	35
January	36	35	36	34	33	35	34	36	34	34	34	--	--	--	--	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33
February	32	32	32	32	32	32	32	32	32	32	32	32	35	35	34	34	35	36	35	35	34	34	34	35	34	34	36	34	40	--	--	34
March	42	38	37	36	40	38	38	36	34	37	38	36	42	40	40	38	44	35	36	35	34	40	42	36	34	36	36	37	36	44	34	38
April	40	42	45	42	42	45	44	45	50	58	56	59	51	56	70	76	62	52	53	52	56	56	60	54	56	60	60	56	56	60	--	53
May	52	60	64	70	69	58	54	58	60	64	64	64	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	78	75	66	68	74	75	76	70	74	70	80	74	74	70	72	72	72	76	74	76	84	76	74	--	--
July	80	78	76	72	76	78	82	77	82	76	62	72	70	72	75	75	80	82	84	79	81	84	84	84	79	84	84	--	80	80	80	78
August	81	84	85	82	85	76	79	76	64	74	72	67	60	60	84	76	74	68	70	74	79	68	70	64	72	62	74	71	74	71	74	74
September	79	80	82	72	74	60	68	70	60	71	65	60	60	70	61	64	64	63	64	66	64	65	62	61	60	63	58	54	51	--	--	66

DES MOINES RIVER BASIN--Continued

5-4864.9. MIDDLE RIVER NEAR INDIANOLA, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	12	17	0.6	5.7	8	0.1	14	--	2
2	11	17	.5	5.7	10	.2	9.1	68	2
3	10	11	.3	5.7	9	.1	8.8	29	.7
4	9.6	12	.3	5.7	8	.1	8.2	73	2
5	8.3	15	.3	5.7	22	.3	7.0	140	3
6	7.6	9	.2	5.7	33	.5	7.6	130	3
7	6.4	6	.1	5.1	10	.2	7.0	46	.9
8	6.4	9	.2	5.7	22	.3	6.2	17	.3
9	5.7	14	.2	6.4	24	.4	5.1	44	.6
10	5.1	12	.2	5.1	27	.4	4.2	39	.4
11	6.4	19	.3	5.7	25	.4	3.7	15	.1
12	5.1	33	.5	5.1	26	.4	3.2	82	.7
13	4.6	28	.3	5.1	29	.4	2.9	46	.4
14	4.6	32	.4	6.4	28	.5	2.6	110	.8
15	4.6	30	.4	5.7	38	.6	2.3	48	.3
16	4.6	28	.3	5.1	24	.3	2.0	59	.3
17	6.4	22	.4	6.4	22	.4	1.8	71	.3
18	6.4	24	.4	5.1	13	.2	1.8	47	.2
19	12	14	.5	5.1	20	.3	1.8	21	.1
20	8.3	22	.5	7.0	27	.5	1.8	17	.1
21	7.0	26	.5	6.4	38	.7	1.8	11	.1
22	9.0	16	.4	16	48	2	1.9	4	T
23	7.6	14	.3	28	32	2	2.0	37	.2
24	9.0	12	.3	22	49	3	2.1	26	.1
25	9.0	9	.2	16	--	2	2.2	26	.2
26	8.3	10	.2	18	--	2	2.3	20	.2
27	7.0	19	.4	19	--	2	2.5	24	.2
28	8.3	8	.2	16	--	2	3.0	40	.3
29	7.6	7	.1	13	--	2	2.8	38	.3
30	7.0	13	.2	12	--	2	2.4	52	.3
31	7.0	9	.2	--	--	--	2.6	39	.3
Total	231.9	--	9.9	279.6	--	26.3	126.7	--	20.4
	JANUARY			FEBRUARY			MARCH		
1	2.9	25	0.2	6.3	9	0.2	11	12	0.4
2	3.1	31	.3	7.1	14	.3	15	14	.6
3	3.2	18	.2	8.0	10	.2	18	18	.9
4	3.4	13	.1	9.3	11	.3	23	12	.7
5	3.5	15	.1	11	6	.2	31	9	.8
6	3.6	15	.1	11	6	.2	36	14	1
7	3.7	10	.1	10	8	.2	34	14	1
8	3.0	--	.1	11	4	.1	31	20	2
9	3.8	--	.1	11	4	.1	37	28	3
10	3.7	--	.1	12	5	.2	30	14	1
11	3.6	--	.1	13	10	.4	33	17	2
12	3.5	--	.1	13	8	.3	31	11	.9
13	3.3	--	.1	14	15	.6	33	15	1
14	3.1	--	.1	14	8	.3	33	9	.8
15	3.0	--	.1	14	4	.2	31	10	.8
16	3.2	--	.2	13	8	.3	29	11	.9
17	3.4	--	.2	12	10	.3	30	8	.6
18	3.7	36	.4	11	19	.6	28	9	.6
19	3.9	38	.4	11	15	.4	23	7	.4
20	4.3	41	.5	9.6	18	.4	23	8	.5
21	4.6	16	.2	9.0	16	.4	24	8	.5
22	5.0	19	.3	8.3	20	.4	22	4	.2
23	5.5	14	.2	7.0	34	.7	22	4	.2
24	6.4	23	.4	7.1	23	.5	22	5	.3
25	7.6	35	.7	6.7	30	.5	16	11	.5
26	7.2	27	.5	6.4	22	.4	17	9	.4
27	6.2	31	.5	6.2	35	.6	18	29	1
28	5.7	26	.4	8.0	30	.6	19	8	.4
29	5.3	29	.4	9.5	11	.3	22	29	2
30	5.0	16	.2	--	--	--	21	11	.6
31	5.8	11	.2	--	--	--	27	11	.8
Total	134.0	--	7.6	290.1	--	10.4	790	--	26.8

T Less than 0.05 ton.

DES MOINES RIVER BASIN--Continued

5-4864.9. MIDDLE RIVER NEAR INDIANOLA, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	25	7	0.5	149	1200	480	82	440	97
2	27	7	.5	126	790	270	71	260	50
3	157	1700	S 4700	118	500	159	68	270	50
4	696	10000	S 22000	106	440	126	60	240	39
5	166	3800	1700	146	2300	A 910	61	180	30
6	117	2400	760	189	3000	1500	58	180	28
7	94	1300	330	119	1700	B 550	55	130	19
8	86	400	B 90	246	5100	3400	51	51	7
9	71	400	77	179	5700	2800	47	53	7
10	60	230	37	136	2200	810	47	28	4
11	53	190	27	108	1000	290	48	24	3
12	50	150	20	93	800	210	52	110	15
13	50	190	26	115	620	190	51	58	8
14	741	6600	S 27000	124	600	200	312	4000	S 6800
15	434	3600	S 4900	111	440	130	829	3900	8700
16	187	2800	1400	91	300	74	826	3600	S 8600
17	148	1800	720	79	210	45	360	1400	1400
18	125	900	300	71	220	42	252	3200	S 3700
19	111	680	200	66	110	20	625	7400	S 16000
20	267	3800	S 3900	62	110	18	2220	7000	S 53000
21	383	4800	S 5600	59	130	21	1920	7000	36000
22	264	2200	1600	60	110	18	1260	7800	S 30000
23	173	1500	700	56	110	17	4300	9600	110000
24	132	1400	500	60	710	120	2460	6800	45000
25	114	720	220	106	1300	370	722	4500	8800
26	103	600	170	212	4700	S 1900	458	1500	1900
27	503	6800	S 12000	383	6100	S 7000	364	1200	1200
28	315	6100	S 6100	294	7000	S 6100	284	650	500
29	246	4700	3100	144	1800	700	246	630	420
30	168	2600	1200	112	1400	420	217	660	390
31	--	--	--	96	450	120	--	--	--
Total	6066	--	99378.0	4022	--	29918	18402	--	332767

Day	JULY			AUGUST			SEPTEMBER		
1	193	530	280	85	94	22	169	2100	960
2	177	480	230	80	84	18	93	1300	330
3	1210	6200	S 32000	76	81	17	81	910	200
4	1040	6900	19000	73	93	18	511	4700	S 8200
5	407	2200	2400	67	91	16	445	4400	5300
6	304	1900	1600	91	260	64	1820	6000	S 40000
7	284	1700	1300	102	370	100	4910	4900	65000
8	254	2400	S 2000	79	350	75	2430	7200	S 52000
9	348	3800	3600	70	260	49	932	2700	6800
10	237	3100	2000	61	180	30	472	1000	1300
11	1150	6700	21000	57	150	23	348	600	560
12	3440	7800	72000	58	110	17	294	430	340
13	1700	5400	25000	58	110	17	264	280	200
14	615	3300	5500	62	100	17	228	280	170
15	432	1600	1900	53	66	9	206	240	130
16	337	990	900	50	53	7	192	200	100
17	274	700	520	49	51	7	195	240	130
18	246	540	360	46	63	8	337	1500	1400
19	215	450	260	43	68	8	315	800	680
20	190	370	190	44	63	7	294	800	640
21	171	310	140	44	72	9	274	900	710
22	157	250	110	44	81	10	228	300	180
23	155	660	280	57	120	18	1410	5900	S 26000
24	540	6900	13000	49	120	16	541	2400	3500
25	284	3400	2600	42	67	8	315	1200	1000
26	173	850	400	136	2600	S 1700	237	700	450
27	140	440	170	146	3000	1200	195	350	180
28	124	330	110	92	1300	320	173	130	61
29	111	270	81	76	700	140	157	200	85
30	101	120	33	154	2200	910	146	--	70
31	93	120	30	246	3000	2000	--	--	--
Total	15102	--	208994	2390	--	6660	18232	--	219676

Total discharge for year (cfs-days)..... 66066.3
Total load for year (tons)..... 893786.4

S Computed by subdividing day.
A Computed from partly estimated-concentration graph.
B Computed from estimated-concentration graph.

DES MOINES RIVER BASIN--Continued

5-4864.9. MIDDLE RIVER NEAR INDIANOLA, IOWA--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Apr. 14, 1964.....	1400	56		1290	15000	52000	34	39	--	65	--	98	99	100	--			VPWC
Apr. 14.....	1400	56		1290	15000	52000	10	19	--	41	--	98	99	100	--			VPN
Apr. 27.....	1430	60		924	13000	32000	50	60	--	85	--	99	99	100	--			VPWC
Apr. 27.....	1430	60		924	13000	32000	22	35	--	73	--	99	99	100	--			VPN
June 15.....	1600	70		1290	4100	14000	39	44	--	68	--	94	96	99	100			VPWC
June 23.....	1345	72		4780	5100	66000	38	41	--	60	--	93	96	99	100			VPWC
July 12.....	1200	72		3720	7300	73000	34	41	--	65	--	90	93	97	100			VPWC
July 12.....	1200	72		3720	7300	73000	23	32	--	61	--	90	93	97	100			VPN
Aug. 31.....	2000	74		383	4500	4700	46	49	57	77	--	99	100	--	--			VPWC
Aug. 31.....	2000	74		383	4500	4700	15	28	43	69	93	99	100	--	--			VPN
Sept. 6.....	1745	66		3830	8800	91000	34	40	43	57	76	82	86	92	99	100		VPWC

ILLINOIS RIVER BASIN

5-5405. DU PAGE RIVER AT TROY, ILL.

LOCATION.--Temperature recorder at gaging station on left bank at Troy, Will County, 400 feet upstream from U.S. Highway 52, and 3.8 miles downstream from Lilly Cache Creek.
DRAINAGE AREA.--325 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1963 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Minimum, 36°F on many days during December to March.
REMARKS.--Thermograph stopped Nov. 2-5, range 43° to 49°F; Apr. 16 to May 21 (ran intermittently), range 49° to 81°F; June 7 to July 2 (ran intermittently), range 59° to 92°F; July 3-26 recorder removed, no range available; Aug. 17 to Sept. 3 (ran intermittently), range 63° to 84°F; Sept. 4-30 recorder removed, no range available.

Temperature (°F) of water, water year October 1963 to September 1964
(Continuous ethyl alcohol-actuated thermograph)

Month	Day																													Average
	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	
October																															
Maximum	--	--	70	70	70	72	72	71	70	69	67	67	66	65	66	70	70	69	69	69	69	69	70	68	69	70	70	60	56	54	53	67
Minimum	--	--	58	60	60	61	63	63	61	62	63	60	56	56	56	62	64	66	66	66	65	62	63	63	65	64	60	54	49	49	52	60
November																															
Maximum	52	--	--	--	--	54	56	55	54	55	52	48	43	46	46	50	56	56	53	50	54	57	57	45	43	45	45	45	43	40	--	50
Minimum	47	--	--	--	--	51	50	50	51	51	46	42	42	41	41	44	50	53	47	49	50	54	45	41	40	41	41	41	40	37	--	46
December																															
Maximum	38	36	36	36	36	36	40	40	38	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Minimum	36	36	36	36	36	36	36	38	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
January																															
Maximum	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Minimum	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
February																															
Maximum	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	--	--	36
Minimum	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	--	--	36
March																															
Maximum	36	38	39	41	43	46	46	43	41	42	43	48	49	52	50	54	45	48	45	43	48	52	51	49	47	41	39	45	40	41	44	45
Minimum	36	36	38	39	37	39	41	39	38	37	37	40	40	46	40	42	38	36	37	37	37	39	40	45	41	36	36	39	36	36	36	39
April																															
Maximum	50	49	49	44	44	49	49	49	47	53	55	55	57	53	55	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	39	46	44	42	42	43	48	45	42	45	49	53	53	48	47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May																															
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	76	75	73	76	71	70	65	67	68	66	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	65	68	67	63	66	63	59	54	54	57	--
June																															
Maximum	66	64	67	71	52	65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	57	57	54	57	50	48	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July																															
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	83	86	84	79	73	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	78	77	77	72	68	--
August																															
Maximum	84	90	91	83	85	84	86	82	77	78	81	71	70	79	80	80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	68	78	80	79	72	72	73	68	66	66	71	65	63	61	64	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
September																															
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
SASKATCHEWAN RIVER BASIN																							
5-145. SWIFTCURRENT CREEK AT MANY GLACIER, MONT.																							
Oct. 31, 1963...	45.4	2.0	0.04	13	4.8	0.8	0.0	60	0	3.0	0.0	0.0	0.0	0.01	75	0.10	9.19	52	3	0.0	104	7.8	1
June 3, 1964....	686	2.6	.49	11	4.3	.6	.4	53	0	2.2	.0	.0	.1	.00	50	.07	92.6	45	2	.0	92	7.0	3
Sept. 2.....	114	1.9	.02	15	3.6	.7	.6	62	0	2.0	.3	.0	.5	.02	67	.09	20.6	52	1	.0	103	6.9	1

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluorids (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
RED RIVER OF THE NORTH BASIN																							
5-517. WILD RICE RIVER NEAR CAYUGA, N. DAK.																							
Mar. 19, 1964	A0.4	12		0.04		90	39	265	14	209	0	620	134	2.0	4.4	0.84	B1250	383	212	5.9	2050	7.5	
Apr. 3.....	A.5	9.2		--		53	23	116	13	110	0	310	66	.7	4.6	.36	684	227	137	3.4	1040	7.5	
May 21.....	15	2.1		.05	0.14	110	63	70	15	316	0	377	26	.4	.4	.13	891	533	274	1.3	1220	7.5	
June 23.....	9.5	17		--		65	24	36	11	187	0	175	17	.2	1.8	.16	460	262	109	1.0	672	7.7	
5-555.2. BIG COULEE NEAR FORT TOTTEN, N. DAK.																							
Dec. 10, 1963	C0.1	34				39	22	26	5.9	248	0	31	9.2	0.3	0.2	0.08	288	189	0	0.8	486	8.0	
Mar. 3, 1964.	A.7	25				62	31	93	5.7	433	7	93	16	.3	.2	.07	551	282	0	2.4	883	8.3	
Apr. 3.....	A1.5	19				51	14	16	16	174	0	75	11	.3	3.4	.04	313	183	40	.5	462	7.8	
May 18.....	2.1	29		0.06	0.01	78	22	24	5.6	350	0	41	7.0	.5	.2	.09	388	284	0	.6	613	8.1	
June 29.....	A.7	40				82	26	26	4.4	414	0	15	5.4	.4	.3	.14	409	312	0	.6	619	8.2	
Sept. 9.....	A.4	33				84	20	24	5.3	380	0	22	8.8	.4	.2	.10	389	292	0	.6	608	8.1	
5-562.5. LAC AUX MORTES NEAR CHURCHS FERRY, N. DAK.																							
Apr. 26, 1963	(D)	8.2		0.07	0.09	56	19	19	13	202	0	85	13	0.2	3.3	0.03	336	219	53	0.6	521	8.0	
May 18, 1964.	(D)	8.3		.06	.13	66	27	33	18	251	0	126	18	.2	.9	.05	452	277	71	.9	686	7.2	
5-565. DEVILS LAKE NEAR DEVILS LAKE, N. DAK.																							
Mar. 4, 1964.	E1411.55	9.9				211	589	3430	331	1160	17	7360	1600	0.2	2.4	3.8	B14100	2950	1970	28	16700	8.3	
May 18.....	E1411.78	10		0.03	0.08	81	500	2710	259	916	0	5580	1180	.2	2.7	1.9	B10800	2260	1510	25	13200	8.0	
5-570. SHEYENNE RIVER NEAR COOPERSTOWN, N. DAK.																							
Jan. 3, 1964.	2.5	28		0.06	--	108	47	115	11	568	0	211	28	0.3	0.1	0.19	849	464	0	2.3	1250	8.2	9
Mar. 4.....	1.8	32		.06	--	112	47	107	8.8	578	0	194	26	.3	.1	.18	835	474	0	2.1	1290	7.9	
Apr. 17.....	465	15		.10	0.43	32	20	47	8.2	212	0	78	10	.2	2.4	.08	331	163	0	1.6	525	7.6	
May 20.....	54	14		.06	.16	62	26	92	9.6	388	0	123	17	.3	.4	.14	553	260	0	2.5	857	7.6	

A Daily mean discharge.
B Calculated from determined constituents.
C Estimated.
D Lake content not known. Information on lake stage available in district office at Lincoln, Nebr.
E Lake elevation, in feet.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
RED RIVER OF THE NORTH BASIN--Continued																							
5-580. SHEYENNE RIVER BELOW BALDHILL DAM, N. DAK.																							
Jan. 13, 1964	27	16		--	--	47	30	69	10	324	0	102	17	0.2	1.1	0.16	480	239	0	1.9	745	7.6	
Mar. 19.....	13	20		0.03	0.74	55	31	75	11	361	0	107	18	.3	5.8	.17	532	265	0	2.0	814	7.4	
Mar. 30.....	13	21		--	--	54	32	77	12	370	0	112	19	.4	4.6	.13	524	266	0	2.1	818	8.0	
May 20.....	11	11		.05	.22	44	26	65	9.8	300	0	94	15	.3	.5	.10	425	215	0	1.9	672	7.6	
June 22.....	331	9.6		--	--	42	26	65	9.2	290	0	94	16	.3	1.4	.22	417	210	0	1.9	656	8.0	
Sept. 14.....	38	16		--	--	39	24	62	9.6	264	0	95	16	.3	.9	.15	404	198	0	1.9	647	7.4	
5-740. LOWER RED LAKE NEAR RED LAKE, MINN.																							
May 26, 1962.	F2195700	5.2	--	0.02	0.01	34	15	3.2	2.0	171	0	12	0.2	0.1	2.8	0.10	180	146	6	0.1	283	7.6	12
Oct. 25, 1963		2.7	0.0	.01	.01	38	16	4.0	2.1	190	0	9.5	1.2	.2	.2	.04	184	160	4	.1	308	7.8	5
May 20, 1964.		2.9	.1	.02	.00	39	15	3.7	2.3	190	0	8.8	1.0	.3	.6	.04	196	160	4	.1	311	7.3	3
Sept. 3.....		9.9	1.0	.02	.03	38	14	3.3	2.5	183	0	9.5	.5	.2	1.4	.04	177	154	4	.1	294	7.6	5
Sept. 27.....		9.1	.2	.03	.02	37	15	3.1	2.5	181	0	10	2.4	.2	.4	.03	174	153	5	.1	290	7.3	5
5-760. THIEF RIVER NEAR THIEF RIVER FALLS, MINN.																							
Apr. 22, 1963	1010	4.8	--	0.05	0.01	57	17	3.1	4.9	156	0	85	1.2	0.0	2.3	0.05	288	212	84	0.1	418	7.4	47
Oct. 25.....	.1	8.3	0.2	.05	.01	70	30	6.8	4.0	284	0	66	4.2	.3	.6	.05	366	299	66	.2	549	7.6	40
Apr. 30, 1964	209	6.2	.5	.09	.00	67	22	4.2	6.0	144	0	137	2.2	.2	1.1	.05	362	257	139	.1	513	7.5	35
May 20.....	454	8.1	.3	.08	.00	82	25	4.4	6.4	162	0	172	3.8	.3	1.0	.08	437	307	174	.1	594	7.4	50
Aug. 6.....	748	9.5	.5	.14	.03	67	22	2.5	4.9	166	0	119	2.2	.2	2.6	.08	354	257	121	.1	494	7.4	45
Sept. 27.....	1160	8.5	.4	.07	.04	59	20	2.9	6.2	113	0	131	2.8	.2	3.7	.03	315	229	136	.1	458	6.6	45
5-785. CLEARWATER RIVER AT RED LAKE FALLS, MINN.																							
Oct. 25, 1963	50	14	0.0	0.02	0.02	58	24	7.9	2.7	292	0	18	2.9	0.2	0.2	0.04	275	245	5	0.2	470	8.1	15
Feb. 11, 1964	45	20	.2	.05	.00	75	27	9.0	3.8	364	0	16	4.8	.2	.6	.04	344	298	0	.2	580	7.8	10
Apr. 15.....	1070	12	.4	.13	.04	55	17	7.0	6.2	172	0	71	4.4	.1	8.5	.04	295	208	67	.2	446	7.4	25
May 20.....	455	9.7	.3	.06	.00	76	27	9.0	4.3	288	0	74	4.0	.3	.3	.06	378	301	65	.2	576	8.0	30
Aug. 14.....	40	8.3	.5	.05	.01	54	28	10	3.6	290	0	28	5.7	.3	.0	.05	294	249	11	.3	489	7.8	17
Sept. 27.....	600	16	.3	.05	.02	54	20	6.4	4.8	214	0	47	4.5	.2	1.5	.03	260	215	39	.2	420	7.5	25

F Lake content, in acre-feet.

5-790. RED LAKE RIVER AT CROOKSTON, MINN.

Dec. 16, 1963	400	3.1	0.1	0.13	0.04	47	19	5.1	3.1	232	0	14	3.4	0.2	0.2	0.04	235	196	6	0.2	377	7.6	5
Feb. 11, 1964	533	3.2	.3	.07	.05	47	19	5.1	2.7	232	0	11	3.0	.2	.0	.05	230	194	4	.2	373	7.9	5
Apr. 15.....	1890	8.5	.4	.14	.04	43	15	5.0	5.6	128	0	61	5.8	.1	9.3	.03	237	168	63	.2	362	7.4	25
May 20.....	1430	6.0	.3	.06	.01	70	24	6.2	5.1	215	0	102	3.5	.2	.4	.08	368	273	97	.2	527	7.6	--
Aug. 6.....	1540	8.1	1.6	.11	.00	52	15	2.3	4.5	125	0	91	2.3	.1	.8	.06	264	190	87	.1	383	7.1	30
Sept. 27.....	2120	4.9	.2	.03	.00	57	26	7.7	5.0	206	0	84	3.5	.2	.2	.04	308	248	79	.2	485	7.6	22

5-994. LITTLE PEMBINA RIVER NEAR WALHALLA, N. DAK.

Apr. 20, 1963	4.3	19	--	0.01	0.11	82	21	61	7.2	232	0	198	20	0.4	2.4	0.12	543	289	99	1.6	829	7.8	12
Oct. 26.....	.4	26	0.0	.01	.05	88	31	56	8.2	316	0	191	17	.4	.0	.14	572	348	89	1.3	842	7.8	3
Apr. 6, 1964.	28.4	14	.1	.19	.07	39	8.9	27	5.9	104	0	91	8.8	.2	5.2	.06	283	134	49	1.0	408	7.0	20
Apr. 7.....	24.8	--	--	--	--	--	--	--	--	143	0	--	--	--	--	--	381	--	--	--	517	7.4	--
Apr. 8.....	25.0	18	.1	.08	.05	59	11	37	6.3	157	0	120	12	.3	4.9	.08	379	193	84	1.2	548	7.6	15
Apr. 9.....	36.2	--	--	--	--	--	--	--	--	176	0	--	--	--	--	--	378	--	--	--	563	7.5	--
Apr. 10:																							
At 1630....	219	--	--	--	--	--	--	--	--	162	0	--	--	--	--	--	389	--	--	--	543	7.6	--
At 2025....	321	23	.2	.40	.06	64	12	33	6.1	153	0	127	7.4	.3	11	.08	385	207	81	1.0	549	7.7	22

5-1202. WINTERING RIVER NEAR BERGEN, N. DAK.

June 14, 1963	16	34				24	14	171	8.8	386	0	155	12	0.2	1.4	0.38	638	116	0	6.9	913	8.2	
Apr. 7, 1964.	7.8	13				14	6.6	72	13	127	0	117	7.1	.2	1.5	.16	340	62	0	4.0	490	7.0	
May 16.....	1.0	28		0.35	0.14	37	12	273	11	508	0	249	41	.6	2.4	.34	964	143	0	10	1370	7.9	
June 26.....	36.0	49				21	8.9	146	9.6	355	0	97	18	.4	3.1	.34	597	89	0	6.7	774	7.9	

MISSISSIPPI RIVER MAIN STEM

5-2010. WINNIBIGOSHISH LAKE NEAR DEER RIVER, MINN.

Oct. 24, 1963	F 510000	10	0.0	0.02	0.00	35	14	4.4	1.8	183	0	4.0	2.8	0.1	0.0	0.02	170	146	0	0.2	282	7.8	5
May 19, 1964.	F 577000	5.1	.1	.04	.00	36	14	4.5	1.8	184	0	4.5	1.0	.1	.1	.03	169	148	0	.2	290	7.2	2
Sept. 26.....	F 506000	9.0	.2	.03	.00	37	14	4.3	2.1	187	0	5.2	1.6	.2	.2	.02	164	149	0	.2	290	7.2	5

F Lake content, in acre-feet.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
LEECH LAKE RIVER BASIN																							
5-2060. LEECH LAKE AT FEDERAL DAM, MINN.																							
May 25, 1962.	--	8.9	--	0.03	0.00	28	14	4.6	1.5	158	0	4.5	0.0	0.1	0.4	0.17	150	126	0	0.2	249	7.5	10
Oct. 24, 1963	F206000	12	0.0	.01	.01	31	16	4.8	2.0	175	0	4.5	2.0	.1	.0	.02	165	142	0	.2	276	7.3	3
May 19, 1964.	F293000	6.7	.0	.03	.00	34	13	4.6	2.0	175	0	3.5	1.0	.1	.0	.02	165	140	0	.2	270	7.0	5
Sept. 26.....	F230000	13	.2	.02	.03	31	14	4.7	2.1	169	0	5.2	1.4	.1	.8	.01	157	135	0	.2	267	6.9	30
MISSISSIPPI RIVER MAIN STEM																							
5-2107. MISSISSIPPI RIVER AT POKEGAMA DAM OUTLET, NEAR GRAND RAPIDS, MINN.																							
Oct. 24, 1963	A490	11	0.0	0.05	0.01	35	14	5.6	2.3	188	0	4.8	1.3	0.2	0.2	0.03	176	146	0	0.2	299	7.9	11
Dec. 12.....	641	9.9	.1	.04	.02	34	17	4.9	1.9	193	0	5.0	1.6	.2	.1	.01	183	154	0	.2	310	7.5	5
Jan. 17, 1964	748	11	.1	.03	.03	41	17	5.8	2.1	216	0	6.0	1.8	.1	.0	.02	202	174	0	.2	339	6.9	5
Feb. 29.....	758	11	.1	.03	.00	42	17	5.4	2.0	220	0	5.8	1.6	.1	.1	.04	200	175	0	.2	345	7.6	8
RUM RIVER BASIN																							
5-2840. MILLE LACS LAKE AT GARRISON, MINN.																							
Oct. 24, 1963		8.3	0.0	0.01	0.00	27	8.9	3.8	2.1	125	0	7.5	2.4	0.1	0.0	0.04	132	104	1	0.2	216	7.1	2
May 18, 1964.		6.3	.0	.02	.00	27	8.9	3.9	2.1	124	0	7.5	1.2	.2	.4	.02	137	104	2	.2	217	6.9	2
Sept. 25.....		9.2	.1	.03	.03	29	7.9	4.0	2.3	128	0	9.0	2.5	.1	.3	.04	127	105	0	.2	219	7.5	2
MINNEHAHA CREEK BASIN																							
5-2890. MINNETONKA LAKE NEAR WAYZATA, MINN.																							
Oct. 26, 1961		1.1	--	0.02	0.01	27	16	10	5.8	153	0	9.8	20	0.1	0.2	0.04	182	133	7	0.4	317	6.5	7
Oct. 23, 1963		3.3	0.0	.01	.00	29	15	12	4.1	157	0	6.0	22	.1	.0	.04	187	136	7	.5	330	7.1	3
May 14, 1964.		.5	.1	.03	.00	35	16	13	6.0	176	0	7.0	24	.2	1.3	.04	209	152	8	.5	366	7.4	3
Sept. 22.....		3.7	.2	.03	.02	27	17	13	6.0	158	0	6.8	23	.2	.4	.06	195	136	6	.5	335	7.2	3
Sept. 25.....		3.5	.2	.02	.02	28	17	13	6.2	159	0	7.5	23	.2	1.4	.04	181	139	9	.5	331	6.7	3

A Daily mean discharge.
F Lake content, in acre-feet.

MINNESOTA RIVER BASIN

5-2915. BIG STONE LAKE AT ORTONVILLE, MINN.

Mar. 29, 1962		5.5	--	0.22	0.00	31	7.9	3.8	7.4	104	0	32	0.2	0.1	9.2	0.03	169	110	25	0.2	256	6.7	37
Oct. 21, 1963		31	0.0	.02	.01	69	46	31	8.8	182	0	267	7.8	.2	.0	.21	583	362	213	.7	796	7.1	5
Sept. 11, 1964.....		4.6	.3	.05	.03	57	53	40	10	148	0	297	11	.3	1.6	.24	597	360	239	.9	837	7.1	5

5-2920. MINNESOTA RIVER AT ORTONVILLE, MINN.

Oct. 23, 1963	42	29	--	0.38	0.16	85	42	33	8.9	205	0	267	8.6	0.3	0.6	0.22	601	385	217	0.7	838	7.8	--
May 21, 1964.	92	8.9	0.1	.02	.20	111	52	39	8.2	274	0	320	14	.3	.2	.19	746	490	265	.8	1030	7.7	7
Sept. 22.....	18	5.7	.2	.02	.03	61	53	41	10	160	0	297	11	.2	1.1	.21	589	368	237	.9	842	7.1	2

ZUMBRO RIVER BASIN

5-3740. ZUMBRO RIVER AT ZUMBRO FALLS, MINN.

Nov. 8, 1963.	115	9.6	--	0.35	0.08	63	25	11	2.3	282	0	24	13	0.3	6.5	0.04	299	260	29	0.3	508	8.2	4
June 12, 1964	113	8.6	0.3	.04	.00	66	24	8.5	2.3	288	0	26	11	.2	4.9	.03	292	262	26	.2	515	7.8	4
July 24.....	333	6.4	.5	.04	.00	53	23	13	2.4	252	0	26	17	.3	1.9	.04	273	228	21	.4	482	7.7	6

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
RED RIVER OF THE NORTH BASIN																		
5-994. LITTLE PEMBINA RIVER NEAR WALHALLA, N. DAK.																		
Apr. 6, 1964	1115	34		28	393	30	--	--	--	--	--	--	--					
Apr. 6	1550	34		19	791	40	--	--	--	--	--	--	--					
Apr. 7	0930	32		42	164	18	--	--	--	--	--	--	--					
Apr. 7	1335	34		25	694	47	--	--	--	--	--	--	--					
Apr. 7	1850	--		31	1130	94	--	--	--	--	--	--	--					
Apr. 8	0910	33		28	246	18	--	--	--	--	--	--	--					
Apr. 8	1405	--		25	729	49	--	--	--	--	--	--	--					
Apr. 8	1945	34		52	2180	310	--	--	--	--	--	--	--					
Apr. 9	0930	33		51	432	59	--	--	--	--	--	--	--					
Apr. 9	1200	39		35	1600	151	--	--	--	--	--	--	--					
Apr. 9	1405	35		37	1360	140	43	58	75	89	96	99	100					VPWC
Apr. 9	1950	39		143	4060	1570	--	--	--	--	--	--	--					
Apr. 10	0835	39		141	2250	857	--	--	--	--	--	--	--					
Apr. 10	1200	40		118	3010	959	--	--	--	--	--	--	--					
Apr. 10	1625	39		210	5300	3000	--	--	--	--	--	--	--					
Apr. 10	2025	40		321	6780	5880	42	55	66	76	85	92	96	99	100			VPWC
Apr. 11	0930	39		167	2780	1250	--	--	--	--	--	--	--					
Apr. 11	1630	40		168	2620	1190	--	--	--	--	--	--	--					
Apr. 14	0830	36		49	500	66	--	--	--	--	--	--	--					
Apr. 14	1730	50		57	711	110	--	--	--	--	--	--	--					
Apr. 15	0735	37		96	2400	620	--	--	--	--	--	--	--					

ST. CROIX RIVER BASIN

5-3335. ST. CROIX RIVER NEAR DANBURY, WIS.

June 13, 1964.....	1500			879	10	24												
Aug. 26.....	0900			837	3	6.8												

CHIPPEWA RIVER BASIN

5-3565. CHIPPEWA RIVER NEAR BRUCE, WIS.

July 19, 1963.....	1045			356	6	5.8												
May 12, 1964.....	0700			2,060	12	67												
June 19.....	1030			526	9	13												

5-3585. FLAMBEAU RIVER AT BABBS ISLAND, NEAR WINTER, WIS.

July 19, 1963.....	1145			560	2	3.0												
May 5, 1964.....	0800			1,150	14	43												
June 9.....	0845			582	7	11												
July 28.....	1700			756	4	8.2												

5-3620. JUMP RIVER AT SHELDON, WIS.

July 19, 1963.....	0930			47	1	0.1												
Apr. 27, 1964.....	1345			839	7	16												
June 8.....	1310			65	4	.7												
July 23.....	1420			22	5	.3												

5-3665. EAU CLAIRE RIVER NEAR FALL CREEK, WIS.

July 18, 1963.....	1330			125	6	2.0												
May 15, 1964.....	1300			450	20	24												
June 16.....	1500			100	4	1.1												

5-3695. CHIPPEWA RIVER AT DURAND, WIS.

July 18, 1963.....	1430			3,170	24	205												
May 15, 1964.....	0930			9,860	34	905												
June 19.....	1400			3,880	16	168												

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
TREMPEALEAU RIVER BASIN																		
5-3795. TREMPEALEAU RIVER AT DODGE, WIS.																		
July 10, 1963	1000			216	162	94												
Oct. 18	1430			213	34	20												
Oct. 21	1565			214	54	31												
Oct. 25	1000			250	125	84												
Nov. 20	1520			244	14	9.2												
Nov. 22	1030			280	78	59												
Mar. 21, 1964	1530			286	58	45												
Apr. 21	1030			307	101	84												
Apr. 27	1610			283	134	102												
May 5	1000			291	818	643												
May 12	1400			296	189	151												
May 17	1815			264	140	100												
May 26	1445			258	318	222												
June 24	1330			194	244	128												
July 1	1020			213	1,620	932												
July 28	1400			130	105	37												
BLACK RIVER BASIN																		
5-3810. BLACK RIVER NEAR NEILLSVILLE, WIS.																		
July 18, 1963	1145			24	2	0.1												
May 6, 1964	1430			623	15	25												
May 11	0800			810	32	70												
June 15	1400			40	6	.6												
5-3820. BLACK RIVER NEAR GALESVILLE, WIS.																		
July 18, 1963	0900			417	14	16												
May 12, 1964	1325			7,140	104	2,000												
June 10	1355			480	32	41												
Aug. 11	1730			277	20	15												

WISCONSIN RIVER BASIN

5-3935. SPIRIT RIVER AT SPIRIT FALLS, WIS.

July 19, 1963.....	1400			4.2	1	T												
Apr. 13, 1964.....	1000			348	14	13												
Apr. 24.....	0930			262	2	1.4												
Apr. 28.....	1500			126	4	1.4												
May 7.....	1030			329	22	20												
May 20.....	0845			51	7	1.0												

T Less than 0.05 ton.

5-3945. PRAIRIE RIVER NEAR MERRILL, WIS.

July 19, 1963.....	1445			73	1	0.2												
Apr. 14, 1964.....	1215			458	10	12												
Apr. 22.....	1500			682	14	26												
Apr. 23.....	1215			666	30	54												
Apr. 30.....	1320			422	3	3.4												
May 5.....	0930			598	14	23												
May 19.....	1350			223	36	22												

5-3975. EAU CLAIRE RIVER AT KELLY, WIS.

July 19, 1963.....	1545			57	2	0.3												
July 10, 1964.....	0830			114	12	3.7												

5-3995. EAU PLEINE RIVER NEAR STRATFORD, WIS.

Apr. 6, 1964.....	1215			142	7	2.7												
Apr. 14.....	0950			378	8	8.2												
Apr. 21.....	1435			773	44	92												
Apr. 29.....	2000			146	8	3.2												
May 7.....	0845			78	6	1.3												
May 8.....	0900			110	7	2.1												
May 9.....	1005			1,250	142	479												
May 24.....	1200			43	10	1.1												
June 23.....	0855			10	4	.1												
July 8.....	1315			26	4	.3												
July 17.....	1730			12	8	.3												
July 18.....	0900			53	6	.8												
July 24.....	2045			20	8	.4												
Aug. 21.....	1710			2.1	6	T												
Aug. 25.....	0930			26	6	.4												
Sept. 2.....	0930			10,100	251	6,840												
Sept. 2.....	1545			10,300	140	3,890												
Sept. 8.....	0930			1,020	34	94												
Sept. 10.....	1150			5,470	70	1,030												

5-4020. YELLOW RIVER AT BABCOCK, WIS.

May 6, 1964.....	1205			1,590	62	266												
June 5.....	0830			26	11	.8												
July 2.....	0845			16	12	.5												
Aug. 11.....	0830			8.8	10	.2												

T Less than 0.05 ton.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
WISCONSIN RIVER BASIN--Continued																		
5-4050. BARABOO RIVER NEAR BARABOO, WIS.																		
July 17, 1963	1030			270	60	44												
Apr. 7, 1964	1500			558	57	86												
May 5	1015			402	55	60												
May 10	1500			431	62	72												
May 14	1420			383	84	87												
5-4070. WISCONSIN RIVER AT MUSCODA, WIS.																		
July 17, 1963	1215			3,780	28	286												
May 22, 1964	1155			9,380	42	1,060												
June 18	1120			3,950	14	149												
July 20	0900			2,900	32	250												
5-4105. KICKAPOO RIVER AT STEUBEN, WIS.																		
July 17, 1963	1330			332	70	63												
May 6, 1964	1100			444	686	822												
May 7	1130			459	338	419												
May 9	1345			622	488	820												
May 13	1535			652	513	903												
May 25	0910			446	236	284												
June 24	1030			456	662	815												
July 27	1400			223	138	83												
July 31	0900			320	221	191												
Aug. 25	1100			272	91	67												
Sept. 8	1130			337	258	235												
ROCK RIVER BASIN																		
5-4260. CRAWFISH RIVER AT MILFORD, WIS.																		
Nov. 23, 1963	1445			485	68	89												
Mar. 24, 1964	1230			138	26	9.7												
Apr. 7	1130			258	38	26												
May 9	1045			224	89	54												
June 28	1315			70	73	14												
July 18	1335			33	57	5.1												

5-4325. PECATONICA RIVER AT DARLINGTON, WIS.

July 16, 1963.....	1330			68	58	11												
Mar. 14, 1964.....	1100			150	114	46												
May 5.....	1430			118	73	23												

5-4330. EAST BRANCH PECATONICA RIVER AT BLANCHARDVILLE, WIS.

July 16, 1963.....	1610			65	50	8.8												
June 8, 1964.....	0900			68	57	10												
June 21.....	1500			70	69	13												

5-4335. YELLOWSTONE RIVER NEAR BLANCHARDVILLE, WIS.

Mar. 14, 1964.....	1000			15	294	12												
June 8.....	0800			5.0	19	.2												
June 12.....	0800			6.4	43	.7												

5-4360. MOUNT VERNON RIVER NEAR MT. VERNON, WIS.

July 16, 1963.....	1655			12	12	0.4												
Mar. 12, 1964.....	1430			16	52	2.2												
May 18.....	0830			14	39	1.5												
June 24.....	0930			11	40	1.2												
July 16.....	0900			10	6	.2												

5-4365. SUGAR RIVER NEAR BRODHEAD, WIS.

July 16, 1963.....	1125			136	68	25												
Mar. 11, 1964.....	0900			235	109	69												
May 13.....	1400			279	99	74												
June 8.....	0700			149	1,380	555												
July 28.....	1400			146	293	116												

PART 6. MISSOURI RIVER BASIN

MISSOURI RIVER MAIN STEM

6-185. BEAVERHEAD RIVER AT BLAINE, MONT.

LOCATION.--At gaging station, on left bank at downstream side of bridge on State Highway 41, 11.5 miles upstream from Ruby River, and 14.5 miles northeast of Dillon, Beaverhead County.
DRAINAGE AREA--3,619 square miles.
RECORDS AVAILABLE.--Chemical analyses: November 1949 to September 1951, July 1962 to September 1964.
Water temperatures: July 1962 to September 1964.
Sediment records: July 1962 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 493 ppm Sept. 17-30; minimum, 366 ppm Feb. 23-29.
Hardness: Maximum, 318 ppm Sept. 1-16; minimum, 232 ppm Jan. 15-31.
Specific conductance: Maximum daily, 844 micromhos May 24; minimum daily, 522 micromhos Nov. 18.
Water temperatures: Maximum, 71°F July 18, Aug. 5; minimum, freezing point Dec. 14, Jan. 8, Feb. 6, 7, 26.
Sediment concentrations: Maximum daily, 670 ppm June 8; minimum daily, 5 ppm Sept. 22, 23.
Sediment loads: Maximum daily, 1,200 tons June 8; minimum daily, 2 tons May 23, 24.
EXTREMES, 1962-64.--Dissolved solids: Maximum, 579 ppm May 19-31, 1963; minimum, 338 ppm Mar. 19-20, 1963.
Hardness: Maximum, 352 ppm May 19-31, 1963; minimum, 213 ppm Mar. 19-20, 1963.
Specific conductance: Maximum daily, 896 micromhos June 23, 1963; minimum daily, 496 micromhos Feb. 6, 1963.
Water temperatures: Maximum, 73°F July 22, 23, Aug. 5, 1963; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 670 ppm June 8, 1964; minimum daily, 5 ppm Sept. 22, 23, 1964.
Sediment loads: Maximum daily, 1,200 tons June 8, 1964; minimum daily, 2 tons May 23, 24, 1964.
REMARKS.--Records of specific conductance of daily samples available in district office at Worland, Wyo. Flow affected by ice Dec. 25, Jan. 6-24.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-22, 1963.	262	25	0.00	70	32	34	6.9	264	0	135	18	0.5	0.6	0.06	471	0.64	333	305	88	0.8	720	7.5	2
Oct. 23-31.....	477	26	.00	76	28	30	5.7	283	0	116	16	.5	1.5	.08	451	.61	581	304	72	.7	692	8.2	2
Nov. 1-15.....	598	24	.00	69	26	28	5.3	246	0	110	14	.5	1.6	.08	415	.56	670	278	76	.7	641	7.5	2
Nov. 16-30.....	612	23	.00	61	27	27	6.3	226	0	110	14	.5	1.7	.08	392	.53	648	263	78	.7	604	7.7	2
Dec. 1-17.....	510	25	.00	64	26	27	4.4	233	0	107	14	.5	2.1	.06	394	.54	542	265	74	.7	612	7.8	1
Dec. 18-31.....	531	24	.00	67	25	26	4.2	240	0	107	14	.5	2.1	.07	395	.54	566	268	71	.7	618	7.6	1
Jan. 1-14, 1964.	437	23	.00	58	23	26	4.4	205	0	107	14	.5	2.2	.07	376	.51	444	241	73	.7	576	7.6	1
Jan. 15-31.....	413	24	.00	50	26	26	4.4	190	0	111	14	.5	1.9	.08	367	.50	409	232	76	.7	562	7.6	1
Feb. 1-12.....	440	24	.01	55	28	26	4.8	214	0	108	13	.5	1.8	.07	380	.52	451	254	78	.7	587	7.5	3
Feb. 13-22.....	432	27	.00	64	27	25	4.5	230	0	110	13	.5	1.4	.07	391	.53	456	269	80	.7	604	7.8	3
Feb. 23-29.....	418	27	.02	57	24	25	4.1	200	0	110	13	.5	1.6	.06	366	.50	413	242	78	.7	565	7.9	3
Mar. 1-10.....	426	23	.02	63	23	25	4.3	216	0	110	14	.5	1.8	.08	378	.51	435	252	75	.7	582	7.9	2
Mar. 11-20.....	421	23	.02	69	24	26	4.5	236	0	111	14	.5	1.7	.07	399	.54	454	272	78	.7	610	7.7	2
Mar. 21-31.....	424	23	.00	73	24	25	4.8	246	0	110	14	.5	1.5	.08	406	.55	465	281	79	.6	627	7.8	3
Apr. 1-15.....	514	24	.01	56	25	27	5.0	212	0	106	15	.5	1.8	.07	372	.51	516	242	68	.8	580	7.9	6

Apr. 16-30, 1964	468	24	.00	57	27	32	5.5	213	0	122	18	.5	.6	.07	399	.54	504	255	80	.9	623	7.9	3
May 1-15.....	294	23	.01	51	27	34	6.1	196	0	126	19	.5	.7	.09	393	.53	312	239	78	1.0	610	8.0	3
May 16-31.....	91.4	28	.00	51	31	39	8.0	203	0	144	20	.5	.7	.11	436	.59	108	256	89	1.1	660	8.2	7
June 1-7.....	174	29	.00	64	33	39	7.8	263	0	140	30	.5	.7	.10	477	.65	224	297	81	1.0	714	8.0	7
June 8-30.....	1442	28	.05	51	30	33	7.2	247	0	101	16	.5	.5	.08	404	.55	1570	252	49	.9	612	8.2	19
July 1-8.....	663	26	.01	72	26	31	5.5	273	0	108	16	.5	.4	.07	428	.58	766	288	64	.8	656	8.1	4
July 9-21.....	309	27	.00	65	30	35	7.0	253	0	124	18	.5	.5	.10	435	.59	363	284	76	.9	671	8.2	3
July 22-31.....	197	30	.00	69	35	37	7.6	273	0	134	19	.5	.8	.23	475	.65	253	316	92	.9	728	8.1	2
Aug. 1-22.....	138	28	.01	68	31	37	7.4	253	0	136	22	.7	.5	.10	463	.63	172	296	88	.9	700	8.0	5
Aug. 23-31.....	338	28	.02	70	29	37	7.4	254	0	136	20	.6	.6	.08	459	.62	419	294	86	.9	700	8.2	5
Sept. 1-16.....	298	27	.02	74	32	40	7.4	272	0	146	22	.5	1.0	.09	491	.67	395	318	95	1.0	743	8.2	5
Sept. 17-30.....	218	27	.02	84	25	40	7.4	264	0	150	22	.5	1.4	.10	493	.67	290	313	96	1.0	743	7.9	3
Weighted average.....	--	25	0.01	61	27	30	5.8	237	--	113	16	0.5	1.2	0.08	409	0.56	493	266	72	0.8	627	7.8	6
Time-weighted average.....	446	26	0.01	63	28	31	6.0	236	--	120	17	0.5	1.2	0.08	419	--	--	272	78	0.8	643	7.8	4
Tons per day..	--	31	0.02	74	33	36	7.0	285	--	137	19	0.6	1.5	0.10	--	--	--	--	--	--	--	--	--

MISSOURI RIVER MAIN STEM--Continued

6-185. BEAVERHEAD RIVER AT BLAINE, MONT.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Aver-age
	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	
October	60	59	57	56	57	56	55	54	55	52	54	54	53	52	53	52	51	52	51	52	51	52	50	49	49	48	47	46	45	45	44	52
November	44	45	45	43	43	43	42	43	44	42	40	41	41	40	41	40	39	38	37	38	37	38	39	40	40	41	40	42	43	41	--	41
December	37	36	35	35	36	35	35	34	34	33	34	35	33	32	33	34	34	35	37	35	35	34	35	33	34	34	33	33	33	34	35	34
January	35	36	36	34	34	34	35	32	34	33	33	34	34	34	35	36	35	35	35	37	36	36	35	35	36	35	36	36	34	35	34	35
February	35	36	35	35	33	32	32	35	38	36	35	35	34	35	34	35	35	36	35	34	35	36	35	36	35	32	34	35	36	--	--	35
March	36	36	35	37	37	36	36	37	36	36	35	36	35	36	38	39	40	43	42	43	44	40	37	40	42	35	38	39	42	50	47	39
April	44	42	43	45	44	45	44	45	46	46	46	45	44	46	45	43	46	46	48	50	49	46	48	50	52	55	57	56	58	57	--	48
May	48	48	47	48	51	50	50	52	56	54	59	60	60	61	63	62	60	66	66	64	58	57	57	56	56	58	61	59	56	55	59	57
June	58	57	56	58	57	60	58	57	56	55	59	56	58	57	65	57	58	59	58	60	61	63	65	61	68	60	65	62	63	69	--	60
July	68	69	67	68	67	68	68	67	69	69	68	69	68	66	66	69	70	71	70	69	68	68	69	67	68	67	68	68	69	70	69	68
August	68	68	69	70	71	68	68	67	68	69	69	67	68	68	67	68	68	68	67	68	67	66	61	58	57	56	54	56	53	56	56	65
September	56	56	57	58	57	57	57	56	55	56	--	56	57	56	56	55	55	57	56	55	56	56	55	56	56	56	56	55	55	53	--	56

MISSOURI RIVER MAIN STEM--Continued

6-185. BEAVERHEAD RIVER AT BLAINE, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	333	48	43	532	63	90	549	50	74
2	294	36	29	532	60	86	546	64	94
3	280	38	29	542	66	97	535	66	95
4	276	47	35	552	66	98	535	58	84
5	278	48	36	569	78	120	535	100	140
6	270	66	48	607	88	140	542	95	140
7	244	44	29	640	70	120	542	80	120
8	216	42	24	632	62	110	513	74	100
9	214	55	32	625	70	120	503	82	110
10	224	29	18	622	68	110	455	87	110
11	234	34	21	629	48	82	436	82	97
12	232	30	19	625	40	68	458	78	96
13	234	28	18	625	36	61	446	87	100
14	240	23	15	625	40	68	474	95	120
15	236	21	13	611	42	69	539	86	130
16	249	28	19	586	60	95	542	88	130
17	255	32	22	586	58	92	526	87	120
18	261	28	20	576	48	75	539	89	130
19	270	50	36	583	42	66	552	100	150
20	289	38	30	618	49	82	552	80	120
21	308	24	20	651	38	67	556	72	110
22	336	30	27	647	28	49	519	72	100
23	373	52	52	586	29	46	532	78	110
24	415	64	72	607	28	46	526	65	92
25	449	68	82	614	32	53	525	70	99
26	471	72	92	659	31	55	526	74	100
27	471	73	93	670	31	56	539	52	76
28	487	60	79	644	30	52	526	55	78
29	522	52	73	597	32	52	519	72	100
30	556	80	120	559	30	45	503	78	110
31	549	68	100	---	---	---	526	70	99
Total	10066	--	1946	18151	--	2370	16116	--	3334
	JANUARY			FEBRUARY			MARCH		
1	526	83	120	455	86	110	439	82	97
2	519	82	110	446	79	95	430	100	120
3	513	81	110	430	82	95	430	100	120
4	490	60	79	442	90	110	427	100	120
5	462	27	34	433	88	100	430	110	130
6	440	27	32	403	53	58	427	90	100
7	425	45	52	446	56	67	421	100	110
8	410	52	58	452	69	84	418	82	93
9	400	80	86	446	73	88	418	88	99
10	395	78	83	439	95	110	424	80	92
11	395	78	83	442	100	120	424	88	100
12	390	49	52	446	96	120	424	78	89
13	380	42	43	439	94	110	421	86	98
14	375	30	30	433	93	110	418	95	110
15	375	72	73	406	65	71	415	92	100
16	375	72	73	427	57	66	421	110	120
17	390	88	93	452	70	85	424	98	110
18	390	110	120	439	100	120	424	99	110
19	390	110	120	430	82	95	421	68	77
20	390	110	120	427	82	95	421	80	91
21	395	120	130	433	88	100	424	82	94
22	395	110	120	430	97	110	415	79	89
23	390	95	100	433	81	95	382	80	83
24	390	95	100	415	85	95	397	77	83
25	415	96	110	379	80	82	421	77	88
26	474	79	100	403	94	100	442	79	94
27	452	71	87	433	83	97	430	84	98
28	449	84	100	430	52	60	433	79	92
29	446	82	99	430	72	84	433	76	89
30	458	81	100	---	---	---	436	76	89
31	446	81	98	---	---	---	452	110	130
Total	13140	--	2715	12519	--	2732	13142	--	3115

MISSOURI RIVER MAIN STEM--Continued

6-185. BEAVERHEAD RIVER AT BLAINE, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	474	110	140	391	120	S 140	202	84	46
2	484	120	160	510	240	330	178	110	53
3	484	130	170	529	140	200	178	100	48
4	487	130	170	462	110	140	176	78	37
5	474	120	150	368	110	110	162	93	41
6	503	110	150	310	96	80	135	69	25
7	487	120	160	283	80	61	190	410	S 260
8	452	120	150	278	120	90	742	670	S 1200
9	446	130	160	255	76	52	1060	220	630
10	522	130	180	222	69	41	1280	120	410
11	607	130	210	208	62	35	1410	140	530
12	614	70	120	164	37	16	1430	80	310
13	566	68	100	152	38	16	1410	110	420
14	552	72	110	154	48	20	1420	85	330
15	552	73	110	121	48	16	1430	57	220
16	563	70	110	103	42	12	1440	58	230
17	604	78	130	95	40	10	1530	78	320
18	566	78	120	81	22	5	1580	40	170
19	526	74	100	75	60	12	1600	22	95
20	484	88	110	66	48	9	1670	21	95
21	442	90	110	45	37	4	1690	29	130
22	424	85	97	42	48	5	1720	21	98
23	462	88	110	38	20	2	1700	27	120
24	513	86	120	28	23	2	1680	17	77
25	519	82	110	28	90	7	1610	18	78
26	478	74	96	44	38	5	1510	30	120
27	433	70	82	56	22	3	1410	40	150
28	385	70	73	82	38	8	1350	34	120
29	338	70	64	186	52	26	1290	44	150
30	285	64	49	244	50	33	1210	38	120
31	--	--	--	249	50	34	--	--	--
Total	14726	--	3721	5869	--	1524	34393	--	6633

Day	JULY			AUGUST			SEPTEMBER		
1	1120	75	230	143	32	12	320	38	33
2	970	150	390	148	43	17	312	40	34
3	789	120	260	141	50	19	292	28	22
4	638	88	150	136	40	15	292	41	32
5	550	80	120	118	20	6	305	21	17
6	487	75	99	104	46	13	298	15	12
7	406	77	84	118	32	10	312	10	8
8	342	60	55	130	48	17	315	11	9
9	292	51	40	167	22	10	300	15	12
10	270	50	36	158	12	5	280	16	12
11	248	52	35	130	22	8	278	12	9
12	240	60	39	120	34	11	272	8	6
13	270	82	60	119	39	13	295	10	8
14	308	92	76	108	34	10	308	15	12
15	372	130	130	116	35	11	295	10	8
16	385	100	100	130	32	11	292	12	9
17	372	100	100	133	30	11	245	16	11
18	338	40	36	124	35	12	231	12	7
19	298	19	15	135	26	9	227	12	7
20	310	19	16	171	12	6	227	10	6
21	320	27	23	186	30	15	231	6	4
22	278	28	21	197	40	21	221	5	3
23	252	38	26	227	28	17	215	5	3
24	223	30	18	268	32	23	213	11	6
25	209	36	20	310	38	32	213	10	6
26	199	33	18	335	30	27	201	9	5
27	211	33	19	352	32	30	203	9	5
28	169	22	10	360	38	37	209	20	11
29	153	19	8	448	36	44	209	22	12
30	143	25	10	397	27	29	203	32	18
31	130	21	7	345	22	20	--	--	--
Total	11292	--	2251	6074	--	521	7814	--	347

Total discharge for year (cfs-days)..... 163302
Total load for year (tons)..... 30609

S Computed by subdividing day.

6-255. BIG HOLE RIVER NEAR MELROSE, MONT.

LOCATION.--At gaging station, on left bank at downstream side of bridge on Interstate Highway 15 and U.S. Highway 91, 0.1 mile downstream from Rock Creek, and 7 miles south of Melrose, Madison County.
DRAINAGE AREA.--2,476 square miles.
RECORDS AVAILABLE.--Chemical analyses: August 1956 to September 1957, August 1960 to September 1964 (discontinued).
Water temperatures: August 1956 to September 1957, August 1960 to September 1964 (discontinued).
Sediment records: August 1956 to September 1957, August 1960 to September 1964 (discontinued).
EXTREMES, 1963-64.--Dissolved solids: Maximum, 154 ppm Nov. 27 to Dec. 17; minimum, 78 ppm May 16-31.
Hardness: Maximum, 102 ppm Oct. 1-15, Nov. 27 to Dec. 7; minimum, 28 ppm May 16-31.
Specific conductance: Maximum daily, 251 micromhos Oct. 3; minimum daily, 71 micromhos May 21.
Water temperatures: Maximum, 67°F Aug. 24; minimum, freezing point on many days during January to March.
Sediment concentrations: Maximum daily, 150 ppm June 9; minimum daily, 1 ppm on several days during October, January to April.
Sediment loads: Maximum daily, 4,300 tons June 9; minimum daily, 1 ton on several days during October, January to April.
EXTREMES, 1956-57, 1960-64.--Dissolved solids: Maximum, 192 ppm Aug. 17-31, 1961; minimum, 64 ppm May 11-21, 1957.
Hardness: Maximum, 140 ppm Aug. 17-31, 1961; minimum, 28 ppm May 16-31, 1964.
Specific conductance: Maximum daily, 340 micromhos Sept. 6, 1961; minimum daily, 66 micromhos June 1, 1963.
Water temperatures: Maximum, 74°F Aug. 1, 1981; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 200 ppm June 29, 1961; minimum daily, 1 ppm on many days in 1960-64.
Sediment loads: Maximum daily, 4,300 tons June 9, 1964; minimum daily, less than 0.50 ton on several days in 1961.
REMARKS.--Records of specific conductance of daily samples available in district office at Worland, Wyo. Flow affected by ice Nov. 21, Nov. 30 to Mar. 9, Mar. 21-24.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-15, 1963.	396	17	0.00	28	7.8	9.2	2.7	128	0	15	2.3	0.2	0.2	0.03	151	0.21	161	102	0	0.4	240	7.3	3
Oct. 16-31.....	494	18	.00	24	6.1	8.5	2.3	110	0	12	1.9	.2	.1	.03	134	.18	179	85	0	.4	208	7.0	3
Nov. 1-8.....	498	18	.01	22	6.8	8.3	2.3	103	0	12	2.1	.2	.1	.03	131	.18	176	82	0	.4	197	7.1	3
Nov. 9-26.....	517	18	.01	21	5.5	8.4	2.1	96	0	12	2.0	.2	.3	.04	124	.17	173	75	0	.4	188	7.0	3
Nov. 27-Dec. 7..	350	20	.00	28	7.8	10	2.7	126	0	17	2.5	.2	.1	.04	154	.21	146	102	0	.4	246	7.3	2
Dec. 8-17.....	289	20	.00	28	6.8	8.8	2.5	121	0	15	2.8	.2	.3	.04	154	.21	120	97	0	.4	226	7.6	2
Dec. 18-31.....	392	19	.00	25	6.0	8.5	2.3	110	0	13	2.2	.2	.3	.03	142	.19	150	87	0	.4	208	7.2	2
Jan. 1-7, 1964..	394	19	.00	24	5.6	8.8	2.3	105	0	14	2.3	.2	.3	.03	143	.19	152	83	0	.4	205	7.3	2
Jan. 8-14.....	371	20	.00	26	6.6	8.7	2.7	116	0	15	2.7	.2	.1	.02	148	.20	148	92	0	.4	222	7.7	3
Jan. 15-31.....	409	19	.00	24	5.9	7.9	2.1	106	0	13	2.7	.2	.1	.02	136	.18	150	84	0	.4	206	7.6	3
Feb. 1-15.....	383	19	.01	22	5.6	7.9	2.3	99	0	13	2.0	.2	.1	.01	127	.17	131	78	0	.4	195	7.0	3
Feb. 18-Mar. 3..	334	19	.00	23	6.0	8.1	2.5	101	0	13	2.0	.2	.3	.03	130	.18	117	82	0	.4	198	7.1	4
Mar. 4-17.....	341	19	.01	22	6.3	7.9	2.1	101	0	14	2.2	.2	.3	.03	128	.17	118	81	0	.4	198	7.0	4
Mar. 18-31.....	366	20	.01	22	6.3	8.1	2.5	102	0	13	2.2	.2	.1	.03	133	.18	131	81	0	.4	200	7.7	4
Apr. 1-15.....	582	17	.05	16	2.9	7.0	3.8	72	0	9.8	2.7	.1	.4	.02	111	.15	174	52	0	.4	150	7.0	26

BIG HOLE RIVER BASIN--Continued

6-255. BIG HOLE RIVER NEAR MELROSE, MONT.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Apr. 16-30, 1964	1459	18	0.05	15	3.3	8.0	3.2	72	0	11	2.7	0.1	0.3	0.02	109	0.15	429	51	0	0.5	147	7.1	23
May 1-15.....	1879	17	.06	11	2.8	6.2	2.2	54	0	9.8	2.2	.1	.0	.03	95	.13	482	39	0	.4	117	7.0	22
May 16-31.....	4337	14	.04	8.1	1.9	3.8	1.5	36	0	7.5	1.7	.1	.3	.01	78	.11	913	28	0	.3	80	6.8	31
June 1-17.....	6846	14	.03	12	1.7	4.8	1.7	48	0	8.0	1.4	.1	.4	.03	83	.11	1530	37	0	.3	98	6.9	26
June 18-30.....	6825	15	.06	13	2.8	4.8	1.7	56	0	7.0	1.4	.1	.3	.03	80	.11	1470	44	0	.3	106	7.2	22
July 1-15.....	2878	16	.02	15	2.8	4.9	1.7	69	0	7.5	1.4	.1	.4	.02	92	.13	715	54	0	.3	131	7.0	12
July 16-31.....	1213	15	.00	20	4.6	5.8	1.9	88	0	9.5	1.4	.2	.1	.01	105	.14	344	69	0	.3	164	7.2	7
Aug. 1-31.....	565	16	.02	28	5.9	8.0	2.5	119	0	13	2.3	.2	.2	.02	136	.18	207	94	0	.4	220	8.1	4
Sept. 1-30.....	489	15	.02	28	6.4	8.2	2.7	120	0	13	2.4	.2	.2	.02	142	.19	187	96	0	.4	225	7.8	4
Weighted average.....	--	16	0.03	15	3.2	5.7	2.0	66	--	9.1	1.7	0.1	0.3	0.02	97	0.13	359	51	--	0.3	130	7.0	19
Time-weighted average.....	1369	17	0.02	21	5.1	7.5	2.3	94	--	12	2.1	0.2	0.2	0.02	123	--	--	74	--	0.4	183	7.2	9
Tons per day..	--	58	0.12	56	12	21	7.3	245	--	34	6.5	0.5	1.1	0.09	--	--	--	--	--	--	--	--	--

BIG HOLE RIVER BASIN--Continued

6-255. BIG HOLE RIVER NEAR MELROSE, MONT.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	56	53	52	55	50	51	51	51	50	50	49	49	50	50	53	54	48	47	45	45	46	45	47	41	43	40	39	38	40	36	40	47
November	40	37	39	42	41	--	39	36	--	--	38	39	40	40	40	--	34	34	33	35	--	33	33	34	35	36	38	33	33	--	--	37
December	33	33	34	35	35	34	33	33	33	33	33	33	33	33	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	36	40	38	38	32	32	32	32	32	35	35	--	47	50	34
April	45	36	45	45	36	40	40	40	39	40	40	36	37	40	47	41	40	43	--	41	41	40	34	38	43	38	47	47	54	46	--	41
May	42	42	40	43	41	42	43	45	46	44	45	48	48	47	51	52	50	50	51	50	52	50	45	48	45	42	41	47	48	49	50	46
June	53	50	51	52	52	54	54	48	48	48	48	50	52	55	53	53	50	53	51	50	49	48	52	56	58	58	55	52	57	57	--	52
July	58	58	59	59	58	56	59	61	61	59	61	61	62	61	60	61	60	62	63	63	63	64	62	59	58	60	60	60	61	60	58	60
August	--	--	--	--	64	56	58	56	57	59	58	59	57	56	57	56	57	51	55	52	55	56	56	67	58	51	50	50	50	50	58	56
September	52	--	59	56	60	58	60	54	56	54	57	58	59	54	52	52	54	52	54	50	48	49	48	47	48	47	47	47	55	51	--	53

BIG HOLE RIVER BASIN--Continued

6-255. BIG HOLE RIVER NEAR MELROSE, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	334	3	3	482	4	5	280	3	2
2	330	2	2	488	2	3	330	4	4
3	326	2	2	488	2	3	350	13	12
4	326	2	2	500	5	7	350	8	8
5	330	1	1	506	3	4	340	4	4
6	358	3	3	512	--	4	330	5	4
7	405	2	2	506	3	4	320	4	3
8	440	4	5	506	3	4	310	7	6
9	440	4	5	530	--	4	280	5	4
10	440	4	5	554	--	3	240	4	3
11	440	4	5	548	2	3	220	4	2
12	445	2	2	542	3	4	220	4	2
13	445	3	4	524	3	4	240	6	4
14	440	2	2	530	4	6	300	7	6
15	440	4	5	542	3	4	360	5	5
16	445	2	2	572	--	4	360	5	5
17	435	4	5	536	3	4	360	3	3
18	430	4	5	530	2	3	360	4	4
19	430	6	7	506	5	7	380	4	4
20	488	4	5	506	4	5	390	3	3
21	530	4	6	470	--	8	370	5	5
22	518	8	11	445	10	12	370	5	5
23	506	5	7	425	6	7	370	2	2
24	524	6	8	500	6	8	380	2	2
25	530	6	9	518	8	11	410	4	4
26	536	4	6	530	5	7	420	4	5
27	518	4	6	530	6	9	420	4	5
28	512	3	4	430	6	7	400	3	3
29	494	3	4	330	6	5	400	3	3
30	506	2	3	260	--	3	400	3	3
31	506	3	4	--	--	--	420	--	3
Total	13847	--	140	14846	--	162	10680	--	128
	JANUARY			FEBRUARY			MARCH		
1	430	3	3	420	4	5	310	--	4
2	420	3	3	410	5	6	280	5	4
3	400	9	10	370	5	5	280	5	4
4	390	3	3	370	4	4	300	1	1
5	380	1	1	360	2	2	310	1	1
6	370	6	6	360	4	4	300	1	1
7	370	3	3	360	4	4	300	1	1
8	370	2	2	390	6	6	300	2	2
9	380	3	3	400	6	6	320	1	1
10	380	3	3	400	8	9	354	6	6
11	380	3	3	390	8	8	375	2	2
12	370	2	2	380	8	8	370	2	2
13	360	3	3	370	11	11	358	5	5
14	360	2	2	380	6	6	362	5	5
15	370	4	4	390	11	12	380	--	5
16	380	3	3	400	4	4	370	4	4
17	390	3	3	400	4	4	380	4	4
18	390	4	4	390	4	4	385	2	2
19	390	2	2	380	3	3	375	2	2
20	390	5	5	380	3	3	366	9	9
21	400	6	6	380	3	3	350	6	6
22	410	1	1	380	2	2	330	7	6
23	400	3	3	360	1	1	320	8	7
24	400	2	2	320	2	2	330	5	4
25	420	3	3	290	2	2	395	1	1
26	420	3	3	260	2	1	385	3	3
27	440	6	7	270	2	1	375	4	4
28	440	--	7	290	3	2	362	4	4
29	440	6	7	310	4	3	375	--	5
30	440	5	6	--	--	--	380	5	5
31	430	6	7	--	--	--	390	5	5
Total	12310	--	120	10560	--	131	10767	--	115

BIG HOLE RIVER BASIN--Continued

6-255. BIG HOLE RIVER NEAR MELROSE, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	445	2	2	2700	130	950	5610	41	620
2	445	2	2	2690	64	460	5140	23	320
3	430	1	1	2350	48	300	5240	22	310
4	420	4	5	1800	39	190	5320	22	320
5	455	3	4	1560	12	51	5430	19	280
6	455	8	10	1580	44	190	5820	70	1100
7	440	10	12	1500	14	57	6390	100	1700
8	476	6	8	1420	10	38	7990	100	2200
9	512	6	8	1430	10	39	10700	150	4300
10	604	8	13	1580	19	81	11200	63	1900
11	692	8	15	1730	20	93	8980	54	1300
12	758	8	16	1750	32	150	7460	62	1200
13	839	18	41	1820	33	160	6520	36	630
14	839	21	48	2030	50	270	6000	43	700
15	920	27	67	2240	44	270	5870	49	780
16	1230	24	80	2480	44	290	5950	11	180
17	1630	9	40	2880	59	460	6760	21	380
18	1570	11	47	3360	68	620	6780	34	620
19	1440	--	30	3850	73	760	7510	68	1400
20	1500	6	24	4320	75	870	7880	65	1400
21	1770	28	130	4800	60	780	9550	67	1700
22	1760	9	43	5020	54	730	9190	64	1600
23	1510	6	24	4920	44	580	8040	35	760
24	1220	11	36	4440	22	260	6810	27	500
25	1140	10	31	3890	24	250	5870	27	430
26	1140	6	18	3440	19	180	5740	22	340
27	1130	6	18	3400	25	230	5820	30	470
28	1190	8	26	4070	46	510	5710	40	620
29	1560	71	300	5690	87	1300	5090	22	300
30	2100	97	550	6390	96	1700	4730	21	270
31	--	--	--	6440	66	1100	--	--	--
Total	30620	--	1649	97570	--	13919	205100	--	28630
	JULY			AUGUST			SEPTEMBER		
1	4440	18	220	930	--	14	660	7	12
2	4030	24	260	884	--	14	684	--	10
3	3920	22	230	830	--	14	684	4	7
4	3610	15	150	749	--	14	668	3	5
5	3340	25	230	668	8	14	653	5	9
6	3100	22	180	618	2	3	611	5	8
7	2880	21	160	590	3	5	572	2	3
8	2610	11	78	584	2	3	548	2	3
9	2370	10	64	578	4	6	518	2	3
10	2370	7	45	584	3	5	488	2	3
11	2240	7	42	584	2	3	465	2	3
12	2080	5	28	560	3	5	450	4	5
13	2060	10	56	554	8	12	450	2	2
14	2060	10	56	536	3	4	455	2	2
15	2060	8	44	530	2	3	445	5	6
16	1970	8	43	512	3	4	445	2	2
17	1760	4	19	470	3	4	435	4	5
18	1630	6	26	440	3	4	400	3	3
19	1520	6	25	465	3	4	385	2	2
20	1410	2	8	470	2	3	395	12	13
21	1320	5	18	470	3	4	420	4	5
22	1240	6	20	460	3	4	425	16	18
23	1120	8	24	440	14	17	430	2	2
24	1060	3	9	430	4	5	435	2	2
25	1030	5	14	420	3	3	445	3	4
26	990	4	11	410	2	2	430	2	2
27	911	4	10	415	4	4	425	4	5
28	848	6	14	455	7	9	415	2	2
29	821	5	11	590	5	8	420	3	3
30	839	4	9	611	4	7	420	4	5
31	940	6	15	676	4	7	--	--	--
Total	62579	--	2119	17513	--	208	14676	--	154

Total discharge for year (cfs-days)..... 501068
Total load for year (tons)..... 47475

BIG HOLE RIVER BASIN--Continued

6-258. WILLOW CREEK NEAR GLEN, MONT.

LOCATION.--At gaging station, on right bank 1 mile below Bond Creek and 7 miles southwest of Glen, Beaverhead County.
DRAINAGE AREA.--35.6 square miles.
RECORDS AVAILABLE.--Chemical analyses: August 1962 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1, 1963....	11	14	A0.11	7.8	1.6	3.6	0.8	37	0	3.2	0.8	0.1	0.0	0.01	51	0.07	1.51	26	0	0.3	68	7.0	5
Nov. 5.....	11	15	A.06	8.5	1.2	4.3	.8	37	0	4.5	1.1	.1	.1	.03	73	.10	2.17	26	0	.4	80	7.0	1
Dec. 4.....	B9.5	16	A.04	7.1	1.5	3.9	.6	35	0	3.2	.8	.0	.1	.00	53	.07	1.36	24	0	.3	74	6.8	3
Jan. 8, 1964....	B7.5	17	A.05	10	.7	5.0	1.0	43	0	3.0	1.3	.1	.3	.00	69	.09	1.40	26	0	.3	86	6.8	3
Feb. 5 C.....	6.3	20	A.07	29	4.3	16	1.2	112	0	26	5.7	.3	1.2	--	167	.23	2.84	90	0	.7	254	7.6	--
Mar. 4.....	6.2	18	A.10	9.1	1.5	5.1	1.0	42	0	4.5	1.9	.1	.2	.01	65	.09	1.09	29	0	.4	66	6.6	1
Apr. 1.....	7.6	17	A.11	10	1.0	4.8	1.2	41	0	5.2	2.0	.1	.4	.00	63	.09	1.33	29	0	.4	85	6.6	2
May 7.....	9.0	17	A.11	9.7	.9	4.8	.9	41	0	4.8	1.1	.0	.0	--	63	.09	1.53	28	0	.4	86	7.0	2
June 3.....	56	9.2	.02	5.8	.9	2.6	1.0	19	0	5.2	1.5	.1	.5	.02	46	.07	7.26	18	2	.3	55	6.9	5
June 30.....	88	7 8	A.25	3.7	.4	2.3	1.2	16	0	2.5	.8	.1	1.9	.00	43	.06	10.2	11	0	.3	43	6.6	2
Aug. 5.....	23	11	A.07	6.4	.7	2.8	.6	27	0	3.5	.7	.0	.1	.00	50	.07	3.11	19	0	.3	53	6.7	1
Sept. 3.....	21	11	A.09	8.8	.5	2.8	.6	29	0	3.0	.8	.0	.1	.00	39	.05	2.21	24	0	.2	62	6.4	1

A In solution at time of collection.
B Daily mean discharge.
C Sample collected at U.S. Highway 91 crossing.

BIG HOLE RIVER BASIN--Continued

6-258. WILLOW CREEK NEAR GLEN, MONT.--Continued

Periodic determinations of suspended-sediment discharge, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 1, 1963	0930	--		11	2	0.1												
Nov. 5	1440	36		11	5	.1												
Dec. 4	1205	32		D 9.5	4	.1												
Jan. 8, 1964	1230	32		D 7.5	16	.3												
Feb. 5	1130	32		6.3	22	.4												
Mar. 4	1515	36		6.2	4	.1												
Apr. 1	0810	35		7.8	2	T												
May 7	1350	42		9.0	2	T												
June 3	1515	57		56	20	3.0												
June 30	1510	55		88	10	2.4												
Aug. 5	1500	59		23	4	.2												
Sept. 3	1130	44		21	2	.1												

T Less than 0.05 ton.
D Daily mean discharge.

LITTLE PRICKLY PEAR CREEK BASIN

6-711. LITTLE PRICKLY PEAR CREEK AT SIEBEN RANCH, NEAR WOLF CREEK, MONT.

LOCATION.--At gaging station at farm bridge, 0.2 mile upstream from Clark Creek and 8 miles south of Wolf Creek, Lewis and Clark County.
DRAINAGE AREA.--270 square miles.
RECORDS AVAILABLE.--Water temperatures: May 1962 to September 1964.
Sediment records: May 1962 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 66°F July 10; minimum, freezing point on several days during December to February.
Sediment concentrations: Maximum daily, 890 ppm June 9; minimum daily, not determined.
Sediment loads: Maximum daily, 1,800 tons June 9, 10; minimum daily, less than 0.50 ton on several days during August.
EXTREMES, 1962-64.--Water temperatures: Maximum, 68°F July 7, 22, 29, 1963; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 890 ppm June 9, 1964; minimum daily, not determined.
Sediment loads: Maximum daily, 1,800 tons June 9, 10, 1964; minimum daily, less than 0.50 ton on many days.
REMARKS.--Flow affected by ice Nov. 21, 22, Jan. 8-12, 22-25, Feb. 6, 7, 24-27, Mar. 23-27, Apr. 6-8.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Feb. 4, 1964....	28	15	0.03	43	19	10	1.3	224	0	20	3.0	0.4	1.0		216	0.29	16.3	186	2	0.3	384	7.7	

LITTLE PRICKLY PEAR CREEK BASIN--Continued

6-711. LITTLE PRICKLY PEAR CREEK AT SIEBEN RANCH, NEAR WOLF CREEK, MONT.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Aver-age
	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	
October	58	--	56	55	53	51	53	--	51	55	56	55	53	53	51	52	51	51	49	50	48	51	46	47	44	43	42	46	44	--	43	50
November	42	42	43	44	43	43	42	42	41	--	40	43	41	42	42	39	39	38	--	--	33	34	35	37	39	43	38	--	37	35	--	40
December	35	35	34	34	38	35	35	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	32	--	--	--	--	--	--	--	33	34	33	33	34	33	33	--	32	32	32	32	32	32	32	32	32	--
February	33	--	34	35	32	--	32	33	37	38	36	35	34	33	33	--	33	33	35	33	32	34	33	33	--	32	33	32	32	--	--	34
March	--	37	36	38	--	35	35	35	35	36	39	37	33	37	--	37	39	--	38	41	37	--	37	--	36	38	--	36	43	--	35	--
April	45	38	--	--	--	--	42	45	45	44	40	43	43	46	45	39	--	46	48	48	45	43	--	38	46	45	46	43	58	--	--	--
May	48	43	--	40	--	43	45	45	--	--	45	49	50	50	--	52	52	50	54	54	--	48	50	48	49	48	48	--	46	48	48	--
June	52	51	54	49	51	52	--	48	48	51	53	54	55	53	53	--	52	51	49	53	--	55	58	59	--	58	59	58	61	61	--	54
July	54	61	57	62	52	62	--	64	64	66	--	64	60	--	62	63	--	65	60	53	64	55	55	64	62	65	62	61	57	63	59	61
August	--	62	64	63	59	64	63	61	62	58	64	58	62	64	54	62	63	62	51	56	59	58	56	53	--	52	56	54	56	--	54	59
September	54	53	54	56	52	--	52	53	55	--	54	56	55	54	56	56	55	51	52	49	--	52	51	56	--	54	51	51	53	51	--	53

LITTLE PRICKLY PEAR CREEK BASIN--Continued

6-711. LITTLE PRICKLY PEAR CREEK AT SIEBEN RANCH, NEAR WOLF CREEK, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	18	C 11	1	20	C 15	1	37	C 43	4
2	18	C 11	1	20	C 15	1	34	C 43	4
3	17	C 11	1	20	C 15	1	41	C 43	5
4	19	C 11	1	21	C 15	1	39	C 43	5
5	20	C 11	1	23	C 15	1	36	C 43	4
6	23	C 11	1	22	C 15	1	39	C 43	5
7	22	110	7	22	C 15	1	36	C 43	4
8	23	--	14	22	C 15	1	39	C 43	5
9	24	95	6	22	C 15	1	25	C 43	3
10	21	46	3	22	C 15	1	16	C 43	2
11	22	C 18	1	22	C 15	1	14	C 43	2
12	21	C 18	1	22	C 15	1	13	C 43	2
13	21	C 18	1	22	C 15	1	12	C 43	1
14	21	C 18	1	24	C 15	1	13	C 43	2
15	22	C 18	1	28	C 15	1	14	C 43	2
16	22	C 18	1	23	C 15	1	15	C 43	2
17	22	C 18	1	22	C 15	1	17	C 43	2
18	22	C 18	1	22	C 15	1	20	C 43	2
19	24	C 18	1	21	C 15	1	25	C 43	3
20	24	C 18	1	17	C 15	1	30	C 43	3
21	23	C 18	1	16	98	4	40	C 43	5
22	23	C 18	1	25	190	13	50	C 43	6
23	21	C 18	1	32	91	8	56	C 43	6
24	19	C 18	1	41	110	12	55	C 43	6
25	19	C 18	1	41	81	9	54	C 43	6
26	19	C 18	1	42	69	8	54	C 43	6
27	20	C 18	1	41	56	6	52	C 43	6
28	20	C 18	1	40	--	4	50	C 43	6
29	20	C 18	1	39	30	3	38	C 43	4
30	20	C 18	1	35	21	2	33	C 43	4
31	20	C 18	1	--	--	--	35	C 43	4
Total	650	--	57	789	--	89	1032	--	121

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	35	C 31	3	28	C 47	4	24	C 40	3
2	35	C 31	3	26	C 47	3	24	C 40	3
3	31	C 31	3	25	C 47	3	22	C 40	2
4	30	C 31	3	28	C 47	4	23	C 40	2
5	29	C 31	2	28	C 47	4	22	C 40	2
6	32	C 31	3	26	C 47	3	21	C 40	2
7	31	C 31	3	27	C 47	3	23	C 40	2
8	28	C 31	2	28	C 47	4	19	C 40	2
9	26	C 31	2	29	C 47	4	21	C 40	2
10	24	C 31	2	31	C 47	4	20	C 40	2
11	23	C 31	2	31	C 47	4	22	C 40	2
12	23	C 31	2	30	C 47	4	23	C 40	2
13	24	C 31	2	29	C 47	4	22	C 40	2
14	25	C 31	2	26	C 47	3	21	C 40	2
15	29	C 31	2	24	C 47	3	22	C 40	2
16	31	C 31	3	28	C 47	4	25	C 40	3
17	31	C 31	3	29	C 47	4	28	C 40	3
18	30	C 31	3	30	C 47	4	29	C 40	3
19	30	C 31	3	32	C 47	4	29	C 40	3
20	32	80	7	34	C 47	4	26	C 40	3
21	30	70	6	32	120	10	25	C 40	3
22	26	--	3	29	32	3	19	C 40	2
23	25	32	2	28	27	2	17	110	5
24	28	49	4	25	34	2	13	--	3
25	31	59	5	21	--	8	17	66	3
26	35	74	7	23	150	9	22	290	17
27	31	180	15	24	80	5	25	--	20
28	28	110	8	24	120	8	29	380	30
29	26	65	5	25	100	7	29	160	13
30	29	49	4	--	--	--	30	--	7
31	28	39	3	--	--	--	36	80	8
Total	896	--	117	800	--	128	728	--	158

C Composite period.

LITTLE PRICKLY PEAR CREEK BASIN--Continued

6-711. LITTLE PRICKLY PEAR CREEK AT SIEBEN RANCH, NEAR WOLF CREEK, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	39	120	13	70	320	60	350	110	100
2	39	110	12	117	510	160	278	70	53
3	35	C 43	4	139	---	160	232	65	41
4	35	C 43	4	175	440	210	220	50	30
5	39	C 43	5	180	---	200	220	45	27
6	35	C 43	4	171	220	100	212	45	26
7	30	C 43	3	164	100	44	216	---	60
8	33	C 43	4	157	80	34	338	240	220
9	37	C 43	4	169	---	100	663	890 S	1800
10	36	C 43	4	208	---	300	857	760	1800
11	37	C 43	4	244	680	450	699	400	750
12	36	C 43	4	269	320	230	554	340	510
13	36	C 43	4	244	330	220	446	240	290
14	36	C 43	4	258	420	290	359	170	160
15	39	C 43	5	271	---	340	318	130	110
16	42	C 43	5	271	550	400	318	---	100
17	39	C 43	5	284	700	540	422	200 S	260
18	37	C 43	4	358	750	720	323	110	96
19	37	C 43	4	400	860	930	292	91	72
20	39	C 43	5	410	860	950	283	80	61
21	45	C 43	5	380	---	550	253	---	44
22	50	C 43	6	340	270	250	245	50	33
23	52	C 43	6	300	190	150	220	49	29
24	50	C 43	6	250	120	81	196	44	23
25	50	C 43	6	200	85	46	162	---	19
26	50	C 43	6	190	60	31	129	47	16
27	49	C 43	6	180	55	27	115	38	12
28	48	C 43	6	210	---	70	110	26	8
29	48	C 43	6	300	300	240	110	19	6
30	53	C 43	6	600	240	390	98	3	1
31	---	---	---	480	150	190	---	---	---
Total	1231	---	160	7989	---	8463	9238	---	6757

Day	JULY			AUGUST			SEPTEMBER		
1	93	C 12	3	34	C 6	1	50	C 8	1
2	86	C 12	3	32	C 6	1	46	C 8	1
3	72	C 12	2	32	C 6	1	45	C 8	1
4	59	C 12	2	29	C 6	T	47	C 8	1
5	59	C 12	2	28	C 6	T	46	C 8	1
6	57	C 12	2	26	C 6	T	44	C 8	1
7	55	C 12	2	26	C 6	T	47	C 8	1
8	54	C 12	2	26	C 6	T	54	C 8	1
9	67	C 12	2	26	C 6	T	52	C 8	1
10	64	C 12	2	24	C 6	T	47	C 8	1
11	59	C 12	2	24	C 6	T	49	C 8	1
12	55	C 12	2	23	C 6	T	50	C 8	1
13	68	C 12	2	23	C 6	T	50	C 8	1
14	66	C 12	2	23	C 6	T	49	C 8	1
15	66	C 12	2	26	C 6	T	46	C 8	1
16	55	C 12	2	26	C 6	T	46	C 8	1
17	49	C 12	2	25	C 6	T	50	C 8	1
18	46	C 12	1	24	C 6	T	49	C 8	1
19	44	C 12	1	28	C 6	T	50	C 8	1
20	42	C 12	1	34	C 6	1	50	C 8	1
21	41	C 12	1	33	C 6	1	52	C 8	1
22	38	C 12	1	30	C 6	T	50	C 8	1
23	36	C 12	1	29	C 6	T	50	C 8	1
24	36	C 12	1	32	C 6	1	50	C 8	1
25	34	C 12	1	33	C 6	1	49	C 8	1
26	33	C 12	1	32	C 6	1	52	C 8	1
27	29	C 12	1	30	C 6	T	52	C 8	1
28	27	C 12	1	38	C 6	1	52	C 8	1
29	27	C 12	1	44	C 6	1	49	C 8	1
30	27	C 12	1	40	C 6	1	47	C 8	1
31	40	C 12	1	42	C 6	1	---	---	---
Total	1584	---	50	922	---	20	1470	---	30

Total discharge for year (cfs-days)..... 27329
Total load for year (tons)..... 16150

S Computed by subdividing day.
T Less than 0.50 ton.
C Composite period.

LITTLE PRICKLY PEAR CREEK BASIN--Continued

6-713. LITTLE PRICKLY PEAR CREEK AT WOLF CREEK, MONT.

LOCATION.--At gaging station at county bridge, 150 feet south of Wolf Creek post office, Lewis and Clark County, and 0.5 mile downstream from Wolf Creek.
DRAINAGE AREA.--381 square miles.
RECORDS AVAILABLE.--Water temperatures: May 1962 to September 1964.
Sediment records: May 1962 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 70°F July 20; minimum, freezing point Mar. 23.
Sediment concentrations: Maximum daily, 2,100 ppm June 9; minimum daily, not determined.
Sediment loads: Maximum daily, 14,000 tons June 9; minimum daily, 1 ton Oct. 1-5.
EXTREMES, 1962-64.--Water temperatures: Maximum, 79°F July 22, 1963; minimum, freezing point, Jan. 23, 1963, Mar. 23, 1964.
Sediment concentrations: Maximum daily, 2,100 ppm June 9, 1964; minimum daily, not determined.
Sediment loads: Maximum daily, 14,000 tons June 9, 1964; minimum daily, less than 0.50 ton on many days.
REMARKS.--Flow affected by ice Nov. 20, 21, Dec. 8-20, Jan. 6-15, 22-26, Feb. 25-29, Mar. 8, 9, 22, 26-28, Apr. 7,8.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C): Parts per million	Dissolved solids (residue at 180°C): Tons per acre-foot	Dissolved solids (residue at 180°C): Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Feb. 4, 1964....	43	14	0.04	42	18	9.8	1.1	214	0	20	2.3	0.4	0.6		201	0.27	23.3	178	2	0.3	370	7.8	
May 6.....	589	14	.01	32	11	5.1	1.1	138	0	17	2.1	.2	1.9	0.03	159	.22	253	124	11	.2	258	7.4	5

Temperature (°F) of water, water year October 1963 to September 1964

Month	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.....	--	60	61	58	54	48	52	59	54	57	58	50	--	57	57	--	54	56	54	54	54	54	49	50	47	--	--	47	47	45	44	53
November.....	44	46	45	44	44	45	46	48	44	42	42	45	47	45	47	40	--	43	40	35	34	38	37	--	44	46	42	35	40	37	--	42
December.....	37	37	--	40	39	38	38	38	37	36	36	34	34	34	33	35	33	36	--	34	36	38	41	43	40	40	40	39	38	39	38	37
January.....	38	38	39	36	36	37	36	34	35	37	35	35	33	35	35	37	36	35	36	36	35	33	34	35	37	38	36	37	38	35	36	36
February.....	37	38	39	38	34	37	36	36	38	42	39	38	37	37	36	37	39	39	36	37	37	38	37	33	35	35	35	37	36	--	--	37
March.....	--	38	39	40	37	39	35	39	37	36	42	40	40	38	40	38	44	41	41	39	38	34	32	34	34	36	41	43	--	--	42	38
April.....	47	40	47	42	42	42	44	48	50	48	44	45	48	47	51	44	47	41	--	51	50	50	40	40	42	47	47	55	56	51	--	46
May.....	53	47	45	45	49	47	48	50	49	--	52	49	49	55	55	50	--	58	60	58	58	51	44	--	55	54	53	53	--	--	--	51
June.....	--	57	60	54	59	55	53	52	52	48	49	49	51	51	51	51	52	51	50	51	50	51	53	55	54	60	57	57	53	57	--	53
July.....	55	57	56	58	60	64	55	55	57	59	60	60	58	59	56	67	63	64	60	70	64	58	60	58	57	54	58	58	58	58	60	59
August.....	59	55	53	69	55	53	58	59	62	58	57	56	60	58	58	59	57	60	53	52	54	52	55	52	53	54	53	52	52	53	50	56
September.....	52	55	55	57	50	56	55	58	56	48	54	47	56	55	57	58	67	54	47	55	57	53	54	58	47	51	54	52	54	46	--	54

LITTLE PRICKLY PEAR CREEK BASIN--Continued

6-713. LITTLE PRICKLY PEAR CREEK AT WOLF CREEK, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	26	14	1	37	210	21	53	740	110
2	26	14	1	29	45	4	53	1000	140
3	26	13	1	23	120	7	49	--	160
4	28	12	1	29	160	13	52	1400	200
5	28	16	1	35	150	14	54	660	96
6	31	32	3	36	180	17	68	220	40
7	31	32	3	35	220	21	60	140	23
8	31	44	4	34	190	17	32	130	11
9	31	130	11	35	40	4	28	120	9
10	31	120	10	35	95	9	22	160	10
11	32	110	10	41	120	13	18	62	3
12	32	40	3	41	240	27	16	45	2
13	32	--	3	44	330	39	14	48	2
14	32	140	12	46	300	37	16	80	3
15	32	85	7	47	340	43	16	100	4
16	34	--	10	47	85	11	18	110	5
17	35	150	14	44	--	13	20	50	3
18	36	260	25	43	140	16	30	34	3
19	37	60	6	37	350	35	50	51	7
20	36	98	10	20	190	10	55	55	8
21	35	760	72	16	130	6	60	44	7
22	38	1400	140	47	220	28	68	50	9
23	36	350	34	53	150	21	86	110	26
24	29	1200	94	55	--	30	86	62	14
25	36	1100	110	59	270	43	82	42	9
26	38	--	50	58	330	52	75	61	12
27	38	--	20	62	250	42	74	48	10
28	38	120	12	62	70	12	74	43	9
29	37	280	28	59	50	8	82	46	10
30	34	340	31	56	55	8	55	44	7
31	37	400	40	--	--	--	60	44	7
Total	1023	--	767	1265	--	621	1526	--	959
	JANUARY			FEBRUARY			MARCH		
1	63	45	8	48	110	14	49	--	3
2	68	40	7	47	54	7	49	28	4
3	63	39	7	36	41	4	46	30	4
4	59	38	6	43	28	3	50	33	4
5	54	60	9	47	28	4	48	48	6
6	55	69	10	41	64	7	46	39	5
7	50	66	9	46	110	14	44	24	3
8	34	32	3	50	33	4	40	20	2
9	34	110	10	50	42	6	42	21	2
10	32	120	10	49	95	13	44	25	3
11	30	42	3	50	100	14	46	19	2
12	30	20	2	49	120	16	48	72	9
13	28	58	4	47	120	15	47	67	8
14	32	100	9	41	130	14	44	22	3
15	39	68	7	35	54	5	48	180	23
16	49	81	11	48	72	9	50	250	34
17	48	68	9	48	83	11	55	300	45
18	49	20	3	42	140	16	59	190	30
19	42	25	3	46	87	11	60	78	13
20	53	74	11	48	52	7	55	60	9
21	49	65	9	50	74	10	54	60	9
22	40	30	3	49	37	5	28	82	6
23	38	32	3	49	32	4	22	60	4
24	40	38	4	38	40	4	21	43	2
25	45	44	5	32	34	3	20	88	5
26	55	42	6	35	45	4	25	100	7
27	53	38	5	40	72	8	30	70	6
28	50	68	9	42	94	11	40	62	7
29	46	40	5	45	18	2	50	--	40
30	49	62	8	--	--	--	48	--	35
31	47	51	6	--	--	--	52	220	31
Total	1424	--	204	1291	--	245	1360	--	364

LITTLE PRICKLY PEAR CREEK BASIN--Continued

6-713. LITTLE PRICKLY PEAR CREEK AT WOLF CREEK, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	64	85	15	276	100	74	613	--	280
2	69	130	24	441	230	270	545	90	130
3	68	50	9	577	540	S 980	485	50	65
4	63	67	11	621	690	1200	457	42	52
5	70	110	21	593	500	800	441	42	50
6	70	130	25	589	280	450	425	37	42
7	75	120	24	533	110	160	429	640	740
8	80	58	13	529	150	210	809	1700	3700
9	88	42	10	553	190	280	2440	2100	14000
10	88	75	18	601	--	300	1740	1000	4700
11	96	38	10	621	180	300	1190	590	1900
12	99	86	23	561	160	240	888	300	720
13	93	110	28	545	180	260	758	200	410
14	93	44	11	573	140	220	654	140	250
15	94	40	10	569	180	280	613	110	180
16	111	99	30	565	140	210	605	130	210
17	113	58	18	605	--	250	654	260	S 490
18	109	12	4	668	290	520	501	78	110
19	105	--	3	663	330	590	457	48	59
20	105	8	2	625	260	440	417	43	48
21	117	16	5	654	320	560	388	24	25
22	131	57	20	633	240	410	377	33	34
23	145	70	27	561	220	330	342	38	35
24	145	40	16	489	--	200	314	24	20
25	145	16	6	405	70	77	282	27	21
26	169	43	20	356	40	38	267	40	29
27	169	120	55	335	29	26	252	18	12
28	157	52	22	384	60	62	240	13	8
29	175	60	28	697	--	600	234	22	14
30	216	90	52	910	--	1000	213	14	8
31	--	--	--	726	--	500	--	--	--
Total	3322	--	560	17458	--	11837	18030	--	28342

Day	JULY			AUGUST			SEPTEMBER		
1	202	C 11	6	81	490	110	76	C 26	5
2	192	C 11	6	80	560	120	82	C 26	6
3	181	C 11	5	78	420	88	80	C 26	6
4	165	C 11	5	72	100	19	82	C 26	6
5	159	C 11	5	64	80	14	81	C 26	6
6	155	C 11	5	60	85	14	80	C 26	6
7	147	C 11	4	63	100	17	76	C 26	5
8	141	C 11	4	62	240	40	88	C 26	6
9	151	C 11	4	59	250	40	86	C 26	6
10	135	C 11	4	56	210	32	82	C 26	6
11	129	C 11	4	56	70	11	84	C 26	6
12	121	C 11	4	60	180	29	84	C 26	6
13	129	C 11	4	62	150	25	81	C 26	6
14	121	C 11	4	56	220	33	75	C 26	5
15	121	C 11	4	58	160	25	75	C 26	5
16	109	C 11	3	60	180	29	72	C 26	5
17	105	C 11	3	62	180	30	75	C 26	5
18	99	C 11	3	62	180	30	76	C 26	5
19	94	C 11	3	64	140	24	78	C 26	5
20	90	C 11	3	76	120	25	78	C 26	5
21	87	C 11	3	74	180	36	80	C 26	6
22	82	C 11	2	70	40	8	78	C 26	5
23	80	C 11	2	68	110	20	78	C 26	5
24	78	C 11	2	64	130	22	78	C 26	5
25	75	C 11	2	58	210	33	80	C 26	6
26	72	270	52	59	160	25	82	C 26	6
27	69	210	39	62	130	22	82	C 26	6
28	69	240	45	64	110	19	81	C 26	6
29	70	320	60	74	30	6	81	C 26	6
30	74	510	100	74	42	8	78	C 26	5
31	84	580	130	66	45	8	--	--	--
Total	3586	--	520	2024	--	962	2389	--	167

Total discharge for year (cfs-days)..... 54698
Total load for year (tons)..... 45548

S Computed by subdividing day.
C Composite period.

LITTLE PRICKLY PEAR CREEK BASIN--Continued

6-713. LITTLE PRICKLY PEAR CREEK AT WOLF CREEK, MONT.--Continued

Particle-size analyses of suspended sediment, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Nov. 6, 1963.....	1730	45		32	245			63		94		100						PWC
Dec. 5.....	1100	39		53	667			41		73		100						PWC

MARIAS RIVER BASIN

6-1015. MARIAS RIVER NEAR CHESTER, MONT.

LOCATION.--At Tiber Dam outlet, 1 mile upstream from gaging station, 5 miles upstream from Pondera Coulee, and 15 miles southwest of Chester, Liberty County.
DRAINAGE AREA.--4,927 square miles upstream from gaging station, of which 518 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: August to September 1964.
REMARKS.--Daily samples for chemical analysis composited by equal-volume. Records of specific conductance of daily samples available in district office at Worland, Wyo.

Chemical analyses, in parts per million, August to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C): Parts per million	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Aug. 12-31, 1964	2657	4.2	0.00	66	12	32	3.2	156	0	148	2.0	0.3	1.0	0.07	348	0.47	2500	212	84	1.0	532	7.9	
Sept. 1-30.....	1115	3.9	.00	53	20	30	2.0	154	0	141	2.8	.3	.9	.06	344	.47	1040	214	88	.9	537	7.3	5

6-1276. MUSSELSHELL RIVER NEAR MOSBY, MONT.

LOCATION.--At gaging station, on left bank 0.8 mile upstream from Flatwillow Creek and 5 miles south of Mosby, Garfield County.
DRAINAGE AREA.--5,941 square miles.
RECORDS AVAILABLE.--Chemical analyses: November 1962 to September 1964.
Water temperatures: November 1962 to September 1964.
Sediment records: November 1962 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 2,930 ppm Dec. 14-20; minimum, 747 ppm June 12-16.
Hardness: Maximum, 1,190 ppm Dec. 14-20; minimum, 352 ppm June 17-30.
Specific conductance: Maximum daily, 3,820 micromhos Dec. 16; minimum daily, 984 micromhos June 30.
Water temperatures: Maximum, 84°F July 14; minimum, freezing point on many days during November to April.
Sediment concentrations: Maximum daily, 8,300 ppm May 4; minimum daily, 6 ppm Feb. 11.
Sediment loads: Maximum daily, 23,000 tons June 21; minimum daily, 1 ton on many days during November to March.
EXTREMES, 1962-64.--Dissolved solids: Maximum, 3,120 ppm Feb. 1-3, 1963; minimum, 653 ppm June 16-21, 1963.
Hardness: Maximum, 1,260 ppm Feb. 1-3, 1963; minimum, 324 ppm June 16-21, 1963.
Specific conductance: Maximum daily, 3,930 micromhos Feb. 1, 1963; minimum daily, 884 micromhos June 17, 19, 1963.
Water temperatures: Maximum, 84°F July 14, 1964; minimum, freezing point on many days during winter months each year.
Sediment concentrations: Maximum daily, 12,000 ppm June 21, 1963; minimum daily, not determined.
Sediment loads: Maximum daily, 29,000 tons June 21, 1963; minimum daily, less than 0.50 ton on several days in 1963.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Daily samples for chemical analysis composited by equal-volume. Records of specific conductance of daily samples available in district office at Worland, Wyo. Flow affected by ice Nov. 19-22, Nov. 28 to Jan. 22, Jan. 26-31, Mar. 13, 22-31.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-11, 1963.	18.3	2.0	0.00	116	101	345	5.2	254	0	1140	30	0.3	0.1	0.27	1860	2.53	91.9	704	496	5.7	2570	8.2	2
Oct. 12-16.....	21.8	1.6	.00	121	109	375	5.2	269	0	1240	33	.3	.0	.29	2020	2.75	119	752	531	6.0	2760	8.2	2
Oct. 17-31.....	36.3	5.2	.00	106	84	241	4.4	271	0	842	22	.3	.0	.23	1440	1.96	141	609	387	4.2	2020	8.1	1
Nov. 1-19.....	42.8	6.6	.00	119	92	278	4.0	305	0	935	24	.3	.1	.22	1610	2.19	186	674	424	4.7	2180	7.7	2
Nov. 20-30.....	47.1	7.1	.00	136	100	297	4.0	344	0	1020	26	.3	.6	.20	1760	2.39	224	750	468	4.7	2430	7.6	2
Dec. 1-13.....	34.9	7.6	.00	149	111	335	4.7	366	0	1220	29	.5	1.0	.25	2040	2.77	192	830	530	5.1	2680	7.8	3
Dec. 14-20.....	18.0	10	.00	208	163	488	6.2	500	0	1760	44	.5	1.6	.37	2930	3.98	142	1190	780	6.2	3670	7.7	4
Dec. 21-31.....	25.4	8.8	.00	186	128	394	5.1	447	0	1420	36	.4	1.9	.27	2400	3.26	164	991	624	5.4	3110	7.8	3
Jan. 1-13, 1964.	21.2	7.7	.00	143	110	316	4.0	360	0	1140	29	.3	1.0	.26	1930	2.62	110	811	516	4.8	2600	7.9	2
Jan. 14-31.....	21.8	7.3	.00	158	127	365	4.6	398	0	1300	33	.3	1.3	.23	2190	2.98	129	918	592	5.2	2890	8.1	2
Feb. 1-11.....	28.6	5.7	.00	142	107	310	3.9	361	0	1080	29	.3	.5	.21	1860	2.53	144	796	500	4.8	2570	7.9	3
Feb. 12-23.....	35.2	4.5	.00	126	92	276	3.5	314	0	955	26	.3	.4	.19	1640	2.23	156	692	434	4.6	2280	7.5	2
Feb. 24-Mar. 8..	47.6	4.3	.00	116	92	271	3.3	283	0	975	25	.2	.3	.20	1630	2.22	209	669	437	4.6	2260	8.0	4
Mar. 9-22.....	54.2	3.7	.00	111	85	253	3.3	286	0	870	23	.2	.3	.18	1490	2.03	218	628	393	4.4	2080	8.0	3
Mar. 23-31.....	37.8	2.9	.02	126	94	293	3.7	312	0	990	28	.2	.4	.17	1690	2.30	172	702	448	4.8	2310	8.1	3

Apr. 1-11, 1964.	60.7	2.5	.00	96	80	274	3.6	220	0	890	25	.2	.0	0.17	1480	2.01	242	570	390	5.0	2060	8.1	2
Apr. 12-30.....	48.9	2.6	.00	114	87	316	4.8	243	0	1050	27	.2	.2	.22	1720	2.34	227	843	444	5.4	2360	8.0	2
May 1-11.....	123	5.2	.06	110	78	281	5.2	254	0	905	27	.3	.5	.17	1540	2.09	511	597	389	5.0	2140	--	--
May 12-25.....	72.4	3.2	.00	133	110	355	6.2	284	0	1200	32	.3	.0	.23	1980	2.69	387	783	550	5.5	2650	8.0	7
May 26-31.....	113	7.0	.00	94	66	179	4.3	262	0	620	17	.3	.0	.15	1120	1.52	342	504	289	3.5	1590	8.0	12
June 1-11.....	260	8.3	.00	94	59	166	4.7	261	0	595	20	.4	.3	.14	1080	1.47	758	476	262	3.3	1540	7.9	6
June 12-16.....	1470	11	.01	80	37	98	6.8	232	0	348	6.6	.4	.7	.15	747	1.02	296	353	163	2.3	1050	7.9	20
June 17-30.....	1495	10	.01	80	37	106	4.6	244	0	361	14	.4	.5	.13	759	1.03	3060	352	152	2.5	1070	8.0	13
July 1-10.....	562	12	.02	82	42	104	3.4	259	0	349	12	.3	.4	.13	768	1.04	1160	377	165	2.3	1130	7.8	3
July 11-31.....	94.8	10	.00	89	65	193	4.4	249	0	625	18	.3	.1	.16	1130	1.54	289	490	286	3.8	1680	7.8	1
Aug. 1-15.....	114	8.1	.00	94	66	178	4.3	239	0	648	17	.4	.3	.19	1130	1.54	348	505	309	3.4	1590	7.9	2
Aug. 16-31.....	249	7.3	.02	87	59	166	5.2	225	0	585	14	.4	.5	.16	1040	1.41	699	460	275	3.4	1480	8.0	3
Sept. 1-14.....	167	5.7	.11	94	68	182	4.0	239	0	648	18	.3	.1	.19	1140	1.55	514	516	320	3.5	1610	7.7	4
Sept. 15-30.....	86.7	3.8	.01	98	85	247	4.0	252	0	842	21	.3	.1	.20	1430	1.94	335	593	386	4.4	1950	7.4	4
Weighted average.....	--	8.8	0.01	91	55	158	4.7	253	--	543	16	0.4	0.4	0.16	1020	1.39	444	451	244	3.1	1430	7.8	9
Time-weighted average.....	161	6.2	0.01	116	87	263	4.4	291	--	908	24	0.3	0.4	0.20	1560	--	--	648	409	4.4	2130	7.8	3
Tons per day..	--	3.8	0.01	40	24	69	2.1	110	--	237	7.0	0.2	0.2	0.07	--	--	--	--	--	--	--	--	--

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	57	55	55	56	56	57	54	53	54	55	54	56	54	53	51	52	54	51	55	60	46	51	54	45	51	40	35	35	37	37	34	50
November.....	33	43	34	33	38	36	36	35	40	41	35	33	40	40	32	33	34	36	32	32	33	32	33	33	33	34	37	33	33	34	--	35
December.....	33	33	32	32	34	34	33	32	32	33	32	32	32	32	32	32	32	32	32	32	32	32	34	32	33	33	32	32	32	32	33	32
January.....	33	33	32	33	32	32	32	32	32	32	33	32	32	33	32	33	33	33	33	34	33	32	32	32	33	32	32	32	33	33	33	33
February.....	33	32	32	33	32	32	33	33	32	32	33	32	32	32	32	32	33	32	33	32	32	32	32	33	32	32	32	32	32	--	--	32
March.....	33	32	32	32	32	32	32	32	33	32	32	32	33	32	33	32	32	41	34	32	33	33	32	32	32	32	32	32	32	32	32	33
April.....	32	44	35	35	44	39	35	38	43	48	49	44	41	43	48	49	45	40	44	46	49	45	49	46	45	45	40	42	49	50	--	43
May.....	50	54	50	44	44	54	50	52	51	55	54	51	55	55	60	60	64	59	61	64	64	60	56	55	57	54	58	56	52	50	53	55
June.....	58	66	60	61	61	66	67	63	55	59	65	65	65	65	66	65	65	60	60	59	60	64	64	68	70	71	72	70	70	70	--	64
July.....	72	73	72	72	75	71	72	74	74	76	74	74	74	84	73	71	71	72	69	70	73	72	75	77	78	68	68	65	67	80	70	73
August.....	70	65	65	74	70	72	69	70	68	65	60	64	62	67	65	66	73	69	62	51	52	57	60	56	55	60	58	60	57	54	59	63
September.....	58	59	55	54	55	55	55	55	56	55	50	50	49	54	60	60	59	55	50	52	54	55	54	55	55	46	45	45	46	51	--	53

MUSSELSHELL RIVER BASIN--Continued

6-1276. MUSSELSHELL RIVER NEAR MOSBY, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	20	70	4	34	48	4	40	37	4
2	21	82	5	34	50	5	45	120	15
3	21	82	5	36	50	5	40	130	14
4	19	84	4	43	60	7	43	68	8
5	18	82	4	44	80	10	47	100	13
6	18	100	5	48	58	8	45	110	13
7	18	82	4	49	50	7	43	80	9
8	18	86	4	50	33	4	38	110	11
9	16	100	4	52	40	6	30	120	10
10	16	97	4	52	38	5	25	120	8
11	16	90	4	49	27	4	25	100	7
12	15	70	3	43	30	3	20	130	7
13	15	70	3	41	12	1	13	180	6
14	17	96	4	41	7	1	15	160	6
15	29	140	11	40	12	1	17	180	8
16	33	130	12	40	10	1	17	180	8
17	46	140	17	41	11	1	18	190	9
18	48	120	16	41	11	1	19	180	9
19	48	100	13	35	16	2	20	150	8
20	52	82	12	33	68	6	20	140	8
21	56	88	13	33	52	5	18	130	6
22	45	74	9	32	20	2	17	22	1
23	36	82	8	59	17	3	20	20	1
24	31	74	6	59	25	4	35	16	2
25	29	70	5	52	32	4	30	10	1
26	26	68	5	60	24	4	25	20	1
27	22	57	3	62	72	12	22	9	1
28	22	70	4	45	64	8	20	15	1
29	25	60	4	40	92	10	25	12	1
30	28	50	4	43	80	9	35	12	1
31	30	58	5	--	--	--	32	32	3
Total	854	--	204	1331	--	143	859	--	200

Day	JANUARY			FEBRUARY			MARCH		
1	30	120	10	20	12	1	55	12	2
2	29	130	10	22	15	1	55	16	2
3	27	140	10	23	22	1	54	36	5
4	25	160	11	35	18	2	52	12	2
5	23	140	9	30	12	1	50	32	4
6	22	140	8	28	12	1	48	10	1
7	20	190	10	28	13	1	47	10	1
8	18	140	7	30	10	1	45	23	3
9	17	120	6	32	10	1	50	38	5
10	16	110	5	35	10	1	52	14	2
11	16	150	6	32	6	1	60	20	3
12	16	150	6	30	8	1	66	23	4
13	17	110	5	28	10	1	65	33	6
14	20	100	5	28	13	1	60	22	4
15	22	76	5	32	20	2	62	28	5
16	25	11	1	35	18	2	47	26	3
17	24	9	1	35	13	1	54	52	8
18	24	10	1	33	18	2	52	78	11
19	23	10	1	32	22	2	51	30	4
20	22	11	1	30	15	1	49	19	3
21	20	18	1	40	17	2	49	20	3
22	16	19	1	50	15	2	42	22	2
23	14	25	1	50	15	2	35	110	10
24	14	38	1	45	13	2	25	16	1
25	19	26	1	40	13	1	30	10	1
26	25	20	1	40	13	1	35	12	1
27	25	32	2	42	14	2	40	8	1
28	27	30	2	45	15	2	42	10	1
29	30	38	3	48	12	2	43	10	1
30	22	18	1	--	--	--	44	89	11
31	20	15	1	--	--	--	46	170	21
Total	668	--	133	998	--	41	1505	--	131

MUSSELSHELL RIVER BASIN--Continued

6-1276. MUSSELSHELL RIVER NEAR MOSBY, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	49	150	20	51	140	19	33	70	6
2	52	140	20	49	170	22	32	85	7
3	64	150	26	70	8000	1500	259	420	290
4	66	170	30	90	8300	2000	246	430	290
5	62	140	23	100	2800	760	201	320	170
6	66	110	20	120	1100	360	161	200	87
7	66	180	32	200	700	380	120	140	45
8	66	240	43	240	500	320	111	130	39
9	66	180	32	167	330	150	139	290	110
10	60	130	21	139	250	94	358	550 S	620
11	51	62	9	125	210	71	1200	3600	12000
12	47	54	7	117	190	60	1600	2700	12000
13	42	18	2	106	190	54	1540	1900	7900
14	40	33	4	94	180	46	1540	1700	7100
15	39	68	7	85	140	32	1520	2100	8600
16	38	70	7	72	120	23	1160	2800	8800
17	38	25	3	66	130	23	946	1300	3300
18	38	32	3	66	140	25	1410	2500	9500
19	39	67	7	51	130	18	2000	2800	15000
20	39	100	11	43	120	14	2140	1500	8700
21	38	100	10	36	110	11	2470	3200 S	23000
22	36	110	11	30	110	9	1890	1600	8200
23	35	130	12	32	140 S	14	1630	1200	5300
24	34	110	10	94	190	48	1520	1100	4500
25	40	150	16	122	210	69	1370	960	3600
26	106	8000 S	1800	186	290	150	1290	1400	4900
27	109	4700 S	1300	186	270	140	1260	1100	3700
28	62	800	130	139	170	64	1110	1200	3600
29	58	260	41	77	100	21	977	570	1500
30	51	160	22	51	65	9	914	720	1800
31	--	--	--	42	65	7	--	--	--
Total	1597	--	3679	3046	--	6513	31147	--	154664

	JULY			AUGUST			SEPTEMBER		
1	828	560	1300	112	110	33	223	250	150
2	742	520	1000	109	120	35	206	200	110
3	699	650	1200	130	140	49	202	160	87
4	665	540	970	130	120	42	206	160	89
5	602	470	760	130	170	60	196	160	85
6	527	400	570	118	140	45	199	160	86
7	470	390	490	104	130	36	172	140	65
8	426	360	410	106	120	34	146	120	47
9	364	300	290	106	120	34	137	120	44
10	301	340	280	118	130	41	134	110	40
11	216	280	160	121	130	42	140	100	38
12	162	220	96	127	120	41	134	90	33
13	127	190	65	104	120	34	127	85	29
14	115	170	53	98	110	29	115	90	28
15	89	160	38	98	100	26	115	75	23
16	76	140	29	115	120	37	115	85	26
17	104	160	45	112	110	33	115	100	31
18	73	120	24	112	110	33	115	85	26
19	73	140	28	98	200	53	106	60	17
20	71	150	29	808	8100 S	20000	98	75	20
21	48	160	21	470	4500 S	6700	92	75	19
22	73	160	32	240	610	400	81	75	16
23	76	190	39	185	520	260	81	80	17
24	56	150	23	185	240	120	81	90	20
25	56	130	20	172	180	84	76	80	16
26	86	150	35	192	150	78	71	100	19
27	98	140	37	202	160	87	68	75	14
28	92	110	27	206	180	100	61	85	14
29	95	110	28	279	300 S	260	59	90	14
30	95	100	26	362	1800 S	1900	54	85	12
31	109	110	32	240	300	190	--	--	--
Total	7614	--	8157	5689	--	30916	3725	--	1235

Total discharge for year (cfs-days)..... 59033
Total load for year (tons)..... 206016

S Computed by subdividing day.

MUSSELSHELL RIVER BASIN--Continued

6-1276. MUSSELSHELL RIVER NEAR MOSBY, MONT.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Apr. 26, 1964.....	0730	45		72	13000	2530		74		91		100	--	--				PWC
May 6.....	1020	54		D 120	1170	379		90		97		100	--	--				VPWC
June 18.....	1700	--		1630	3520	15300		64		79		92	98	100				VPWC
June 30.....	1230	72		923	1030	2570	1	1		93		93	97	100				VPN
June 30.....	1230	72		923	1030	2570		50		77		93	97	100				PWC
Aug. 20.....	0810	51		602	14600	23700		58		72		100	--	--				PWC

D Daily mean discharge.

6-1300. FLATWILLOW CREEK NEAR MOSBY, MONT.

LOCATION.--At gaging station, on upstream handrail of county bridge, 0.2 mile upstream from mouth, and 5 miles south of Mosby, Garfield County.
DRAINAGE AREA.--1,855 square miles.
RECORDS AVAILABLE.--Chemical analyses: March to September 1964.
Water temperatures: March to September 1964.
Sediment records: March to September 1964.
EXTREMES, March to September 1964.--Dissolved solids: Maximum, 3,650 ppm Mar. 23-31; minimum, 774 ppm May 3-9.
Hardness: Maximum, 1,370 ppm Mar. 11-22; minimum, 345 ppm May 3-9.
Specific conductance: Maximum daily, 4,720 micromhos Mar. 30; minimum daily, 663 micromhos May 5.
Water temperatures: Maximum, 84°F July 22.
Sediment concentrations: Maximum daily, 10,000 ppm May 3; minimum daily, 33 ppm Mar. 1-31.
Sediment loads: Maximum daily, 38,000 tons June 20; minimum daily, less than 0.50 ton Mar. 1-31.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Records of specific conductance of daily samples available in district office at Worland, Wyo. Flow affected by ice Mar. 23-28.

Chemical analyses, in parts per million, March to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Mar. 11-22, 1964	1.9	5.1	0.00	245	184	590	6.2	233	0	2260	40	0.5	0.0	0.41	3450	4.69	17.7	1370	1180	6.9	4190	7.4	4
Mar. 23-31.....	1.7	4.4	.01	240	185	670	6.6	203	0	2400	42	.4	.0	.38	3650	4.96	16.8	1360	1190	7.9	4530	7.9	--
Apr. 1-7.....	6.9	3.7	.00	238	186	621	6.7	265	0	2260	34	.6	.0	.51	3480	4.73	64.8	1360	1140	7.3	4230	7.6	2
Apr. 8-17.....	16.3	4.5	.00	204	161	486	6.9	245	0	1860	24	.6	.0	.58	2870	3.90	126	1170	969	6.2	3570	7.8	2
Apr. 18-27.....	3.6	3.6	.00	209	163	480	7.3	240	0	1860	28	.6	.0	.41	2870	3.90	27.9	1190	993	6.0	3580	7.6	1
Apr. 28-May 2...	27.8	3.3	.00	219	183	594	7.6	205	0	2220	29	.6	1.0	.49	3360	4.57	252	1300	1130	7.2	4050	7.6	4
May 3-9.....	1079	8.0	.01	72	40	110	6.5	142	0	435	4.5	.5	2.1	.15	774	1.05	2250	345	229	2.6	1090	7.5	14
May 10-21.....	287	8.5	.01	132	63	110	6.9	229	0	582	6.7	.5	.7	.15	1020	1.39	790	589	401	2.0	1410	7.8	10
May 22-31.....	169	6.4	.00	122	83	137	5.7	221	0	695	7.9	.5	.4	.17	1170	1.59	534	644	463	2.3	1580	7.8	5
June 1-11.....	189	4.9	.01	121	77	125	5.5	193	0	670	7.0	.3	.4	.12	1110	1.51	566	617	459	2.2	1500	7.9	4
June 12-21.....	1689	8.9	.01	100	46	72	8.7	210	0	392	5.8	.4	1.3	.11	810	1.10	3690	438	266	1.5	1060	7.9	12
June 22-30.....	1037	9.3	.02	110	58	81	7.9	240	0	455	6.8	.4	2.1	.11	911	1.24	2550	511	314	1.6	1190	8.1	7
July 1-10.....	480	8.2	.01	131	67	112	7.0	282	0	558	5.6	.5	1.6	.16	1030	1.40	1330	603	372	2.0	1420	7.9	5
July 11-22.....	182	7.5	.02	149	81	143	6.2	245	11	730	9.5	.4	1.5	.20	1260	1.71	619	708	487	2.3	1670	8.4	3
July 23-31.....	61.6	5.4	.01	173	110	227	6.6	265	0	1070	14	.5	.2	.24	1740	2.37	289	885	668	3.3	2200	7.8	2
Aug. 1-19.....	22.7	5.2	.02	219	139	338	7.0	255	0	1500	17	.6	.2	.43	2350	3.20	144	1120	911	4.4	3080	7.4	5
Aug. 20-31.....	91.5	6.3	.01	149	65	212	6.6	183	0	892	8.4	.5	1.2	.26	1430	1.94	353	638	488	3.6	1900	7.2	9
Sept. 1-10.....	28.1	5.3	.01	195	121	272	6.2	227	0	1270	14	.6	.1	.40	2000	2.72	152	986	800	3.8	2580	7.6	5
Sept. 11-30.....	27.1	4.5	.01	172	117	240	5.6	236	0	1140	12	.6	.1	.35	1810	2.46	132	910	716	3.5	2370	7.8	5

MUSSELSHELL RIVER BASIN--Continued

6-1300. FLATWILLOW CREEK NEAR MOSBY, MONT.--Continued

Temperature (°F) of water, March to September 1964

Month	Day																													Average
	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	
March	--	--	--	--	--	--	--	--	--	--	45	37	34	34	37	37	39	42	36	34	33	35	34	36	35	37	38	38	45	39	40	--
April	45	42	40	39	51	39	50	42	47	48	50	55	45	46	49	47	47	48	45	48	47	49	50	47	47	45	44	51	57	58	--	47
May	55	55	49	46	50	53	53	53	56	61	59	55	58	65	63	62	68	66	70	70	68	65	63	61	60	61	58	57	54	54	65	59
June	61	66	69	71	67	70	69	61	59	60	65	62	64	67	66	65	66	62	62	61	63	63	67	70	71	74	74	68	68	70	--	66
July	70	71	73	76	73	77	73	78	79	79	78	76	80	80	80	79	81	82	81	83	78	84	72	72	76	78	76	70	80	71	--	77
August	78	70	72	78	70	77	76	76	71	71	69	70	72	74	75	75	75	76	54	52	51	58	58	59	64	62	61	60	56	63	58	67
September	62	60	54	52	61	64	58	59	58	54	60	62	59	60	58	62	65	59	64	59	58	57	56	56	49	59	56	59	59	59	--	59

MUSSELSHELL RIVER BASIN--Continued

6-1300. FLATWILLOW CREEK NEAR MOSBY, MONT.--Continued

Suspended sediment, March to September 1964

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1							1.5	C 33	T
2							1.5	C 33	T
3							1.5	C 33	T
4							1.5	C 33	T
5							1.5	C 33	T
6							1.5	C 33	T
7							1.5	C 33	T
8							1.5	C 33	T
9							1.5	C 33	T
10							1.5	C 33	T
11							1.5	C 33	T
12							1.5	C 33	T
13							1.7	C 33	T
14							1.0	C 33	T
15							.6	C 33	T
16							3.4	C 33	T
17							2.9	C 33	T
18							2.9	C 33	T
19							2.2	C 33	T
20							2.6	C 33	T
21							1.1	C 33	T
22							1.0	C 33	T
23							.8	C 33	T
24							.5	C 33	T
25							.6	C 33	T
26							.7	C 33	T
27							.9	C 33	T
28							1.0	C 33	T
29							1.1	C 33	T
30							4.2	C 33	T
31							5.5	C 33	T
Total							52.7	--	5

Day	APRIL			MAY			JUNE		
1	6.0	67	1	7.2	180	3	176	180	86
2	7.2	180	3	69	500	93	176	190	90
3	8.0	240	5	780	10000	S 24000	174	190	89
4	7.0	260	5	1660	7000	31000	160	190	82
5	7.0	250	5	1710	4200	19000	152	170	70
6	7.2	240	5	1310	3200	11000	138	160	60
7	5.8	250	4	895	2300	5600	125	160	54
8	3.9	220	2	672	1500	2700	138	170	63
9	16	260	11	524	1100	1600	133	180	65
10	54	280	41	435	830	970	166	260	120
11	46	260	32	370	770	770	541	1900	S 4000
12	14	250	9	322	700	610	1670	4000	S 17000
13	7.6	170	3	277	670	500	1490	1600	6400
14	6.0	150	2	274	640	470	1220	1000	3300
15	5.5	200	3	274	610	450	1180	3000	S 11000
16	4.2	170	2	271	550	400	950	1200	3100
17	6.0	180	3	265	530	380	840	920	2100
18	7.0	210	4	253	550	380	1170	2600	S 9600
19	2.4	180	1	238	480	310	2420	3900	25000
20	2.6	180	1	235	460	290	3130	4500	38000
21	2.7	180	1	232	410	260	2820	3100	24000
22	2.9	190	1	224	390	240	1880	2100	11000
23	2.9	160	1	207	330	180	1390	1200	4500
24	2.6	150	1	181	230	110	1140	840	2600
25	1.6	170	1	171	260	120	1020	850	2300
26	4.5	180	2	155	210	88	900	700	1700
27	7.2	160	3	141	170	65	850	640	1500
28	46	240	30	149	170	68	780	730	S 1600
29	11	240	7	157	170	72	694	590	1100
30	6.0	200	3	152	140	57	676	830	S 1600
31	--	--	--	157	150	64	--	--	--
Total	310.8	--	192	12767.2	--	101850	28299	--	172179

S Computed by subdividing day.
T Less than 0.50 ton.
C Composite period.

MUSSELSHELL RIVER BASIN--Continued

6-1300. FLATWILLOW CREEK NEAR MOSBY, MONT.--Continued

Suspended sediment, March to September 1964--Continued

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	667	770	1400	32	180	16	33	180	16
2	541	570	830	26	180	13	31	190	16
3	600	780	1300	29	190	15	26	200	14
4	626	740	S 1300	28	220	17	23	200	12
5	694	780	1500	25	250	17	28	230	17
6	426	660	760	24	230	15	27	220	16
7	316	630	540	23	230	14	29	250	20
8	308	560	470	23	220	14	28	240	18
9	312	520	440	23	200	12	28	230	17
10	312	2600	S 2400	23	210	13	28	200	15
11	274	500	370	22	220	13	28	200	15
12	270	400	290	21	200	11	26	200	14
13	226	330	200	21	190	11	26	180	13
14	229	310	190	21	210	12	27	160	12
15	206	270	150	19	200	10	26	160	11
16	181	240	120	18	180	9	25	160	11
17	168	120	54	17	170	8	26	180	13
18	145	110	43	18	180	9	25	150	10
19	136	96	35	18	160	8	26	160	11
20	129	100	35	210	6000	S 4100	26	160	11
21	116	140	44	288	4900	S 4400	27	120	9
22	105	120	34	127	860	290	28	120	9
23	90	100	24	113	500	190	29	140	11
24	77	120	25	70	260	49	28	130	10
25	61	140	23	53	260	37	29	120	9
26	58	130	20	51	220	30	28	110	8
27	53	130	19	42	180	20	28	110	8
28	48	140	18	38	130	13	28	110	8
29	53	190	27	37	120	12	28	120	9
30	66	270	48	36	140	14	27	120	9
31	48	240	31	33	180	16	--	--	--
Total	7541	--	12740	1529	--	9368	822	--	372

Total discharge for period Mar. 1 to Sept. 30 (cfs-days)..... 51321.7
Total load for period Mar. 1 to Sept. 30 (tons)..... 296706

S Computed by subdividing day.

MUSSELSHELL RIVER BASIN--Continued

6-1300. FLATWILLOW CREEK NEAR MOSHY, MONT.--Continued

Periodic determinations of suspended-sediment discharge and particle size, March to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
May 6, 1964.....	1130	53		1320	3210	11400		49		67		92	98	100				VPWC
June 19.....	1000	---		2320	3140	19700		1		55		83	98	100				VPN
June 19.....	1000	--		2320	3140	19700		36		54		83	98	100				VPWC
June 30.....	1330	60		740	1240	2480		56		81		95	100	--				VPWC

MILK RIVER BASIN

6-1405. MILK RIVER AT HAVRE, MONT.

LOCATION.--At gaging station, on upstream side of highway bridge on 7th Avenue East in Havre, Hill County, 30 feet downstream from Bullhook Creek, 9 miles downstream from Big Sandy Creek, and 17 miles downstream from Fresno Dam.
DRAINAGE AREA.--5,844 square miles, of which 670 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: August to September 1964.
REMARKS.--Records of specific conductance of daily samples available in district office at Worland, Wyo.

Chemical analyses, in parts per million, August to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C): Parts per million	Tons per acre-foot	Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Aug. 12-20, 1964	895	5.3	0.01	34	13	29	2.2	185	0	45	1.6	0.2	0.2	0.04	222	0.30	536	140	0	1.1	368	7.9	3
Aug. 21-31.....	656	5.3	.01	33	12	23	2.2	168	0	39	1.7	.2	.2	.06	199	.27	352	130	0	.9	336	7.9	4
Sept. 1-15.....	493	5.9	.02	32	11	24	2.4	170	0	36	2.2	.3	.1	.06	200	.27	266	126	0	.9	350	7.2	5
Sept. 16-30.....	333	6.0	.02	30	12	25	2.8	174	0	33	2.2	.3	.2	.06	204	.28	183	125	0	1.0	343	7.4	5

MILK RIVER BASIN--Continued

6-1541. MILK RIVER NEAR HARLEM, MONT.

LOCATION.--At bridge on U.S. Highway 2, 0.5 mile upstream from gaging station, 3 miles southeast of Harlem, Blaine County, and 6 miles upstream from Thirty Mile Creek.
DRAINAGE AREA.--9,822 square miles upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: June to September 1960, May to October 1961, April to October 1962, April to September 1963, April to September 1964.
Water temperatures: August to September 1960, May to October 1961, April to October 1962, April to September 1963, April to September 1964.
EXTREMES, April to September 1964.--Dissolved solids: Maximum, 600 ppm Apr. 20-25; minimum, 219 ppm May 1-4.
Hardness: Maximum, 244 ppm Apr. 20-25; minimum, 116 ppm May 1-4.
Specific conductance: Maximum daily, 970 micromhos Apr. 20; minimum daily, 354 micromhos May 2.
Water temperatures: Maximum, 79°F July 13, 14.
EXTREMES, 1961-64.--Dissolved solids: Maximum, 764 ppm Oct. 1-31, 1961; minimum, 173 ppm Sept. 1-17, 1961.
Hardness: Maximum, 311 ppm Oct. 1-31, 1961; minimum, 110 ppm Sept. 1-17, 1961.
Specific conductance: Maximum daily, 1,240 micromhos Oct. 31, 1962; minimum daily, 294 micromhos Sept. 12, 1961.
Water temperatures: Maximum, 79°F July 13, 14, 1964.
REMARKS.--Records of specific conductance of daily samples available in district office at Worland, Wyo. Flow regulated by Fresno Reservoir.

Chemical analyses, in parts per million, April to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Apr. 20-25, 1964	113	2.5	0.01	53	27	112	3.4	255	0	228	30	0.1	1.1	0.10	600	0.82	183	244	35	3.1	932	7.2	8
Apr. 26-30.....	340	3.4	.17	25	15	42	2.0	160	0	75	6.6	.1	.2	.06	264	.36	242	126	0	1.6	425	7.4	17
May 1-4.....	509	4.2	.00	28	11	33	1.7	154	0	55	3.9	.0	.1	.05	219	.30	301	116	0	1.3	371	7.7	17
May 5-19.....	430	9.7	.00	38	17	47	5.6	199	0	96	7.9	.2	.5	.08	336	.46	390	163	0	1.6	525	7.8	22
May 20-31.....	507	7.0	.00	33	14	45	3.7	189	0	78	5.6	.3	.1	.07	287	.39	393	139	0	1.7	466	7.9	22
June 1-15.....	688	5.3	.01	33	13	46	3.6	182	0	80	5.1	.2	.9	.05	289	.39	537	134	0	1.7	465	7.5	14
June 16-30.....	571	5.4	.01	34	13	42	3.4	186	0	72	5.3	.2	.8	.05	278	.38	428	138	0	1.6	450	7.6	11
July 1-31.....	478	6.7	.02	33	15	43	2.8	194	0	74	5.0	.1	.3	.02	289	.39	373	145	0	1.6	457	7.8	3
Aug. 1-31.....	417	6.4	.01	26	25	38	4.5	199	0	72	5.4	.1	.4	.06	289	.39	325	166	3	1.3	461	8.0	5
Sept. 1-10.....	297	6.0	.01	38	16	39	2.6	196	0	71	6.0	.3	.3	.08	278	.38	223	159	0	1.3	465	7.9	5
Sept. 11-30.....	232	6.6	.01	39	17	47	3.4	216	0	77	8.4	.3	.3	.07	311	.42	195	166	0	1.6	511	7.5	9
Weighted average.....	A221	6.4	0.01	33	17	43	3.6	192	--	78	5.9	0.2	0.5	0.05	293	0.40	344	149	1	1.6	470	7.7	11
Tons per day..	--	7.5	0.02	38	19	51	4.2	225	--	91	7.0	0.2	0.5	0.06	--	--	--	--	--	--	--	--	--

A Mean discharge based on 366 days; mean discharge for 164 days of chemical analyses, 434 cfs.

MILK RIVER BASIN--Continued

6-1541. MILK RIVER NEAR HARLEM, MONT.--Continued

Temperature (°F) of water, April to September 1964
(Once-daily measurement between 1500 and 1800)

Month	Day																													Average
	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	
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	54	52	50	50	48	48	47	49	52	56	57	--	--
May	56	56	54	53	53	52	52	53	54	56	57	60	59	61	62	64	66	66	66	68	66	63	62	61	59	61	61	59	60	62	64	60
June	63	64	65	66	66	67	67	66	64	64	64	63	67	69	67	65	65	64	64	63	63	65	69	72	74	76	75	73	70	70	--	67
July	71	73	74	75	73	72	73	75	77	77	77	78	79	79	77	75	75	74	75	76	77	77	77	73	73	72	72	73	72	73	75	75
August	--	--	--	--	--	--	72	72	71	69	70	71	71	71	72	72	73	74	73	72	70	69	68	68	66	64	66	67	67	67	68	70
September	64	61	60	58	58	56	55	56	57	56	56	56	57	57	58	60	61	60	58	58	57	56	56	58	57	56	57	54	52	53	--	57

MILK RIVER BASIN--Continued

6-1740. WILLOW CREEK NEAR GLASGOW, MONT.

LOCATION.--At gaging station, on right bank 6 miles southb of Glasgow, Valley County, and 8 miles upstream from mouth.
DRAINAGE AREA.--538 square miles.
RECORDS AVAILABLE.--Sediment records: October 1953 to September 1964 (discontinued).
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, not determined; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 150,000 tons May 4, June 19; minimum daily, 0 tons on many days.
EXTREMES, 1953-64.--Sediment concentrations: Maximum daily, 58,000 ppm Apr. 5, 1954; minimum daily, no flow on many days each year.
Sediment loads: Maximum daily, 860,000 tons July 14, 1962; minimum daily, 0 tons on many days each year.
REMARKS.--Flow affected by ice Mar. 19, 20, 30, Apr. 8. Bureau of Land Management has extensive spreader systems on some of the tributaries upstream from station.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
May 5, 1964.....	2660	20	A0.13	50	15	129	6.1	76	0	400	2.6	0.4	1.7	0.15	700	0.95	5030	187	125	4.1	988	6.6	49

A In solution at time of collection.

Monthly and annual summary of water and suspended-sediment discharge, water year October 1963 to September 1964

Month	Discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum observed
October 1963.....	0	0	0	0	0	0		--
November.....	0	0	0	0	0	0		--
December.....	3.5	6.9	3	.1	E 2	0		--
January 1964.....	8.4	16.7	11	.4	E 4	0		--
February.....	0	0	0	0	0	0		--
March.....	63.8	127	206	66	E 100	0		--
April.....	538.8	1069	12185	406	6400	E 1		29100
May.....	8472.8	16810	387288	12500	B150000	T		41700
June.....	12505.0	24800	445803	14900	B150000	0		25400
July.....	479.1	950	4589	148	2500	0		14600
August.....	81.8	162	1184	38	B 640	0		11800
September.....	23.7	47.0	40	1	E 15	0		--
Water year.....	22176.9	43990	851309	2330	150000	0		41700

E Estimated.
T Less than 0.50 ton.
B Computed from estimated-concentration graph.

MILK RIVER BASIN--Continued

6-1740. WILLOW CREEK NEAR GLASGOW, MONT.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							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	
May 5, 1964.....	1310	50		2340	17200	109000		65		88		100						VPWC
May 6.....	1400	50		888	16400	39300		60		83		100						VPWC

LITTLE PORCUPINE CREEK BASIN

6-1754. FRAZER RESERVOIR OUTLET AT FRAZER, MONT.

LOCATION.--In sec. 35, T. 27 N., R. 44 E., at outlet of Frazer Reservoir, 1 mile southeast of Frazer, Valley County.
RECORDS AVAILABLE.--Chemical analyses: October and November 1961, April 1962 to September 1964.
REMARKS.--No outflow from reservoir during the water year.

YELLOWSTONE RIVER BASIN

6-2078. BLUEWATER CREEK NEAR BRIDGER, MONT.

LOCATION.--At gaging station, on right bank 200 feet downstream from outflow of State fish hatchery, 6 miles northeast of Bridger, Carbon County, and 8 miles upstream from mouth.
DRAINAGE AREA.--27.5 square miles.
RECORDS AVAILABLE.--Sediment records: April 1960 to September 1962, October 1963 to September 1964.
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, not determined; minimum daily, not determined.
Sediment loads: Maximum daily, 7,000 (estimated) tons June 29; minimum daily, 1 ton on many days during December to April, August, and September.
EXTREMES, 1961-62, 1963-64.--Sediment concentrations: Maximum daily, not determined; minimum daily, not determined.
Sediment loads: Maximum daily, 7,000 (estimated) tons June 29, 1964; minimum daily, 1 ton on many days in 1963-64.
REMARKS.--Temperature records for May 1960 to September 1964 have been found to be in error. The temperature records for the 1963-64 water year have been omitted.

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	27	C 50	4	27	C 50	4	27	C 43	3
2	26	C 50	4	28	C 50	4	27	C 43	3
3	26	C 50	4	28	C 50	4	27	C 43	3
4	26	C 50	4	28	C 50	4	27	C 43	3
5	27	C 50	4	28	C 50	4	27	C 43	3
6	27	C 50	4	28	C 50	4	26	C 43	3
7	27	C 50	4	28	C 50	4	26	C 43	3
8	27	C 50	4	28	C 50	4	27	C 43	3
9	27	C 50	4	28	C 50	4	27	C 43	3
10	27	C 50	4	28	C 50	4	27	C 43	3
11	27	C 50	4	28	C 50	4	27	C 43	3
12	27	C 50	4	28	C 50	4	27	C 43	3
13	27	C 50	4	28	C 50	4	27	C 43	3
14	27	C 50	4	27	C 50	4	27	C 43	3
15	27	C 50	4	27	C 50	4	27	C 43	3
16	27	C 50	4	27	C 50	4	28	C 43	3
17	27	C 50	4	27	C 50	4	28	C 43	3
18	27	C 50	4	27	C 50	4	28	22	2
19	27	C 50	4	27	C 50	4	28	25	2
20	28	C 50	4	27	C 50	4	28	13	1
21	27	C 50	4	27	C 50	4	28	26	2
22	27	C 50	4	27	C 50	4	28	28	2
23	27	C 50	4	27	C 50	4	29	32	2
24	27	C 50	4	27	C 50	4	29	--	2
25	27	C 50	4	27	C 50	4	29	--	2
26	27	C 50	4	27	C 50	4	29	25	2
27	27	C 50	4	28	C 50	4	29	20	2
28	27	C 50	4	27	C 50	4	29	15	1
29	27	C 50	4	28	C 50	4	29	--	1
30	27	C 50	4	27	C 50	4	29	17	1
31	27	C 50	4	--	--	--	29	16	1
Total	835	--	124	824	--	120	860	--	74

C Composite period.

YELLOWSTONE RIVER BASIN--Continued

6-2078. BLUEWATER CREEK NEAR BRIDGER, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	30	14	1	28	28	2	28	50	4
2	30	15	1	28	25	2	28	34	3
3	30	12	1	28	86	6	28	26	2
4	30	17	1	27	--	4	28	28	2
5	30	39	3	27	--	2	28	28	2
6	30	45	4	28	--	2	28	42	3
7	30	32	3	27	19	1	28	64	5
8	29	27	2	27	24	2	28	50	4
9	30	34	3	28	16	1	28	59	4
10	29	20	2	28	33	2	28	51	4
11	30	54	4	28	36	3	28	62	5
12	29	32	2	28	29	2	28	50	4
13	28	22	2	28	21	2	28	69	5
14	28	--	2	27	19	1	28	63	5
15	28	21	2	27	20	1	28	47	4
16	28	30	2	27	20	1	28	53	4
17	28	24	2	27	16	1	28	54	4
18	28	24	2	28	12	1	28	46	3
19	28	18	1	28	15	1	28	47	4
20	28	26	2	28	--	1	28	--	3
21	28	31	2	28	24	2	27	37	3
22	28	24	2	28	19	1	27	20	1
23	27	20	1	28	16	1	26	18	1
24	27	22	2	28	19	1	26	15	1
25	28	22	2	28	14	1	26	67	5
26	27	--	2	28	22	2	26	56	4
27	27	23	2	28	--	2	26	80	6
28	28	24	2	28	24	2	26	61	4
29	28	20	2	28	23	2	26	60	4
30	28	19	1	--	--	--	26	390	27
31	28	23	2	--	--	--	26	68	5
Total	885	--	62	804	--	52	848	--	135

	APRIL			MAY			JUNE		
1	26	30	2	30	120	10	27	43	3
2	27	120	9	32	200 S	19	27	43	3
3	26	66	5	33	260	23	29	390 S	39
4	26	33	2	30	200	16	26	120	8
5	26	34	2	29	140	11	27	66	5
6	26	55	4	29	160	13	24	62	4
7	26	56	4	29	100	8	24	52	3
8	26	52	4	29	88	7	50	690 S	320
9	26	35	2	28	60	5	60	1000 S	220
10	26	36	3	28	81	6	25	--	14
11	26	44	3	40	1200 S	190	33	440 S	52
12	26	35	2	32	390	34	30	--	16
13	26	25	2	30	220	18	30	160	13
14	26	32	2	30	150	12	29	280	22
15	26	33	2	30	150	12	30	200	16
16	26	49	3	29	390	31	31	390 S	39
17	26	56	4	28	130	10	28	120	9
18	26	--	2	27	85	6	29	180	14
19	26	20	1	28	91	7	35	460 S	62
20	26	22	2	28	80	6	28	160	12
21	26	22	2	27	78	6	28	120	9
22	26	44	3	28	50	4	27	75	5
23	26	31	2	27	62	5	26	43	3
24	26	26	2	27	68	5	25	45	3
25	38	320 S	56	27	--	4	24	40	3
26	78	2300 S	580	27	34	2	24	27	2
27	35	570	54	27	--	3	24	25	2
28	32	530	46	27	44	3	24	--	2
29	31	240	20	27	--	3	84	--	7000
30	30	180	15	27	44	3	26	450	32
31	--	--	--	27	--	3	--	--	--
Total	869	--	840	897	--	485	934	--	7935

S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2078. BLUEWATER CREEK NEAR BRIDGER, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	25	160	11	26	43	3	29	58	5
2	24	140	9	26	--	4	29	59	5
3	24	96	6	26	59	4	30	69	6
4	25	80	5	26	64	4	29	--	5
5	24	66	4	26	--	3	29	67	5
6	23	52	3	26	28	2	29	75	6
7	25	70	5	26	34	2	28	77	6
8	26	180	13	26	90	6	30	72	6
9	26	87	6	26	48	3	30	81	7
10	26	58	4	26	20	1	29	72	6
11	26	--	3	26	35	2	29	91	7
12	26	--	2	26	46	3	29	130	10
13	26	29	2	26	48	3	29	75	6
14	26	50	4	26	63	4	28	57	4
15	26	98	7	27	32	2	28	28	2
16	26	69	5	27	23	2	28	32	2
17	26	46	3	26	22	2	28	39	3
18	26	--	3	27	22	2	28	24	2
19	26	--	3	27	98	7	29	35	3
20	26	--	4	28	98	7	30	32	3
21	26	55	4	27	83	6	30	--	3
22	26	58	4	27	34	2	30	40	3
23	26	35	2	27	30	2	30	38	3
24	26	35	2	27	37	3	29	--	3
25	26	52	4	27	18	1	29	30	2
26	26	--	4	28	--	2	30	49	4
27	26	70	5	28	22	2	30	32	3
28	26	--	5	28	61	5	29	20	2
29	26	64	4	28	53	4	28	20	2
30	26	--	4	28	48	4	28	18	1
31	26	--	4	28	52	4	--	--	--
Total	794	--	144	829	--	101	871	--	125

Total discharge for year (cfs-days)..... 10250
Total load for year (tons)..... 10197

YELLOWSTONE RIVER BASIN--Continued

6-2078. BLUEWATER CREEK NEAR BRIDGER, MONT.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							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	
Apr. 26, 1964....	1035	44		56	1920	290		43		70		93	98	100				VPWC
May 11.....	1600	51		54	2970	433		42		71		90	96	100				VPWC
June 11.....	1615	56		38	738	76		30		54		83	93	99	100			VPWC

YELLOWSTONE RIVER BASIN--Continued

6-2078.5. BLUEWATER CREEK AT SANFORD RANCH, NEAR BRIDGER, MONT.

LOCATION.--At gaging station at Sanford Ranch, 0.5 mile north of county road, 5.2 miles northeast of Bridger, Carbon County, and 8 miles upstream from mouth.
RECORDS AVAILABLE.--Water temperatures: October 1963 to September 1964.
Sediment records: October 1963 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 77°F Aug. 13; minimum, 33°F Dec. 13.
Sediment concentrations: Maximum daily, not determined; minimum daily, not determined.
Sediment loads: Maximum daily, 10,000 (estimated) tons Apr. 26; minimum daily, 2 tons on several days during March, April, August, and September.
REMARKS.--Recorder stopped Oct. 22-27, Apr. 26 to May 14, May 28-31, June 10-17, Sept. 7. Records of discharge available in district office at Worland, Wyo.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October																																
Maximum	64	62	59	60	57	55	58	56	58	58	57	59	54	59	54	54	53	57	50	50	56	--	--	--	--	--	--	50	50	46	48	55
Minimum	48	44	44	50	46	44	42	42	46	44	42	44	46	44	41	41	41	41	44	40	46	--	--	--	--	--	--	44	44	40	36	43
November																																
Maximum	46	48	50	53	54	52	56	51	56	51	52	49	54	54	50	55	49	48	47	46	42	--	48	50	48	52	53	44	47	47	--	50
Minimum	39	42	41	40	46	44	46	46	46	43	40	40	42	45	48	46	45	46	45	36	34	--	43	42	42	46	42	36	37	36	--	42
December																																
Maximum	47	48	48	48	50	49	44	46	44	41	40	40	41	44	47	46	41	43	50	46	48	50	52	54	50	48	49	46	47	48	52	47
Minimum	38	36	36	38	40	44	41	40	40	38	36	34	33	37	41	39	36	38	42	40	44	46	46	47	48	42	44	44	41	42	48	41
January																																
Maximum	49	48	47	50	47	47	46	52	44	49	46	42	45	45	45	47	46	52	46	48	46	--	52	44	46	54	46	47	47	50	48	47
Minimum	45	42	40	42	43	45	44	44	40	41	38	37	36	37	37	43	41	43	42	42	40	--	44	39	44	46	41	38	41	41	40	41
February																																
Maximum	51	51	47	50	49	45	49	48	48	50	44	50	47	50	--	52	49	49	47	48	48	45	47	45	46	46	53	45	47	--	--	48
Minimum	46	44	41	42	40	37	42	43	44	44	41	44	44	40	--	46	44	44	43	41	45	42	42	38	36	40	45	42	42	--	--	42
March																																
Maximum	48	52	49	51	49	47	50	47	50	51	48	--	46	49	50	53	56	52	50	47	--	45	43	45	49	53	51	54	54	57	57	50
Minimum	42	44	40	44	42	43	45	43	43	46	43	--	41	41	46	44	46	46	44	39	--	36	37	35	36	46	44	43	45	46	46	43
April																																
Maximum	--	50	48	55	56	50	54	58	60	59	56	51	53	59	63	57	54	57	61	61	56	56	58	52	49	--	--	--	--	--	--	56
Minimum	--	44	44	46	48	42	43	46	48	49	49	46	47	46	51	47	45	47	48	49	51	50	49	49	42	--	--	--	--	--	--	47
May																																
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	66	69	67	64	66	66	67	65	65	68	63	57	54	--	--	--	--	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	45	43	43	43	51	50	50	50	50	53	49	45	47	--	--	--	--	--
June																																
Maximum	67	68	62	67	67	68	60	56	53	--	--	--	--	--	--	--	--	60	64	64	--	65	68	71	66	68	66	64	68	67	--	--
Minimum	48	43	52	50	52	50	55	50	46	--	--	--	--	--	--	--	--	48	47	46	--	52	47	50	46	50	50	49	49	50	--	--
July																																
Maximum	69	69	70	71	70	68	70	70	70	72	72	72	68	68	70	70	72	69	72	73	70	74	71	69	74	72	73	74	69	64	69	70
Minimum	49	49	50	48	51	46	46	46	47	50	49	46	49	50	50	48	50	50	50	50	50	52	52	48	50	52	48	46	50	49	49	49
August																																
Maximum	71	68	69	70	70	76	70	73	74	66	68	67	77	70	67	68	70	67	58	53	58	67	63	61	64	63	61	57	64	61	65	66
Minimum	46	48	44	47	56	56	51	54	50	51	44	45	54	50	46	43	47	45	50	49	51	47	52	50	46	49	48	50	52	47	46	49
September																																
Maximum	64	59	62	62	62	59	--	65	61	55	59	60	64	63	63	62	62	57	59	57	60	60	60	65	61	56	57	58	58	64	--	60
Minimum	48	48	43	42	42	48	--	50	47	48	45	44	44	45	50	44	45	48	44	46	46	48	45	48	48	44	42	42	41	48	--	46

YELLOWSTONE RIVER BASIN--Continued

6-2078.5. BLUEWATER CREEK AT SANFORD RANCH, NEAR BRIDGER, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	18	C 100	5	25	C 64	4	28	C 140	11
2	18	C 100	5	25	C 64	4	28	C 140	11
3	18	C 100	5	25	C 64	4	27	C 140	10
4	20	C 100	5	25	C 64	4	27	C 140	10
5	22	C 100	6	25	C 64	4	27	C 140	10
6	22	C 100	6	25	C 64	4	27	C 140	10
7	22	C 100	6	25	C 64	4	27	C 140	10
8	23	C 100	6	25	C 64	4	27	C 140	10
9	24	C 100	6	25	C 64	4	27	C 140	10
10	23	C 100	6	26	C 64	4	27	C 140	10
11	23	C 100	6	26	C 64	4	27	C 140	10
12	23	C 100	6	26	C 64	4	27	C 140	10
13	24	C 100	6	26	C 64	4	27	C 140	10
14	23	C 100	6	26	C 64	4	27	C 140	10
15	23	C 100	6	26	C 64	4	26	C 140	10
16	24	C 100	6	26	C 64	4	27	C 140	10
17	24	C 100	6	26	C 64	4	27	C 140	10
18	24	C 100	6	26	C 64	4	27	140	10
19	24	C 100	6	26	C 64	4	27	130	9
20	24	C 100	6	27	C 64	5	27	130	9
21	25	C 100	7	28	C 64	5	26	160	11
22	25	C 100	7	28	C 64	5	26	150	11
23	25	C 100	7	28	C 64	5	27	180	13
24	25	C 100	7	28	C 64	5	27	--	12
25	25	C 100	7	28	C 64	5	27	--	11
26	25	C 100	7	28	C 64	5	27	150	11
27	25	C 100	7	28	C 64	5	27	140	10
28	25	C 100	7	28	C 64	5	27	130	9
29	25	C 100	7	28	C 64	5	27	--	8
30	25	C 100	7	28	C 64	5	27	110	8
31	25	C 100	7	--	--	--	27	150	11
Total	721	--	193	792	--	131	836	--	315

Day	JANUARY			FEBRUARY			MARCH		
1	27	120	9	27	95	7	28	130	10
2	27	210	15	27	88	6	28	130	10
3	27	130	9	27	130	9	28	50	4
4	27	100	7	28	--	9	28	100	8
5	27	120	9	28	--	8	28	150	11
6	27	110	8	28	--	8	28	160	12
7	27	150	11	28	96	7	28	42	3
8	27	130	9	28	110	8	29	35	3
9	27	120	9	28	130	10	29	70	5
10	27	100	7	28	110	8	29	97	8
11	27	88	6	28	100	8	29	48	4
12	27	110	8	28	120	9	29	82	6
13	28	100	8	28	100	8	29	110	9
14	28	--	7	27	110	8	29	87	7
15	27	86	6	27	150	11	29	82	6
16	27	100	7	27	150	11	29	32	3
17	27	140	10	27	100	7	29	22	2
18	27	120	9	27	95	7	30	25	2
19	27	160	12	27	100	7	30	30	2
20	27	170	12	27	--	7	30	--	4
21	28	160	12	28	110	8	30	66	5
22	28	120	9	28	96	7	30	100	8
23	28	140	11	28	82	6	30	88	7
24	28	100	8	28	78	6	30	38	3
25	27	80	6	28	84	6	30	230	19
26	27	--	7	28	110	8	30	42	3
27	28	100	8	28	--	9	30	110	9
28	28	88	7	28	130	10	30	140	11
29	27	78	6	28	90	7	32	350	30
30	27	68	5	--	--	--	32	450	39
31	27	75	5	--	--	--	31	160	13
Total	845	--	262	802	--	230	911	--	266

C Composite period.

YELLOWSTONE RIVER BASIN--Continued

6-2078.5. BLUEWATER CREEK AT SANFORD RANCH, NEAR BRIDGER, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL				MAY				JUNE			
	Mean discharge (cfs)	Suspended sediment			Mean discharge (cfs)	Suspended sediment			Mean discharge (cfs)	Suspended sediment		
		Mean concentration (ppm)		Tons per day		Mean concentration (ppm)		Tons per day		Mean concentration (ppm)		Tons per day
1	31	50		4	32	380		33	28	120		9
2	32	200		17	40	--		140	26	230		16
3	33	440	S	42	85	4500	S	1100	40	--		100
4	33	460	S	44	45	1600		190	25	280		19
5	32	190	S	17	35	2000		190	27	220		16
6	33	590		53	41	1200	S	160	26	250		18
7	35	1100	S	110	32	420		36	22	150		9
8	35	1200	S	120	32	300		26	117	4500	S	6200
9	33	260		23	32	290		25	65	4900	S	1600
10	32	150		13	36	460	S	50	37	--		130
11	32	120		10	158	4500	S	2500	43	--		300
12	32	150		13	37	800		80	27	--		40
13	32	90		8	31	500		42	26	310		22
14	32	56		5	30	340		28	25	240		16
15	32	47		4	30	280		23	25	240		16
16	32	38		3	30	320		26	28	1000	S	86
17	32	50		4	30	290		23	27	300		22
18	32	--		4	29	220		17	41	--		200
19	32	58		5	28	240		18	59	--		1000
20	32	34		3	28	200		15	25	280		19
21	32	34		3	28	160		12	24	240		16
22	32	28		2	28	150		11	24	210		14
23	33	42		4	28	160		12	22	180		11
24	33	46		4	27	--		10	22	160		10
25	153	--		4300	28	--		10	21	160		9
26	208	--		10000	27	110		8	21	130		7
27	38	700		72	28	--		10	23	--		20
28	35	730		69	28	130		10	21	--		19
29	32	420		36	27	--		10	86	4000		6600
30	32	380		33	27	170		12	42	1800	S	230
31	--	--		--	27	--		10	--	--		--
Total	1277	--		15025	1144	--		4837	1045	--		16774

Day	JULY			AUGUST			SEPTEMBER		
1	35	390	37	12	--	2	18	130	6
2	35	320	30	12	--	2	18	120	6
3	35	240	23	12	78	3	20	150	8
4	33	280	25	13	100	4	21	120	7
5	33	280	25	13	110	4	21	110	6
6	33	220	20	13	92	3	21	110	6
7	30	--	17	13	110	4	21	100	6
8	25	--	12	12	100	3	21	110	6
9	23	--	9	11	110	3	22	120	7
10	22	110	7	10	88	2	24	100	6
11	21	--	5	10	73	2	23	160	10
12	22	--	6	10	82	2	22	110	7
13	21	110	6	10	120	3	22	110	7
14	21	120	7	10	76	2	21	120	7
15	20	100	5	10	130	4	21	120	7
16	20	96	5	10	140	4	21	94	5
17	20	98	5	10	110	3	21	78	4
18	20	--	5	10	78	2	22	62	4
19	20	--	5	13	170	6	22	86	5
20	20	--	5	14	120	5	22	100	6
21	18	110	5	13	120	4	23	100	6
22	15	92	4	11	100	3	21	90	5
23	13	84	3	12	64	2	21	77	4
24	13	94	3	14	98	4	21	82	5
25	14	100	4	17	130	6	22	80	5
26	15	--	4	17	110	5	22	68	4
27	14	90	3	17	92	4	22	80	5
28	13	--	3	17	90	4	22	28	2
29	13	82	3	18	150	7	21	37	2
30	12	--	3	17	90	4	21	72	4
31	12	110	4	17	96	4	--	--	--
Total	661	--	298	398	--	110	640	--	168

Total discharge for year (cfs-days)..... 10072
Total load for year (tons)..... 38609

S Computed by subdividing day.

6-2078.5. BLUEWATER CREEK AT SANFORD RANCH, NEAR BRIDGER, MONT.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Apr. 7, 1964.....	1540	54		40	1730	187		77		96		100	--	--				PWC
May 3.....	1340	44		105	4510	1280		51		68		94	98	100				VPWC
May 11.....	1050	46		322	7720	6710		48		66		89	96	100				VPWC
June 11.....	1230	61		33	275	24		40		63		91	98	100				VPWC
June 29.....	2050	56		345	36000	34800		33		68		96	99	100				VPWC

YELLOWSTONE RIVER BASIN--Continued

6-2078.7. BLUEWATER CREEK NEAR FROMBERG, MONT.

LOCATION.--At gaging station, 100 feet downstream from bridge on county road, 2.8 miles southeast of Fromberg, Carbon County, and 4.7 miles upstream from mouth.
RECORDS AVAILABLE.--Water temperatures: October 1963 to September 1964.
Sediment records: October 1963 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 87°F Aug. 9, 13; minimum, freezing point on several days during November to March.
Sediment concentrations: Maximum daily, not determined; minimum daily, not determined.
Sediment loads: Maximum daily, 13,000 (estimated) tons Apr. 26; minimum daily, less than 0.50 ton on several days during July and August.
REMARKS.--Recorder stopped Oct. 22-27, Apr. 26-28, June 9 to July 26. Records of discharge available in district office at Worland, Wyo.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October																																
Maximum	60	58	56	62	56	53	62	60	60	62	60	60	55	59	56	55	54	56	49	48	55	--	--	--	--	--	--	49	50	40	46	55
Minimum	48	42	44	49	48	48	44	40	46	43	40	40	44	42	40	40	40	40	40	39	40	--	--	--	--	--	--	40	38	34	35	42
November																																
Maximum	46	47	49	50	59	56	59	54	59	52	53	46	54	55	52	51	45	44	44	40	34	40	43	47	46	51	54	--	44	47	--	49
Minimum	36	38	38	39	44	42	43	45	48	41	38	37	36	42	47	41	36	38	38	32	32	32	36	34	36	42	40	--	34	35	--	39
December																																
Maximum	46	44	46	46	48	46	38	38	38	36	36	36	38	39	43	41	36	40	45	38	40	41	42	49	50	48	42	42	44	42	45	42
Minimum	37	36	35	36	38	38	33	33	33	34	33	32	33	32	35	36	32	34	36	32	33	35	38	42	43	38	38	38	37	36	40	36
January																																
Maximum	49	46	45	45	47	45	44	48	40	41	40	37	37	40	42	41	42	49	42	43	46	40	48	40	42	50	46	46	45	48	43	44
Minimum	42	38	36	40	40	42	40	40	36	36	33	32	32	32	32	36	33	37	36	36	36	33	36	34	39	40	37	37	39	34	34	36
February																																
Maximum	44	44	46	46	45	40	47	47	46	48	40	49	45	49	--	49	44	46	44	43	46	44	47	39	39	39	49	42	44	--	--	45
Minimum	37	35	37	37	35	33	37	40	42	36	36	40	39	40	--	43	38	38	37	34	38	40	39	32	32	32	34	36	34	--	--	37
March																																
Maximum	47	49	46	47	45	46	45	47	46	47	46	50	46	46	48	51	54	46	47	47	49	41	39	38	46	48	48	54	52	52	55	47
Minimum	36	37	36	40	38	36	36	38	36	36	37	39	36	33	40	36	41	40	42	37	38	36	36	32	32	37	37	39	39	39	41	37
April																																
Maximum	57	51	45	54	54	44	51	55	62	56	58	49	51	58	61	50	48	53	60	59	52	56	54	46	--	--	--	--	60	63	--	54
Minimum	45	44	40	41	43	36	35	41	50	46	43	42	42	41	45	40	35	38	40	42	45	44	41	44	--	--	--	--	50	50	--	42
May																																
Maximum	59	65	59	64	56	57	55	51	60	58	59	60	62	66	66	69	68	66	68	64	66	68	63	--	63	57	52	59	50	61	68	61
Minimum	53	47	45	46	40	45	41	44	44	41	42	43	44	44	44	41	43	40	46	44	46	44	43	--	48	41	43	50	44	45	50	44
June																																
Maximum	61	--	62	68	70	67	60	55	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	45	--	52	47	50	49	52	50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July																																
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	79	73	78	71	79	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	45	48	50	49	49	--
August																																
Maximum	79	73	77	80	80	76	76	81	87	70	72	68	87	75	73	76	75	76	58	52	60	67	65	62	66	64	64	57	64	65	65	71
Minimum	46	44	41	46	56	46	46	56	54	51	40	40	56	50	40	44	42	44	43	49	48	46	61	48	43	49	46	49	52	48	46	47
September																																
Maximum	63	63	63	64	67	58	62	68	62	52	58	60	64	68	66	65	63	57	62	57	62	60	62	72	66	54	58	54	59	69	--	62
Minimum	44	46	43	42	42	45	45	44	44	44	44	44	44	44	52	47	44	44	44	44	45	46	44	48	51	42	40	40	41	48	--	44

YELLOWSTONE RIVER BASIN--Continued

6-2078.7. BLUEWATER CREEK NEAR FROMBERG, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	10	C 95	3	24	C 200	13	27	C 240	17
2	10	C 95	3	24	C 200	13	27	C 240	17
3	10	C 95	3	24	C 200	13	27	C 240	17
4	13	C 95	3	24	C 200	13	27	C 240	17
5	14	C 95	4	24	C 200	13	28	C 240	17
6	14	C 95	4	24	C 200	13	28	C 240	17
7	14	C 95	4	25	C 200	14	27	C 240	17
8	15	C 95	4	25	C 200	14	27	C 240	17
9	15	C 95	4	25	C 200	14	27	C 240	17
10	16	C 95	4	24	C 200	13	27	C 240	17
11	15	C 95	4	25	C 200	14	27	C 240	17
12	15	C 95	4	25	C 200	14	27	C 240	17
13	15	C 95	4	26	C 200	14	27	C 240	17
14	16	C 95	4	25	C 200	14	27	C 240	17
15	19	C 95	5	25	C 200	14	27	C 240	17
16	18	C 95	5	25	C 200	14	27	C 240	17
17	18	C 95	5	26	C 200	14	27	C 240	17
18	18	C 95	5	26	C 200	14	27	C 240	17
19	18	C 95	5	26	C 200	14	27	C 240	17
20	20	C 95	5	26	C 200	14	27	C 240	17
21	20	C 95	5	27	C 200	15	27	230	17
22	20	C 95	5	27	C 200	15	27	250	18
23	20	C 95	5	27	C 200	15	27	250	18
24	20	C 95	5	27	C 200	15	27	--	17
25	20	C 95	5	27	C 200	15	27	--	18
26	20	C 95	5	27	C 200	15	27	270	20
27	20	C 95	5	27	C 200	15	27	260	19
28	20	C 95	5	27	C 200	15	27	270	20
29	20	C 95	5	27	C 200	15	27	--	20
30	22	C 95	6	27	C 200	15	27	270	20
31	24	C 95	6	--	--	--	27	290	21
Total	529	--	139	768	--	423	839	--	548
	JANUARY			FEBRUARY			MARCH		
1	28	270	20	28	230	17	27	160	12
2	28	300	23	28	240	18	26	150	11
3	28	270	20	28	230	17	26	220	15
4	28	270	20	28	--	17	26	260	18
5	28	270	20	28	--	16	27	150	11
6	28	250	19	28	--	15	27	140	10
7	28	270	20	28	180	14	27	130	9
8	28	230	17	28	230	17	27	140	10
9	28	230	17	28	250	19	27	140	10
10	28	270	20	28	220	17	27	130	9
11	28	280	21	28	200	15	27	130	9
12	28	230	17	28	200	15	28	--	11
13	28	220	17	28	180	14	27	180	13
14	28	--	17	28	220	17	27	150	11
15	28	220	17	29	240	19	28	140	11
16	28	220	17	28	210	16	28	130	10
17	28	220	17	27	180	13	29	150	12
18	28	230	17	27	190	14	29	120	9
19	28	220	17	28	170	13	30	140	11
20	28	260	20	28	--	11	30	--	11
21	27	290	21	28	170	13	30	140	11
22	28	230	17	26	210	15	30	140	11
23	28	220	17	27	170	12	30	150	12
24	28	210	16	28	230	17	30	200	16
25	28	190	14	28	210	16	29	180	14
26	28	--	14	27	230	17	29	180	14
27	28	250	19	27	--	16	29	160	13
28	28	250	19	27	190	14	30	170	14
29	28	200	15	27	220	16	30	280	23
30	28	180	14	--	--	--	31	410	34
31	28	180	14	--	--	--	31	260	22
Total	867	--	553	804	--	450	879	--	407

C Composite period.

YELLOWSTONE RIVER BASIN--Continued

6-2078.7. BLUEWATER CREEK NEAR FROMBERG, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	30	160	13	33	530	47	20	92	5
2	30	130	11	38	1000	100	20	120	6
3	31	220	18	67	3500 S	710	26	--	80
4	30	360	29	37	1100 S	120	19	390	20
5	30	310	25	35	600	57	18	230	11
6	31	390	33	39	1300	140	20	280	15
7	33	510	45	32	400	34	18	180	9
8	33	790	70	31	330	28	31	1000 S	540
9	31	500	42	31	280	23	181	13000 S	10000
10	30	250	20	33	370	33	33	--	120
11	30	200	16	153	7200 S	3900	38	--	300
12	30	250	20	37	1400 S	160	29	--	50
13	30	180	15	30	570	46	27	370	27
14	30	150	12	29	450	35	27	--	25
15	30	130	11	28	340	26	26	310	22
16	30	120	10	27	450	33	29	--	60
17	30	110	9	27	360	26	53	--	1100
18	30	--	11	26	280	20	53	5700 S	960
19	30	150	12	26	300	21	51	5600 S	1200
20	30	130	11	25	250	17	26	820	58
21	30	110	9	25	220	15	24	360	23
22	31	80	7	25	180	12	24	280	18
23	32	90	8	25	190	13	23	260	16
24	32	72	6	25	180	12	23	260	16
25	104	--	2200	25	--	9	22	230	14
26	226	--	13000	25	130	9	22	180	11
27	42	1200	140	25	--	9	24	200 S	14
28	38	600	62	25	140	9	22	--	11
29	34	460	42	23	--	8	43	1600 S	1500
30	33	480	43	20	98	5	58	3800 S	1700
31	--	--	--	20	--	5	--	--	--
Total	1211	--	15950	1047	--	5682	1030	--	17931

	JULY			AUGUST			SEPTEMBER		
1	23	500	31	3.5	--	T	7.8	130	3
2	22	400	24	3.1	--	1	8.2	110	2
3	22	300	18	2.5	120	1	8.8	140	3
4	22	320	19	2.5	160	1	9.1	100	2
5	22	270	16	2.9	180	1	8.2	98	2
6	21	240	14	3.1	140	1	8.5	95	2
7	16	--	10	3.5	150	1	9.1	93	2
8	12	--	6	4.2	130	1	8.5	100	2
9	11	--	3	5.3	150	2	12	140	5
10	9.7	74	2	5.1	120	2	14	210	8
11	8.5	--	2	4.8	130	2	14	160	6
12	8.2	--	2	4.8	120	2	13	150	5
13	8.0	68	1	5.5	150	2	14	120	5
14	8.0	55	1	5.5	110	2	14	100	4
15	8.2	68	2	4.8	100	1	13	90	3
16	8.0	76	2	4.8	110	1	14	48	2
17	7.8	86	2	5.8	100	2	13	85	3
18	7.8	--	1	6.0	96	2	14	120	5
19	7.2	--	1	6.8	130	2	14	90	3
20	7.2	--	1	7.0	130	2	15	110	4
21	8.2	47	1	6.8	120	2	15	150	6
22	7.8	63	1	6.2	110	2	15	100	4
23	7.0	33	1	6.0	82	1	16	81	3
24	6.2	50	1	6.0	68	1	16	110	5
25	5.1	57	1	6.2	110	2	16	100	4
26	5.1	--	1	6.5	80	1	17	26	1
27	4.8	34	T	6.8	110	2	17	14	1
28	4.2	--	T	7.0	80	2	17	29	1
29	4.2	32	T	7.5	92	2	16	21	1
30	4.2	--	T	7.5	71	1	16	66	3
31	4.0	--	T	8.0	82	2	--	--	--
Total	320.4	--	166	166.0	--	47	393.2	--	100

Total discharge for year (cfs-days)..... 8653.6
Total load for year (tons)..... 42396

S Computed by subdividing day.
T Less than 0.50 ton.

YELLOWSTONE RIVER BASIN--Continued

6-2078.7. BLUEWATER CREEK NEAR FROMBERG, MONT.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							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	
Apr. 26, 1964.....	1000	40		219	8860	5240		40		62		94	99	100				VPWC
May 3.....	1330	42		75	3400	689		49		66		94	99	100				VPWC
May 11.....	1315	48		324	12600	11000		46		65		88	97	100				VPWC
May 11.....	1620	51		137	8350	3090		39		54		86	95	100				VPWC
June 10.....	1730	60		31	517	43		45		68		94	98	100				VPWC
June 30.....	0020	57		377	23300	23700		43		77		92	97	99	100			VPWC
June 30.....	1715	67		25	992	67		40		71		96	99	100				VPWC

YELLOWSTONE RIVER BASIN--Continued

6-2079. BLUEWATER CREEK AT FROMBERG, MONT.

LOCATION.--At gaging station on left bank, 0.3 mile upstream from moutb and 0.7 mile southeast of Fromberg, Carbon County.
DRAINAGE AREA.--53.2 square miles.
RECORDS AVAILABLE.--Water temperatures: August 1961 to September 1964.
Sediment records: October 1961 to September 1962, October 1963 to June 1964 (discontinued).
EXTREMES, 1963-64.--Water temperatures: Maximum, 78°F July 31; minimum, freezing point on many days during November to March.
Sediment concentrations: Maximum daily, not determined; minimum daily, not determined.
Sediment loads: Maximum daily, 13,000 (estimated) tons June 9; minimum daily, 8 tons Feb. 1.
EXTREMES, 1961-64.--Water temperatures: Maximum, 78°F July 31, 1964; minimum, freezing point on many days during winter months each year.
Sediment concentrations (1961-62, 1963-64): Maximum daily, not determined; minimum daily, not determined.
Sediment loads (1961-62, 1963-64): Maximum daily, 13,000 (estimated) tons June 9, 1964; minimum daily, 1 ton July 25, 1962.
REMARKS.--Recorder stopped Oct. 22-27, July 18-26, Sept. 26-27. Flow affected by ice Dec. 11, 19, Jan. 12-16, Feb. 25, 26, Mar. 23-25.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October																																
Maximum	62	60	58	58	54	52	55	54	53	54	54	54	49	56	54	53	53	52	47	50	51	--	--	--	--	--	--	41	43	40	41	52
Minimum	50	47	47	50	48	46	46	43	46	44	42	42	44	43	42	41	40	40	42	42	42	--	--	--	--	--	--	39	38	36	33	43
November																																
Maximum	40	42	42	46	47	45	47	44	46	48	47	42	47	47	46	46	41	39	39	37	34	35	35	36	38	--	49	45	46	46	--	43
Minimum	34	38	35	36	40	38	38	40	40	43	40	37	36	38	44	38	36	36	36	32	32	32	32	32	34	--	44	37	37	38	--	37
December																																
Maximum	45	45	46	46	48	44	40	40	36	--	33	33	33	34	33	33	34	33	34	33	36	36	36	41	44	40	40	40	41	38	43	39
Minimum	37	36	37	37	38	40	37	34	33	--	32	32	32	32	32	32	32	32	32	32	32	32	35	36	38	34	35	38	36	34	38	35
January																																
Maximum	47	42	38	42	40	41	40	43	36	36	37	34	32	32	--	36	40	43	36	40	40	34	39	36	38	42	37	40	41	44	41	39
Minimum	40	37	35	36	36	38	37	36	33	32	32	32	32	32	--	33	32	35	34	34	34	32	33	32	34	36	33	33	35	33	33	34
February																																
Maximum	43	43	36	38	37	33	40	40	39	44	39	44	41	42	36	44	44	40	40	39	42	40	38	37	36	36	40	40	40	--	--	40
Minimum	36	35	33	32	32	32	32	35	37	36	36	38	38	36	34	36	34	34	36	34	38	38	35	32	32	32	34	34	33	--	--	35
March																																
Maximum	43	48	43	43	42	41	43	42	42	41	43	45	44	40	43	47	50	45	40	39	45	37	35	37	34	40	46	47	50	50	52	43
Minimum	36	37	36	40	38	35	36	37	36	36	36	39	36	33	37	36	41	40	35	33	36	34	32	32	32	32	37	39	39	40	43	36

April																																			
Maximum	54	49	44	49	52	45	47	51	56	54	54	47	48	52	57	51	45	48	52	53	51	54	55	49	48	48	50	55	57	61	--	51
Minimum	46	43	41	40	43	41	39	41	46	47	46	45	43	41	46	42	39	40	40	42	47	46	46	48	46	45	44	47	49	50	--	44
May																																		
Maximum	59	--	52	50	48	49	49	51	57	54	50	51	55	57	68	68	68	61	61	63	62	58	54	56	53	56	52	52	49	50	53	56
Minimum	54	--	50	42	41	43	43	44	48	50	45	44	45	48	53	56	58	51	51	52	53	50	46	47	47	46	48	49	46	45	46	48
June																																		
Maximum	58	61	58	60	59	60	55	54	52	56	55	57	61	63	63	62	59	55	54	54	56	62	65	68	70	64	65	61	63	64	--	60
Minimum	49	49	53	52	53	52	52	50	49	49	50	49	51	53	56	56	55	50	48	46	47	54	55	57	59	58	57	55	55	55	--	52
July																																		
Maximum	64	71	69	69	69	66	66	62	62	63	62	62	65	62	64	64	64	--	--	--	--	--	--	--	--	--	76	73	77	76	78	--
Minimum	54	60	61	59	61	57	56	54	53	56	54	52	56	58	58	58	58	--	--	--	--	--	--	--	--	--	60	60	64	63	64	--
August																																		
Maximum	76	69	70	74	70	67	69	66	72	72	67	68	72	72	70	73	72	69	58	52	58	67	63	59	62	61	60	56	56	60	64	66
Minimum	58	55	53	54	59	52	52	52	52	53	52	53	58	54	53	53	54	52	46	49	49	48	56	52	45	52	49	49	48	46	50	52
September																																		
Maximum	65	64	62	63	66	55	59	62	60	51	51	57	61	57	60	60	62	56	54	54	53	51	54	55	56	--	--	50	55	56	--	57
Minimum	52	54	50	47	46	48	44	46	50	40	38	39	42	46	47	42	42	46	41	44	43	42	41	40	44	--	--	40	38	42	--	44

YELLOWSTONE RIVER BASIN--Continued

6-2079. BLUEWATER CREEK AT FROMBERG, MONT.--Continued

Suspended sediment, October 1963 to June 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	69	330	61	41	C 270	30	27	C 180	13
2	55	--	40	44	C 270	32	27	C 180	13
3	49	--	30	51	C 270	37	27	C 180	13
4	43	220	26	50	C 270	36	27	C 180	13
5	33	C 160	14	49	C 270	36	27	C 180	13
6	33	C 160	14	50	C 270	36	27	C 180	13
7	35	C 160	15	52	C 270	38	27	C 180	13
8	35	C 160	15	53	C 270	39	24	C 180	12
9	34	C 160	15	54	C 270	39	23	C 180	11
10	41	C 160	18	54	C 270	39	23	C 180	11
11	38	C 160	16	54	C 270	39	22	C 180	11
12	38	C 160	16	55	C 270	40	21	C 180	10
13	42	C 160	18	53	C 270	39	21	C 180	10
14	43	C 160	19	55	C 270	40	21	C 180	10
15	41	C 160	18	55	C 270	40	21	C 180	10
16	47	C 160	20	50	C 270	36	25	C 200	14
17	38	C 160	16	50	C 270	36	30	C 200	16
18	31	C 160	13	48	C 270	35	30	C 200	16
19	31	C 160	13	29	C 180	14	30	C 200	16
20	34	C 160	15	28	C 180	14	31	C 200	17
21	43	C 160	19	27	C 180	13	30	C 200	16
22	42	C 160	18	27	C 180	13	30	C 200	16
23	34	C 160	15	27	C 180	13	31	C 200	17
24	32	C 160	14	27	C 180	13	31	C 200	17
25	33	C 160	14	27	C 180	13	30	C 200	16
26	40	C 160	17	27	C 180	13	30	C 200	16
27	36	C 160	16	27	C 180	13	30	C 200	16
28	36	C 160	16	27	C 180	13	30	C 200	16
29	41	C 160	18	27	C 180	13	30	C 200	16
30	40	C 160	17	27	C 180	13	30	C 200	16
31	41	C 160	18	--	--	--	30	C 200	16
Total	1228	--	594	1245	--	825	843	--	433

Day	JANUARY			FEBRUARY			MARCH		
1	30	200	16	30	100	8	28	140	11
2	31	260	22	30	120	10	27	140	10
3	30	190	15	30	140	11	27	150	11
4	30	170	14	30	--	11	28	170	13
5	30	190	15	30	--	11	28	160	12
6	30	180	15	30	--	11	28	160	12
7	30	180	15	30	130	11	28	160	12
8	30	200	16	30	140	11	28	150	11
9	31	190	16	30	170	14	28	150	11
10	30	200	16	30	200	16	28	180	14
11	31	140	12	30	150	12	28	220	17
12	30	140	11	30	180	15	28	210	16
13	30	130	11	30	150	12	28	200	15
14	30	--	10	30	190	15	28	160	12
15	30	160	13	30	170	14	28	180	14
16	30	250	20	30	130	11	29	170	13
17	30	200	16	30	120	10	29	200	16
18	30	160	13	30	150	12	30	190	15
19	30	160	13	30	130	11	30	120	10
20	30	190	15	30	--	11	30	--	10
21	30	200	16	30	120	10	30	150	12
22	30	170	14	30	120	10	30	230	19
23	30	160	13	30	140	11	29	220	17
24	30	160	13	31	160	13	28	--	20
25	30	150	12	30	190	15	27	300	22
26	30	--	11	28	170	13	31	260	22
27	30	150	12	28	--	11	30	210	17
28	30	150	12	28	130	10	30	220	18
29	30	190	15	28	140	11	30	300	24
30	30	150	12	--	--	--	31	840	70
31	30	120	10	--	--	--	30	580	47
Total	933	--	434	863	--	341	892	--	543

C Composite period.

YELLOWSTONE RIVER BASIN--Continued

6-2079. BLUEWATER CREEK AT FROMBERG, MONT.--Continued

Suspended sediment, October 1963 to June 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	31	C 340	28	40	--	100	61	C 320	53
2	31	C 340	28	50	--	300	61	C 320	53
3	33	C 340	30	60	--	500	70	--	250
4	33	C 340	30	70	3000	570	57	--	100
5	32	C 340	29	64	1200	210	57	550	85
6	34	C 340	31	68	--	300	59	--	80
7	32	C 340	29	59	1100	180	51	--	70
8	34	C 340	31	57	850	130	52	550	77
9	33	C 340	30	56	--	130	258	--	13000
10	31	C 340	28	54	--	130	64	1500	260
11	31	C 340	28	140	6200	S 3000	76	3100	640
12	31	C 340	28	69	4300	800	65	--	400
13	30	C 120	10	55	--	350	70	--	200
14	30	C 120	10	60	--	250	69	--	200
15	30	C 120	10	67	1000	180	69	--	200
16	30	C 120	10	69	--	150	71	--	200
17	30	C 120	10	67	--	100	79	--	300
18	30	C 120	10	73	1100	220	124	4500	S 1800
19	30	C 120	10	80	--	300	106	--	1300
20	30	C 120	10	79	--	200	83	--	200
21	31	C 120	10	73	--	150	78	C 400	84
22	31	C 120	10	64	640	110	72	C 400	78
23	31	C 120	10	60	--	80	68	C 400	73
24	32	C 120	10	63	--	60	69	C 400	75
25	54	--	400	47	C 320	41	74	C 400	80
26	214	--	12000	46	C 320	40	76	C 400	82
27	55	--	500	44	C 320	38	76	--	150
28	40	--	100	47	C 320	41	69	--	200
29	35	550	52	52	C 320	45	47	300	38
30	35	--	50	57	C 320	49	93	--	6500
31	--	--	--	52	C 320	45	--	--	--
Total	1184	--	13572	1942	--	8799	2324	--	26828

Total discharge for period Oct. 1 to June 30 (cfs-days)..... 11454
Total load for period Oct. 1 to June 30 (tons)..... 52369

S Computed by subdividing day.
C Composite period.

YELLOWSTONE RIVER BASIN--Continued

6-2079. BLUEWATER CREEK AT FROMBERG, MONT.--Continued

Periodic determinations of suspended-sediment discharge and particle size, October 1963 to June 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
May 11, 1964.....	1330	49		198	10200	5450		50		68		92	98	100				VPWC
May 11.....	1530	50		228	11500	7080		38		54		93	97	100				VPWC
June 10.....	1305	55		61	1250	206		54		76		96	100	--				VPWC
June 30.....	1120	60		62	5560	931		47		81		98	100	--				VPWC
June 30.....	1625	65		59	1830	292		47		77		97	99	100				VPWC

6-2145. YELLOWSTONE RIVER AT BILLINGS, MONT.

LOCATION.--At gaging station, near left bank at City of Billings water department intake, 1 mile east of Billings, Yellowstone County, and 12 miles upstream from Pryor Creek.
DRAINAGE AREA.--11,783 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1958, July 1963 to September 1964.
Water temperatures: December 1950 to September 1958, July 1963 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 408 ppm Apr. 26-27; minimum, 93 ppm June 25-30.
Hardness: Maximum, 213 ppm Mar. 25-27; minimum, 58 ppm June 25-30.
Specific conductance: Maximum daily, 660 micromhos Mar. 26; minimum daily, 140 micromhos June 30.
Water temperatures: Maximum, 69°F July 22, Aug. 1; minimum, freezing point on many days during November to March.
EXTREMES, 1950-58, 1963-64.--Dissolved solids: Maximum, 868 ppm Feb. 2, 1951; minimum, 93 ppm June 25-30, 1964.
Hardness: Maximum, 476 ppm Feb. 2, 1951; minimum, 52 ppm May 21-23, 1954.
Specific conductance: Maximum daily, 1,210 micromhos Feb. 2, 1951; minimum daily, 129 micromhos May 22, 1954.
Water temperatures: Maximum, 80°F July 24, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance of daily samples available in district office at Worland, Wyo.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-16, 1963.	3377	14	0.00	42	15	29	6.2	165	0	81	5.9	0.5	0.6	0.18	281	0.38	2560	166	31	1.0	450	7.6	4
Oct. 17-31.....	3101	15	.00	43	17	31	3.1	173	0	88	6.5	.5	.3	.21	302	.41	2530	176	34	1.0	475	7.2	4
Nov. 1-18.....	3384	15	.00	44	15	29	2.9	168	0	86	6.6	.5	.7	.23	291	.40	2660	173	35	1.0	464	7.4	1
Nov. 19-30.....	3256	17	.00	43	16	28	3.1	166	0	85	7.2	.5	.9	.24	292	.40	2570	174	38	.9	462	7.2	1
Dec. 1-19.....	2234	16	.00	49	13	29	3.7	171	0	90	7.2	.5	1.2	.24	303	.41	1830	176	36	1.0	476	7.4	1
Dec. 20-31.....	2838	17	.00	49	14	30	3.3	172	0	88	7.2	.5	1.4	.22	306	.42	2340	180	39	1.0	478	7.5	1
Jan. 1-6, 1964..	2750	15	.00	51	13	30	2.9	166	0	94	7.3	.6	1.3	.22	294	.40	2180	180	44	1.0	470	7.7	--
Jan. 7-19.....	2062	18	.00	71	8.5	36	3.3	192	0	112	8.2	.8	1.8	.26	350	.48	1950	212	54	1.1	547	7.6	--
Jan. 20-31.....	2475	17	.00	53	13	31	3.6	171	0	96	7.5	.8	1.5	.26	306	.42	2040	186	46	1.0	485	7.7	--
Feb. 1-14.....	2954	17	.00	52	13	32	3.3	167	0	96	7.7	.8	1.3	.27	304	.41	2420	182	45	1.0	477	8.0	--
Feb. 15-23.....	2439	16	.00	58	10	31	3.2	170	0	98	7.6	.8	1.0	.29	308	.42	2030	184	45	1.0	488	7.7	--
Feb. 24-29.....	2167	16	.00	58	12	34	3.2	176	0	104	7.6	.8	1.0	.28	322	.44	1880	194	50	1.1	509	7.5	--
Mar. 1-24.....	2487	17	.00	45	16	30	3.3	164	0	94	8.6	.4	.6	.27	307	.42	2060	179	44	1.0	482	7.7	5
Mar. 25-27.....	2000	16	.00	52	20	37	4.0	176	0	126	11	.4	3.4	.27	381	.52	2060	213	69	1.1	567	7.2	8
Mar. 28-Apr. 10.	2457	16	.01	50	14	37	4.9	166	0	111	8.0	.8	.0	.28	300	.41	1990	183	47	1.2	495	7.5	--
Apr. 11-25.....	3042	15	.00	44	12	30	4.7	155	0	88	7.3	.8	.0	.27	256	.35	2100	160	33	1.0	440	7.4	--
Apr. 26-27.....	9630	--	--	--	--	62	--	189	0	158	--	--	--	--	408	.55	10610	198	43	1.9	624	7.4	--
Apr. 28-May 22..	8224	19	.00	25	17	26	3.4	133	0	70	3.9	.7	.9	.12	220	.30	4880	132	23	1.0	373	7.6	--
May 23-31.....	18610	13	.01	21	4.7	8.6	1.8	78	0	23	.3	.4	.4	.06	106	.14	5330	72	8	.4	182	7.1	--
June 1-8.....	22400	13	.01	19	5.2	8.6	1.9	76	0	27	1.0	.4	.0	.06	96	.13	5810	69	7	.5	175	7.3	--

YELLOWSTONE RIVER BASIN--Continued

6-2145. YELLOWSTONE RIVER AT BILLINGS, MONT.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
June 9-24, 1964.	29390	12	0.00	23	4.7	12	2.0	84	0	33	1.4	0.5	0.0	0.06	116	0.16	9200	77	8	0.6	206	6.9	--
June 25-30.....	37050	11	.00	17	3.8	7.9	1.5	65	0	18	1.2	.4	.0	.07	A93	.13	9300	58	5	.5	153	6.8	--
July 1-20.....	23360	11	.00	18	3.4	8.9	1.6	68	0	19	1.3	.4	.0	.07	A97	.13	6120	59	3	.5	162	7.3	--
July 21-31.....	10950	11	.00	22	6.6	15	2.3	91	0	35	3.4	.7	.1	.11	138	.19	4080	82	7	.7	234	7.4	--
Aug. 1-10.....	7474	12	.00	28	8.8	20	2.9	109	0	49	5.3	.6	.1	.14	180	.24	3630	106	17	.8	288	7.1	--
Aug. 11-31.....	5017	13	.00	36	11	27	3.1	135	0	69	6.2	.6	.3	.18	228	.31	3090	134	23	1.0	373	7.5	--
Sept. 1-15.....	4417	13	.00	40	11	28	3.1	150	0	73	6.1	.6	.4	.16	252	.34	3000	147	24	1.0	402	7.8	--
Sept. 16-30.....	3287	14	.00	46	13	34	3.6	165	0	93	6.5	.6	.2	.20	282	.38	2500	169	34	1.1	461	8.0	--
Weighted average.....	--	13	0.00	28	8.1	18	2.5	107	--	49	3.3	0.5	0.3	0.12	171	0.23	3430	104	17	0.8	282	7.2	--
Time-weighted average.....	7430	15	0.00	40	12	26	3.2	145	--	76	5.8	0.6	0.6	0.19	249	--	--	149	30	1.0	402	7.4	--
Tons per day..	--	267	0.03	566	162	357	50	2150	--	974	66	10	6.1	2.4	--	--	--	--	--	--	--	--	--

A Calculated from determined constituents.

YELLOWSTONE RIVER BASIN--Continued

6-2145. YELLOWSTONE RIVER AT BILLINGS, MONT.--Continued

Temperature (°F) of water, water year October 1963 to September 1964
(Once-daily measurement between 0500 and 0900)

Month	Day																													Average
	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	
October	60	59	59	58	58	56	55	55	55	56	54	55	55	54	54	54	53	52	52	52	50	51	52	48	48	46	44	40	41	43	41	52
November	40	40	40	40	42	41	41	41	42	43	41	39	39	39	41	42	39	37	35	33	32	32	33	33	34	34	36	35	34	33	--	38
December	33	32	32	32	33	34	35	32	32	32	32	32	--	--	--	--	--	--	--	33	33	33	33	33	33	32	32	33	32	32	32	--
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	37	37	34	35	35	32	32	32	32	32	32	32	37	41	33
April	46	46	40	39	45	43	39	41	45	48	50	47	42	43	46	49	41	44	46	47	51	48	51	52	49	44	43	48	51	50	--	46
May	49	56	50	44	45	49	52	51	51	55	50	50	54	56	59	59	60	59	58	58	56	55	53	52	53	54	53	53	50	48	50	53
June	53	55	57	54	56	57	56	50	49	49	50	56	55	57	57	57	55	51	51	51	52	54	55	58	60	60	58	56	56	57	--	55
July	58	59	59	61	62	60	61	62	62	63	64	64	65	64	64	64	65	67	65	66	68	69	68	65	65	66	67	66	67	68	68	64
August	69	67	66	66	68	66	66	66	66	66	64	64	66	66	65	66	66	67	67	58	55	57	58	59	58	61	59	58	55	54	57	63
September	59	59	57	56	56	56	55	56	58	57	51	53	55	55	58	58	58	58	57	56	56	55	54	54	55	50	49	49	50	53	--	55

YELLOWSTONE RIVER BASIN--Continued

6-2280. WIND RIVER AT RIVERTON, WYO.

LOCATION.--At gaging station, on left bank at downstream side of bridge on State Highway 789, 1.1 miles southeast of post office in Riverton, Fremont County, and 1.5 miles upstream from Little Wind River (corrected).
DRAINAGE AREA (revised).--2,309 square miles.
RECORDS AVAILABLE.--Chemical analyses: March 1947 to September 1949.
Water temperatures: April 1947 to September 1949, April to September 1953, August 1954 to September 1956.
Sediment records: October 1948 to December 1953, August 1954 to September 1956, October 1959 to September 1964 (discontinued).

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 21, 1963	1315	53		790	773	1650		--		--		--	--	--	--			
Nov. 27	1325	35		478	925	1190		--		--		--	--	--	--			
Jan. 10, 1964	1620	32		890	21	50		--		--		--	--	--	--			
Feb. 11	1200	35		645	60	104		--		--		--	--	--	--			
Mar. 9	1540	33		374	59	60		--		--		--	--	--	--			
Apr. 27	1050	44		672	123	223		--		--		--	--	--	--			
May 18	1400	63		582	474	745		--		--		--	--	--	--			
May 22	0930	55		1270	1320	4530		--		--		--	--	--	--			
May 25	1645	62		672	291	528		--		--		--	--	--	--			
June 8	1030	50		4080	2410	26500		--		--		--	--	--	--			
June 9	1450	52		3030	1720	14100		--		--		--	--	--	--			
June 12	1530	61		1840	422	2100		--		--		--	--	--	--			
June 15	0925	60		1850	704	3520		--		--		--	--	--	--			
June 16	1615	61		3120	1980	16700		--		--		--	--	--	--			
June 18	1350	56		3480	1230	11600		--		--		--	--	--	--			
June 19	1600	59		2080	969	5440	8	9	14	18	24	42	66	96	100			VBWC
June 24	1505	--		850	175	402		--		--		--	--	--	--			
June 25	1610	--		2210	1360	8120		--		--		--	--	--	--			
June 29	0845	67		2980	1690	13600		--		--		--	--	--	--			
June 29	1645	66		3820	1620	16700		--		--		--	--	--	--			
June 29	2050	61		4170	2180	24500		15		24		55	75	95	100			VPWC
June 30	1705	63		4470	2330	28100		--		--		--	--	--	--			
July 3	1910	--		4690	1260	16000		--		--		--	--	--	--			
July 7	1530	63		3490	832	7840		--		--		--	--	--	--			
July 9	1720	71		2710	956	7000		6		13		41	70	96	99	100		VPWC
July 14	1755	62		3080	933	7760		17		30		48	68	98	100			VPWC
July 15	1610	68		2820	440	3350		--		--		--	--	--	--			

July 17, 1964.....	1345	68		2390	346	2230		--		--		--	--	--	--							
July 20.....	1550	72		1520	253	1040		--		--		--	--	--	--							
July 22.....	1345	71		1110	196	587		--		--		--	--	--	--							
Aug. 5.....	1620	75		214	24	14		--		--		--	--	--	--							
Sept. 10.....	1515	66		74	20	4		--		--		--	--	--	--							

YELLOWSTONE RIVER BASIN--Continued

6-2303. RAY LAKE OUTLET NEAR FORT WASHAKIE, WYO.

LOCATION.--At gaging station at bridge on U.S. Highway 287, 0.2 mile downstream from Ray Lake Dam and 5 miles southeast of Fort Washakie, Fremont County.
RECORDS AVAILABLE.--Chemical analyses: August 1960 to September 1964.
Water temperatures: August 1960 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 707 ppm Sept. 22-29; minimum, 583 ppm Aug. 19-31.
Hardness: Maximum, 298 ppm Sept. 22-29; minimum, 243 ppm July 28 to Aug. 18.
Specific conductance: Maximum daily, 1,220 micromhos Sept. 29; minimum daily, 845 micromhos July 31.
Water temperatures: Maximum, 79°F July 28.
EXTREMES, 1960-64.--Dissolved solids: Maximum, 707 ppm Sept. 22-29, 1964; minimum, 454 ppm Aug. 1-15, 1961.
Hardness: Maximum, 298 ppm Sept. 22-29, 1964; minimum, 188 ppm Aug. 1-15, 1961.
Specific conductance: Maximum daily, 1,220 micromhos Sept. 29, 1964; minimum daily, 665 micromhos May 28, 1962.
Water temperatures: Maximum, 79°F July 28, 1964.
REMARKS.--Records of specific conductance of daily samples available in district office at Worland, Wyo. Records of discharge for water year October 1963 to September 1964 furnished by U.S. Indian Service, Fort Washakie, Wyo. No flow Oct. 1 to July 27, Sept. 30.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
July 28-Aug. 18, 1964.....	35.5	2.6	0.01	43	33	92	2.7	116	0	318	8.6	0.2	0.2	0.08	596	0.81	57.1	243	148	2.6	859	7.6	2
Aug. 19-31.....	28.8	2.7	.01	44	34	96	2.7	117	0	333	8.6	.2	.2	.08	583	.79	45.3	250	154	2.6	891	7.4	1
Sept. 1-21.....	28.1	.4	.01	50	32	103	2.7	120	0	342	9.3	.3	.3	.10	612	.83	46.4	257	159	2.8	906	7.5	0
Sept. 22-29.....	21.0	4.5	.01	60	36	108	2.9	141	0	371	9.6	.3	1.4	.10	707	.96	40.1	298	182	2.7	997	7.3	3
Weighted average.....	A5.2	2.1	0.01	47	33	98	2.7	120	--	333	8.9	0.2	0.3	0.09	608	0.83	49.1	254	156	2.7	892	7.5	1
Tons per day..	--	0.2	0.00	3.8	2.7	7.9	0.2	10	--	27	0.7	0.0	0.0	0.01	--	--	--	--	--	--	--	--	--

A Mean discharge based on 366 days; mean discharge for 64 days of actual flow, 29.9 cfs.

YELLOWSTONE RIVER BASIN--Continued

6-2303. RAY LAKE OUTLET NEAR FORT WASHAKIE, WYO.--Continued

Temperature (°F) of water, water year October 1963 to September 1964
(Once-daily measurement between 0900 and 1900)

Month	Day																													Average
	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	
October	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	79	77	72	71	--
August	73	70	--	73	73	74	71	79	75	72	70	71	72	73	70	70	71	70	67	64	68	65	67	65	68	66	66	63	60	65	61	69
September	67	62	65	59	62	64	63	62	61	61	57	63	62	61	65	60	61	62	61	63	56	59	56	62	59	56	60	50	51	55	--	60

6-2355. LITTLE WIND RIVER NEAR RIVERTON, WYO.

LOCATION.--At gaging station at county road bridge, 1.8 miles upstream from mouth and 1.9 miles southeast of Riverton, Fremont County.
DRAINAGE AREA (revised).--1,904 square miles.
RECORDS AVAILABLE.--Water temperatures: March to September 1949, May to September 1953, October 1955 to September 1956.
Sediment records: March 1949 to December 1953, October 1955 to September 1958, October 1959 to September 1964 (discontinued).

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 21, 1963	1440	54		318	908	780	--	--	--	--	--	--	--	--	--	--		
Nov. 26	1605	36		333	54	49	--	--	--	--	--	--	--	--	--	--		
Jan. 10, 1964	1610	32		408	4	4.4	--	--	--	--	--	--	--	--	--	--		
Feb. 11	1140	35		E 190	57	29	--	--	--	--	--	--	--	--	--	--		
Mar. 9	1605	34		545	51	75	--	--	--	--	--	--	--	--	--	--		
Apr. 27	1030	46		380	1730	1770	--	--	--	--	--	--	--	--	--	--		
May 6	0900	47		268	784	567	--	--	--	--	--	--	--	--	--	--		
May 18	1315	64		862	1710	3980	--	--	--	--	--	--	--	--	--	--		
May 22	0915	53		1870	1580	7980	--	--	--	--	--	--	--	--	--	--		
May 25	1550	61		1320	584	2080	--	--	--	--	--	--	--	--	--	--		
June 8	0930	53		5070	1280	17500	--	--	--	--	--	--	--	--	--	--		
June 9	1435	53		4190	579	6550	--	--	--	--	--	--	--	--	--	--		
June 12	1415	57		2260	324	1980	--	--	--	--	--	--	--	--	--	--		
June 15	1000	58		2240	294	1780	--	--	--	--	--	--	--	--	--	--		
June 16	1540	59		3110	576	4840	--	--	--	--	--	--	--	--	--	--		
June 18	1255	54		3800	364	3730	--	--	--	--	--	--	--	--	--	--		
June 19	1510	57		2800	280	2120	18	22	30	38	48	68	79	94	99	100		VBWC
June 24	1445	--		1550	430	1800	--	--	--	--	--	--	--	--	--	--		
June 26	1620	65		2420	521	3400	--	--	--	--	--	--	--	--	--	--		
June 29	2010	61		3450	376	3500	9	11	18	23	32	58	75	93	98	100		VBWC
June 30	1640	63		3270	268	2370	--	--	--	--	--	--	--	--	--	--		
July 3	1400	--		2290	146	903	--	--	--	--	--	--	--	--	--	--		
July 7	1610	63		1500	108	437	--	--	--	--	--	--	--	--	--	--		
July 9	1630	71		1170	111	351	--	--	--	--	--	--	--	--	--	--		
July 14	1450	71		987	98	261	--	--	--	--	--	--	--	--	--	--		
July 22	1440	76		388	42	44	--	--	--	--	--	--	--	--	--	--		
Aug. 5	1600	75		133	90	32	--	--	--	--	--	--	--	--	--	--		
Sept. 10	1445	65		78	91	19	--	--	--	--	--	--	--	--	--	--		

E Estimated.

YELLOWSTONE RIVER BASIN--Continued

6-2390. MUSKRAT CREEK NEAR SHOSHONI, WYO.

LOCATION.--At gaging station on right bank, 2 miles upstream from mouth and 7 miles southwest of Shoshoni, Fremont County.
DRAINAGE AREA.--733 square miles.
RECORDS AVAILABLE.--Sediment records: June 1950 to September 1958, October 1959 to September 1964.
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, 65,000 ppm June 22; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 50,000 tons June 22; minimum daily, 0 tons on many days.
EXTREMES, 1950-58, 1959-64.--Sediment concentrations: Maximum daily, not determined; minimum daily, no flow on many days each year.
Sediment loads: Maximum daily, 851,000 tons Feb. 10, 1962; minimum daily, 0 tons on many days each year.

Monthly and annual summary of water and suspended-sediment discharge, water year October 1963 to September 1964

Month	Discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum observed
October 1963	0	0	0	0	0	0		--
November	0	0	0	0	0	0		--
December	0	0	0	0	0	0		--
January 1964	0	0	0	0	0	0		--
February	0	0	0	0	0	0		--
March	0	0	0	0	0	0		--
April	56	111	4550	152	E 1700	0		40600
May	46	91	4110	132	1700	0		33400
June	386	766	79730	2660	50000	0		117000
July	0	0	0	0	0	0		--
August	0	0	0	0	0	0		--
September	0	0	0	0	0	0		--
Water year	466	968	88380	241	50000	0		117000

E Estimated.

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964

Date of collection	Time (24 hour)	Water temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							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	
Apr. 29, 1964	1245	68		8.0	40800	914		86		97		98	96	99	99	100		VPWC
June 22	1655	68		230	49300	31700		60		76		95	98	100				VPWC

YELLOWSTONE RIVER BASIN--Continued

6-2445. FIVEMILE CREEK ABOVE WYOMING CANAL, NEAR PAVILLION, WYO.

LOCATION.--At gaging station, on right bank 1,400 feet upstream from Wyoming Canal siphon and 4 miles north of Pavillion, Fremont County.
DRAINAGE AREA.--118 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to November 1951.
Water temperatures: October 1950 to September 1951, April to September 1961.
Sediment records: October 1949 to September 1958, April 1961 to September 1964.
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, 13,000 ppm May 28; minimum daily, no flow on many days during August and September.
Sediment loads: Maximum daily, 930 tons May 28; minimum daily, 0 tons on many days during August and September.
EXTREMES, 1949-58, 1961-64.--Sediment concentrations: Maximum daily, 77,400 ppm Sept. 20, 1950; minimum daily, no flow on many days each year.
Sediment loads: Maximum daily, 123,000 tons Sept. 20, 1950; minimum daily, 0 tons on many days each year.
REMARKS.--Flow affected by ice Nov. 29 to Mar. 29.

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	1.0	--	1	4.3		2	1		1
2	1.1	--	1	4.4		2	1		1
3	1.2	--	1	4.2		2	1		1
4	1.4	--	1	4.2		2	1		1
5	1.2	--	1	3.9		2	1		1
6	1.4	--	1	3.8		2	.9		1
7	1.4	--	1	3.6		2	.8		1
8	1.6	--	1	3.2		2	.7		T
9	1.6	--	1	2.6		1	.6		T
10	1.2	--	1	2.8		2	.5		T
11	1.2	--	1	2.7		2	.5		T
12	1.2	--	1	3.1		2	.5		T
13	2.2	--	1	3.9		2	.5		T
14	1.7	--	1	3.6	130	1	.5		T
15	1.7	--	1	4.1		2	.5		T
16	1.7	--	1	4.6		2	.5	580	1
17	1.9	--	1	3.6		2	.5		T
18	1.9	--	1	2.8		2	.5		T
19	1.7	--	1	3.3		2	.5		T
20	2.1	--	1	2.5		1	.5		T
21	2.1	--	1	4.2		2	.5		T
22	2.1	210	1	4.5		2	.5		T
23	2.3	--	1	5.4		3	.5		T
24	2.3	--	1	5.1		3	.6		T
25	2.1	--	1	2.8		2	.7		T
26	2.3	--	1	3.0		2	.8		1
27	2.1	--	1	3.3		2	.9		1
28	2.0	--	1	2.2		1	1		1
29	2.5	220	1	2.0		1	1		1
30	4.8	--	2	1.5		1	1		1
31	4.2	--	2	--		--	1		1
Total	59.2	--	33	105.2	--	56	22.0	--	21

T Less than 0.50 ton.

YELLOWSTONE RIVER BASIN--Continued

6-2445. FIVEMILE CREEK ABOVE WYOMING CANAL, NEAR PAVILLION, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	1	--	1	0.1	--	T	1.5		1
2	1	--	1	.1	--	T	1.0		1
3	1	--	1	.1	--	T	.8		1
4	1	--	1	.1	--	T	.6		T
5	1	--	1	.1	340	T	.6		T
6	1	--	1	.1	--	T	.6		T
7	1	--	1	.1	--	T	.6		T
8	1	--	1	.1	--	T	.6		T
9	1	--	1	.1	--	T	.6		T
10	1	170	T	.1	440	T	.6		T
11	.6	--	T	.1	--	T	.6		T
12	.3	--	T	.1	--	T	.6		T
13	.1	--	T	.2	--	T	.5		T
14	.1	--	T	.3	--	T	.5		T
15	.1	--	T	.4	--	T	.5		T
16	.1	--	T	.5	--	T	.6		T
17	.1	--	T	.6	--	T	.8		1
18	.1	--	T	.7	--	T	1.0		1
19	.1	--	T	.8	--	1	1.5		1
20	.1	--	T	.9	--	1	2.0		1
21	.3	--	T	1.0	--	1	2.5		1
22	.5	270	T	1.5	--	1	3.0		2
23	.3	--	T	2	--	1	3.5		2
24	.2	--	T	2	--	1	3.5		2
25	.1	--	T	2	--	1	3.5		2
26	.1	--	T	2	--	1	3.5		2
27	.1	--	T	2	--	1	3.5		2
28	.1	--	T	2	--	1	3.5		2
29	.1	--	T	2	--	1	3.5		2
30	.1	--	T	--	--	--	3.8		2
31	.1	--	T	--	--	--	6.6		3
Total	13.7	--	12	22.1	--	14	56.5	--	34

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1	7.8	--	4	4.2	760	9	3.6	980	10
2	4.2	--	2	4.2	--	10	2.8	610	5
3	3.1	--	2	3.0	--	8	3.0	850	7
4	3.6	--	2	2.7	970	S 8	2.5	630	4
5	5.4	--	3	3.0	--	8	1.9	410	2
6	3.0	--	2	3.0	1400	11	1.4	290	1
7	3.7	--	2	2.5	1100	7	3.6	1500	S 22
8	5.7	--	40	2.5	790	5	3.3	1600	S 15
9	9.9	2300	S 70	2.1	--	4	3.2	1300	S 13
10	14	--	130	1.7	580	3	3.0	1000	S 9
11	8.1	--	60	2.4	800	5	2.1	630	4
12	5.6	--	40	2.1	690	4	2.1	500	3
13	3.0	--	10	1.9	480	2	1.9	310	2
14	4.2	--	20	1.4	--	2	1.9	280	1
15	4.8	--	30	1.1	370	1	1.7	290	1
16	4.5	--	20	1.1	320	1	1.4	--	1
17	3.1	--	10	1.1	300	1	1.6	230	1
18	3.3	--	10	1.0	460	1	1.4	260	1
19	3.3	--	10	1.0	340	1	1.1	--	1
20	7.2	--	50	1.0	300	1	1.0	--	1
21	7.0	--	50	1.0	290	1	2.1	--	2
22	4.5	940	11	1.0	410	1	6.0	3000	S 52
23	3.9	830	9	.8	400	1	4.6	--	10
24	4.5	850	10	.9	370	1	2.8	--	4
25	6.0	--	40	.9	220	1	1.6	360	2
26	4.8	--	30	1.0	220	1	.7	250	T
27	3.9	--	10	4.6	3400	S 200	.5	70	T
28	3.9	1200	13	25	13000	S 930	.4	70	T
29	4.2	--	20	15	2800	110	.2	100	T
30	3.9	--	10	8.5	1500	34	.1	80	T
31	--	--	--	4.8	1000	13	--	--	--
Total	154.1	--	720	106.5	--	1385	63.5	--	175

S Computed by subdividing day.
T Less than 0.50 ton.

YELLOWSTONE RIVER BASIN--Continued

6-2445. FIVEMILE CREEK ABOVE WYOMING CANAL, NEAR PAVILLION, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0.1	C 41	T						
2	.1	C 41	T						
3	.1	C 41	T						
4	.1	C 41	T						
5	.1	C 41	T						
6	.1	C 41	T						
7	.1	C 41	T						
8	.1	C 41	T						
9	.1	C 41	T						
10	.1	C 41	T						
11	.1	C 41	T						
12	.1	C 41	T						
13	.1	C 41	T						
14	.1	C 41	T						
15	.1	C 41	T						
16	.1	C 41	T						
17	.1	C 41	T						
18	.1	C 41	T						
19	.1	C 41	T						
20	.1	C 41	T						
21	.1	C 41	T						
22	.1	C 41	T						
23	.1	C 41	T						
24	.1	C 41	T						
25	.1	C 41	T						
26	.1	C 41	T						
27	.1	C 41	T						
28	.1	C 41	T						
29	.1	C 41	T						
30	.1	C 41	T						
31	.1	C 41	T						
Total	3.1	--	T	0		0	0		0

Total discharge for year (cfs-days)..... 605.9
Total load for year (tons)..... 2450

T Less than 0.50 ton.
C Composite period.

YELLOWSTONE RIVER BASIN--Continued

6-2500. FIVEMILE CREEK NEAR RIVERTON, WYO.

LOCATION.--At gaging station, on right bank 3 miles downstream from Ocean drain, 12.5 miles north of Riverton, Fremont County, and 13 miles upstream from mouth.
DRAINAGE AREA.--356 square miles, of which 132 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: September 1950 to November 1951.
Water temperatures: October 1950 to September 1951, October 1952 to September 1958, October 1959 to September 1964.
Sediment records: October 1949 to September 1958, October 1959 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 79°F July 19, 21, 31; minimum, freezing point on many days during December to March.
Sediment concentrations: Maximum daily, 14,000 ppm Apr. 18; minimum daily, 190 ppm Dec. 13, 14.
Sediment loads: Maximum daily, 5,900 tons May 28; minimum daily, 16 tons Jan. 15.
EXTREMES, 1949-58, 1959-64.--Water temperatures: Maximum (1959-64), 79°F July 25, 1963, July 19, 21, 31, 1964; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 89,500 ppm Sept. 20, 1950; minimum daily (1959-64), 120 ppm Dec. 17, 1961.
Sediment loads: Maximum daily, 199,000 tons Sept. 20, 1950; minimum daily (1959-64), 2 tons on several days in 1960-61.
REMARKS.--Flow affected by ice Dec. 12 to Feb. 15, Feb. 17, 27.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	64	62	62	62	61	61	62	62	60	60	60	59	59	59	58	58	57	57	54	51	55	57	54	52	54	50	48	47	50	47	47	56
November	45	46	45	47	45	45	44	44	46	46	44	41	42	45	45	41	38	38	37	38	36	36	37	39	37	37	38	35	34	33	--	41
December	33	33	32	33	34	36	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	32	34	32	33	33	32
February	32	32	32	32	32	32	32	32	33	33	32	32	32	32	32	35	32	32	32	32	33	32	36	32	32	32	33	35	36	--	--	33
March	36	36	39	39	37	40	33	37	38	39	40	43	35	41	41	43	41	41	37	32	44	34	32	32	36	37	37	41	46	50	49	39
April	46	38	41	44	45	39	49	52	55	55	52	45	45	52	58	57	48	45	50	49	48	55	57	52	38	50	54	62	62	64	--	50
May	59	47	45	53	48	56	55	53	60	59	53	61	61	65	65	68	64	67	69	68	66	68	58	63	62	53	62	57	55	52	58	59
June	54	64	57	57	65	70	66	57	55	65	60	66	68	71	67	63	59	53	62	66	57	63	69	74	72	72	69	70	71	74	--	65
July	72	77	74	73	76	76	78	75	73	71	74	77	70	72	72	77	78	76	79	75	79	77	76	78	78	76	78	75	75	77	79	76
August	76	78	77	78	72	74	75	75	75	67	68	72	73	72	72	70	73	75	59	58	62	63	68	63	67	64	65	59	58	64	67	69
September	66	60	62	65	66	62	67	65	65	62	63	61	60	64	65	66	64	59	58	59	58	61	59	61	57	48	56	56	58	56	--	61

YELLOWSTONE RIVER BASIN--Continued

6-2500. FIVEMILE CREEK NEAR RIVERTON, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	159	1400	600	60	580	94	50	550	74
2	152	1500	620	59	590	94	47	540	69
3	152	1400	570	58	550	86	49	560	74
4	158	1600	680	56	540	82	51	560	77
5	151	1600	650	56	550	83	42	540	61
6	146	1400	550	59	680	110	49	600	79
7	156	1700	720	66	1000	180	44	610	72
8	152	1800	740	67	830	150	41	410	45
9	152	1800	740	61	750	120	43	300	35
10	162	1400	610	60	820	130	44	410	49
11	162	1600	700	73	1400	280	42	230	26
12	165	1300	580	72	1100	210	42	220	25
13	170	1400	640	84	2300	520	42	190	22
14	165	1300	580	74	950	190	42	190	22
15	162	1400	610	59	920	150	42	240	27
16	149	1400	560	63	920	160	42	230	26
17	118	1400	450	56	700	110	42	220	25
18	111	1200	360	52	590	83	42	250	28
19	96	820	210	52	590	83	42	290	33
20	80	830	180	55	650	97	42	370	42
21	76	780	160	52	600	84	41	390	43
22	74	790	160	52	530	74	41	300	33
23	74	690	140	53	490	70	40	310	33
24	72	650	130	53	600	86	40	330	36
25	71	640	120	52	650	91	39	310	33
26	69	630	120	51	580	80	39	360	38
27	67	550	99	52	600	84	39	400	42
28	65	550	97	50	650	88	39	290	31
29	66	550	98	49	590	78	39	370	39
30	67	690	120	48	580	75	39	350	37
31	64	630	110	--	--	--	39	400	42
Total	3683	--	12704	1754	--	3822	1315	--	1318

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	39	410	43	25	780	53	30	830 S	78
2	39	460	48	25	940	63	28	750	57
3	39	380	40	23	730	45	29	880	69
4	39	310	33	23	790	49	29	930	73
5	39	330	35	25	610	41	28	790	60
6	39	380	40	28	670	51	25	890	60
7	39	410	43	30	590	48	27	1200	87
8	41	390	43	31	630	53	26	1000 S	75
9	41	290	32	32	880	76	27	780 S	60
10	37	330	33	32	800	69	27	760	55
11	34	370	34	32	810	70	27	1200 S	93
12	30	250	20	32	990	86	29	1200	94
13	28	290	22	32	730	63	27	1000 S	77
14	25	260	18	32	1200	100	26	850 S	65
15	25	240	16	30	1000	81	28	970 S	77
16	25	320	22	29	800	63	29	1200	94
17	25	370	25	28	750	57	32	1200 S	120
18	25	350	24	27	880 S	70	36	1500	150
19	27	360	26	26	770	54	34	1300	120
20	30	400	32	29	900 S	94	31	1200	100
21	30	490	40	30	550	45	33	980 S	93
22	30	490	40	29	570	45	32	1200	100
23	28	660	50	29	820	64	26	1200	84
24	25	790	53	29	680	53	25	880 S	63
25	25	1100	74	29	850 S	73	28	880 S	75
26	25	990	67	26	660 S	53	28	1000 S	84
27	25	800	54	25	730	49	27	1100 S	86
28	25	810	55	27	920 S	74	28	920 S	75
29	25	750	51	28	760 S	60	32	1300 S	120
30	25	900	61	--	--	--	35	1100 S	110
31	25	790	53	--	--	--	37	2100 S	230
Total	954	--	1227	823	--	1802	906	--	2784

S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2500. FIVEMILE CREEK NEAR RIVERTON, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	41	3300	370	72	3600	700	149	3300	1300
2	39	2700	280	75	3500	710	145	2800	1100
3	35	2000	190	82	3500	770	144	2700	1000
4	35	2200	210	88	3800	900	152	3200	1300
5	37	2600	260	104	5100	1400	144	2700	1000
6	34	2200	200	120	7100	2300	141	2400	910
7	29	1400 S	120	98	3700	980	163	3200	1400
8	32	2100	180	80	3100	670	163	2800	1200
9	34	2300	210	75	2800	570	159	3000	1300
10	34	2400	220	76	2500	510	190	3200	1600
11	34	2400	220	82	2800	620	172	3100	1400
12	32	2000	170	83	2400	540	156	2800	1200
13	29	1700	130	86	3100	720	152	3000	1200
14	27	2000	150	82	2600	580	159	3000	1300
15	34	2500 S	250	77	2200	460	158	3000	1300
16	37	4400 S	520	83	2400	540	137	2700	1000
17	55	6100	910	96	2500	650	135	2900	1100
18	99	14000	4100	91	2500	610	139	2800	1000
19	106	12000	3400	97	2800	730	134	2500	900
20	99	10000	2700	90	2400	580	134	2300	830
21	106	8800	2500	99	3000	800	130	2200	770
22	90	6300	1500	96	2700	700	194	3400	1800
23	74	4500	900	103	3100	860	169	2500	1100
24	73	3900	770	131	4000	1400	174	2300	1100
25	104	6200 S	1900	137	3600	1300	162	2300	1000
26	98	5700	1500	149	3700	1500	162	2200	960
27	71	3600	690	158	3800	1600	152	1600	660
28	50	2500	340	211	9900 S	5900	142	1600	610
29	59	3500	560	187	5700	2900	137	1700	630
30	75	3900	790	188	4500	2300	142	1900	730
31	--	--	--	148	3500	1400	--	--	--
Total	1702	--	26240	3344	--	36200	4590	--	32700
	JULY			AUGUST			SEPTEMBER		
1	148	1700	680	200	1700	920	181	1600	780
2	145	1800	700	199	1600	860	170	1300	600
3	135	1600	580	206	1900	1100	159	1100	470
4	138	1600	600	204	1700	940	156	1500	630
5	145	1500	590	202	1500	820	163	1800	790
6	139	1500	560	196	1500	790	159	1700	730
7	153	1600	660	199	1900	1000	156	1500	630
8	157	1300	550	202	2200	1200	163	1400	620
9	151	1400	570	187	2100	1100	165	1700	760
10	151	1400	570	184	1900	940	166	1500	670
11	162	1800	790	184	2100	1000	175	1500	710
12	170	1900	870	198	2100	1100	186	1700	850
13	187	2200	1100	198	2200	1200	190	1400	720
14	188	1900	960	221	2200	1300	187	1600	810
15	210	2200	1200	217	2300	1300	172	1400	650
16	210	2300	1300	216	1900	1100	158	1300	550
17	199	2000	1100	219	1800	1100	158	1200	510
18	193	1900	990	210	1700	960	160	1200	520
19	192	2300	1200	200	1600	860	165	1200	530
20	193	2500	1300	187	1700	860	178	1200	580
21	172	2200	1000	193	1500	780	186	1200	600
22	162	2200	960	196	1500	790	182	1100	540
23	162	1800	790	199	1500	810	180	1300	630
24	166	1600	720	200	1400	760	188	1100	560
25	176	1500	710	211	1500	850	181	1100	540
26	190	2000	1000	208	1400	790	176	950	450
27	196	1900	1000	199	1100	590	190	1000	510
28	186	1700	850	200	1200	650	190	1000	510
29	205	1800	1000	196	1500	790	187	1000	500
30	188	1700	860	186	1600	800	174	1000	470
31	199	1600	860	193	1600	830	--	--	--
Total	5362	--	26620	6210	--	28890	5201	--	18420

Total discharge for year (cfs-days)..... 35844
Total load for year (tons)..... 192727

S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2500. FIVEMILE CREEK NEAR RIVERTON, WYO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 16, 1963.....	1330	56		146	1320	520	17	17	21	26	32	45	58	78	96	100	--	VBWC
Oct. 28.....	1330	46		65	582	102	24	27	35	43	49	59	64	78	93	99	100	VBWC
Nov. 13.....	1010	37		92	2930	728	--	35	--	55	--	78	86	93	97	100	--	VPWC
Apr. 17, 1964.....	1515	51		57	5760	886	--	37	--	58	--	88	94	97	99	100	--	VPWC
Apr. 20.....	1035	44		99	9660	2580	--	16	--	47	--	77	93	98	99	100	--	VPWC
May 15.....	1535	68		75	2080	421	--	23	--	34	--	52	69	86	96	100	--	VPWC
May 27.....	1130	56		166	3840	1720	--	21	--	32	--	55	73	90	97	99	100	VPWC
May 28.....	1115	54		245	13200	8730	--	39	--	61	--	84	93	98	99	100	--	VPWC
June 3.....	0945	55		148	2920	1170	--	18	--	27	--	42	60	81	92	99	100	VPWC
June 12.....	0850	52		166	2680	1200	--	19	--	28	--	45	62	83	93	97	100	VPWC
July 16.....	1430	76		208	2400	1350	--	26	--	41	--	64	80	90	97	99	100	VPWC
Aug. 6.....	1450	75		199	1860	999	--	19	--	34	--	56	69	84	95	97	100	VPWC

YELLOWSTONE RIVER BASIN--Continued

6-2530. FIVEMILE CREEK NEAR SHOSHONI, WYO.

LOCATION.--At gaging station, on right bank 1.2 miles upstream from normal high waterline of Boysen Reservoir at elevation 4,725 feet and 5 miles west of Shoshoni, Fremont County.
DRAINAGE AREA.--418 square miles, of which 133 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: September 1949 to November 1951.
Water temperatures: December 1948 to September 1964.
Sediment records: August 1948 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 78°F July 19; minimum, freezing point on many days during December to March.
Sediment concentrations: Maximum daily, 7,300 ppm Apr. 18; minimum daily, 210 ppm Dec. 9, 10.
Sediment loads: Maximum daily, 5,200 tons May 28; minimum daily, 26 tons Feb. 5.
EXTREMES, 1948-64.--Water temperatures: Maximum (1948-58, 1959-64), 84°F June 10, 1949; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 136,000 ppm June 12, 1949; minimum daily, 10 ppm Jan. 31, 1951.
Sediment loads: Maximum daily, 350,000 (estimated) tons Sept. 19, 1948; minimum daily, less than 0.50 ton Jan. 31, 1951.
REMARKS.--Flow affected by ice Dec. 11 to Mar. 6, Mar. 21-26.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	60	60	60	60	59	61	54	59	58	58	59	57	56	54	59	58	58	55	53	55	49	54	48	50	53	50	47	43	45	44	48	54
November	44	45	46	44	46	43	40	45	49	45	46	44	44	40	46	40	35	39	40	40	37	37	39	35	34	36	40	33	33	--	--	41
December	38	33	34	33	34	35	34	--	34	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33
January	33	32	33	32	32	33	32	32	33	33	32	32	32	33	33	32	32	32	32	32	34	32	34	34	34	32	33	32	34	35	32	33
February	32	32	33	33	33	33	33	33	34	33	32	33	33	32	32	32	32	33	32	34	32	33	32	32	32	32	33	32	32	--	--	33
March	33	34	34	35	34	39	35	--	37	39	39	42	39	39	39	45	41	42	43	44	45	36	--	--	32	41	34	--	--	53	51	39
April	51	40	42	43	51	39	46	37	48	50	51	47	37	52	47	52	46	44	49	49	51	50	58	60	36	50	53	58	68	61	--	49
May	62	54	45	54	49	52	56	55	63	58	55	59	60	66	66	66	65	67	69	70	67	61	63	57	60	54	65	58	53	54	58	59
June	55	66	57	67	65	70	63	59	56	62	62	67	68	70	69	66	61	65	62	67	60	64	69	72	73	73	71	67	70	75	--	66
July	73	75	74	77	74	74	76	77	73	67	74	68	70	73	76	75	76	75	78	75	73	74	72	--	75	77	77	74	68	75	76	74
August	75	75	77	75	72	70	--	--	--	--	--	65	70	64	71	71	73	63	61	60	61	67	68	63	64	64	64	56	--	61	65	67
September	66	64	--	56	64	64	63	62	62	62	60	62	64	63	63	63	64	63	58	57	53	54	58	60	58	46	55	57	60	55	--	60

YELLOWSTONE RIVER BASIN--Continued

6-2530. FIVEMILE CREEK NEAR SHOSHONI, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	254	1300	890	104	390	110	81	400	87
2	245	1400	930	104	410	120	78	390	82
3	248	1200	800	106	430	120	78	340	72
4	257	1400	970	102	420	120	77	400	83
5	254	1400	960	101	350	95	80	420	91
6	242	1200	780	101	450	120	84	380	86
7	245	1200	790	110	530	160	77	290	60
8	248	1200	800	110	520	150	66	270	48
9	248	1200	800	104	500	140	70	210	40
10	275	1500	1100	101	390	110	70	210	40
11	281	1400	1100	113	990	300	70	C 300	57
12	300	1500	1200	115	510	160	70	C 300	57
13	313	1500	1300	123	1200	400	70	C 300	57
14	316	1500	1300	108	670	200	70	C 300	57
15	313	1500	1300	99	440	120	70	C 300	57
16	303	1500	1200	104	410	120	70	C 300	57
17	222	1300	780	94	300	76	70	C 300	57
18	184	1100	550	89	270	65	70	C 300	57
19	164	860	380	89	220	53	70	C 300	57
20	132	620	220	87	260	61	70	C 300	57
21	121	820	270	87	270	63	70	C 300	57
22	117	1000	320	84	260	59	68	C 300	55
23	115	560	170	83	270	60	66	C 300	53
24	111	460	140	86	280	65	64	C 300	52
25	110	470	140	84	330	75	62	C 300	50
26	108	350	100	83	320	72	60	C 300	49
27	104	350	98	83	300	67	60	C 300	49
28	104	350	98	81	330	72	60	C 300	49
29	108	390	110	80	310	67	60	C 300	49
30	111	460	140	78	--	64	60	C 300	49
31	108	430	130	--	--	--	60	C 300	49
Total	6261	--	19866	2893	--	3464	2151	--	1820
	JANUARY			FEBRUARY			MARCH		
1	62	C 290	49	45	--	64	50	310	42
2	62	C 290	49	44	--	58	50	540	73
3	62	C 290	49	42	480	54	45	830	100
4	60	C 290	48	40	360	39	45	1700	210
5	58	C 290	45	40	240	26	47	860	110
6	56	C 290	44	40	280	30	50	1000	130
7	54	C 290	42	40	330	36	46	1100	140
8	50	C 290	39	41	310	34	43	--	100
9	48	C 290	38	42	410	46	44	870	100
10	46	C 290	36	44	480	57	45	630	77
11	44	C 290	34	45	470	57	42	600	68
12	42	C 290	33	46	490	61	45	640	78
13	40	C 290	31	48	500	65	43	710	82
14	40	C 290	31	49	530	70	42	740	84
15	40	C 290	31	50	390	53	44	730	87
16	40	C 290	31	51	--	54	45	760	92
17	40	C 290	31	52	390	55	48	960	120
18	45	C 550	67	53	410	59	48	600	78
19	48	C 550	71	54	--	54	44	710	84
20	50	C 550	74	55	320	48	33	780	69
21	50	C 550	74	56	480	73	37	720	72
22	48	C 550	71	58	680	110	40	640	69
23	46	C 550	68	58	--	90	38	--	65
24	45	C 550	67	58	450	70	30	--	55
25	45	C 550	67	54	520	76	35	720	68
26	45	C 550	67	45	--	40	40	800	86
27	45	C 550	67	45	250	30	45	570	69
28	45	C 550	67	46	260	32	40	--	60
29	45	C 550	67	46	--	32	46	--	70
30	45	C 550	67	--	--	--	48	750	97
31	45	C 550	67	--	--	--	53	960	140
Total	1491	--	1622	1387	--	1573	1351	--	2775

C Composite period.

YELLOWSTONE RIVER BASIN--Continued

6-2530. FIVEMILE CREEK NEAR SHOSHONI, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	59	1100	180	182	2100	1000	306	2300	1900
2	60	1400	230	169	2100	960	319	2100	1800
3	53	1100	160	169	2000	910	322	2600	2300
4	54	980	140	169	2500	1100	332	2500	2200
5	54	910	130	179	2600	1300	326	2100	1800
6	54	1500	220	187	2400	1200	313	2100	1800
7	45	760	92	159	2500	1100	345	3000	2800
8	48	1300	170	134	1600	580	332	2100	1900
9	52	1300	180	136	1500	550	329	1900	1700
10	54	1500	220	145	1600	630	342	2300	2100
11	53	1300	190	162	1600	700	313	2300	1900
12	53	1200	170	164	1600	710	294	2000	1600
13	47	890	110	179	1800	870	291	1800	1400
14	45	1100	130	172	1700	790	297	1800	1400
15	48	1300	170	152	1500	620	300	1600	1300
16	77	4200 S	1200	162	1600	700	288	1400	1100
17	179	4800	2300	195	1700	900	291	1300	1000
18	192	7300	3800	179	1700	820	291	1500	1200
19	211	7100	4000	206	2000	1100	300	1400	1100
20	206	6500	3600	208	1700	950	306	1200	990
21	203	6100	3300	225	1900	1200	313	1300	1100
22	206	4400	2400	225	1800	1100	443	3700	4400
23	184	3000	1500	233	1900	1200	372	2300	2300
24	174	2500	1200	254	2300	1600	382	1900	2000
25	222	2400	1400	260	2200	1500	352	1600	1500
26	214	3100	1800	278	2100	1600	342	1400	1300
27	126	2600	880	294	2700	2100	322	1700	1500
28	87	--	800	326	5900	5200	313	1500	1300
29	102	4400 S	1100	326	4300	3800	313	1300	1100
30	211	2700	1500	358	4100	4000	306	1300	1100
31	--	--	--	300	2400	1900	--	--	--
Total	3373	--	33272	6487	--	42690	9695	--	50890

Day	JULY			AUGUST			SEPTEMBER		
1	310	1400	1200	362	1200	1200	352	1100	1000
2	303	1100	900	372	1100	1100	335	1200	1100
3	291	1200	940	390	940	990	319	1000	860
4	303	1100	900	393	660	700	306	1100	910
5	313	1100	930	393	900	950	316	950	810
6	303	1100	900	382	1200	1200	306	900	740
7	297	1100	880	382	1400	1400	310	900	750
8	294	790	630	390	1100	1200	313	1000	850
9	297	690	550	382	1100	1100	316	1100	940
10	300	920	750	379	1200	1200	322	1000	870
11	319	1100	950	376	1200	1200	329	1000	890
12	322	1300	1100	382	1500	1500	335	920	830
13	339	1500	1400	390	1300	1400	339	950	870
14	352	1800	1700	386	1300	1400	339	1000	920
15	376	1800	1800	400	1200	1300	326	940	830
16	382	1800	1900	393	1100	1200	310	1000	840
17	379	1700	1700	386	1000	1000	306	700	580
18	372	1500	1500	372	1200	1200.	300	820	660
19	376	1500	1500	355	1100	1100	294	800	640
20	365	1800	1800	339	1000	920	306	700	580
21	342	1600	1500	342	920	850	313	880	740
22	329	1400	1200	339	1000	920	316	780	670
23	326	1400	1200	345	850	790	306	800	660
24	339	1400	1300	352	950	900	329	760	680
25	345	1200	1100	358	1100	1100	329	900	800
26	352	1300	1200	358	1100	1100	319	720	620
27	358	1400	1400	355	1000	960	329	820	730
28	332	1100	990	365	1100	1100	345	1000	930
29	348	1400	1300	365	--	1000	358	660	640
30	342	1200	1100	365	1000	990	342	700	650
31	348	1100	1000	362	850	830	--	--	--
Total	10354	--	37220	11510	--	33800	9665	--	23590

Total discharge for year (cfs-days)..... 66618
Total load for year (tons)..... 252582

S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2530. FIVEMILE CREEK NEAR SHOSHONI, WYO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(*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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 28, 1963.....	1045	40		104	466	131	28	33	36	44	50	62	67	79	98	100	--	VBWC
Nov. 13.....	1115	37		141	1620	617	23	26	35	49	55	76	80	88	99	100	--	VBWC
Apr. 17, 1964.....	0925	38		184	4660	2320	--	26	--	43	--	75	84	95	99	100	--	VPWC
Apr. 20.....	1235	48		219	5920	3500	--	26	--	39	--	70	83	93	98	100	--	VPWC
Apr. 29.....	1635	64		157	4920	2090	--	18	--	33	--	77	88	94	99	100	--	VPWC
May 15.....	1020	57		154	1710	711	--	19	--	29	--	45	61	79	93	99	100	VPWC
May 27.....	1250	59		306	3190	2640	--	20	--	31	--	53	69	85	97	100	--	VPWC
May 30.....	0810	49		372	4490	4510	--	22	--	33	--	55	73	90	98	100	--	VPWC
June 5.....	1440	62		326	2490	2190	--	18	--	28	--	43	60	86	95	100	--	VPWC
June 19.....	1120	56		303	2110	1730	--	14	--	23	--	39	52	72	89	98	100	VPWC
June 22.....	1100	54		503	4420	6000	--	27	--	43	--	65	80	92	98	99	100	VPWC
July 23.....	1000	68		352	1690	1610	--	19	--	30	--	50	62	79	93	98	100	VPWC
Aug. 6.....	1100	66		404	1500	1640	--	16	--	25	--	44	58	78	97	100	--	VPWC

YELLOWSTONE RIVER BASIN--Continued

6-2570. BADWATER CREEK AT BONNEVILLE, WYO.

LOCATION.--At gaging station, on right bank 0.4 mile west of Bonneville, Fremont County, and 3 miles upstream from normal high waterline of Boysen Reservoir at elevation 4,725 feet.
DRAINAGE AREA.--808 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1963 to September 1964.
Sediment records: October 1947 to February 1954, August 1954 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 92°F July 17; minimum, freezing point on several days during March.
Sediment concentrations: Maximum daily, 44,000 ppm June 22; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 100,000 tons June 22; minimum daily, 0 tons on many days.
EXTREMES, 1947-64.--Sediment concentrations: Maximum daily, 108,000 ppm July 11, 1949; minimum daily, no flow on many days each year.
Sediment loads: Maximum daily, 290,000 tons June 15, 1963; minimum daily, 0 tons on many days each year.
REMARKS.--Flow affected by ice Mar. 10-14, 23-29. No flow October 1 to March.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--
December	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--	32	33	32	--	--	39	45	36	39	45	38	33	32	32	33	32	32	--	--	59	56	--
April	53	37	43	52	--	39	52	58	53	54	39	--	41	45	49	45	45	37	49	57	53	57	54	55	--	56	63	64	66	64	--	51
May	61	59	43	52	51	55	58	59	72	--	56	62	60	71	65	71	71	72	70	67	65	68	66	59	63	57	71	59	55	47	55	61
June	59	78	56	71	78	78	65	62	60	69	60	76	--	69	76	69	62	67	61	64	65	57	70	57	81	79	71	66	82	80	--	69
July	84	88	85	83	--	--	88	90	77	82	88	88	72	83	86	85	92	73	--	72	73	88	81	90	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

YELLOWSTONE RIVER BASIN--Continued

6-2570. BADWATER CREEK AT BONNEVILLE, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0	--	0						
2	0	--	0						
3	0	--	0						
4	0	--	0						
5	0	--	0						
6	0	--	0						
7	0	--	0						
8	0	--	0						
9	0	--	0						
10	0	--	0						
11	0	--	0						
12	0	--	0						
13	0	--	0						
14	.1	3100 S	5						
15	0	--	0						
16	0	--	0						
17	0	--	0						
18	0	--	0						
19	0	--	0						
20	0	--	0						
21	0	--	0						
22	0	--	0						
23	0	--	0						
24	0	--	0						
25	0	--	0						
26	0	--	0						
27	0	--	0						
28	0	--	0						
29	0	--	0						
30	.5	--	10						
31	0	--	0						
Total	0.6	--	15	0		0	0		0

Day	JANUARY			FEBRUARY			MARCH		
1							0	--	0
2							0	--	0
3							0	--	0
4							0	--	0
5							0	--	0
6							0	--	0
7							0	--	0
8							0	--	0
9							0	--	0
10							.2	--	1
11							1	--	1
12							3	--	3
13							5	600	8
14							7	--	30
15							9.7	--	100
16							9.2	2400 S	130
17							11	3100 S	180
18							52	6500 S	1500
19							48	3800	490
20							29	5400 S	540
21							35	4600 S	480
22							46	4600	570
23							20	--	100
24							8	--	30
25							5	--	5
26							6	600	10
27							7	720	14
28							8	--	20
29							10	--	60
30							14	3600 S	180
31							16	7000 S	450
Total	0		0	0		0	350.1	--	4902

S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2570. BADWATER CREEK AT BONNEVILLE, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	29	8500	S 810	124	14000	4700	120	7700	2500
2	30	9200	750	129	14000	4900	116	6100	1900
3	21	5000	280	160	14000	6000	106	5600	1600
4	20	3200	170	165	14000	6200	120	6400	2100
5	20	6200	S 400	129	13000	4500	116	6400	2000
6	18	6100	300	116	9800	3100	120	5100	1700
7	17	4100	S 200	120	8700	2800	152	13000	S 6200
8	19	4800	S 270	106	9500	2700	142	8400	3200
9	17	5800	S 310	92	6300	1600	177	11000	5300
10	20	7000	380	96	--	1500	145	10000	S 4200
11	19	7200	370	92	5700	1400	156	6200	2600
12	17	--	250	92	7000	1700	165	5200	2300
13	12	5000	S 170	99	6900	1800	156	--	1600
14	13	6200	S 240	120	9000	2900	177	12000	S 7100
15	17	4800	220	184	14000	7000	134	9600	3500
16	18	6700	330	262	18000	13000	116	6100	1900
17	22	8600	510	284	20000	15000	106	5400	1500
18	25	9700	650	326	20000	18000	119	11000	3500
19	31	6400	540	317	19000	16000	116	8600	2700
20	32	6500	560	342	19000	18000	106	5800	1700
21	31	5400	450	334	18000	16000	113	4600	1400
22	37	5600	560	315	19000	16000	701	44000	S 100000
23	32	4000	350	240	19000	S 13000	491	33000	45000
24	37	4800	480	239	21000	14000	360	11000	11000
25	74	--	1600	195	14000	7400	201	13000	7100
26	106	18000	5200	232	11000	6900	160	9600	4100
27	106	22000	6300	225	9600	5900	138	7900	2900
28	129	18000	6300	160	8800	3800	129	8100	S 3000
29	152	20000	8200	171	9000	4200	116	11000	S 3600
30	138	18000	6700	160	9700	4200	85	6700	1500
31	--	--	--	138	9000	3400	--	--	--
Total	1259	--	43850	5764	--	227600	5159	--	238700

Day	JULY			AUGUST			SEPTEMBER		
1	82	4200	930						
2	78	3700	780						
3	72	3500	680						
4	65	3500	610						
5	65	--	600						
6	58	--	500						
7	48	2800	360						
8	48	2600	340						
9	60	3600	580						
10	47	5300	670						
11	36	4300	420						
12	44	--	400						
13	42	2400	270						
14	52	3000	420						
15	38	3700	380						
16	28	2700	200						
17	22	3300	200						
18	18	2500	120						
19	17	--	100						
20	14	2200	83						
21	11	1500	45						
22	8.0	700	15						
23	7.2	700	14						
24	3.3	390	S 4						
25	0	--	0						
26	0	--	0						
27	0	--	0						
28	0	--	0						
29	0	--	0						
30	0	--	0						
31	0	--	0						
Total	963.5	--	8721	0		0	0		0

Total discharge for year (cfs-days)..... 13496.2
Total load for year (tons)..... 523768

S Computed by subdividing day.

6-2570. BADWATER CREEK AT BONNEVILLE, WYO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(*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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 14, 1963.....	1100	61		D 0.1	31200	8		90		100		--	--	--				PWC
Apr. 29, 1964.....	1550	66		129	23100	8050		39		56		89	98	100				VPWC
May 22.....	1445	67		376	18400	18700		22		37		70	76	88	92	100		VPWC

D Daily mean discharge.

YELLOWSTONE RIVER BASIN--Continued

6-2575. MUDDY CREEK NEAR PAVILLION, WYO.

LOCATION.--At gaging station, on left bank 600 feet upstream from Wyoming Canal siphon, 4.1 miles downstream from Sheep Creek, and 9.2 miles northeast of Pavillion, Fremont County.
DRAINAGE AREA.--267 square miles.
RECORDS AVAILABLE.--Water temperatures: March to July 1949, October 1954 to September 1958, April 1961 to September 1962.
Sediment records: March 1949 to November 1953, October 1954 to September 1958, April 1961 to September 1964 (discontinued).
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, 24,000 ppm May 28; minimum daily, no flow on several days during September.
Sediment loads: Maximum daily, 5,400 tons May 27; minimum daily, 0 tons on several days during September.
EXTREMES, 1949-53, 1954-58, 1961-64.--Sediment concentrations: Maximum daily (1961-64), 54,000 ppm Sept. 19, 1961, June 16, 1963; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 140,000 (estimated) tons July 4, 1950; minimum daily, 0 tons on many days.
REMARKS.--Flow affected by ice Nov. 1, 2, 12, Nov. 16 to Apr. 9.

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0.7	70	T	4.5	--	3	3		2
2	.8	--	T	4.0	--	2	3		2
3	.7	--	T	5.4	--	3	3		2
4	.7	--	T	5.4	--	3	3		2
5	.5	--	T	5.1	--	3	3		2
6	.5	--	T	4.8	240	3	3		2
7	.6	--	T	5.1	--	3	3		2
8	.9	--	T	4.8	--	3	2.5		1
9	1.6	--	1	5.4	--	3	2.0		1
10	2.4	110	1	5.4	--	3	1.5		1
11	2.0	--	1	5.4	--	3	1		1
12	2.0	--	1	5.0	--	3	1		1
13	2.8	--	1	6.0	--	3	1		1
14	5.4	--	3	6.0	200	3	1		1
15	5.4	--	3	5.7	--	3	1		1
16	4.5	--	3	5.2	--	4	1	190	1
17	8.7	--	80	4.5	--	3	1		1
18	18	--	140	1.6	--	1	1		1
19	12	--	100	2.6	--	1	1		1
20	6.0	--	4	4.5	330	4	1		1
21	5.4	--	3	4.2	--	2	1		1
22	5.1	160	2	4.6	--	2	1		1
23	4.2	--	2	4.2	--	2	1		1
24	3.6	--	2	5.3	--	3	1.5		1
25	3.6	--	2	5.0	--	2	2		1
26	3.6	--	2	4.8	--	2	2		1
27	3.9	--	2	5.0	--	4	2		1
28	3.3	--	2	4.0	--	2	2		1
29	4.5	220	3	3.5	--	2	2		1
30	6.0	--	4	3.0	--	2	2		1
31	5.7	--	4	--	--	--	2.5		1
Total	125.1	--	368	140.0	--	80	56.0	--	38

T Less than 0.50 ton.

YELLOWSTONE RIVER BASIN--Continued

6-2575. MUDDY CREEK NEAR PAVILLION, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	3	--	2	2		1	5		3
2	3	--	2	2		1	5		3
3	3	--	2	2		1	4.5		3
4	3	--	2	2		1	4		2
5	3	--	2	2.5	250	2	4		2
6	3	--	2	3.0		2	4		2
7	3	--	2	3.5		2	4		2
8	3	--	2	4		2	4		2
9	3	--	2	4		2	4		2
10	3	170	1	4		2	4		2
11	3	--	2	4		2	4		2
12	2.5	--	1	3.5		2	4		2
13	2	--	1	3		2	4		2
14	2	--	1	3		2	4		2
15	2	--	1	3		2	4		2
16	2	--	1	3		2	4		2
17	2	--	1	3		2	4.5		3
18	2	--	1	3		2	4.5		3
19	2	--	1	3		2	4.5		3
20	2	--	1	3		2	4.5		3
21	2	--	1	3.5		2	4.5		3
22	2	240	1	4.0		2	4.5		3
23	2	--	1	4.5		3	4.5		3
24	2	--	1	5		3	4.5		3
25	2	--	1	5		3	5.5		5
26	2	--	1	5		3	6.0		5
27	2	--	1	5		3	6.5		10
28	2	--	1	5		3	7		10
29	2	--	1	5		3	8		20
30	2	--	1	--		--	9		20
31	2	--	1	--		--	11		40
Total	73.5	--	41	102.5		61	155.5		169

Day	APRIL			MAY			JUNE		
1	10	--	40	5.8	--	60	19	1500	77
2	9.5	--	40	7.0	--	70	21	--	160
3	9.0	--	50	7.8	--	70	21	--	160
4	8.5	--	60	6.3	3600	61	18	--	140
5	8	--	60	7.5	--	70	16	--	130
6	8	--	70	6.0	--	60	13	--	110
7	8	--	70	5.2	--	60	11	--	90
8	10	--	90	5.5	--	60	13	2800	98
9	15	--	120	5.8	--	60	13	--	110
10	16	--	130	6.5	--	60	13	--	110
11	13	--	110	7.5	--	70	11	1200	36
12	10	--	90	8.2	--	80	7.8	700	15
13	6.5	--	60	6.8	2300	42	7.8	800	17
14	7.0	--	70	6.0	--	60	14	--	120
15	8.2	--	80	7.2	--	70	20	14000	S 920
16	7.8	--	70	9.2	--	80	16	2500	110
17	6.5	--	60	8.2	--	80	14	1500	57
18	6.8	--	70	7.5	--	70	16	1700	73
19	6.5	--	60	7.2	--	70	14	1500	57
20	9.6	--	90	8.9	--	80	9.2	800	20
21	8.9	--	80	12	3000	97	10	750	20
22	8.2	3800	80	13	--	110	29	18000	S 2000
23	7.0	--	70	12	--	100	22	3500	210
24	6.5	--	60	10	--	90	15	1800	73
25	14	--	120	10	--	90	13	1400	49
26	18	--	140	12	--	100	8.6	1000	23
27	18	--	140	42	12000	S 5400	7.2	890	17
28	13	3500	120	45	24000	S 3900	7.8	560	12
29	10	--	90	18	--	140	8.2	730	16
30	6.8	--	70	18	4000	190	14	4200	160
31	--	--	--	18	--	140	--	--	--
Total	294.3	--	2460	350.1	--	11690	422.6	--	5190

S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2575. MUDDY CREEK NEAR PAVILLION, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	15	1500	61	2.6	100	1	0.3	C 9	T
2	13	820	29	2.6	70	1	.2	C 9	T
3	8.9	510	12	1.8	70	T	.1	C 9	T
4	9.6	370	10	1.8	70	T	.1	C 9	T
5	11	310	9	2.0	30	T	.2	C 9	T
6	11	240	7	1.8	30	T	.2	C 9	T
7	11	190	6	1.6	50	T	.2	C 9	T
8	10	180	5	1.8	70	T	.1	C 9	T
9	10	220	6	1.4	20	T	0	--	0
10	11	390	12	1.3	10	T	0	--	0
11	10	320	9	1.1	50	T	0	--	0
12	10	240	6	1.5	110	T	0	--	0
13	10	230	6	1.8	130	1	0	--	0
14	10	1900	S 130	1.2	70	T	0	--	0
15	13	6300	220	.8	C 16	T	0	--	0
16	8.9	1100	26	.7	C 16	T	0	--	0
17	6.8	600	11	.7	C 16	T	.1	C 7	T
18	5.2	510	T	.7	C 16	T	.2	C 7	T
19	5.0	400	5	.5	C 16	T	.4	C 7	T
20	5.0	310	4	.2	C 16	T	.4	C 7	T
21	4.8	240	3	.7	C 16	T	.5	C 7	T
22	4.6	180	2	.9	C 16	T	.4	C 7	T
23	4.2	340	4	1.0	C 16	T	.4	C 7	T
24	3.8	160	2	.9	C 16	T	.9	C 7	T
25	3.6	120	1	.9	C 16	T	1.3	C 32	T
26	3.4	110	1	.8	C 16	T	1.0	C 32	T
27	3.0	90	1	.4	C 16	T	1.2	C 32	T
28	2.7	90	1	.5	C 16	T	1.5	C 32	T
29	2.6	100	1	.4	C 16	T	1.6	C 32	T
30	2.7	130	1	.4	C 16	T	1.8	C 32	T
31	3.0	150	1	.4	C 16	T	---	---	---
Total	232.8	--	599	35.2	--	6	13.1	---	1
Total discharge for year (cfs-days)									2000.7
Total load for year (tons)									20703

S Computed by subdividing day.
T Less than 0.50 ton.
C Composite period.

6-2575. MUDDY CREEK NEAR PAVILLION, WYO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
May 21, 1964.....	1530	75		13	3540	124		22		35		78	95	100	--			VPWC
May 28.....	1345	55		36	32600	3290		44		67		91	97	100	--			VPWC
June 15.....	1130	71		15	11800	478		56		77		93	97	99	100			VPWC
June 22.....	0620	--		48	19600	2540		14		24		80	94	99	100			VPWC
July 15.....	0945	72		13	6590	231		68		86		92	97	100	--			VPWC

YELLOWSTONE RIVER BASIN--Continued

6-2580. MUDDY CREEK NEAR SHOSHONI, WYO.

LOCATION.--At gaging station, on left bank 2.2 miles upstream from normal high waterline of Boysen Reservoir at elevation 4,725 feet and 9 miles northwest of Sbosboni, Fremont County.
DRAINAGE AREA.--332 square miles.
RECORDS AVAILABLE.--Water temperatures: Marcb to July 1949, October 1956 to September 1964 (discontinued).
Sediment records: March 1949 to September 1964 (discontinued).
EXTREMES, 1963-64.--Water temperatures: Maximum, 85°F July 3; minimum, freezing point on many days during November to April.
Sediment concentrations: Maximum daily, 25,000 ppm May 28; minimum daily, not determined.
Sediment loads: Maximum daily, 7,800 tons May 28; minimum daily, 4 tons on several days during December and January.
EXTREMES, 1949-64.--Water temperatures: Maximum (1956-58, 1959-64), 91°F July 19, 1960; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily (1951-58, 1959-64), 119,000 ppm July 22, 1951; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 200,000 (estimated) tons July 5, 1950; minimum daily, 0 tons on many days.
REMARKS.--Flow affected by ice Nov. 30 to Apr. 10.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Aver-age
	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	
October	66	50	--	62	--	64	47	--	63	--	61	68	56	64	--	60	--	63	54	--	54	56	55	53	46	--	--	--	--	45	--	--
November	45	47	45	42	40	38	39	42	--	--	45	41	37	--	47	36	--	32	--	--	--	32	--	--	--	33	37	32	--	--	--	--
December	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	35	37	32
April	33	33	33	33	35	33	32	36	37	38	39	37	41	51	53	56	43	45	53	43	55	59	54	50	34	48	53	65	67	70	--	45
May	--	53	47	51	44	63	66	56	62	54	53	42	62	60	73	63	66	67	68	78	71	69	66	67	70	51	62	56	46	53	54	60
June	57	69	58	53	65	66	67	58	59	74	65	68	51	70	70	69	64	65	65	65	56	66	71	76	77	73	73	70	79	84	--	67
July	69	78	85	67	72	67	77	74	70	79	75	78	70	69	73	82	71	75	81	76	77	76	72	82	69	78	73	69	71	74	82	75
August	73	78	76	79	68	77	77	73	79	71	74	75	70	73	77	--	67	74	70	61	60	76	74	63	53	63	59	57	--	--	57	70
September	72	--	--	59	--	--	--	74	71	71	73	74	74	60	--	57	72	51	54	60	61	59	60	68	51	--	--	46	--	47	--	--

YELLOWSTONE RIVER BASIN--Continued

6-2580. MUDDY CREEK NEAR SHOSHONI, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	16	C 460	20	16	C 550	24	10	C 380	10
2	16	C 460	20	15	C 550	22	10	C 380	10
3	16	C 460	20	14	C 550	21	10	C 380	10
4	14	C 460	17	14	C 550	21	10	C 380	10
5	14	C 460	17	14	C 550	21	10	C 380	10
6	13	C 460	16	14	C 550	21	10	C 380	10
7	14	C 460	17	14	C 550	21	9	C 380	9
8	15	C 460	19	14	C 550	21	8	C 380	8
9	16	C 460	20	14	C 550	21	7	C 380	7
10	18	C 460	22	14	C 550	21	6	C 380	6
11	19	600	31	14	C 550	21	5	C 380	5
12	19	280	14	14	C 550	21	4	C 380	4
13	18	600	29	14	C 550	21	6	C 380	6
14	17	420	19	14	C 500	19	5	C 380	5
15	21	--	E 80	14	C 500	19	4	C 380	4
16	21	1200	68	15	C 500	20	4	C 380	4
17	22	--	E 40	16	C 500	22	4	C 380	4
18	32	2200	S 210	13	C 500	18	4	C 380	4
19	38	3100	320	12	C 500	16	4	C 380	4
20	27	--	E 120	11	C 500	15	4	C 380	4
21	17	1100	50	12	C 500	16	5	C 380	5
22	14	800	30	12	C 500	16	5	C 380	5
23	14	C 550	21	11	C 500	15	5	C 380	5
24	14	C 550	21	15	C 500	20	6	C 380	6
25	13	C 550	19	13	C 500	18	6	C 380	6
26	13	C 550	19	9.5	C 500	13	6	C 380	6
27	13	C 550	19	9.5	C 500	13	6	C 380	6
28	13	C 550	19	10	C 500	14	6	C 380	6
29	13	C 550	19	7.5	C 500	10	6	C 380	6
30	14	C 550	21	8	C 500	11	6	C 380	6
31	16	C 550	24	--	--	--	6	C 380	6
Total	540	--	1381	387.5	--	552	197	--	197
	JANUARY			FEBRUARY			MARCH		
1	6	C 390	6	7	C 400	8	10	C 440	12
2	6	C 390	6	7	C 400	8	10	C 440	12
3	6	C 390	6	6	C 400	6	8	C 440	10
4	6	C 390	6	5	C 400	5	8	C 440	10
5	6	C 390	6	4	C 400	5	9	C 440	11
6	6	C 390	6	5	C 400	5	10	C 440	12
7	6	C 390	6	5	C 400	5	8	C 440	10
8	6	C 390	6	5	C 400	5	8	C 440	10
9	6	C 390	6	6	C 400	6	9	C 440	11
10	6	C 390	6	7	C 400	8	10	C 440	12
11	5	C 390	5	8	C 400	9	10	C 440	12
12	5	C 390	5	7	C 400	8	10	C 440	12
13	4	C 390	4	6	C 400	6	10	C 440	12
14	4	C 390	4	5	C 400	5	10	C 440	12
15	4	C 390	4	5	C 400	5	11	C 440	13
16	5	C 390	5	5	C 400	5	12	C 440	14
17	5	C 390	5	6	C 400	6	13	C 440	15
18	5	C 390	5	7	C 400	8	14	C 440	17
19	5	C 390	5	8	C 400	9	15	C 440	18
20	6	C 390	6	7	C 400	8	13	C 440	15
21	7	C 390	7	7	C 400	8	14	C 440	17
22	7	C 390	7	8	C 400	9	13	C 440	15
23	6	C 390	6	8	C 400	9	15	C 440	18
24	5	C 390	5	8	C 400	9	10	C 440	12
25	4	C 390	4	7	C 400	8	10	460	12
26	4	C 390	4	6	C 400	6	11	350	10
27	5	C 390	5	8	C 400	9	12	350	11
28	6	C 390	6	9	C 400	10	12	410	13
29	7	C 390	7	10	C 400	11	11	460	14
30	7	C 390	7	--	--	--	14	580	22
31	7	C 390	7	--	--	--	20	1000	54
Total	173	--	173	192	--	209	350	--	448

E Estimated.
S Computed by subdividing day.
C Composite period.

YELLOWSTONE RIVER BASIN--Continued

6-2580. MUDDY CREEK NEAR SHOSHONI, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	30	950	77	22	--	E 100	38	3200	330
2	30	1700	140	27	3400	S 280	41	3900	430
3	25	1800	120	35	3200	300	43	4200	490
4	28	2100	160	38	3700	380	38	3600	370
5	30	2600	210	34	3700	340	36	2700	260
6	35	1500	140	28	3000	230	34	2000	180
7	30	500	40	18	2200	110	32	2100	180
8	35	1400	130	16	1800	78	29	1900	150
9	35	3500	330	16	1300	56	29	1800	140
10	30	4000	320	16	1700	73	30	2100	170
11	25	2000	140	17	1700	78	31	2300	190
12	22	1000	59	19	1500	77	29	1800	140
13	23	2200	140	18	1400	68	28	1600	120
14	22	3000	180	14	1400	53	28	1500	110
15	20	3000	160	16	2000	S 91	36	3700	S 400
16	19	2500	130	21	2400	140	42	8200	930
17	19	2600	130	20	2500	140	39	4600	480
18	19	2000	100	16	1400	60	37	3000	300
19	19	2200	110	18	1500	73	41	2900	320
20	21	1900	110	19	1500	77	31	2500	210
21	23	2600	160	19	1800	92	28	2600	200
22	24	2000	130	21	2300	130	40	7700	S 1100
23	23	2800	170	22	1700	100	50	14000	1900
24	22	2700	160	22	1300	77	39	4100	430
25	32	6600	S 610	21	1200	68	31	2700	230
26	58	7900	1200	22	1500	89	28	2100	160
27	56	7400	1100	23	2500	S 170	26	1000	70
28	45	5800	700	80	25000	S 7800	24	1400	91
29	30	3800	310	44	17000	2000	21	1400	79
30	25	2800	190	37	5600	560	19	1000	51
31	--	--	--	36	5200	510	--	--	--
Total	855	--	7656	775	--	14400	998	--	10211

Day	JULY			AUGUST			SEPTEMBER		
1	27	1700	120	24	1200	78	14	C 420	16
2	33	3400	300	23	960	60	14	C 420	16
3	24	1300	84	22	1300	77	14	C 420	16
4	22	770	46	19	1400	72	14	C 420	16
5	27	1700	120	17	1200	55	14	C 420	16
6	29	1800	140	18	430	21	14	C 420	16
7	27	1200	87	18	800	39	13	C 420	15
8	24	1100	71	20	720	39	12	C 420	14
9	22	1200	71	19	440	23	14	C 420	16
10	25	1500	100	17	320	15	15	C 420	17
11	24	1300	84	16	700	30	13	C 420	15
12	25	1100	74	17	680	31	11	C 220	7
13	35	3000	280	18	650	32	10	C 220	6
14	29	1900	150	18	620	30	10	C 220	6
15	24	1600	100	17	550	25	9.5	C 220	6
16	24	5800	380	19	--	E 30	9.0	C 220	5
17	24	1900	120	19	640	33	9.0	C 220	5
18	21	3200	180	17	720	33	9.5	C 220	6
19	19	2800	140	16	1000	43	12	390	13
20	19	790	41	16	800	35	14	700	26
21	19	840	43	14	680	26	14	470	18
22	18	600	29	15	420	17	14	810	31
23	19	820	42	14	C 440	17	13	650	23
24	20	1100	59	13	C 440	15	13	620	22
25	22	1000	59	13	C 440	15	12	C 430	14
26	23	1300	81	13	C 440	15	13	C 430	15
27	22	1300	77	14	C 440	17	13	C 430	15
28	20	1100	59	14	C 440	17	14	C 430	16
29	19	990	51	14	C 440	17	15	C 430	17
30	19	1300	67	14	C 440	17	13	C 430	15
31	21	1100	62	15	C 440	18	--	--	--
Total	726	--	3317	523	--	992	379.0	--	439

Total discharge for year (cfs-days)..... 6095.5
Total load for year (tons)..... 39975

E Estimated.
S Computed by subdividing day.
C Composite period.

YELLOWSTONE RIVER BASIN--Continued

6-2580. MUDDY CREEK NEAR SHOSHONI, WYO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Apr. 21, 1964.....	1555	55		22	3840	228		36		48		69	77	94	100			VPWC
Apr. 28.....	1505	65		42	4850	550		31		46		70	84	96	100			VPWC
May 28.....	1050	54		143	49400	19800		37		60		85	92	98	100			VPWC
May 29.....	1150	51		41	19400	2150		56		80		89	92	97	100			VPWC
June 2.....	1530	69		38	3950	405		28		42		68	86	98	100			VPWC
June 17.....	1515	64		40	4980	538		21		37		63	76	93	100			VPWC
June 22.....	1940	66		54	7080	1030		14		23		67	83	96	100			VPWC
June 24.....	1305	76		37	4100	410		25		39		69	82	95	99	100		VPWC
July 16.....	1150	82		25	8160	551		74		91		94	97	100	--			VPWC

YELLOWSTONE RIVER BASIN--Continued

6-2590. WIND RIVER BELOW BOYSEN RESERVOIR, WYO.

LOCATION.--At tailrace of powerplant at Boysen Dam, 0.6 mile upstream from gaging station and 12.4 miles north of Shoshoni, Fremont County.
DRAINAGE AREA.--7,701 square miles upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: November 1953 to September 1954, December 1960 to September 1964.
Water temperatures: December 1953 to September 1954, December 1960 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 722 ppm Apr. 1-3; minimum, 362 ppm Aug. 11-31.
Hardness: Maximum, 295 ppm Apr. 1-3; minimum, 169 ppm Aug. 11-31.
Specific conductance: Maximum daily, 1,030 micromhos Apr. 3; minimum daily, 517 micromhos Aug. 20.
Water temperatures: Maximum, 68°F on several days during August; minimum, 37°F on several days during December.
EXTREMES, 1953-54, 1960-64.--Dissolved solids: Maximum, 888 ppm Apr. 2, 1963; minimum, 332 ppm Aug. 1-31, 1962.
Hardness: Maximum, 326 ppm Apr. 2, 1963; minimum, 156 ppm Aug. 1-31, 1962.
Specific conductance: Maximum daily, 1,380 micromhos June 18, 1954; minimum daily, 484 micromhos Aug. 11, 1962.
Water temperatures: Maximum (1960-64), 71°F on several days in 1961; minimum, 35°F on several days in 1961-63.
REMARKS.--Daily samples for chemical analysis composited by equal-volume. Records of specific conductance of daily samples available in district office at Worland, Wyo.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-12, 1963.	929	9.3	0.00	51	15	61	2.8	148	0	180	8.4	0.3	0.1	0.08	444	0.60	1110	190	69	1.9	647	7.1	2
Oct. 13-31.....	1449	9.8	.00	52	16	66	2.6	155	0	186	8.4	.3	.3	.10	438	.59	1700	197	70	2.1	655	7.6	1
Nov. 1-11.....	1438	10	.02	54	15	66	2.7	156	0	192	8.0	.3	.2	.07	445	.81	1730	197	69	2.0	673	7.2	5
Nov. 12-30.....	1663	9.9	.00	54	16	66	2.7	160	0	196	7.6	.3	.4	.06	458	.82	2080	201	70	2.0	885	7.4	5
Dec. 1-13.....	1754	9.8	.00	54	17	66	2.9	160	0	205	8.2	.4	.3	.09	462	.63	2190	204	73	2.0	695	7.2	2
Dec. 14-31.....	2080	9.9	.00	56	17	68	2.7	164	0	211	8.2	.4	.2	.09	478	.65	2680	209	74	2.0	714	7.2	2
Jan. 1-12, 1964.	2092	10	.00	57	17	69	2.7	169	0	213	8.4	.4	.3	.09	482	.66	2720	213	74	2.1	721	7.6	2
Jan. 13-31.....	1617	10	.00	58	18	70	2.7	171	0	216	8.9	.3	.4	.10	489	.87	2130	217	77	2.1	736	7.5	2
Feb. 1-13.....	741	10	.00	60	18	71	2.9	173	0	218	9.8	.3	.2	.10	504	.69	1010	222	80	2.1	752	7.7	2
Feb. 14-29.....	687	9.9	.00	80	18	71	3.1	175	0	218	10	.3	.3	.09	501	.68	929	223	79	2.1	752	7.7	2
Mar. 1-19.....	705	10	.00	60	20	73	3.2	176	0	218	10	.5	.3	.16	494	.67	940	231	87	2.1	747	7.3	25
Mar. 20-31.....	828	10	.00	60	20	75	2.9	177	0	227	8.8	.4	.0	.10	497	.68	1110	230	85	2.1	751	7.6	7
Apr. 1-3.....	1363	--	--	--	--	120	--	204	0	341	--	--	--	--	722	.98	2860	295	128	3.0	1030	7.4	--
Apr. 4-18.....	1596	11	.00	45	32	83	2.8	185	0	248	11	.3	.2	.12	552	.75	2380	243	91	2.3	815	7.8	3
Apr. 19-30.....	1808	10	.00	43	32	79	2.6	184	0	239	9.6	.3	.2	.10	536	.73	2620	240	89	2.2	797	8.0	2
May 1-15.....	1907	9.8	.00	63	23	79	4.6	186	0	248	9.8	.3	.0	.05	552	.75	2840	252	99	2.2	812	8.0	5
May 16-31.....	1968	9.4	.00	84	22	81	2.7	192	0	253	9.9	.1	.1	.06	571	.78	3030	249	91	2.2	826	8.2	5
June 1-9.....	1887	9.2	.00	64	21	81	3.1	185	0	249	10	.4	.3	.10	580	.76	2850	245	93	2.2	814	7.8	3

June 10-19, 1964	1865	8.0	.00	60	19	73	3.2	174	0	228	9.4	.4	.3	.09	510	.69	2570	228	85	2.1	754	7.8	4
June 20-30.....	1881	8.4	.00	53	17	62	3.2	157	0	196	8.2	.3	.4	.09	450	.61	2280	200	71	1.9	666	7.7	5
July 1-18.....	2139	8.4	.00	53	14	56	2.3	142	0	175	7.3	.2	.3	.02	400	.54	2310	188	72	1.8	611	7.4	5
July 19-31.....	2201	8.3	.00	51	13	53	2.3	138	0	166	7.0	.2	.2	.04	381	.52	2260	182	69	1.7	588	7.1	2
Aug. 1-10.....	1918	9.1	.01	43	17	50	2.3	137	0	160	6.2	.2	.2	.07	380	.52	1970	178	66	1.6	570	7.7	3
Aug. 11-31.....	1242	8.5	.00	43	15	48	2.4	135	0	151	6.0	.2	.2	.06	362	.49	1210	169	58	1.6	548	7.7	3
Sept. 1-30.....	1208	8.5	.01	46	13	53	2.2	138	0	154	6.2	.3	.1	.04	364	.50	1190	170	57	1.8	564	7.2	2
Weighted average.....	--	9.4	0.00	54	18	67	2.8	163	--	205	8.4	0.3	0.2	0.08	467	0.64	1930	210	76	2.2	698	7.5	4
Time-weighted average.....	1532	9.5	0.00	54	18	67	2.8	163	--	204	8.4	0.3	0.2	0.08	466	--	--	210	76	2.2	698	7.4	4
Tons per day..	--	39	0.01	223	76	277	11	673	--	847	35	1.0	1.0	0.31	--	--	--	--	--	--	--	--	--

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	65	65	65	65	65	65	65	65	65	64	64	64	64	63	63	63	63	63	62	62	61	61	61	61	60	60	58	58	58	57	57	62
November.....	57	56	56	56	56	--	--	--	--	--	--	52	52	52	52	51	50	50	50	50	49	49	47	48	48	48	48	47	47	47	--	51
December.....	47	47	47	47	46	44	44	43	42	41	40	39	38	37	37	37	37	37	37	37	38	38	38	38	38	38	38	38	38	38	38	40
January.....	39	39	39	39	39	39	38	38	--	38	38	38	38	38	38	38	38	38	38	38	39	39	39	38	39	39	39	39	39	39	39	39
February.....	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	40	40	40	39	40	40	40	40	40	40	40	40	40	--	--	39
March.....	40	40	40	41	41	40	40	40	40	41	41	41	--	--	41	41	42	42	--	40	40	--	39	39	40	40	--	40	40	40	41	40
April.....	41	41	41	41	41	41	41	41	41	42	42	42	42	42	43	43	43	43	43	44	44	44	45	45	--	46	46	47	47	48	--	43
May.....	48	48	48	48	48	--	--	48	48	48	48	48	48	48	49	50	51	50	51	52	53	53	53	53	56	54	54	54	51	50	54	50
June	55	56	53	57	57	57	59	59	58	58	58	58	59	59	59	59	59	59	60	60	60	57	59	59	60	60	60	60	62	62	--	59
July.....	--	61	62	63	63	63	64	64	64	64	66	67	65	65	65	65	64	64	64	64	65	65	65	67	67	66	67	65	66	66	67	65
August.....	67	67	68	68	68	68	68	67	67	68	68	68	68	68	68	68	68	68	68	68	64	66	66	66	66	66	66	66	65	65	64	67
September.....	65	64	65	64	64	64	64	64	64	63	63	62	62	62	63	63	62	62	61	61	61	60	60	61	--	59	59	59	59	59	--	62

YELLOWSTONE RIVER BASIN--Continued

6-2685. FIFTEEN MILE CREEK NEAR WORLAND, WYO.

LOCATION.--At gaging station, on left bank 300 feet upstream from Bighorn Canal spillway, 1.8 miles upstream from mouth, and 2.8 miles west of Worland, Washakie County.
DRAINAGE AREA.--518 square miles.
RECORDS AVAILABLE.--Water temperatures: Octoher 1960 to September 1964.
Sediment records: March 1951 to September 1964.
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, 85,000 ppm June 8; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 180,000 tons Apr. 26; minimum daily, 0 tons on many days.
EXTREMES, 1951-64.--Water temperatures (1960-64): Maximum, 88°F June 28, 1962; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 125,000 ppm Apr. 16, 1952; minimum daily, no flow on many days each year.
Sediment loads: Maximum daily, 418,000 tons May 22, 1952; minimum daily, 0 tons on many days each year.
REMARKS.--Flow affected hy ice Mar. 9-17. Bureau of Land Management has extensive spreader systems on some of the tributaries upstream from station.

Temperature (°F) of water, water year Octoher 1963 to Septemher 1964

Month	Day																													Aver-age
	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	
October	--	--	--	--	--	--	--	--	--	--	--	--	--	--	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	44	--
November	44	--	--	--	--	--	--	--	--	--	--	--	--	--	--	42	42	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	36	34	34	38	34	33	37	41	46	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	43	49	57	59	64	--	--
May	68	54	45	52	53	55	59	41	49	62	61	65	51	70	75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June	--	--	--	66	72	66	--	56	56	67	65	57	76	75	65	68	70	72	59	75	67	65	70	81	67	83	--	--	71	76	--	69
July	--	68	--	--	--	84	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

YELLOWSTONE RIVER BASIN--Continued

6-2685. FIFTEEN MILE CREEK NEAR WORLAND, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0	--	0	0.7	10000	19			
2	0	--	0	0	--	0			
3	0	--	0	0	--	0			
4	0	--	0	0	--	0			
5	0	--	0	0	--	0			
6	0	--	0	0	--	0			
7	0	--	0	0	--	0			
8	0	--	0	0	--	0			
9	0	--	0	0	--	0			
10	0	--	0	0	--	0			
11	0	--	0	0	--	0			
12	0	--	0	.1	--	1			
13	12	--	70	0	--	0			
14	44	--	3000	0	--	0			
15	2	1400	S 12	0	--	0			
16	0	--	0	7.2	17000	S 380			
17	0	--	0	2.4	14000	S 110			
18	0	--	0	.6	10000	16			
19	0	--	0	0	--	0			
20	0	--	0	0	--	0			
21	0	--	0	0	--	0			
22	0	--	0	0	--	0			
23	0	--	0	0	--	0			
24	0	--	0	0	--	0			
25	0	--	0	0	--	0			
26	0	--	0	0	--	0			
27	0	--	0	0	--	0			
28	0	--	0	0	--	0			
29	0	--	0	0	--	0			
30	7.8	--	200	0	--	0			
31	7.2	19000	S 450	--	--	--			
Total	73.0	--	3732	11.0	--	526	0		0

Day	JANUARY			FEBRUARY			MARCH		
1							0	--	0
2							0	--	0
3							0	--	0
4							0	--	0
5							0	--	0
6							0	--	0
7							0	--	0
8							0	--	0
9							1	1700	5
10							1	1400	4
11							1	1000	3
12							4	3100	33
13							10	9700	260
14							10	9800	260
15							4	7400	80
16							2	4800	26
17							1	2700	7
18							0	--	0
19							0	--	0
20							0	--	0
21							0	--	0
22							0	--	0
23							0	--	0
24							0	--	0
25							0	--	0
26							0	--	0
27							0	--	0
28							0	--	0
29							0	--	0
30							0	--	0
31							0	--	0
Total	0		0	0		0	34	--	678

S Computed by subdividing.

YELLOWSTONE RIVER BASIN--Continued

6-2685. FIFTEEN MILE CREEK NEAR WORLAND, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0	--	0	35	18000	1700	0	--	0
2	0	--	0	102	49000	S 20000	0	--	0
3	0	--	0	445	67000	83000	0	--	0
4	0	--	0	280	51000	S 46000	52	45000	S 9800
5	0	--	0	64	20000	3500	18	42000	2100
6	0	--	0	40	13000	1400	11	32000	990
7	0	--	0	31	14000	1200	17	--	1700
8	0	--	0	25	13000	880	324	85000	S 94000
9	0	--	0	21	11000	620	323	70000	S 70000
10	0	--	0	18	9000	440	132	45000	S 19000
11	0	--	0	17	9000	410	27	23000	1700
12	0	--	0	17	9000	410	17	20000	920
13	0	--	0	15	16000	650	16	18000	780
14	0	--	0	13	13000	460	12	19000	620
15	0	--	0	9.5	11000	280	9.0	18000	440
16	0	--	0	3	--	70	6.5	19000	330
17	0	--	0	1	--	10	6.0	18000	290
18	0	--	0	0	--	0	5.2	16000	220
19	0	--	0	0	--	0	1.2	14000	45
20	0	--	0	0	--	0	.8	10000	22
21	0	--	0	0	--	0	.2	3500	2
22	0	--	0	0	--	0	71	42000	S 11000
23	0	--	0	0	--	0	48	35000	S 5400
24	0	--	0	0	--	0	18	20000	970
25	3.4	--	70	0	--	0	12	16000	520
26	735	84000	S 180000	0	--	0	6.0	15000	240
27	425	63000	S 88000	0	--	0	5.2	--	200
28	137	38000	15000	0	--	0	5.2	--	200
29	96	28000	7300	0	--	0	80	33000	S 9400
30	57	21000	3200	0	--	0	23	30000	S 2000
31	--	--	--	--	--	--	--	--	--
Total	1453.4	--	293570	1136.5	--	161030	1246.3	--	232889

Day	JULY			AUGUST			SEPTEMBER		
1	21	--	1100						
2	18	10000	490						
3	15	--	300						
4	10	--	200						
5	5	--	80						
6	1	3000	8						
7	0	--	0						
8	0	--	0						
9	0	--	0						
10	0	--	0						
11	0	--	0						
12	0	--	0						
13	0	--	0						
14	0	--	0						
15	0	--	0						
16	0	--	0						
17	0	--	0						
18	0	--	0						
19	0	--	0						
20	0	--	0						
21	0	--	0						
22	0	--	0						
23	0	--	0						
24	0	--	0						
25	0	--	0						
26	0	--	0						
27	0	--	0						
28	0	--	0						
29	0	--	0						
30	0	--	0						
31	0	--	0						
Total	70	--	2178	0		0	0		0

Total discharge for year (cfs-days)..... 4024.2
Total load for year (tons)..... 694603

S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2685. FIFTEEN MILE CREEK NEAR WORLAND, WYO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							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	
Oct. 31, 1963.....	1100	39		6.0	19300	313		18		100		--	--	--				PWC
Apr. 26, 1964.....	1405	41		1060	66200	196000		49		59		81	94	99	100			VPWC
May 3.....	1345	45		430	68000	81900		38		50		83	97	100				VPWC
June 9.....	1820	--		604	82600	140000		40		55		88	98	100				VPWC
June 24.....	1100	--		18	21100	1030		97		100		--	--	--				PWC

YELLOWSTONE RIVER BASIN--Continued

6-2795. BIGHORN RIVER AT KANE, WYO.

LOCATION.--At bridge on State Highway 14, 0.5 mile upstream from Shoshone River, 1.5 miles northeast of Kane, Big Horn County, and 12.5 miles downstream from gaging station.
DRAINAGE AREA.--15,846 square miles.
RECORDS AVAILABLE.--Chemical analyses: December 1949 to September 1953, June 1955 to September 1957, December 1960 to September 1964.
Water temperatures: July to September 1949, October 1950 to September 1964.
Sediment records: March 1946 to September 1964 (discontinued).
EXTREMES, 1963-64.--Dissolved solids: Maximum, 893 ppm Aug. 12-31; minimum, 301 ppm June 27-30.
Hardness: Maximum, 394 ppm Aug. 12-31; mininum, 159 ppm June 27-30.
Specific conductance: Maximum daily, 1,620 micromhos Aug. 29; minimum daily, 437 micromhos June 28.
Water temperatures: Maximum, 79°F Aug. 6, 9, 14; minimum, freezing point on many days during December to March.
Sediment concentrations: Maximum daily, 27,000 ppm Apr. 27; minimum daily, 36 ppm Dec. 18.
Sediment loads: Maximum daily, 480,000 tons Apr. 27; minimum daily, 180 tons Aug. 15.
EXTREMES, 1946-64.--Dissolved solids (1955-57, 1960-64): Maximum, 2,860 ppm July 7, 1961; minimum, 292 ppm June 6, 1956.
Hardness (1955-57, 1960-64): Maximum, 1,450 ppm July 7, 1961; minimum, 152 ppm June 6, 1956.
Specific conductance (1955-57, 1960-64): Maximum daily, 3,030 micromhos July 7, 1961; minimum daily, 437 micromhos June 28, 1964.
Water temperatures (1950-64): Maximum, 85°F July 14, 30, 1953, July 12, 1954; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 35,000 ppm Apr. 29, 1963; minimum daily, not determined.
Sediment loads: Maximum daily, 972,000 tons June 25, 1946; minimum daily, not determined.
REMARKS.--Records of specific conductance of daily samples available in district office at Worland, Wyo. No appreciable inflow between gaging station and sampling point except during periods of intense local precipitation. Flow affected by ice Dec. 8 to Feb. 6, Feb. 10-15, 19, 20, 23-26, Mar. 14-24.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-18, 1963.	1356	11	0.00	91	30	100	4.0	217	0	351	16	0.4	0.7	0.15	769	1.05	2820	352	174	2.3	1070	7.3	7
Oct. 19-31.....	1695	11	.00	83	26	93	3.6	204	0	321	14	.4	.8	.13	694	.94	3180	315	148	2.3	987	7.5	4
Nov. 1-20.....	2182	11	.00	79	26	90	3.4	205	0	302	13	.4	.9	.11	674	.92	3970	306	138	2.2	959	7.3	5
Nov. 21-30.....	1886	12	.00	89	29	100	3.8	223	0	340	16	.4	1.0	.15	740	1.01	3770	342	159	2.4	1050	7.4	3
Dec. 1-21.....	2013	11	.00	83	23	89	3.9	210	0	300	14	.5	1.1	.13	667	.91	3620	301	129	2.2	956	7.5	2
Dec. 22-31.....	2200	10	.00	76	23	83	3.5	203	0	277	13	.5	1.0	.14	625	.85	3710	285	118	2.1	903	7.4	3
Jan. 1-15, 1964.	2200	12	.00	76	25	87	3.8	208	0	285	14	.4	.7	.13	633	.86	3760	292	121	2.2	934	8.1	2
Jan. 16-31.....	1875	11	.00	79	26	87	3.7	213	0	292	14	.4	.7	.14	645	.88	3260	302	127	2.2	940	8.1	3
Feb. 1-18.....	1258	10	.05	94	30	102	3.9	231	0	339	18	.4	.9	.15	744	1.01	2530	356	167	2.3	1070	7.5	5
Feb. 19-29.....	1183	11	.00	94	32	107	4.1	233	0	354	20	.4	1.6	.16	775	1.05	2480	368	177	2.4	1110	7.5	5
Mar. 1-19.....	1345	11	.00	87	30	102	4.1	219	0	333	19	.4	1.6	.16	740	1.01	2690	339	159	2.4	1040	8.1	5
Mar. 20-31.....	1402	11	.03	99	34	114	4.4	221	0	396	20	.4	1.4	.13	845	1.15	3200	385	204	2.5	1170	7.8	5
Apr. 1-15.....	2176	14	.00	94	30	110	4.2	217	0	372	19	.4	1.1	.15	776	1.06	4560	356	178	2.5	1100	7.5	15

Apr. 16-30, 1964	2629	12	.00	83	27	107	4.0	206	0	340	16	.4	1.3	.12	715	.97	5080	318	149	2.6	1020	7.6	5
May 1-21.....	3481	12	.01	74	27	97	4.2	196	0	308	13	.5	2.2	.11	674	.92	6330	296	135	2.5	969	7.6	4
May 22-31.....	4970	10	.01	52	13	41	2.8	132	0	146	6.4	.4	1.0	.08	363	.49	4870	184	76	1.3	540	7.6	8
June 1-15.....	5461	12	.01	60	18	65	3.0	160	0	211	8.8	.3	1.2	.08	475	.65	7000	224	93	1.9	715	7.8	7
June 16-26.....	7003	11	.05	54	17	54	3.0	138	0	188	7.2	.3	.9	.09	427	.58	8070	204	91	1.6	637	7.9	7
June 27-30.....	7845	10	.00	44	12	34	2.6	127	0	118	5.1	.2	1.0	.05	301	.41	6380	159	55	1.2	467	7.8	6
July 1-9.....	4711	17	.00	52	13	40	2.1	136	0	148	6.0	.2	.3	.22	397	.54	5050	185	73	1.3	532	7.4	3
July 10-23.....	2939	11	.00	64	21	61	2.9	163	0	214	8.9	.2	.5	.06	476	.65	3780	247	113	1.7	703	7.3	3
July 24-31.....	1635	10	.00	83	23	85	3.5	192	0	294	12	.3	.5	.08	630	.86	2780	303	145	2.1	883	7.3	4
Aug. 1-11.....	1377	9.7	.00	75	29	95	4.1	201	0	313	20	.4	.4	.11	675	.92	2510	306	141	2.4	954	8.2	4
Aug. 12-31.....	1316	11	.00	73	52	132	5.0	219	0	447	11	.5	2.1	.20	893	1.21	3170	394	214	2.9	1230	7.9	3
Sept. 1-30.....	1327	11	.01	97	29	107	3.7	218	0	364	14	.5	1.0	.15	767	1.04	2750	360	181	2.4	1080	7.7	6
Weighted average.....	--	12	0.01	73	24	82	3.5	186	--	274	12	0.4	1.1	0.12	605	0.82	3910	281	128	2.1	869	7.6	5
Time-weighted average.....	2397	11	0.01	80	27	92	3.8	202	--	310	14	0.4	1.1	0.13	674	--	--	311	146	2.2	960	7.6	5
Tons per day..	--	74	0.06	473	155	528	23	1210	--	1770	79	2.0	7.0	0.78	--	--	--	--	--	--	--	--	--

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	60	59	60	58	63	56	57	57	56	56	--	54	56	56	52	52	55	49	52	50	54	50	52	50	50	48	44	45	45	45	46	53
November.....	42	42	45	46	47	45	46	46	47	47	49	47	46	45	45	44	40	42	40	38	33	36	37	39	39	36	40	39	36	33	--	42
December.....	34	35	--	35	36	36	35	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	33	33	34	34	34	33	33
January.....	32	33	33	32	32	32	33	33	33	32	32	32	32	33	33	33	33	33	33	33	33	33	33	33	34	34	33	34	34	33	33	33
February.....	33	33	33	33	32	32	32	33	33	35	33	34	34	34	35	36	34	34	34	33	34	34	34	33	32	32	33	33	34	--	--	33
March.....	35	34	35	35	35	35	35	36	35	36	36	35	36	36	36	35	38	35	35	37	40	32	32	33	35	36	35	38	45	39	51	36
April.....	48	46	41	46	50	43	44	49	52	52	50	44	48	51	46	50	50	52	55	56	66	54	57	55	55	42	45	48	53	61	--	50
May.....	60	54	53	49	--	49	54	50	52	53	48	52	54	60	62	63	60	64	62	59	60	58	55	56	59	58	54	58	58	50	54	56
June.....	53	56	--	--	66	--	63	59	53	53	56	56	58	63	64	63	60	56	59	58	57	58	60	61	64	69	66	62	62	69	--	60
July.....	72	67	74	71	74	70	78	73	78	70	75	70	72	72	--	69	78	73	73	72	73	77	75	70	72	71	70	67	73	74	76	73
August.....	72	78	70	72	72	79	72	78	79	70	72	74	78	79	70	69	66	71	69	58	57	58	60	62	61	62	62	62	55	53	58	68
September.....	59	60	58	57	58	57	56	60	56	55	54	54	54	56	59	--	67	59	55	55	53	53	53	50	50	47	46	51	52	65	--	55

YELLOWSTONE RIVER BASIN--Continued

6-2795. BIGHORN RIVER AT KANE, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	1500	610	2500	2490	5500	37000	2350	910	5800
2	1490	450	1800	2540	3000	21000	2340	930	5900
3	1440	510	2000	2560	1200	8300	2260	--	E 4000
4	1430	470	1800	2570	1200	8300	1560	470	2000
5	1400	340	1300	2570	1200	8300	1540	450	1900
6	1400	440	1700	2560	1100	7600	1560	360	1500
7	1390	560	2100	2560	1000	6900	1560	500	2100
8	1360	300	1100	2540	800	5500	2000	530	2900
9	1350	290	1100	2230	700	4200	2500	140	940
10	1340	300	1100	1300	470	1600	1900	86	440
11	1340	--	E 900	1230	540	1800	1800	68	330
12	1320	250	890	1240	200	670	1900	70	360
13	1310	350	1200	2080	1400	7900	1800	49	240
14	1310	430	1500	2230	1100	6600	1800	54	260
15	1320	440	1600	2230	1200	7200	2000	70	380
16	1220	1600	5300	2260	910	5600	2200	52	310
17	1180	1300	4100	2260	1100	6700	2400	39	250
18	1300	1300	4600	2260	1100	6700	2200	36	210
19	1390	1900	7100	2260	930	5700	2200	50	300
20	1450	1000	3900	1680	250	1100	2200	50	300
21	1500	750	3000	1600	120	520	2200	54	320
22	1540	1000	4200	1440	140	540	2200	83	490
23	1590	800	3400	1170	300	950	2200	52	310
24	1590	340	1500	1180	350	1100	2200	51	300
25	1570	390	1700	1380	440	S 2000	2200	67	400
26	1550	350	1500	2360	1200	7600	2200	58	340
27	1590	1300	5600	2590	1200	8400	2200	150	890
28	1630	1000	4400	2430	770	5100	2200	110	650
29	1880	1200	S 6700	2410	340	2200	2200	98	580
30	2350	1700	11000	2380	920	5900	2200	82	490
31	2400	1400	9100	--	--	--	2200	90	530
Total	46430	--	99690	62590	--	192980	64270	--	35720
	JANUARY			FEBRUARY			MARCH		
1	2200	100	590	1600	120	520	1250	230	780
2	2200	160	950	1500	130	530	1240	130	440
3	2200	280	1700	1400	100	380	1220	210	690
4	2200	360	2100	1300	95	330	1260	260	880
5	2200	500	3000	1200	270	870	1240	310	1000
6	2200	500	3000	1100	130	390	1310	310	1100
7	2200	110	650	1100	140	420	1260	370	1300
8	2200	120	710	1270	180	620	1230	340	1100
9	2200	110	650	1270	220	750	1270	450	1500
10	2200	120	710	1200	240	780	1250	540	1800
11	2200	70	420	1200	250	810	1290	380	1300
12	2200	90	530	1200	230	750	1270	360	1200
13	2200	90	530	1200	240	780	1360	550	2000
14	2200	60	360	1200	230	750	1500	890	3600
15	2200	65	390	1100	200	590	1400	1100	4200
16	2200	85	500	1260	220	750	1400	1400	5300
17	2100	75	430	1280	300	1000	1500	2000	8100
18	2000	90	490	1270	320	1100	1600	3200	14000
19	2000	90	490	1200	260	840	1700	4100	19000
20	1900	100	510	1200	410	1300	1600	2900	13000
21	1900	95	490	1250	280	940	1500	2500	10000
22	1800	95	460	1270	350	1200	1400	1100	4200
23	1900	85	440	1200	370	1200	1300	980	3400
24	1800	110	530	1200	460	1500	1200	330	1100
25	1800	120	580	1200	390	1300	1140	300	920
26	1800	140	680	1200	490	1600	1310	540	1900
27	1800	120	580	985	290	770	1430	880	3400
28	1800	100	490	1150	170	530	1490	1100	4400
29	1800	120	580	1160	160	500	1360	980	3600
30	1700	130	600	--	--	--	1430	1000	3900
31	1700	130	600	--	--	--	1670	1500	6800
Total	63000	--	24740	35665	--	23800	42380	--	125910

E Estimated.
S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2795. BIGHORN RIVER AT KANE, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	2480	4000	27000	3400	4000	37000	3320	1900	17000
2..	2510	3800	26000	4000	14000	15000	2940	1900	15000
3..	2400	3600	23000	4400	9400	S 120000	2780	1900	14000
4..	2290	1900	12000	4600	24000	300000	3630	5600	S 58000
5..	2160	1800	S 11000	3600	8900	86000	3440	2300	21000
6..	1560	1200	5100	3000	4100	33000	4030	4500	S 57000
7..	1420	1000	3800	3000	2300	19000	4130	8100	S 170000
8..	1880	1200	6100	2800	2400	18000	7330	11000	S 290000
9..	1970	1300	6900	2800	2900	22000	9930	14000	S 430000
10..	2280	1200	7400	2600	2300	16000	8540	12000	S 300000
11..	2540	1400	9600	2800	1600	12000	7600	6000	S 130000
12..	2480	1200	8000	2800	2000	15000	6910	3200	60000
13..	2410	1200	7800	2800	1900	14000	6060	2300	38000
14..	2260	1000	6100	3000	1700	14000	5570	2000	30000
15..	2000	800	4300	3000	2300	19000	5710	2400	37000
16..	2340	900	5700	3200	3600	31000	6360	2700	46000
17..	2180	750	4400	3600	3800	37000	7550	2800	57000
18..	2300	1000	6200	3900	4100	43000	8540	5100	S 110000
19..	2290	1100	6800	4200	4500	51000	7410	3400	68000
20..	2240	1000	6000	4600	5200	65000	5940	3600	58000
21..	2180	800	4700	5000	5600	76000	5030	2600	35000
22..	2140	750	4300	5520	5800	86000	5260	2000	28000
23..	2110	650	3700	6010	5700	92000	8260	12000	270000
24..	2040	850	4700	5450	3700	54000	7330	6700	S 140000
25..	2070	900	5000	4960	2400	32000	7960	3500	75000
26..	3570	4800	S 56000	4780	2200	28000	7390	2800	56000
27..	4890	27000	S 480000	4740	2100	27000	7470	3600	73000
28..	3290	18000	S 210000	4670	2000	25000	7870	3600	76000
29..	2800	7400	56000	5310	3800	54000	8460	3400	78000
30..	3000	5000	40000	4390	2900	34000	7580	3000	61000
31..	--	--	--	3870	2000	21000			
Total	72080	--	1057600	122800	--	1631000	190330	--	2898000

Day	JULY			AUGUST			SEPTEMBER		
1..	6700	3400	62000	1400	490	1900	1800	300	1500
2..	6260	2600	44000	1410	550	2100	1700	340	1600
3..	5380	1900	28000	1420	820	3100	1600	540	2300
4..	4980	1800	24000	1420	1000	3800	1500	260	1100
5..	4830	1700	22000	1330	480	1700	1400	270	1000
6..	4520	1500	18000	1320	310	1100	1300	110	390
7..	3690	1300	13000	1320	480	1700	1200	140	450
8..	3100	1100	9200	1350	310	1100	1100	440	1300
9..	2940	1200	9500	1390	350	1300	1100	400	1200
10..	3160	1400	12000	1430	520	2000	1100	700	2100
11..	3520	1500	14000	1360	450	1700	1200	430	1400
12..	3000	1600	13000	1500	680	2800	1200	380	1200
13..	3590	1500	15000	949	250	640	1200	380	1200
14..	3000	1400	11000	884	220	520	1200	410	1300
15..	2910	--	E 12000	852	80	180	1200	310	1000
16..	3090	1500	13000	820	150	330	1200	--	E 900
17..	2730	1300	9600	820	220	490	1200	290	940
18..	2540	1100	7500	800	250	540	1230	310	1000
19..	2940	1400	11000	800	300	650	1240	220	740
20..	3000	1500	12000	900	3200	S 12000	1270	70	240
21..	2840	1200	9200	1100	1100	S 4000	1310	110	390
22..	2670	1000	7200	1100	260	770	1320	200	710
23..	2160	1300	7600	1100	290	860	1320	240	860
24..	1930	1100	5700	1100	240	710	1320	210	750
25..	1870	950	4800	1200	110	360	1340	160	580
26..	1860	1100	5500	1200	180	580	1410	260	990
27..	1760	1000	4800	1100	270	800	1440	380	1500
28..	1400	620	2300	2400	100	650	1480	150	600
29..	1400	660	2500	3600	26000	S 270000	1470	160	640
30..	1430	760	2900	2200	7400	S 40000	1450	340	1300
31..	1430	780	3000	1900	900	4600	--	--	--
Total	96630	--	415300	41475	--	362980	39800	--	31180

Total discharge for year (cfs-days)..... 877450
Total load for year (tons)..... 8898900

E Estimated.
S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2795. BIGHORN RIVER AT KANE, WYO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment										Method of analysis
							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	
Apr. 3, 1964.....	1430	46		2110	4550	25900		44		66		86	95	98	100			VPWC
Apr. 27.....	1640	48		D 4890	27500	363000		60		79		95	97	98	99	100		VPWC
May 7.....	1510	58		D 3000	2000	16200		31		46		76	90	97	100			VPWC
June 5.....	1540	66		3400	2220	20400		31		42		89	87	98	100			VPWC
July 2.....	1000	67		5940	3130	50200		24		38		69	86	97	100			VPWC

D Daily mean discharge.

6-2862. SHOSHONE RIVER AT KANE, WYO.

LOCATION.--At gaging station, on right pier of county bridge, 1 mile north of Kane, Big Horn County, and 1.5 miles upstream from mouth.
DRAINAGE AREA.--2,989 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to June 1953, August 1958 to September 1964.
Water temperatures: October 1959 to September 1964.
Sediment records: October 1959 to September 1964 (discontinued).
EXTREMES, 1963-64.--Water temperatures: Maximum, 79°F Aug. 6; minimum, freezing point on many days during December to March.
Sediment concentrations: Maximum daily, 21,000 ppm Apr. 26; minimum daily, 79 ppm Dec. 12, 17.
Sediment loads: Maximum daily, 310,000 tons June 9; minimum daily, 130 tons Dec. 17.
EXTREMES, 1959-64.--Water temperatures: Maximum, 80°F June 26, 1960; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 26,000 ppm Apr. 28, 1963; minimum daily, 20 ppm Dec. 17, 28, 1961, Jan. 17, 18, 1962.
Sediment loads: Maximum daily, 524,000 tons Sept. 19, 1961; minimum daily, 41 tons Apr. 1, 1961.
REMARKS.--Flow affected by ice Dec. 12 to Feb. 16.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Nov. 4, 1963....	826	17	A0.09	104	39	131	4.2	307	0	428	12	0.6	4.4	0.34	936	1.27	2090	420	168	2.8	1260	7.7	4
Dec. 2.....	604	17	A.14	109	38	127	5.1	296	0	412	11	.6	1.4	.24	915	1.24	1490	428	185	2.7	1260	7.5	7
Jan. 6, 1964....	B600	19	A.09	121	33	120	5.2	316	0	403	11	.6	.3	.21	917	1.25	1480	439	180	2.5	1260	7.3	4
Feb. 3.....	B600	18	A.06	117	35	115	5.0	310	0	387	13	.5	.2	.24	879	1.20	1420	436	182	2.4	1230	7.5	5
Mar. 2.....	475	18	A.09	112	37	112	4.9	313	0	372	12	.6	.4	.26	851	1.16	1090	432	175	2.3	1210	7.4	6
Apr. 3.....	1141	15	A.13	52	51	102	3.9	235	0	329	14	.4	2.3	.18	746	1.01	2300	340	147	2.4	1050	7.9	4
May 7.....	1024	17	A.13	84	30	118	4.2	226	0	356	18	.5	3.1	.34	769	1.05	2130	332	147	2.8	1090	7.4	35
June 5.....	1432	17	.02	55	44	122	4.0	214	0	379	13	.5	6.5	.19	800	1.09	3090	318	142	3.0	1110	7.8	4
July 2.....	5555	17	.02	46	11	38	2.5	154	0	108	3.4	.3	1.7	.06	314	.43	4710	159	33	1.3	472	7.6	8
Aug. 7.....	842	16	A.10	91	32	125	3.9	228	0	398	13	.6	4.9	.18	842	1.15	1910	360	173	2.9	1160	8.0	5
Sept. 5.....	970	16	A.10	85	28	110	3.1	223	0	348	9.7	.5	4.7	.14	736	1.00	1930	327	144	2.6	1330	7.9	2

A In solution at time of collection.
B Daily mean discharge.

YELLOWSTONE RIVER BASIN--Continued

6-2862. SHOSHONE RIVER AT KANE, WYO.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	58	56	55	54	60	56	55	55	54	54	--	52	54	54	53	53	54	51	52	49	55	51	50	48	48	50	41	41	47	45	46	52
November	43	41	47	45	45	40	43	40	41	47	44	47	46	45	46	44	41	45	38	37	33	33	36	36	39	36	39	38	33	34	--	41
December	38	34	--	32	35	38	35	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	33	33	34	34	36	33	33
January	33	34	34	34	33	32	33	33	32	32	32	32	32	33	33	33	33	33	34	34	33	33	33	33	33	33	33	34	34	34	34	33
February	33	33	34	33	33	33	33	33	33	36	34	35	35	36	37	36	37	37	37	35	37	36	37	35	32	32	34	36	38	--	--	35
March	36	36	38	40	39	40	39	40	39	42	39	39	39	40	40	40	43	45	40	40	40	32	32	34	34	35	40	42	45	49	50	40
April	50	41	46	46	50	46	49	57	52	55	50	42	49	52	56	49	50	51	55	55	56	54	55	55	--	42	45	58	52	55	--	51
May	56	53	54	50	46	--	49	49	49	54	49	49	54	54	57	60	60	58	59	55	56	58	54	54	58	53	55	55	--	52	54	54
June	54	55	59	53	--	62	61	58	52	52	55	53	58	61	63	64	60	56	59	58	57	56	58	61	64	71	64	64	63	73	--	59
July	70	66	70	63	65	69	72	64	69	63	70	65	66	65	66	--	78	65	68	65	66	67	66	64	66	65	66	61	64	65	70	67
August	69	68	64	67	67	79	64	74	76	69	70	69	70	70	65	64	63	65	63	59	54	59	59	59	59	58	59	59	55	53	55	64
September	58	59	52	56	55	53	53	58	53	53	54	52	53	52	58	--	64	58	53	53	54	52	52	50	50	46	44	54	51	55	--	54

YELLOWSTONE RIVER BASIN--Continued

6-2862. SHOSHONE RIVER AT KANE, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	1260	250	850	1070	190	550	768	250	520
2	1240	240	800	1010	190	520	691	170	320
3	1220	210	690	988	120	320	677	-- E	350
4	1230	210	700	979	120	320	670	200	360
5	1220	170	560	804	220	480	658	100	180
6	1200	190	620	719	190	370	664	130	230
7	1230	200	660	726	180	350	658	150	270
8	1200	210	680	882	170	400	646	170	300
9	1140	200	620	834	150	340	652	150	260
10	1140	170	520	684	130	240	670	560	1000
11	1130	-- E	500	670	150	270	658	140	250
12	1130	150	460	664	150	270	650	79	140
13	1100	160	480	640	120	210	650	100	180
14	1100	160	480	652	140	250	650	100	180
15	1090	180	530	640	120	210	650	94	160
16	1050	210	600	733	200	400	600	84	140
17	1090	220	650	705	120	230	600	79	130
18	1100	230	680	705	94	180	650	100	180
19	1080	210	610	698	150	280	650	140	250
20	1100	220	650	684	100	180	650	94	160
21	1070	200	580	628	150	250	650	84	150
22	1130	250	760	634	210	360	650	89	160
23	1130	300	920	664	170	300	650	100	180
24	1150	230	710	646	150	260	650	180	320
25	1190	230	740	616	150	250	650	190	330
26	1200	270	900	604	150	240	650	220	390
27	1200	330	1100	604	140	230	650	300	530
28	1200	260	840	586	100	160	650	400	700
29	1640	460	2000	568	140	210	650	450	790
30	1410	300	1100	640	150	260	650	290	510
31	1350	240	870	--	--	--	650	360	630
Total	36720	--	22860	21677	--	8890	20312	--	10250
	JANUARY			FEBRUARY			MARCH		
1	650	700	1200	600	410	660	574	170	260
2	650	820	1400	600	200	320	592	210	340
3	600	480	780	600	150	240	726	780 S	1700
4	600	270	440	600	130	210	988	920	2500
5	600	210	340	600	160	260	1080	460	1300
6	600	340	550	600	160	260	1010	410	1100
7	600	2500	4000	600	130	210	988	1000	2700
8	650	2000	3500	600	170	280	997	1400	3800
9	600	940	1500	600	140	230	1020	410	1100
10	600	400	650	600	420	680	1020	660	1800
11	650	460	810	600	550	890	962	930	2400
12	650	1400	2500	600	500	810	979	1900 S	5600
13	650	2600	4600	600	440	710	1140	2200	6800
14	650	580	1000	600	450	730	882	770	1800
15	650	290	510	600	460	750	775	760	1600
16	650	270	470	600	290	470	796	1500	3200
17	700	170	320	574	220	340	834	690	1600
18	750	130	260	550	250	370	818	550	1200
19	700	160	300	550	180	270	804	400	870
20	800	150	320	550	210	310	796	500	1100
21	900	270	660	574	210	330	866	320 S	860
22	800	140	300	556	190	290	997	1900 S	5400
23	700	84	160	550	170	250	826	1600	3600
24	600	100	160	556	170	260	874	1700	4000
25	600	150	240	528	170	240	850	1700	3900
26	650	120	210	562	180	270	866	540	1300
27	650	130	230	592	260	420	858	320	740
28	650	140	250	586	190	300	922	710	1800
29	650	180	320	580	170	270	1210	1500	4900
30	600	120	190	--	--	--	1320	880	3100
31	600	89	140	--	--	--	1330	870	3100
Total	20400	--	28310	16908	--	11630	28700	--	75470

E Estimated.
S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2862. SHOSHONE RIVER AT KANE, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	1350	970	3500	1100	2200	6500	979	590	1600
2	1360	890	3300	1430	5600 S	25000	946	520	1300
3	1330	740	2700	2460	12000 S	76000	1170	2600 S	12000
4	1320	610	2200	1740	6200 S	31000	1560	4400 S	20000
5	1330	1500	5400	1270	2200	7500	1320	1600	5700
6	1290	710	2500	1270	2700	9300	1530	3600	15000
7	1200	590	1900	1230	1900	6300	1530	3500	14000
8	1090	650	1900	1170	1000	3200	2560	8600	59000
9	1110	820	2500	1170	840	2700	5940	17000 S	310000
10	1170	970	3100	1120	740	2200	2460	6100	41000
11	1200	830	2700	1330	2500	9000	1980	3000 S	17000
12	1160	520	1600	1230	1000	3300	1540	1900	7900
13	1120	680	2100	1150	570	1800	1410	1500	5700
14	1030	630	1800	1080	720	2100	1270	900	3100
15	1010	710	1900	970	700	1800	1250	1200	4000
16	988	650	1700	874	570	1300	1220	1100	3600
17	930	690	1700	775	540	1100	1280	1300	4500
18	954	1300	3300	775	520	1100	1600	4000	17000
19	1030	2000	5600	684	470	870	1400	1100	4200
20	1040	1500	4200	705	520	990	1300	780	2700
21	898	1600	3900	640	550	950	1650	2200	9800
22	898	1500	3600	568	480	740	1340	1000 S	3800
23	866	1200	2800	586	420	660	1120	590	1800
24	733	1300 S	2400	610	430	710	1080	690	2000
25	775	-- E	3800	610	430	710	938	360	910
26	2790	21000 S	180000	562	510	770	954	460	1200
27	1890	13000	66000	574	610	950	946	320	820
28	1100	4100	12000	610	390	640	914	320	790
29	1070	4200	12000	747	-- E	1000	938	390	990
30	1090	2700	7900	796	630	1400	1450	1600 S	7400
31	--	--	--	898	610	1500	--	--	--
Total	35122	--	350000	30734	--	203090	45575	--	578810

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	4040	2600 S	31000	874	240	570	1350	590	2200
2	6290	5400	92000	858	210	490	1290	560	2000
3	6840	3200	59000	922	150	370	1220	440	1400
4	6920	1600	30000	898	150	360	1200	360	1200
5	7060	1500	29000	850	130	300	1130	380	1200
6	6710	1300	24000	850	160	370	1100	430	1300
7	5990	1100	18000	826	190	420	1100	320	950
8	5710	1000	15000	850	230	530	1030	290	810
9	5520	900	13000	898	250	610	898	290	700
10	5500	600	8900	898	260	630	850	320	730
11	5590	680	10000	842	230	520	914	310	760
12	5560	500	7500	842	200	450	962	340	880
13	5180	500	7000	850	200	460	997	370	1000
14	5190	460	6400	796	200	430	979	280	740
15	5080	490	6700	768	250	520	882	290	690
16	4910	1300	17000	768	260	540	850	-- E	600
17	4460	700	8400	796	220	470	842	220	500
18	3970	450	4800	768	250	520	810	190	420
19	3560	360	3500	761	240	490	826	190	420
20	3260	300	2600	1040	2200	6200	850	210	480
21	2780	290	2200	1340	1500	5400	882	210	500
22	2360	180	1100	1290	750	2600	890	270	650
23	2060	190	1100	1320	740	2600	850	200	460
24	2060	200	1100	1300	680	2400	890	200	480
25	1780	180	860	1270	660	2300	930	260	650
26	1580	190	810	1180	540	1700	1020	280	770
27	1320	150	530	1110	420	1300	1120	360	1100
28	1090	180	530	1090	240	710	1150	340	1100
29	1010	260	710	2010	4900 S	30000	1110	330	990
30	938	190	480	1490	2000	8000	1110	260	780
31	914	200	490	1440	800	3100	--	--	--
Total	125232	--	403710	31795	--	75360	30032	--	26460

Total discharge for year (cfs-days)..... 443207
Total load for year (tons)..... 1794840

E Estimated.
S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2862. SHOSHONE RIVER AT KANE, WYO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(*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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
May 7, 1964.....	1330	57		1220	1520	5010		60		75		96	97	100	--			VPWC
June 5.....	1440	66		1350	1440	5250		44		58		80	95	99	100			VPWC
July 2.....	1125	66		6360	3750	64400		26		41		70	90	96	100			VPWC

YELLOWSTONE RIVER BASIN--Continued

6-2870. BIGHORN RIVER NEAR ST. XAVIER, MONT.

LOCATION.--Temperature recorder at Big Horn Canal diversion dam, 0.2 mile upstream from Grapevine Creek, 1.2 miles upstream from gaging station, and 15 miles southwest of St. Xavier, Big Horn County.
RECORDS AVAILABLE.--Water temperatures: December 1962 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 76°F July 21, 22, Aug. 1, 4; minimum, freezing point on many days during November to March.
EXTREMES, 1962-64.--Water temperatures: Maximum, 76°F Aug. 9, 1963, July 21, 22, Aug. 1, 4, 1964; minimum, freezing point on many days during winter months each year.
REMARKS.--Recorder stopped Aug. 8-26, 1964.

Temperature (°F) of water, December 1962 to September 1963

Month	Day																													Average
	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	
December																																
Maximum	--	--	--	--	--	--	--	--	--	--	--	35	36	36	37	36	37	37	37	38	37	35	33	33	33	33	33	33	33	33	33	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	34	34	35	35	36	36	36	36	37	35	33	33	33	33	33	33	33	32	32	32	--
January																																
Maximum	33	33	33	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	33	33	32	32	32	32	32	32	32	32	33	33	33	33
Minimum	33	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February																																
Maximum	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34	35	35	35	35	35	36	--	--	--	34
Minimum	33	32	33	32	32	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34	34	34	35	35	35	--	--	--	33
March																																
Maximum	--	39	38	38	38	39	39	39	42	44	44	44	40	39	40	40	42	44	44	47	49	51	53	52	52	51	50	52	51	52	52	45
Minimum	--	38	37	36	35	36	37	37	38	41	42	40	35	36	38	38	38	40	42	44	45	47	49	51	49	48	47	49	49	49	49	42
April																																
Maximum	52	50	44	46	50	51	52	53	52	51	51	53	55	56	56	56	52	52	50	49	45	44	46	49	53	56	56	50	50	54	--	51
Minimum	49	44	42	43	46	49	50	50	51	48	47	49	51	54	55	52	50	48	48	45	41	41	42	45	48	51	50	48	48	49	--	48
May																																
Maximum	55	55	54	57	60	61	62	61	59	60	60	57	58	59	59	61	62	60	60	59	58	59	63	65	64	61	59	60	63	63	63	60
Minimum	53	52	51	53	55	58	60	58	57	57	57	53	53	55	52	58	58	57	56	56	54	54	57	60	61	59	58	58	60	62	62	57
June																																
Maximum	63	61	61	59	60	61	60	61	60	60	62	64	67	67	66	62	62	63	66	66	66	66	65	65	65	67	68	68	68	66	--	64
Minimum	61	60	59	58	59	60	58	58	59	59	58	61	64	66	62	61	60	61	63	66	64	64	62	64	64	65	67	66	66	65	--	62
July																																
Maximum	67	68	68	70	70	69	71	70	70	70	68	68	70	70	70	68	70	71	71	72	73	74	73	74	73	70	65	68	69	70	--	70
Minimum	64	66	67	67	68	67	68	68	68	68	67	66	66	67	67	66	66	67	67	68	69	70	69	70	70	60	62	63	67	67	--	67
August																																
Maximum	71	72	69	70	72	74	74	75	76	75	75	75	73	73	74	74	72	70	70	70	70	69	68	69	68	70	70	70	68	65	65	71
Minimum	68	69	67	66	68	71	71	72	73	72	73	73	71	70	71	71	69	68	68	68	67	67	66	66	66	67	68	67	65	63	63	69
September																																
Maximum	65	66	67	67	68	68	69	69	68	70	68	67	67	66	63	63	62	62	62	64	65	65	63	62	62	62	63	62	62	63	--	65
Minimum	64	63	64	64	65	66	66	68	66	66	66	64	65	63	60	60	60	60	61	61	63	60	60	60	59	59	59	60	59	60	--	62

6-2870. BIGHORN RIVER NEAR ST. XAVIER, MONT.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October																																
Maximum	63	63	62	62	61	61	60	60	59	59	59	58	58	59	59	58	56	55	54	54	53	53	53	52	50	49	47	46	46	45	44	55
Minimum	60	60	60	59	59	58	58	57	57	57	57	56	56	57	57	55	54	53	53	52	51	51	52	49	48	47	46	45	44	44	43	53
November																																
Maximum	44	43	43	44	45	45	45	45	45	44	43	42	42	42	44	44	43	41	40	39	35	32	33	34	35	36	38	37	37	36	--	41
Minimum	42	42	41	42	43	44	44	43	44	43	42	41	40	41	42	43	41	40	39	35	32	32	32	33	34	35	36	36	36	35	--	20
December																																
Maximum	36	36	35	35	35	35	35	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34
Minimum	35	34	34	34	34	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	32	33	33	33	33	33	33	33	33	33	33
January																																
Maximum	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34	33	33
Minimum	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
February																																
Maximum	34	34	33	34	33	33	33	34	34	34	34	34	34	34	33	33	34	35	34	34	34	33	34	33	33	33	33	33	33	--	--	34
Minimum	33	33	33	33	33	33	33	33	33	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	32	--	--	33
March																																
Maximum	33	33	33	34	33	33	33	33	33	34	34	36	35	35	35	37	39	39	36	35	37	36	32	32	32	32	32	34	34	41	47	35
Minimum	32	32	32	32	32	32	32	32	32	32	32	33	33	33	34	35	36	36	33	33	33	32	32	32	32	32	32	32	32	34	41	33
April																																
Maximum	47	46	44	46	48	45	42	45	50	53	53	51	48	50	52	51	50	50	52	54	52	53	54	55	52	48	48	49	52	54	--	50
Minimum	45	43	41	42	45	42	40	40	45	50	49	47	46	47	50	48	47	48	50	51	49	50	53	52	47	45	46	48	49	52	--	47
May																																
Maximum	59	59	54	51	51	53	56	55	55	59	55	56	58	61	63	65	66	64	65	64	64	61	58	58	58	57	57	57	56	55	57	58
Minimum	54	55	49	49	50	51	53	52	52	55	53	53	55	57	60	61	63	62	63	62	60	57	56	58	56	56	56	56	55	54	55	56
June																																
Maximum	59	59	59	59	60	60	61	60	54	54	56	57	59	60	62	62	61	58	58	59	59	59	61	63	65	65	66	65	64	64	65	60
Minimum	57	57	56	56	58	59	59	54	52	51	54	56	57	58	60	61	58	57	57	58	58	58	58	60	62	64	64	64	63	63	64	58
July																																
Maximum	65	66	66	66	67	71	68	69	70	71	72	71	71	72	71	72	73	74	73	74	76	76	75	72	72	74	74	73	74	75	75	72
Minimum	64	65	65	65	66	67	67	68	68	69	70	70	70	69	70	71	72	72	71	72	74	74	70	68	69	69	71	70	70	72	72	69
August																																
Maximum	76	73	74	76	74	70	70	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	62	61	59	57	61	--
Minimum	73	70	70	72	70	65	65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	60	58	55	54	56	--
September																																
Maximum	64	63	63	61	63	59	60	63	62	58	56	59	60	61	62	63	70	63	66	64	60	58	57	60	57	54	52	53	55	56	--	60
Minimum	60	60	60	59	59	57	57	58	58	54	54	55	57	58	59	59	58	53	54	55	55	55	55	56	53	49	50	51	53	54	--	56

YELLOWSTONE RIVER BASIN--Continued

6-2885. BIGHORN RIVER NEAR HARDIN, MONT.

LOCATION.--Temperature recorder at Two Leggin Canal diversion dam, 0.2 mile upstream from Two Leggin Creek, and 6.4 miles southwest of Hardin, Big Horn County.
RECORDS AVAILABLE.--Water temperatures: December 1962 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 79°F July 21, 22; minimum, freezing point on many days during December to March.
EXTREMES, 1962-64.--Water temperatures: Maximum, 79°F Aug. 10, 1963, July 21, 22, 1964; minimum, freezing point on many days during winter months.
REMARKS.--Recorder stopped July 19-28, Oct. 5-28, 1963, and Jan. 31 to Feb. 28, Mar. 6 to May 19, June 21 to July 7, 1964.

Temperature (°F) of water, December 1962 to September 1963

Month	Day																													Average
	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	
December																																
Maximum	--	--	--	--	--	--	--	--	--	--	34	36	36	37	37	38	37	38	38	38	37	37	33	33	33	33	33	33	33	33	33	--
Minimum	--	--	--	--	--	--	--	--	--	--	34	33	33	35	35	36	36	36	37	37	36	33	33	33	33	33	33	33	33	33	33	--
January																																
Maximum	33	33	33	34	33	34	35	35	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	36	33	37	33	33	33	33	33
Minimum	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	32	33	33	32	32	33	32	33	32	33	33	33	33	33
February																																
Maximum	33	33	33	33	33	45	46	46	45	45	45	45	45	45	45	46	46	45	47	45	45	45	45	47	49	49	48	--	--	--	--	43
Minimum	33	33	33	33	33	33	45	45	45	45	45	45	44	44	44	45	45	45	45	44	44	44	45	45	45	46	47	--	--	--	--	42
March																																
Maximum	--	39	39	39	37	39	41	40	42	43	44	40	40	40	41	40	41	44	45	49	50	52	55	53	53	51	53	52	52	59	54	46
Minimum	--	36	36	34	34	34	35	36	37	38	40	38	35	34	35	35	34	36	40	41	43	45	48	48	46	46	47	48	47	47	47	40
April																																
Maximum	53	49	48	50	53	52	54	54	52	50	53	51	59	61	59	54	56	52	53	50	43	46	50	51	55	59	57	52	54	53	--	53
Minimum	46	43	40	43	44	47	47	49	47	45	47	46	50	53	53	48	47	47	46	43	41	40	42	44	46	50	52	49	48	49	--	46
May																																
Maximum	55	57	56	59	60	63	63	61	58	62	59	56	59	60	64	63	65	61	63	60	62	62	65	68	66	65	62	64	65	66	68	62
Minimum	53	52	53	51	54	57	58	57	55	53	55	53	51	54	56	57	57	56	54	55	52	52	54	58	62	60	57	55	58	61	60	55
June																																
Maximum	66	64	61	61	61	62	63	61	64	59	63	67	71	71	68	66	64	66	68	68	67	66	66	66	68	69	71	72	71	70	--	66
Minimum	62	60	59	57	58	58	58	57	57	58	57	59	62	65	64	62	60	60	60	63	64	61	59	60	62	62	63	66	66	64	--	61
July																																
Maximum	70	71	74	74	73	73	75	75	74	74	73	71	73	72	73	73	73	73	--	--	--	--	--	--	--	--	--	--	73	74	--	--
Minimum	63	65	67	67	68	67	68	68	68	68	67	65	65	67	67	67	66	67	--	--	--	--	--	--	--	--	--	--	68	67	--	--
August																																
Maximum	75	74	74	74	74	77	76	77	78	79	78	76	77	76	76	76	76	74	74	73	73	72	71	71	73	72	73	71	70	68	66	74
Minimum	68	66	67	67	70	70	71	73	71	73	72	70	69	70	70	70	69	68	68	67	66	65	65	66	67	67	67	65	64	63	64	68
September																																
Maximum	65	69	69	69	70	70	71	71	71	71	70	69	67	66	64	63	63	63	64	64	63	65	63	63	62	62	63	63	62	63	--	66
Minimum	64	63	64	64	65	65	66	68	68	67	67	66	65	64	62	62	61	61	62	61	62	62	61	61	60	61	61	61	61	61	--	63

YELLOWSTONE RIVER BASIN--Continued

6-2885. BIGHORN RIVER NEAR HARDIN, MONT.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October																																
Maximum	63	63	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46	45	45	--
Minimum	62	61	58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	45	45	44	--
November																																
Maximum	--	43	43	42	43	43	43	43	43	43	43	42	41	41	42	42	42	41	41	40	38	36	35	34	35	35	36	36	36	36	--	40
Minimum	--	42	42	42	42	42	42	42	42	43	42	41	40	40	41	41	41	40	40	38	36	35	34	34	34	35	35	36	36	35	--	20
December																																
Maximum	36	36	35	35	35	35	35	34	33	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33
Minimum	35	35	35	35	35	34	34	33	33	33	33	32	32	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33
January																																
Maximum	32	32	32	32	32	32	32	32	33	33	33	33	34	34	33	34	34	34	34	34	34	33	34	34	34	34	34	34	33	33	--	33
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	34	34	34	33	33	33	33	33	33	33	33	33	33	33	--	33
February																																
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	32	--	--	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	32	--	--	--
March																																
Maximum	32	32	32	32	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	32	32	32	32	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April																																
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May																																
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	67	67	64	60	62	60	59	58	59	56	60	59	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	62	62	58	55	55	56	55	55	56	54	54	54	--
June																																
Maximum	61	60	64	64	66	64	61	56	57	61	62	66	67	67	67	62	60	62	62	62	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	55	57	57	60	61	61	56	53	54	56	58	60	62	64	62	59	57	58	58	59	--	--	--	--	--	--	--	--	--	--	--	--
July																																
Maximum	--	--	--	--	--	--	--	74	74	74	75	75	75	75	75	75	76	77	77	77	79	79	77	75	70	76	76	76	76	78	78	--
Minimum	--	--	--	--	--	--	--	71	68	68	68	68	69	69	68	68	69	70	70	69	71	72	71	70	67	68	69	68	69	71	71	--
August																																
Maximum	78	77	77	78	74	75	75	73	77	73	72	71	73	75	76	76	77	--	69	--	63	65	62	63	65	65	65	61	57	60	63	70
Minimum	72	70	69	70	71	67	67	68	68	69	65	64	66	68	68	68	69	--	99	--	57	58	58	58	58	61	59	56	55	56	59	64
September																																
Maximum	65	64	63	64	64	60	61	64	65	57	59	60	61	62	64	64	65	61	61	60	60	59	59	60	59	54	54	54	55	56	--	60
Minimum	61	58	58	58	58	55	57	57	57	53	53	54	56	57	59	58	59	56	55	56	56	55	55	55	51	49	49	51	53	53	--	55

YELLOWSTONE RIVER BASIN--Continued

6-2947. BIGHORN RIVER AT BIGHORN, MONT.

LOCATION.--At gaging station, on right bank just downstream from bridge on U.S. Highway 10, 0.8 mile upstream from mouth, 1 mile southwest of Bighorn, Treasure County, and 4 miles east of Custer.
DRAINAGE AREA.--22,885 square miles.
RECORDS AVAILABLE.--Chemical analyses: February 1950 to September 1964.
Water temperatures: April 1949 to September 1951, August 1952 to November 1958, June 1959 to September 1964.
Sediment records: July 1947 to September 1954, October 1955 to September 1958, October 1959 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 960 ppm Nov. 26-28; minimum, 343 ppm June 29 to July 9.
Hardness: Maximum, 453 ppm Nov. 26-28; minimum, 183 ppm June 29 to July 9.
Specific conductance: Maximum daily, 1,320 micromhos Nov. 28; minimum daily, 469 micromhos July 8.
Water temperatures: Maximum, 76°F July 12, 19, Aug. 9; minimum, freezing point on many days during December to March.
Sediment concentrations: Maximum daily, 16,000 ppm Apr. 29; minimum daily, not determined.
Sediment loads: Maximum daily, 510,000 tons June 10, 11; minimum daily, 460 tons Aug. 18.
EXTREMES, 1947-64.--Dissolved solids (1951-64): Maximum, 1,460 ppm July 10-11, 1961; minimum, 304 ppm June 23, 1951.
Hardness (1951-64): Maximum, 643 ppm Sept. 24, 1963; minimum, 151 ppm June 23, 1951.
Specific conductance (1951-64): Maximum daily, 1,940 micromhos July 10, 1961; minimum daily, 384 micromhos June 20, 1951.
Water temperatures (1949-51, 1952-64): Maximum, 89°F Aug. 7, 1953; minimum, freezing point on many days during winter months.
Sediment concentrations (1947-54, 1955-58, 1959-64): Maximum daily, 23,200 ppm May 24, 1952; minimum daily, not determined.
Sediment loads (1947-54, 1955-58, 1959-64): Maximum daily, 727,000 tons May 24, 1952; minimum daily, 100 (estimated) tons on several days in 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Worland, Wyo. Flow affected by ice Dec. 12 to Mar. 18.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-31, 1963.	2981	12	0.00	89	32	105	3.7	226	0	355	12	0.4	1.1	0.13	763	1.04	6140	353	168	2.4	1080	7.6	5
Nov. 1-11.....	3714	--	--	--	--	98	--	227	0	324	--	--	--	--	731	.99	7330	343	157	2.3	1030	7.9	--
Nov. 12-25.....	3101	--	--	--	--	111	--	236	0	379	--	--	--	--	820	1.12	6860	382	188	2.5	1140	7.6	--
Nov. 26-28.....	3007	--	--	--	--	126	--	276	0	440	--	--	--	--	960	1.31	7790	453	227	2.6	1300	8.2	--
Nov. 29-Dec. 11.	3402	--	--	--	--	105	--	240	0	356	--	--	--	--	769	1.05	7060	368	171	2.4	1080	7.8	--
Jan. 13-21, 1964	3200	--	--	--	--	91	--	223	0	316	--	--	--	--	689	.94	5950	332	149	2.2	985	7.9	--
Jan. 22-31.....	3200	--	--	--	--	82	--	224	0	292	--	--	--	--	650	.88	5620	328	144	2.0	944	8.0	--
Feb. 1-6.....	2817	--	--	--	--	83	--	224	0	292	--	--	--	--	651	.89	4950	322	138	2.0	947	8.1	--
Feb. 7-19.....	2285	--	--	--	--	96	--	238	0	340	--	--	--	--	748	1.02	4610	370	175	2.2	1060	7.8	--
Feb. 20-29.....	2150	--	--	--	--	93	--	217	0	335	--	--	--	--	728	.99	4230	352	174	2.2	1030	7.6	--
Mar. 1-14.....	2521	--	--	--	--	95	--	205	0	329	--	--	--	--	684	.93	4660	336	168	2.3	976	7.1	--
Mar. 15-22.....	3165	--	--	--	--	107	--	221	0	350	--	--	--	--	732	1.00	6260	344	163	2.5	1040	7.7	--
Mar. 23-31.....	2704	--	--	--	--	122	--	224	0	397	--	--	--	--	822	1.12	6000	382	198	2.7	1140	7.7	--
Apr. 1-14.....	4023	--	--	--	--	113	--	226	0	366	--	--	--	--	781	1.06	8480	364	179	2.6	1090	7.5	--
Apr. 15-26.....	4256	--	--	--	--	105	--	223	0	334	--	--	--	--	726	.99	8340	344	161	2.5	1020	7.6	--

Apr. 27-May 12, 1964.....	7110	--	--	--	--	120	--	208	0	387	--	--	--	--	798	1.09	15320	343	172	2.8	1120	7.9	--
May 13-23.....	7343	--	--	--	--	74	--	199	0	262	--	--	--	--	581	.79	11520	288	125	1.9	844	8.1	--
May 24-31.....	8835	11	.03	58	17	42	2.4	163	0	160	6.4	.2	.8	.03	403	.55	9610	216	82	1.2	593	7.9	4
June 1-10.....	10440	--	--	--	--	63	--	186	0	211	--	--	--	--	496	.67	13980	253	100	1.7	731	7.9	--
June 11-20.....	14970	--	--	--	--	60	--	186	0	195	--	--	--	--	462	.63	18670	236	83	1.7	691	8.0	--
June 21-28.....	12390	--	--	--	--	56	--	176	0	207	--	--	--	--	474	.64	15860	247	103	1.6	696	7.6	--
June 29-July 9..	12730	12	.01	49	15	36	2.4	156	0	126	5.0	.2	.2	.04	343	.47	11790	183	55	1.2	521	7.7	4
July 10-21.....	8148	--	--	--	--	43	--	156	0	149	--	--	--	--	355	.48	7810	197	69	1.3	556	7.9	--
July 22-31.....	3894	--	--	--	--	69	--	183	0	230	--	--	--	--	525	.71	5520	258	108	1.9	773	7.8	--
Aug. 1-18.....	2154	--	--	--	--	100	--	205	0	346	--	--	--	--	715	.97	4160	333	165	2.4	1020	7.2	--
Aug. 19-26.....	2366	12	.02	90	36	121	4.1	222	0	406	14	.5	1.8	.16	821	1.12	5240	371	189	2.7	1200	7.2	6
Aug. 27-Sept. 18	3152	--	--	--	--	112	--	216	0	372	--	--	--	--	772	1.05	6570	352	175	2.6	1090	7.6	--
Sept. 19-30.....	2792	9.5	.00	109	23	112	3.9	218	0	378	13	.5	1.0	.15	792	1.08	5970	366	187	2.5	1110	7.7	1
Weighted average A.....	--	--	--	--	--	82	--	200	--	276	--	--	--	--	611	0.83	7710	295	131	2.0	878	7.7	--
Time-weighted average.....	4680	--	--	--	--	93	--	212	--	315	--	--	--	--	683	--	--	326	151	2.2	973	7.6	--
Tons per day..	--	--	--	--	--	1030	--	2530	--	3490	--	--	--	--	--	--	--	--	--	--	--	--	--

A Includes estimated data for missing periods. Represents 100 percent of runoff for water year.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	62	60	59	64	59	59	59	58	59	57	56	55	55	56	55	50	53	54	50	50	49	51	53	49	49	49	42	41	42	42	41	53
November.....	--	42	44	41	41	44	42	42	42	41	42	--	--	39	44	43	42	42	42	42	41	37	37	36	36	40	40	36	37	36	--	40
December.....	36	36	39	33	36	36	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33
January.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	34	34	--	32	32	32	32	32	34	36	36	40	33
April.....	40	44	41	40	43	40	38	40	46	47	50	48	46	45	48	49	42	45	50	50	49	47	56	51	50	47	40	44	50	55	--	46
May.....	55	51	52	44	46	50	51	51	54	56	52	52	55	57	59	63	62	62	66	60	65	62	57	59	60	61	59	56	56	56	59	56
June.....	56	57	60	58	64	64	64	63	57	57	55	57	62	64	65	65	66	59	60	59	60	60	61	64	66	69	70	69	62	66	--	62
July.....	68	70	70	72	74	70	72	72	72	73	73	76	74	74	71	72	73	74	76	73	75	75	75	73	71	74	71	69	71	74	72	73
August.....	75	74	70	74	73	69	68	75	76	74	66	66	70	70	69	72	71	73	71	67	57	60	61	59	58	62	61	61	57	56	59	67
September.....	60	61	62	60	59	57	55	56	59	57	53	54	57	57	58	53	59	60	64	57	57	57	55	55	57	54	55	50	52	54	--	57

YELLOWSTONE RIVER BASIN--Continued

6-2947. BIGHORN RIVER AT BIGHORN, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	2930	380	3000	4010	--	5800	3570	280	2700
2	2900	330	2600	4150	580	6500	3750	270	2700
3	2880	310	2400	3810	470	4800	3790	280	2900
4	2800	220	1700	3810	1600	16000	3750	270	2700
5	2780	210	1600	3810	1100	11000	3270	190	1700
6	2780	190	1400	3730	510	5100	2840	160	1200
7	2750	140	1000	3550	320	3100	2860	160	1200
8	2730	140	1000	3610	330	3200	3130	81	680
9	2730	160	1200	3630	380	3700	2900	81	630
10	2680	140	1000	3830	310	3200	3630	90	880
11	2660	140	1000	2910	200	1600	3510	99	940
12	2660	99	710	2460	140	930	3400	--	800
13	2700	90	660	2390	110	710	3200	--	700
14	2680	99	720	2580	220 S	1700	2200	--	600
15	2840	200	1500	3410	390	3600	2200	--	600
16	2860	210	1600	3730	320	3200	2400	--	600
17	2800	220	1700	3770	330	3400	2300	--	600
18	2680	220	1600	3830	330	3400	2600	--	600
19	3090	620	5200	3790	360	3700	2400	--	600
20	3130	540	4600	3710	370	3700	2800	--	700
21	3150	360	3100	3250	330	2900	3500	--	700
22	3170	290	2500	2880	230	1800	3700	--	700
23	3210	300	2600	2720	180	1300	3600	--	700
24	3270	320	2800	2490	140	940	3500	--	700
25	3090	240	2000	2400	140	910	3500	--	700
26	2910	190	1500	2420	99	650	3400	--	700
27	2970	190	1500	2990	520 S	4900	3400	--	700
28	3530	290	2800	3610	500	4900	3400	--	700
29	3510	280	2700	3630	360	3500	3500	--	700
30	3830	560	5800	3590	300	2900	3600	--	700
31	3710	540	5400	--	--	--	3500	--	700
Total	92410	--	68890	100500	--	113040	99100	--	31730
	JANUARY			FEBRUARY			MARCH		
1	3400	--	700	3000	260	2100	2100	490	2800
2	3500	--	700	3000	250	2000	2100	400	2300
3	3600	--	700	2900	180	1400	2300	500	3100
4	3600	--	700	2800	250	1900	2400	430	2800
5	3600	--	700	2700	350	2600	2600	430	3000
6	3600	--	700	2500	280	1900	2800	260	2000
7	3500	--	700	2300	190	1200	2700	400	2900
8	3500	72	680	2200	210	1200	2600	520	3600
9	3400	--	700	2100	500	2800	2600	380	2700
10	3200	--	700	2200	570	3400	2600	430	3000
11	2900	--	700	2300	410	2500	2600	--	4300
12	2900	--	1000	2500	310	2100	2600	750	5300
13	3100	280	2300	2400	500	3200	2600	580	4100
14	3200	230	2000	2300	410	2500	2700	500	3600
15	3100	170	1400	2300	430	2700	2800	--	4200
16	2800	220	1700	2200	500	3000	2800	1300	9800
17	2900	250	2000	2300	360	2200	2700	1700	12000
18	3000	220	1800	2300	420	2600	3100	2500	21000
19	3400	--	2900	2300	580	3600	3590	3000 S	31000
20	3700	470	4700	2300	640	4000	3670	2400	24000
21	3600	450	4400	2300	670	4200	3470	2000	19000
22	3500	--	4200	2300	860	5300	3190	--	16000
23	3400	570	5200	2200	--	2900	2930	1800	14000
24	3500	570	5400	2200	400	2400	2450	790	5200
25	3300	350	3100	2300	--	2000	1920	400	2100
26	3000	--	2200	2000	270	1500	2280	430	2600
27	2900	--	2500	1900	220	1100	2990	990	8000
28	3100	510	4300	2000	210	1100	2970	880	7100
29	3100	250	2100	2000	450	2400	2840	990	7600
30	3100	170	1400	--	--	--	2990	850	6900
31	3100	--	1400	--	--	--	2970	1100	8800
Total	101500	--	63680	68100	--	71800	84960	--	244800

S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2947. BIGHORN RIVER AT BIGHORN, MONT.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	3090	1300	11000	4900	8000	110000	7700	1900	40000
2..	3990	1500	S 18000	4600	4100	51000	6890	1300	24000
3..	4400	2800	33000	5420	3600	53000	6180	1400	23000
4..	4340	2400	28000	9280	7100	180000	6180	1300	22000
5..	4150	2200	25000	8680	8300	190000	7670	1700	35000
6..	4210	2200	25000	6450	7700	130000	7750	3600	75000
7..	3830	1900	20000	5400	6400	93000	9700	3600	94000
8..	3490	1400	13000	5180	3300	46000	12000	5100	170000
9..	3510	1300	12000	4980	2000	27000	17500	8100	380000
10..	3710	1300	13000	4920	1400	19000	22800	8300	510000
11..	4270	1600	18000	5560	2300	S 39000	22600	8300	510000
12..	4440	1400	17000	9160	5500	140000	17300	6300	290000
13..	4470	1300	16000	8230	3700	82000	14700	3900	150000
14..	4420	990	12000	6380	1900	33000	12600	2600	88000
15..	4230	850	9700	5800	1500	23000	11700	2000	63000
16..	3990	760	8200	5680	1200	18000	11600	1700	53000
17..	3830	760	7900	5850	1100	17000	12200	2400	79000
18..	4130	680	7600	6280	1500	25000	15300	3400	140000
19..	3910	630	6600	6940	1900	36000	16500	4600	200000
20..	3970	580	6200	7540	2100	43000	15200	3400	140000
21..	3970	700	7500	8260	2500	56000	12200	2900	96000
22..	3770	750	7600	9310	3000	75000	11200	2600	79000
23..	3670	630	6200	10500	3400	96000	11400	2000	62000
24..	3630	630	6200	10800	3400	99000	12500	2700	91000
25..	3650	810	8000	9730	2500	66000	13000	7000	250000
26..	8320	7900	S 240000	8480	2000	46000	12800	3700	130000
27..	14500	9400	370000	8010	1700	37000	13000	2600	91000
28..	11900	13000	420000	7980	1500	32000	13000	2000	70000
29..	7330	16000	320000	7920	1500	32000	13400	2200	80000
30..	5500	13000	190000	9280	2100	53000	13600	2400	88000
31..	--	--	--	8480	1800	41000	--	--	--
Total	146620	--	1882700	225980	--	1988000	380170	--	4123000
	JULY			AUGUST			SEPTEMBER		
1..	12500	2900	98000	2490	430	2900	4110	8900	99000
2..	12700	2700	93000	2490	400	2700	3810	2800	29000
3..	14000	3300	120000	2440	330	2200	3550	900	8600
4..	14000	2800	110000	2400	330	2100	3370	1100	10000
5..	13500	2100	77000	2360	360	2300	3190	560	4800
6..	13100	2000	71000	2260	250	1500	3110	560	4700
7..	12500	1900	64000	2200	270	1600	3010	460	3700
8..	10900	1700	50000	2180	260	1500	2900	480	3800
9..	9880	1600	43000	2210	300	1800	2860	450	3500
10..	9010	1300	32000	2260	300	1800	2730	350	2600
11..	9250	1200	30000	2220	300	1800	2570	290	2000
12..	9250	1100	27000	2160	280	1600	2540	330	2300
13..	8890	1100	26000	2200	270	1600	2630	300	2100
14..	8740	1000	24000	2200	320	1900	2660	300	2200
15..	8510	980	23000	1810	300	1500	2650	270	1900
16..	8400	950	22000	1700	150	690	2600	260	1800
17..	8260	1100	25000	1630	160	700	2560	270	1900
18..	7510	1100	22000	1560	110	460	2560	270	1900
19..	6830	1000	18000	1530	160	660	2540	260	1800
20..	6730	980	18000	1730	290	1400	2520	240	1600
21..	6400	820	14000	2000	280	1500	2580	300	2100
22..	5820	800	13000	2650	1300	S 10000	2660	310	2200
23..	5250	820	12000	2800	1500	11000	2750	270	2000
24..	4580	900	11000	2750	1300	9700	2750	250	1900
25..	4250	1100	13000	2750	870	6500	2680	260	1900
26..	3970	750	8000	2720	540	4000	2730	200	1500
27..	3690	640	6400	2660	440	3200	2880	240	1900
28..	3410	630	5800	2560	520	3600	3070	320	2700
29..	2900	670	5200	2960	1800	S 17000	3150	310	2600
30..	2580	500	3500	5660	7100	S 120000	3190	370	3200
31..	2490	430	2900	5250	9700	S 130000	--	--	--
Total	249800	--	1087800	76790	--	349210	86910	--	211200

Total discharge for year (cfs-days)..... 1712840
Total load for year (tons)..... 10235850

S Computed by subdividing day.

YELLOWSTONE RIVER BASIN--Continued

6-2947. BIGHORN RIVER AT BIGHORN, MONT.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							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	
Mar. 31, 1964.....	0850	40		2950	1090	8680		48		69		77	81	96	100			VPWC
Apr. 27.....	1000	42		15800	8970	383000		59		74		94	98	100	--			VPWC
May 4.....	1340	49		9460	5700	146000		40		61		88	97	100	--			VPWC
June 4.....	1005	63		6000	1210	19600		35		50		68	83	97	98	98	100	VPWC
July 2.....	1045	72		12300	2270	75400		29		61		80	93	98	100			VPWC
Sept. 3.....	1025	60		3590	954	9250		50		70		80	90	100	--			VPWC

6-3055. GOOSE CREEK BELOW SHERIDAN, WYO.

LOCATION.--At bridge on State Highway 1706, 0.4 mile downstream from gaging station and 0.5 mile north of Sheridan city limits, Sheridan County.
DRAINAGE AREA.--392 square miles upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: August 1959 to September 1960, August 1961 to September 1964 (discontinued).

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe) A/	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 4, 1963....	30	10	0.32	96	72	56	4.9	400	0	302	8.4	0.4	0.0	0.19	776	1.06	62.9	536	208	1.1	1110	7.8	23
Nov. 7.....	83	9.0	.06	78	55	38	3.2	351	0	194	4.7	.3	5.1	.15	608	.83	136	422	134	.8	877	7.9	3
Dec. 6.....	77	11	.11	75	49	33	2.8	332	0	166	4.6	.3	5.5	.13	526	.72	109	388	116	.7	811	7.8	2
Jan. 9, 1964....	37	9.9	.06	86	52	38	2.9	349	0	204	6.4	.6	4.7	.13	599	.81	59.8	428	142	.8	903	7.4	3
Feb. 6.....	38	12	.08	29	78	35	3.1	322	0	188	6.6	.4	.2	.11	549	.75	56.3	393	129	.8	839	8.0	4
Mar. 5.....	74	12	.04	29	75	33	3.1	314	0	170	4.8	.3	6.2	.17	524	.71	105	382	124	.7	807	7.8	2
Mar. 30.....	85	9.1	.06	32	68	33	2.9	292	0	174	4.9	.3	.5	.11	500	.68	115	358	118	.8	771	8.1	4
May 4.....	203	12	.08	43	26	19	1.8	180	0	100	3.6	.1	3.2	.07	306	.42	168	215	67	.6	481	7.1	5
June 4.....	413	8.7	.60	26	11	9.6	1.8	100	0	51	1.5	.2	1.7	.05	172	.23	192	112	30	.4	274	7.1	9
July 2.....	1090	7.1	.13	19	8.4	5.6	1.1	82	0	24	.7	.2	1.1	.02	121	.16	356	82	15	.3	191	7.1	4
Aug. 6.....	27	5.3	.10	90	75	62	5.4	372	0	314	13	.3	3.9	.14	786	1.07	57.3	534	229	1.2	1130	8.2	8
Sept. 3.....	66	7.0	.09	74	53	41	4.1	340	0	190	5.4	.3	3.0	.08	563	.77	100	403	124	.9	1090	7.6	10

A In solution at time of collection.

YELLOWSTONE RIVER BASIN--Continued

6-3085. TONGUE RIVER AT MILES CITY, MONT.

LOCATION.--At gaging station, on right bank 4 miles south of Miles City, Custer County, and 8 miles upstream from mouth.
DRAINAGE AREA.--5,379 square miles.
RECORDS AVAILABLE.--Chemical analyses: January 1951 to September 1964.
Water temperatures: April 1949 to September 1964.
Sediment records: June 1946 to September 1951.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 1,080 ppm Dec. 14-19; minimum, 231 ppm June 13-16.
Hardness: Maximum, 568 ppm Dec. 14-19; minimum, 155 ppm June 13-26.
Specific conductance: Maximum daily, 1,660 micromhos Dec. 15; minimum daily, 332 micromhos June 14.
Water temperatures: Maximum, 76°F July 22; minimum, freezing point on many days during November to March.
EXTREMES, 1949-64.--Dissolved solids (1951-64): Maximum, 1,790 ppm Sept. 11, 1958; minimum, 200 ppm June 23-27, 1953.
Hardness (1951-64): Maximum, 688 ppm Sept. 11, 1958; minimum, 94 ppm May 4, 1955.
Specific conductance (1951-64): Maximum daily, 2,390 micromhos Sept. 11, 1958; minimum daily, 260 micromhos Feb. 8, 1963.
Water temperatures: Maximum, 86°F July 20, 1954; minimum, freezing point on many days during winter months.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Records of specific conductance of daily samples available in district office at Worland, Wyo.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Parts per million	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 1-9, 1963..	31.9	--	--	--	--	100	--	336	0	298	--	--	--	--	735	1.00	63.3	376	100	2.2	1070	8.0	--
Oct. 10-21.....	23.8	--	--	--	--	117	--	371	0	326	--	--	--	--	807	1.10	51.9	400	96	2.5	1170	8.1	--
Oct. 22-31.....	21.7	13	0.00	74	55	128	2.7	382	0	351	5.8	0.4	0.3	0.23	849	1.15	49.7	409	96	2.7	1240	7.9	5
Nov. 1-19.....	74.4	--	--	--	--	99	--	330	0	315	--	--	--	--	742	1.01	149	397	126	2.2	1080	8.0	--
Nov. 20-Dec. 7..	69.7	--	--	--	--	100	--	322	0	331	--	--	--	--	762	1.04	143	403	139	2.2	1110	7.5	--
Dec. 8-13.....	43.3	--	--	--	--	120	--	352	0	406	--	--	--	--	892	1.21	104	452	163	2.5	1270	7.9	--
Dec. 14-19.....	40.0	17	.00	100	77	146	7.9	440	0	508	8.4	.4	.1	.25	1080	1.47	117	568	207	2.7	1540	7.8	5
Dec. 20-31	108	--	--	--	--	107	--	385	0	375	--	--	--	--	880	1.20	257	487	171	2.1	1260	8.0	--
Jan. 1-31, 1964.	142	--	--	--	--	68	--	282	0	293	--	--	--	--	673	.92	258	387	156	1.5	973	8.0	--
Feb. 1-17.....	177	--	--	--	--	62	--	296	0	265	--	--	--	--	646	.88	309	395	152	1.4	944	8.2	--
Feb. 18-29.....	185	--	--	--	--	63	--	258	0	266	--	--	--	--	612	.83	306	357	145	1.5	923	8.1	--
Mar. 1-19.....	190	--	--	--	--	67	--	235	0	255	--	--	--	--	575	.78	295	324	131	1.6	847	7.7	--
Mar. 20-31.....	203	--	--	--	--	69	--	268	0	264	--	--	--	--	615	.84	337	362	142	1.6	905	7.5	--
Apr. 1-15.....	306	--	--	--	--	65	--	296	0	257	--	--	--	--	626	.85	517	388	143	1.4	924	7.7	--
Apr. 16-30.....	298	--	--	--	--	62	--	281	0	245	--	--	--	--	597	.81	480	364	133	1.4	886	7.6	--
May 1-15.....	464	7.8	.01	60	45	48	4.2	254	0	216	5.6	.4	.2	.09	542	.74	679	335	127	1.1	798	8.1	4
May 16-28.....	1139	10	.00	59	40	38	4.2	235	0	190	3.2	.3	.4	.08	485	.66	1490	312	119	.9	721	7.8	9

May 29-June 12, 1964.....	1142	--	--	--	--	25	--	176	0	91	--	--	--	--	291	.40	897	209	65	.8	460	7.5	--
June 13-16.....	3205	9.8	.02	38	15	13	2.7	153	0	56	2.0	.2	.3	.01	231	.31	2000	155	29	.5	361	7.5	7
June 17-30.....	3529	--	--	--	--	24	--	166	0	74	--	--	--	--	258	.35	2460	161	25	.8	405	7.7	--
July 1-10.....	2024	--	--	--	--	19	--	160	0	80	--	--	--	--	264	.36	1440	181	50	.6	410	7.8	--
July 11-31.....	476	--	--	--	--	32	--	190	0	114	--	--	--	--	332	.45	427	209	53	1.0	520	7.8	--
Aug. 1-21.....	180	--	--	--	--	46	--	236	0	152	--	--	--	--	422	.57	205	259	65	1.2	661	7.5	--
Aug. 22-31.....	525	--	--	--	--	71	--	209	0	136	--	--	--	--	395	.54	560	170	0	2.4	616	7.6	--
Sept. 1-19.....	313	--	--	--	--	39	--	228	0	150	--	--	--	--	412	.56	348	260	73	1.1	639	8.0	--
Sept. 20-30.....	269	--	--	--	--	42	--	244	0	166	--	--	--	--	455	.62	330	292	92	1.1	700	7.8	--
Weighted average.....	--	--	--	--	--	36	--	202	--	134	--	--	--	--	376	0.51	497	234	68	1.0	573	7.7	--
Time-weighted average.....	490	--	--	--	--	65	--	268	--	233	--	--	--	--	572	--	--	329	109	1.6	848	7.8	--
Tons per day..	--	--	--	--	--	48	--	268	--	177	--	--	--	--	--	--	--	--	--	--	--	--	--

Temperature (°F) of water, water year October 1963 to September 1964
(Once-daily measurement at 0700)

Month	Day																													Average
	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	
October.....	57	54	50	55	56	57	56	52	54	55	50	51	53	52	49	50	50	48	51	50	48	49	51	40	43	40	35	34	40	39	35	49
November.....	34	35	34	37	39	35	42	38	42	40	37	34	36	33	36	40	38	38	37	32	32	32	32	32	32	33	35	32	32	32	--	35
December.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
January.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	34	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
April.....	37	38	40	41	39	37	35	40	42	46	51	45	43	44	48	49	40	42	46	48	50	46	51	52	50	48	43	46	44	51	--	44
May.....	51	54	53	49	47	49	51	50	51	52	54	48	50	54	60	61	63	64	64	66	68	65	60	58	61	61	61	58	55	53	54	56
June.....	56	55	60	61	65	65	64	65	62	59	60	59	64	65	62	64	64	62	56	59	61	63	62	65	67	70	71	70	69	70	--	63
July.....	70	70	70	71	70	72	72	73	74	75	73	74	74	75	75	74	75	74	73	72	75	76	74	67	66	69	68	66	70	69	73	72
August.....	69	69	71	72	69	64	63	66	65	66	57	60	62	64	65	66	68	69	70	60	56	58	59	56	55	61	58	59	60	56	58	63
September.....	64	61	57	56	58	57	56	58	60	54	50	48	57	55	55	55	58	60	53	55	56	56	51	52	55	46	45	47	50	54	--	55

6-3295. YELLOWSTONE RIVER NEAR SIDNEY, MONT.

LOCATION.--At bridge on State Highway 23, 2 miles south of Sidney, Richland County, 4.5 miles downstream from gaging station, 2 miles downstream from Fox Creek, and 30 miles upstream from mouth.
DRAINAGE AREA.--69,103 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1964.
Water temperatures: January 1951 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 670 ppm Nov. 17-30; minimum, 119 ppm Aug. 11-29.
Hardness: Maximum, 320 ppm Nov. 17-30; minimum, 96 ppm Aug. 11-29.
Specific conductance: Maximum daily, 1,080 micromhos Mar. 23; minimum daily, 193 micromhos Aug. 15.
Water temperatures: Maximum, 80°F July 16; minimum, freezing point on many days during February to April.
EXTREMES, 1951-64.--Dissolved solids: Maximum, 1,370 ppm Jan. 2-3, 1954; minimum, 119 ppm Aug. 11-29, 1964.
Hardness: Maximum, 649 ppm Jan. 2-3, 1954; minimum, 96 ppm Aug. 11-29, 1964.
Specific conductance: Maximum daily, 2,780 micromhos Jan. 14, 1951; minimum daily, 193 micromhos Aug. 15, 1964.
Water temperatures: Maximum, 84°F July 23, 1960; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance of daily samples available in district office at Worland, Wyo. No appreciable inflow between gaging station and sampling point.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-31, 1963.	6697	12	0.00	69	27	80	3.4	218	0	258	11	0.5	0.2	0.17	597	0.81	10790	284	105	2.1	877	7.7	5
Nov. 1-16.....	7604	--	--	--	--	81	--	217	0	265	--	--	--	--	604	.82	12400	292	114	2.1	890	7.9	--
Nov. 17-30.....	6649	--	--	--	--	91	--	217	0	304	--	--	--	--	670	.91	12030	320	142	2.2	973	7.9	--
Dec. 1-15.....	5370	--	--	--	--	76	--	218	0	250	--	--	--	--	584	.79	8470	290	111	1.9	864	7.8	--
Dec. 16-31.....	4938	--	--	--	--	76	--	218	0	247	--	--	--	--	585	.80	7800	290	111	1.9	859	8.1	--
Jan. 1-12, 1964.	7367	--	--	--	--	77	--	195	0	256	--	--	--	--	578	.79	11500	275	115	2.0	850	8.1	--
Jan. 13-31.....	5779	14	.00	67	26	75	4.4	194	0	251	14	.5	.8	.22	576	.78	8990	272	113	2.0	848	8.0	4
Feb. 1-9.....	6956	--	--	--	--	81	--	210	0	268	--	--	--	--	611	.83	11480	298	126	2.0	892	8.1	--
Feb. 10-20.....	6064	--	--	--	--	82	--	222	0	269	--	--	--	--	620	.84	10150	311	129	2.0	912	8.0	--
Feb. 21-29.....	5356	--	--	--	--	81	--	224	0	267	--	--	--	--	620	.84	8960	318	134	2.0	912	8.2	--
Mar. 1-16.....	5756	11	.00	54	33	90	5.4	172	0	297	15	.4	1.5	.16	623	.85	9680	272	131	2.4	904	7.6	4
Mar. 17-31.....	6560	13	.01	51	38	94	5.8	187	0	304	15	.4	2.5	.17	648	.88	11480	284	131	2.4	940	7.5	6
Apr. 1-14.....	8556	--	--	--	--	89	--	190	0	275	--	--	--	--	614	.84	14180	278	122	2.3	888	7.8	--
Apr. 15-19.....	7962	12	.01	73	29	92	5.1	207	0	297	17	.5	1.1	.18	656	.89	14100	300	130	2.3	942	8.0	5
Apr. 20-30.....	10490	--	--	--	--	88	--	183	0	266	--	--	--	--	589	.80	16680	260	110	2.4	860	7.6	--
May 1-14.....	13760	--	--	--	--	27	--	140	0	92	--	--	--	--	277	.38	10290	157	42	.9	423	7.8	--
May 15-30.....	22530	--	--	--	--	27	--	136	0	92	--	--	--	--	271	.37	16480	153	41	.9	420	7.5	--
May 31-June 2...	29600	13	.08	44	10	26	2.1	140	0	85	6.6	.3	16	.07	268	.36	21420	152	37	.9	412	7.6	5

June 3-15, 1964.	40820	--	--	--	--	39	--	142	0	148	--	--	--	--	361	.49	39790	194	78	1.2	545	7.6	--
June 16-28.....	53000	--	--	--	--	39	--	135	0	148	--	--	--	--	359	.49	51370	190	79	1.2	540	7.7	--
June 29-July 7..	55900	--	--	--	--	29	--	136	0	94	--	--	--	--	273	.37	41200	154	42	1.0	424	7.8	--
July 8-22.....	32910	12	.00	37	10	30	2.1	124	0	87	5.8	.3	.2	.08	254	.35	22570	135	33	1.1	400	7.4	--
July 23-31.....	15670	--	--	--	--	37	--	140	0	108	--	--	--	--	297	.40	12560	159	44	1.3	464	7.2	--
Aug. 1-10.....	9939	--	--	--	--	44	--	172	0	126	--	--	--	--	350	.48	9390	186	45	1.4	476	7.6	--
Aug. 11-29.....	7309	1.1	.02	29	5.8	3.5	2.7	112	0	13	.9	.1	2.0	.02	119	.16	2350	96	4	.2	206	7.8	--
Aug. 30-Sept. 13	11090	--	--	--	--	91	--	211	0	236	--	--	--	--	542	.74	16230	228	55	2.6	815	7.5	--
Sept. 14-30.....	6238	--	--	--	--	82	--	206	0	256	--	--	--	--	577	.78	9720	277	108	2.2	856	7.8	--
Weighted average.....	--	--	--	--	--	50	--	159	--	164	--	--	--	--	403	0.55	14700	204	73	1.5	603	7.6	--
Time-weighted average.....	13500	--	--	--	--	65	--	182	--	210	--	--	--	--	493	--	--	240	91	1.8	729	7.7	--
Tons per day..	--	--	--	--	--	1820	--	5800	--	5970	--	--	--	--	--	--	--	--	--	--	--	--	--

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	64	62	63	65	64	62	62	63	64	62	63	62	62	64	64	63	62	60	62	61	62	61	58	55	51	50	51	44	45	49	52	59
November	54	52	53	45	44	44	42	43	42	42	43	41	39	41	41	41	40	41	41	40	41	40	40	40	40	39	41	40	40	39	--	42
December	40	39	39	38	40	40	39	39	38	37	37	36	35	35	36	35	34	35	35	35	36	37	37	38	38	37	37	36	38	37	35	37
January.....	34	34	34	35	35	35	34	37	36	33	38	37	37	37	35	36	35	33	36	36	38	36	40	39	41	40	42	42	41	41	42	37
February.....	38	36	39	33	33	34	33	33	34	35	33	34	34	33	34	34	33	34	34	34	34	35	32	34	33	35	35	34	34	--	--	34
March.....	34	34	36	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	32	35	32
April.....	32	32	32	37	36	40	39	42	44	44	47	48	48	47	49	48	47	46	48	48	47	48	52	51	54	51	50	53	48	48	--	45
May.....	52	59	55	55	56	54	57	55	61	58	58	61	59	61	58	55	57	55	56	58	63	61	59	61	62	60	58	59	60	55	61	58
June	60	60	68	73	72	70	70	71	72	72	74	72	72	73	74	73	74	74	73	69	68	72	72	70	70	71	73	72	71	69	--	71
July.....	70	71	76	74	70	71	74	75	75	76	74	77	77	76	78	80	79	78	79	79	--	78	78	73	78	79	78	71	70	71	76	75
August.....	78	75	77	--	75	73	74	72	71	72	71	72	69	70	70	68	68	69	66	65	67	66	65	64	64	66	65	65	64	63	66	69
September.....	67	66	62	62	61	63	62	62	61	61	62	62	62	61	62	62	60	61	60	58	57	58	56	55	54	54	52	54	54	52	--	59

MISSOURI RIVER MAIN STEM

6-3300. MISSOURI RIVER NEAR WILLISTON, N. DAK.

LOCATION.--At gaging station, on downstream end of right pier of Lewis and Clark Highway Bridge, 5 miles southwest of Williston, Williams County, 29.3 miles downstream from Yellowstone River, and at mile 1,552.7.
DRAINAGE AREA.--164,500 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1964.
Water temperatures: May 1951 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 587 ppm Apr. 30 to May 6; minimum, 296 ppm July 7-10.
Hardness: Maximum, 296 ppm Dec. 1-31; minimum, 154 ppm July 7-10.
Specific conductance: Maximum daily, 1,010 micromhos May 7, 13; minimum daily, 351 micromhos June 12.
Water temperatures: Maximum, 78°F July 10; minimum, freezing point on many days during November to March.
EXTREMES, 1950-64.--Dissolved solids: Maximum, 771 ppm Dec. 25-31, 1961; minimum, 199 ppm June 21-26, 1959.
Hardness: Maximum, 398 ppm Dec. 25-31, 1961; minimum, 115 ppm June 21-26, 1959.
Specific conductance: Maximum daily, 1,360 micromhos Dec. 28, 1961; minimum daily, 297 micromhos Mar. 19, 1960.
Water temperatures (1951-64): Maximum, 80°F July 21, 22, 1958; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance of daily samples and some spectrographic and radiochemical data available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-31, 1963.	11960	--	--	--	--	70	--	211	0	--	--	--	--	--	533	0.72	17210	262	89	1.9	808	7.5	
Nov. 1-30.....	12140	--	--	--	--	72	--	213	0	--	--	--	--	--	540	.73	17700	267	92	1.9	810	7.4	
Dec. 1-31.....	12650	11	0.10	72	28	70	4.3	229	0	226	13	0.6	0.2	0.17	557	.76	19020	296	108	1.8	837	7.3	
Jan. 1-31, 1964.	16530	--	--	--	--	64	--	220	0	--	--	--	--	--	525	.71	23430	272	92	1.7	790	7.6	
Feb. 1-29.....	14670	--	--	--	--	55	--	198	0	--	--	--	--	--	456	.62	18060	245	83	1.5	705	7.6	
Mar. 1-5.....	13560	--	--	--	--	76	--	223	0	--	--	--	--	--	580	.79	21230	285	102	2.0	859	7.6	
Mar. 6-12.....	9919	--	--	--	--	51	--	154	0	--	--	--	--	--	429	.58	11490	212	86	1.5	641	7.6	
Mar. 13-23.....	11220	--	--	--	--	52	--	164	0	--	--	--	--	--	438	.60	13270	224	89	1.5	656	7.6	
Mar. 24-Apr. 8..	11710	--	--	--	--	75	--	207	0	--	--	--	--	--	555	.75	17550	271	101	2.0	825	7.8	
Apr. 9.....	18000	8.3	.06	67	24	73	4.0	197	0	233	16	.5	1.0	.14	552	.75	26830	267	105	1.9	811	7.5	
Apr. 10-29.....	12380	--	--	--	--	78	--	213	0	--	--	--	--	--	575	.78	19220	278	103	2.0	846	7.9	
Apr. 30-May 6...	18660	--	--	--	--	81	--	215	0	--	--	--	--	--	587	.80	29570	274	98	2.1	858	7.3	
May 7-17.....	26020	--	--	--	--	84	--	216	0	--	--	--	--	--	579	.79	40680	270	93	2.2	854	7.6	
May 18-22.....	21880	--	--	--	--	70	--	196	0	--	--	--	--	--	514	.70	30360	245	84	1.9	761	7.2	
May 23-31.....	31380	--	--	--	--	43	--	168	0	--	--	--	--	--	373	.51	31600	193	55	1.3	566	7.1	
June 1-11.....	35130	--	--	--	--	40	--	162	0	--	--	--	--	--	360	.49	34150	197	64	1.2	549	7.1	
June 12-19.....	59260	--	--	--	--	35	--	156	0	--	--	--	--	--	321	.44	51360	178	50	1.1	496	6.7	

June 20-July 6, 1964.....	62650	--	--	--	--	35	--	172	0	--	--	--	--	--	333	.45	56330	189	48	1.1	517	6.9	
July 7-10.....	50050	11	--	43	11	32	3.3	143	0	99	5.0	.4	.0	.09	296	.40	40000	154	37	1.1	447	7.4	20
July 11-21.....	34560	--	--	--	--	41	--	162	0	--	--	--	--	--	343	.47	32010	184	51	1.3	532	6.9	
July 22-27.....	24030	--	--	--	--	39	--	178	0	--	--	--	--	--	352	.48	22840	196	50	1.2	539	7.4	
July 28-Aug. 6..	17180	--	--	--	--	59	--	185	0	--	--	--	--	--	390	.53	18090	209	57	1.8	646	7.8	
Aug. 7-19.....	12690	--	--	--	--	74	--	196	0	--	--	--	--	--	454	.62	15560	202	41	2.3	700	7.6	
Aug. 20.....	10800	9.3	.04	45	26	57	4.0	189	0	173	9.2	.7	.0	.14	431	.59	12570	221	66	1.7	668	7.5	
Aug. 21-29.....	13380	--	--	--	--	47	--	164	0	--	--	--	--	--	357	.49	12900	183	48	1.5	567	7.1	
Aug. 30.....	15600	--	--	--	--	75	--	167	0	--	--	--	--	--	448	.61	18780	211	74	2.2	692	7.5	
Aug. 31.....	24200	--	--	--	--	50	--	183	0	--	--	--	--	--	395	.54	25810	208	58	1.5	624	7.5	
Sept. 1-4.....	18800	--	--	--	--	69	--	203	0	--	--	--	--	--	501	.68	25430	248	81	1.9	767	7.3	
Sept. 5-28, 30..	14480	--	--	--	--	60	--	194	0	--	--	--	--	--	443	.60	17320	228	69	1.7	692	7.4	
Sept. 29.....	13900	8.4	.01	59	23	63	4.5	199	0	200	11	.6	.2	.15	477	.65	17900	243	80	1.8	730	8.1	
Weighted average.....	--	--	--	--	--	--	55	--	189	--	--	--	--	--	--	439	0.60	23300	227	72	1.6	667	7.2	
Time-weighted average.....	19660	--	--	--	--	--	62	--	198	--	--	--	--	--	--	477	--	--	243	80	1.7	724	7.3	
Tons per day..	--	--	--	--	--	--	2920	--	10030	--	--	--	--	--	--	--	--	--	--	--	--	--	--	

Temperature (F°) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	64	61	62	61	60	61	58	57	58	57	58	60	58	58	60	59	58	59	57	56	56	54	56	50	--	51	51	51	42	44	44	56
November.....	40	41	41	43	48	40	42	42	40	40	40	40	37	39	38	37	37	37	37	37	32	32	32	32	32	32	34	32	32	32	--	37
December.....	32	32	34	32	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
January.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	33	33	32
April.....	33	33	34	35	36	36	36	38	38	41	45	45	46	46	48	50	50	50	50	50	49	49	49	54	56	57	59	52	53	54	--	46
May.....	56	54	54	55	56	56	56	56	56	56	56	56	55	57	58	60	60	60	67	68	70	69	69	68	68	68	66	67	68	69	69	61
June	67	67	68	69	67	69	68	65	62	64	62	62	62	61	61	60	60	67	65	67	60	64	65	65	65	69	75	75	75	75	--	66
July.....	72	72	70	70	70	75	76	77	77	78	77	77	77	77	77	76	76	75	75	75	76	76	75	74	74	75	74	73	72	68	71	74
August.....	74	76	76	76	76	75	71	69	68	68	64	61	64	64	62	62	70	71	70	70	68	65	63	62	60	60	61	63	60	61	62	67
September.....	65	63	59	58	58	58	57	57	56	56	54	55	56	54	53	54	56	56	56	56	55	54	53	53	52	52	52	52	51	51	--	55

MISSOURI RIVER MAIN STEM--Continued

6-3390. MISSOURI RIVER BELOW GARRISON DAM, N. DAK.

LOCATION.--Temperature recorder at gaging station, on right bank 4.3 miles north of Stanton, 5.1 miles upstream from Knife River, 9.1 miles downstream from Garrison Dam, Mercer County, and at mile 1,380.8.
DRAINAGE AREA.--181,400 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: June 1952 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 65°F Aug. 11; minimum, 34°F on many days during December to March.
EXTREMES, 1952, 1954-64.--Water temperatures: Maximum, 76°F July 27, 28, 1954; minimum, freezing point on many days during winter months.
REMARKS.--Recorder stopped Feb. 2-4, 7-9, 12-14, 17-19, 22-24, Mar. 2-4, 7-9, 12-14, 17-19.

Temperature (°F) of water, water year October 1963 to September 1964
(Recorder with temperature attachment, continuous ethyl alcohol-actuated thermograph)

Month	Day																													Average
	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	
October																																
Maximum	52	53	53	53	54	54	54	55	55	54	54	54	55	56	56	55	55	55	56	57	56	55	56	55	54	54	56	56	56	56	55	55
Minimum	52	52	52	52	53	54	54	54	54	52	52	52	54	55	55	55	54	55	55	56	55	55	55	53	54	54	54	55	54	55	54	54
November																																
Maximum	55	55	54	54	54	54	54	53	53	53	52	52	50	50	50	50	50	50	50	50	48	48	47	47	47	47	46	46	46	46	--	50
Minimum	54	54	54	54	54	53	53	53	53	52	52	50	50	50	50	50	50	50	50	48	48	47	47	47	46	46	46	46	46	45	--	50
December																																
Maximum	45	44	44	44	44	44	44	42	41	40	40	40	37	36	36	36	36	36	36	34	34	34	34	34	34	34	34	34	34	34	34	38
Minimum	44	44	44	44	44	44	42	41	40	40	40	37	36	36	36	36	36	36	34	34	34	34	34	34	34	34	34	34	34	34	34	37
January																																
Maximum	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Minimum	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
February																																
Maximum	34	--	--	--	34	34	--	--	--	34	34	--	--	--	34	34	--	--	--	34	34	--	--	--	34	34	34	35	35	--	--	--
Minimum	34	--	--	--	34	34	--	--	--	34	34	--	--	--	34	34	--	--	--	34	34	--	--	--	34	34	34	35	35	--	--	--
March																																
Maximum	35	--	--	--	35	35	--	--	--	35	35	--	--	--	35	35	--	--	--	35	35	35	35	35	35	35	35	35	35	36	36	--
Minimum	35	--	--	--	35	35	--	--	--	35	35	--	--	--	35	35	--	--	--	35	35	35	34	34	35	35	35	35	35	36	36	--
April																																
Maximum	37	37	37	37	36	37	37	37	37	36	37	37	37	37	37	38	38	37	38	37	38	38	39	38	40	40	39	41	41	40	--	38
Minimum	36	36	36	36	36	36	36	37	36	36	36	36	36	36	37	37	37	37	36	36	37	38	38	38	38	39	39	39	40	40	--	37
May																																
Maximum	40	40	40	41	41	41	42	42	43	44	44	45	44	44	45	46	47	46	48	48	48	50	49	49	49	50	52	52	49	50	49	46
Minimum	40	40	40	40	40	41	40	42	42	42	42	43	43	42	43	44	44	44	46	46	45	47	48	47	47	48	49	49	49	48	48	44
June																																
Maximum	50	50	50	50	49	51	50	51	52	51	50	51	54	53	52	52	52	52	52	53	54	53	55	55	56	56	57	56	58	56	--	53
Minimum	47	48	48	48	49	49	50	50	51	50	50	50	51	51	51	51	51	52	52	52	53	53	53	55	54	54	54	54	55	55	--	51
July																																
Maximum	56	56	55	56	56	56	57	56	56	55	56	56	56	57	56	57	56	57	57	56	57	57	56	59	59	59	59	59	58	58	58	57
Minimum	55	54	54	54	54	54	54	55	55	54	54	54	54	54	55	54	54	54	55	54	54	54	54	55	57	57	58	57	57	57	58	55
August																																
Maximum	59	59	59	60	59	59	60	59	60	59	65	64	62	61	62	61	62	62	61	61	61	61	60	61	63	62	62	62	62	62	62	61
Minimum	58	58	57	59	58	58	58	58	58	58	58	62	61	61	60	60	60	61	61	61	61	60	60	60	60	61	61	61	60	60	60	60
September																																
Maximum	62	62	61	62	63	62	63	62	62	62	62	62	62	61	61	61	61	61	62	61	61	61	60	61	60	60	59	59	59	58	--	61
Minimum	61	61	60	60	62	61	62	62	62	61	61	61	61	61	60	60	61	61	60	61	61	60	60	60	60	58	58	59	58	58	--	60

6-3395. KNIFE RIVER NEAR GOLDEN VALLEY, N. DAK.

LOCATION (revised).--At gaging station at highway bridge, 4.5 miles downstream from Elm Creek and 9 miles south of Golden Valley, Mercer County.
DRAINAGE AREA.--1,230 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1963 to September 1964.
Water temperatures: December 1963 to September 1964.
Sediment records: June 1946 to September 1949, January to September 1964.
EXTREMES, December 1963 to September 1964.--Dissolved solids: Maximum, 2,700 ppm Jan. 10-19; minimum, 310 ppm Sept. 6-8.
Hardness: Maximum, 432 ppm Jan. 10-18; minimum, 72 ppm Sept. 6-8.
Specific conductance: Maximum daily, 4,130 micromhos Jan. 16; minimum daily, 391 micrombos Sept. 7.
Water temperatures: Maximum, 79°F May 21, July 12; minimum, freezing point on many days during December to April.
Sediment concentrations (January to September 1964): Maximum daily, 4,000 ppm June 10; minimum daily, no flow Aug. 20.
Sediment loads (January to September 1964): Maximum daily, 6,400 tons July 7; minimum daily, 0 tons Aug. 20.
EXTREMES, 1946-49, 1964.--Sediment concentrations (1964): Maximum daily, 4,000 ppm June 10, 1964; minimum daily, no flow Aug. 20, 1964.
Sediment loads: Maximum daily, 29,680 tons June 23, 1947; minimum daily, 0 tons Aug. 20, 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Flow affected by ice Jan. 4 to Apr. 14.

Chemical analyses, in parts per million, December 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Dec. 11, 1963..	3.6	9.4	0.08	58	34	500	9.8	942	0	578	6.8	0.7	2.3	0.42	1660	2.26	16.1	285	0	13	2440	7.9	--
Dec. 12-31....	.9	12	.08	65	46	620	25	1110	0	730	7.8	.7	1.7	.41	2050	2.79	4.98	352	0	14	2900	8.2	--
Jan. 1-9, 1964.	1.1	15	--	68	53	620	23	1060	0	795	8.0	.7	1.9	.31	2110	2.87	6.27	388	0	14	2960	8.0	--
Jan. 10-18.....	1.0	16	.10	64	66	806	29	1410	0	1010	11	.8	1.8	.49	2700	3.67	7.29	432	0	17	3770	8.2	--
Jan. 19.....	1	15	.09	43	63	826	29	1370	0	1040	9.0	.8	1.9	.52	2700	3.67	7.29	366	0	19	3800	8.1	1
Jan. 20-31.....	1.0	15	.10	72	56	750	27	1340	0	908	9.8	.8	2.1	.47	2500	3.40	6.75	411	0	16	3550	8.1	--
Feb. 1-29.....	1.1	16	.11	59	49	684	11	1050	73	750	12	.7	3.6	.45	2180	2.96	6.47	349	0	16	3200	8.5	--
Mar. 1-15.....	1.8	13	.11	62	43	609	9.4	1090	0	720	10	.7	.9	.41	2000	2.72	9.72	333	0	15	2880	8.1	--
Mar. 16-31.....	2.8	10	.10	60	35	.555	8.6	912	39	635	8.0	.7	.8	.36	1800	2.45	13.6	293	0	14	2590	8.4	--
Apr. 1.....	10	7.3	--	34	25	375	7.8	671	0	435	6.0	.7	.3	.29	1220	1.66	32.9	187	0	12	1850	7.9	--
Apr. 2-6.....	15	7.0	.28	31	20	324	6.4	557	0	378	4.0	.5	1.0	.25	1050	1.43	42.5	160	0	11	1590	7.6	--
Apr. 7-8.....	25	12	--	32	24	358	6.4	595	0	450	4.5	.5	.7	.37	1180	1.60	79.7	179	0	12	1780	7.7	--
Apr. 9.....	40	5.6	.05	30	21	328	5.8	515	0	423	4.2	.5	.2	.25	1070	1.46	116	161	0	11	1640	7.7	--
Apr. 10-19.....	25.5	5.3	.23	28	18	308	5.6	473	0	388	3.4	.5	.6	.26	A991	1.35	68.2	144	0	11	1530	7.4	--
Apr. 20-27.....	11.7	4.6	.13	33	19	304	6.0	518	0	377	4.0	.5	1.0	.27	1000	1.36	31.6	162	0	10	1530	7.6	--
Apr. 28-May 5..	22.8	3.3	--	38	20	326	7.4	513	0	433	4.9	.6	1.2	.25	1090	1.48	67.1	179	0	11	1640	7.8	43
May 6.....	55	4.0	--	30	24	315	8.2	506	0	432	7.8	.5	3.2	.29	1070	1.46	159	173	0	10	1620	7.7	--

A Calculated from determined constituents.

KNIFE RIVER BASIN--Continued

6-3395. KNIFE RIVER NEAR GOLDEN VALLEY, N. DAK.--Continued

Chemical analyses, in parts per million, December 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
May 7, 1964....	244	5.0	--	29	14	170	8.4	282	0	271	3.4	0.3	5.0	0.17	708	0.96	466	130	0	6.5	1010	7.6	--
May 8-9.....	121	4.5	--	34	22	340	8.4	490	0	492	7.8	.5	3.7	.29	1150	1.56	376	174	0	11	1720	7.9	--
May 10-11.....	49.5	4.5	--	35	20	301	8.0	472	0	408	6.3	.6	2.5	.30	1020	1.39	136	168	0	10	1550	7.7	--
May 12-14.....	23.7	4.5	--	38	18	305	8.2	496	0	408	5.6	.6	2.5	.30	1030	1.40	65.9	168	0	10	1580	8.0	--
May 15.....	14	4.1	0.06	35	20	298	8.0	494	0	390	4.5	.6	1.8	.27	1010	1.37	38.2	169	0	10	1530	7.7	53
May 16-20.....	9.7	4.2	--	45	23	353	8.8	567	0	487	6.0	.6	1.6	.34	1210	1.65	31.7	208	0	11	1810	7.8	--
May 21-31.....	3.6	4.5	.28	50	27	416	9.6	660	0	552	6.4	.7	1.9	.36	1390	1.89	13.5	238	0	12	2080	7.7	50
June 1-8.....	1.5	9.7	.13	48	29	452	10	711	0	622	6.4	.7	1.1	.36	1530	2.08	6.20	241	0	13	2230	8.2	35
June 9.....	68	10	--	31	18	288	10	464	0	383	6.1	.5	5.1	.22	A980	1.33	180	150	0	10	1480	7.8	--
June 10.....	289	11	--	34	9.5	195	9.2	336	0	271	2.8	.4	7.7	.22	792	1.08	618	124	0	7.6	1090	7.7	--
June 11-18.....	216	10	.54	31	9.8	137	7.8	260	0	201	2.4	.4	4.3	.15	558	.76	325	118	0	5.5	830	7.7	40
June 19.....	692	8.9	--	31	9.8	105	8.2	211	0	167	1.3	.3	4.5	.12	528	.72	987	118	0	4.2	705	7.5	--
June 20-21.....	486	10	--	30	9.0	92	7.6	197	0	150	1.4	.3	2.9	.12	456	.62	598	112	0	3.8	639	7.5	--
June 22-23.....	176	11	--	28	11	99	8.2	217	0	152	1.9	.3	2.2	.14	452	.61	215	115	0	4.0	665	7.7	--
June 24-30.....	47 9	12	.58	33	14	137	8.6	273	0	204	3.0	.4	1.3	.16	574	.78	74.2	142	0	5.0	857	7.4	--
July 1-3.....	54.3	11	--	35	17	169	9.2	327	0	238	4.2	.5	2.0	.22	680	.92	99.7	156	0	5.9	1000	7.9	--
July 4-6.....	174	11	.56	32	13	142	9.0	288	0	195	3.0	.4	4.4	.18	588	.80	276	132	0	5.4	860	7.9	--
July 7.....	789	11	--	28	8.8	50	8.0	168	0	69	2.0	.5	9.3	.09	320	.44	682	106	0	2.1	427	7.4	--
July 8-10.....	275	11	--	30	10	79	8.3	196	0	126	2.8	.3	3.2	.11	392	.53	291	116	0	3.2	582	7.4	--
July 11-15.....	85.4	12	.23	41	16	150	9.0	289	0	240	3.2	.4	2.4	.20	640	.87	148	168	0	5.0	951	7.3	--
July 16-18.....	45	12	--	37	15	137	8.8	275	0	212	3.0	.5	2.7	.20	600	.82	72.9	156	0	4.8	883	7.6	--
July 19-22.....	16.2	11	.24	40	17	139	8.6	283	0	220	3.2	.4	2.0	.19	599	.81	26.2	168	0	4.6	904	7.9	--
July 23-Aug. 10	33.3	12	.10	49	20	185	9.4	398	0	269	4.6	.4	.6	.21	778	1.06	70.0	203	0	5.6	1150	7.8	--
Aug. 11-16.....	.5	12	.04	53	25	236	10	486	0	325	4.6	.5	.2	.25	935	1.27	1.26	235	0	6.7	1380	7.6	--
Aug. 17-19, 21-23.....	.2	11	.09	48	25	247	11	495	0	351	4.8	.5	.9	.26	979	1.33	.53	224	0	7.2	1440	7.6	--
Aug. 24-31.....	.2	11	.06	51	30	311	10	565	0	428	5.4	.5	.2	.28	1130	1.54	.61	252	0	8.5	1700	7.9	--
Sept. 1-5.....	190	9.3	--	30	13	178	8.8	331	0	224	3.2	.4	3.9	.24	668	.91	343	130	0	6.8	1000	7.7	--
Sept. 6-8.....	55.3	8.6	--	18	6.6	60	8.2	149	0	79	2.8	.3	3.3	.08	310	.42	46.3	72	0	3.1	420	7.1	--
Sept. 9-11.....	24.7	8.9	--	19	7.4	65	8.2	167	0	82	2.2	.3	2.0	.08	332	.45	22.1	78	0	3.2	457	7.6	--
Sept. 12-17....	10.4	9.5	--	22	9.0	79	8.6	201	0	98	2.4	.3	1.6	.10	361	.49	10.1	92	0	3.6	524	7.7	--

Sept. 18-28, 1964.....	3.8	10	--	31	11	117	9.0	277	0	142	3.2	.3	1.9	.12	591	.80	6.06	124	0	4.6	725	7.6	--
Sept. 29-30....	2.8	10	.18	36	14	139	9.0	322	0	171	3.0	.3	1.3	.16	575	.78	4.35	147	0	5.0	855	7.4	--
Weighted average.....	--	9.7	--	33	13	157	8.3	299	--	222	3.1	0.4	3.6	0.17	633	0.86	63.9	136	0	5.6	926	7.5	--
Time-weighted average....	37.4	11	--	47	30	393	12	681	--	487	6.3	0.6	1.9	0.30	1350	--	--	241	0	10	1960	7.7	--
Tons per day.	--	1.0	--	3.3	1.3	16	0.8	30	--	22	0.3	0.0	0.4	0.02	--	--	--	--	--	--	--	--	--

A Calculated from determined constituents.

Temperature (°F) of water, December 1963 to September 1964

Month	Day																													Average
	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	
December	--	--	--	--	--	--	--	--	--	--	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--
January.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
March.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
April.....	34	35	35	35	32	32	32	32	35	37	41	37	40	45	51	52	49	49	50	55	52	48	54	56	60	61	50	52	55	52	--	45
May.....	52	49	53	54	58	59	58	56	61	58	52	60	64	66	65	69	70	71	71	75	79	75	66	64	61	60	59	57	57	66	67	62
June	64	62	62	62	71	70	66	65	58	59	59	68	69	70	61	59	61	61	61	61	62	65	66	64	70	75	77	77	74	74	--	66
July.....	72	73	71	71	69	70	71	73	73	75	72	79	73	74	75	77	76	76	77	75	75	76	77	73	72	70	71	70	69	66	71	73
August.....	72	74	74	71	73	70	75	67	68	70	62	59	59	62	66	64	78	67	69	--	63	60	59	57	56	64	65	61	62	63	69	66
September.....	71	67	62	62	56	55	59	56	60	53	49	42	50	43	49	49	52	51	55	51	53	54	50	50	52	48	46	46	45	43	--	53

KNIFE RIVER BASIN--Continued

6-3395. KNIFE RIVER NEAR GOLDEN VALLEY, N. DAK.--Continued

Suspended sediment, January to September 1964

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	1.3	130	T	1	130	T	1.1	89	T
2	1.7	140	1	1	110	T	1.1	100	T
3	1.1	130	T	1	140	T	1.1	120	T
4	1	130	T	1	100	T	1.1	110	T
5	1	140	T	1	140	T	1.1	100	T
6	1	130	T	1	190	1	1.1	94	T
7	1	120	T	1	190	1	1.1	75	T
8	1	120	T	1	100	T	1.1	88	T
9	1	130	T	1	130	T	1.1	86	T
10	1	170	T	1	120	T	1.5	110	T
11	1	160	T	1.1	100	T	2	100	1
12	1	130	T	1.1	97	T	3	85	1
13	1	150	T	1.1	100	T	3	84	1
14	1	160	T	1.1	120	T	3	96	1
15	1	170	T	1.1	130	T	4	93	1
16	1	190	1	1.1	84	T	4	66	1
17	1	180	T	1.1	95	T	4	20	T
18	1	160	T	1.1	87	T	4	27	T
19	1	160	T	1.1	100	T	3	22	T
20	1	160	T	1.1	100	T	3	26	T
21	1	160	T	1.1	100	T	3	33	T
22	1	160	T	1.1	100	T	2	19	T
23	1	93	T	1.1	96	T	2	27	T
24	1	83	T	1.1	85	T	2	27	T
25	1	97	T	1.1	66	T	2	22	T
26	1	99	T	1.1	87	T	2	32	T
27	1	100	T	1.1	85	T	2	35	T
28	1	87	T	1.1	57	T	2	31	T
29	1	85	T	1.1	89	T	3	29	T
30	1	85	T	--	--	--	3	110	1
31	1	120	T	--	--	--	4	200	2
Total	32.1	--	12	30.9	--	10	71.4	--	14

	APRIL			MAY			JUNE		
1	10	180	5	24	330	21	1.7	180	1
2	15	160	6	20	260	14	1.1	230	1
3	15	120	5	21	240	14	1.1	210	1
4	15	110	4	21	530	30	.9	200	T
5	15	110	4	28	410	31	.4	210	T
6	15	91	4	55	670	99	.9	190	T
7	20	170	9	244	1800	1200	1.3	170	1
8	30	230	19	148	1100	440	4.5	280	3
9	40	140	15	94	600	150	68	2500 S	550
10	35	130	12	59	500	80	289	4000 S	3300
11	35	120	11	40	390	42	500	2400	3200
12	30	140	11	29	510	40	374	2200	2200
13	30	140	11	24	520	34	209	2800	1600
14	25	160	11	18	430	21	117	2100	660
15	24	130	8	14	390	15	74	2000	400
16	22	110	6	13	340	12	75	1700	340
17	19	120	6	11	350	10	98	1400	370
18	18	100	5	9.4	310	8	283	3000 S	2600
19	17	100	4	8.2	320	7	692	2100	3900
20	16	110	5	7.0	330	6	616	1500	2500
21	14	130	5	6.2	270	4	355	1200	1200
22	12	140	4	5.7	260	4	212	1100	630
23	11	150	4	5.0	270	4	139	940	350
24	9.7	150	4	4.5	350	4	94	930	240
25	9.7	170	4	3.8	300	3	66	770	140
26	8.2	160	4	3.2	300	2	49	580	77
27	13	170	6	3.0	290	2	37	420	42
28	17	320	15	2.3	260	2	29	330	26
29	22	480 S	33	2.3	250	2	27	300	22
30	29	500	39	2.1	240	1	33	220	20
31	--	--	--	1.7	220	1	--	--	--
Total	591.6	--	279	927.4	--	2303	4447.9	--	24375

S Computed by subdividing day.
T Less than 0.50 ton.

KNIFE RIVER BASIN--Continued

6-3395. KNIFE RIVER NEAR GOLDEN VALLEY, N. DAK.--Continued

Suspended sediment, January to September 1964--Continued

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	32	110	S 11	3.0	110	1	42	220	S 64
2	47	300	38	2.5	100	1	246	990	660
3	84	650	S 160	2.1	110	1	336	2500	2300
4	165	880	390	1.7	120	1	216	1800	1000
5	154	1700	710	1.7	100	T	109	1400	410
6	202	2800	S 1700	1.5	83	T	72	1300	250
7	789	3000	6400	1.3	73	T	54	1000	140
8	397	1700	1800	1.3	72	T	40	900	97
9	267	1600	1200	1.5	64	T	32	880	76
10	161	1600	700	1.1	77	T	24	770	50
11	88	1200	280	.7	91	T	18	650	32
12	62	640	110	.7	68	T	16	650	28
13	63	480	82	.4	65	T	12	600	19
14	116	450	140	.3	62	T	11	550	16
15	98	470	120	.4	64	T	8.8	490	12
16	64	560	97	.4	89	T	7.9	430	9
17	42	350	40	.4	94	T	7.0	440	8
18	29	260	20	.3	97	T	5.2	400	6
19	21	200	11	.1	150	T	5.4	370	5
20	20	170	9	0	--	0	4.5	330	4
21	13	150	5	.2	130	T	4.1	280	3
22	11	140	4	.3	130	T	3.4	260	2
23	8.8	140	3	.2	120	T	3.4	220	2
24	7.9	120	2	.3	130	T	3.0	200	2
25	6.5	120	2	.3	110	T	2.8	190	1
26	5.4	130	2	.7	96	T	3.4	190	2
27	3.6	120	1	1.3	110	T	3.8	180	2
28	3.4	130	1	1.3	110	T	2.8	150	1
29	3.4	130	1	1.9	120	1	2.8	150	1
30	3.4	130	1	3.4	130	1	2.8	130	1
31	3.2	100	1	3.0	100	1	--	--	--
Total	2970.6	--	14041	34.3	--	11	1299.1	--	5203

Total discharge for period Jan. 1 to Sept. 30 (cfs-days)..... 10405.3
Total load for period Jan. 1 to Sept. 30 (tons)..... 46248

S Computed by subdividing day.
T Less than 0.50 ton.

KNIFE RIVER BASIN--Continued

6-3395. KNIFE RIVER NEAR GOLDEN VALLEY, N. DAK.--Continued

Periodic determinations of suspended-sediment discharge and particle size, January to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Dec. 12, 1963.....	1430	31		3.8	66	0.7	--	--	--	--	--	86	--	--				S
May 7, 1964.....	1700	58		270	2350	1710	46	60	67	--	89	99	100	--				VPWC
May 15.....	1120	63		15	357	14	93	94	95	98	98	100	--	--				SPWC
June 10.....	1800	59		484	3340	4360	52	65	73	78	88	96	99	100				VPWC
June 13.....	0715	62		247	3090	2060	76	85	90	94	96	100	--	--				SPWC
June 19.....	1010	61		799	2180	4700	--	--	--	--	--	94	98	100				V
July 7.....	1300	73		910	2760	6780	66	77	87	89	94	97	99	100				VPWC
July 7.....	1840	75		819	2680	5930	82	86	89	92	96	99	100	--				VPWC

Particle-size analyses of bed material, January to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters										Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Dec. 12, 1963.....	1430		4	3.8			18	26	34	48	60	69	84	97	100	--	--	SV
Apr. 9, 1964.....	1025		3	44			0	1	2	6	10	14	21	30	42	73	100	SV
May 15.....	1120		3	15			0	1	1	3	5	8	12	19	32	89	100	SV
Sept. 29.....	1015		4	2.8			0	1	2	4	7	11	22	38	80	100	--	SV

6-3575. GRAND RIVER AT SHADEHILL, S. DAK.

LOCATION.--At irrigation outlet of Shadehill Reservoir, 0.2 mile upstream from gaging station, 0.8 mile west of Shadehill, Perkins County, 12 miles southwest of Lemmon, and 4 miles downstream from confluence of North and South Forks of Grand River.
DRAINAGE AREA.--3,120 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: April to October 1952, Marcb 1953 to September 1964.
Water temperatures: August 1954 to September 1959.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 1,030 ppm Feb. 21-29; minimum, 641 ppm July 11-29.
Hardness: Maximum, 139 ppm Apr. 1-9; minimum, 115 ppm June 24 to July 10.
Specific conductance: Maximum daily, 1,510 micromhos Feb. 26, Mar. 3; minimum daily, 1,260 micromhos July 13-16, 21.
EXTREMES, 1954-84.--Dissolved solids (1954-58, 1959-64): Maximum, 1,220 ppm Mar. 1-25, 1962 (irrigation outlet); minimum, 510 ppm Mar. 27, 1956 (spillway outlet).
Hardness: Maximum, 167 ppm Apr. 4-7, 1955 (irrigation outlet); minimum, 100 ppm Mar. 31 to Apr. 3, 1959 (spillway outlet).
Specific conductance: Maximum daily, 1,780 micromhos Mar. 1, 2, 14, 16, 19, 1962 (irrigation outlet); minimum daily, 790 micromhos Mar. 27, 1956 (spillway outlet).
REMARKS.--Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Flow regulated by an ungated spillway and by a regulated irrigation outlet.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-31, 1963	125	--	--	--	--	265	--	394	12	--	--	--	--	--	932	1.27	315	120	0	11	1360	8.4	
Nov. 1-Dec. 15.	63.1	--	--	--	--	272	--	399	13	--	--	--	--	--	955	1.30	163	121	0	11	1390	8.5	
Dec. 16-Jan. 31, 1964.....	49.6	--	--	--	--	286	--	430	7	--	--	--	--	--	991	1.35	133	126	0	11	1450	8.3	
Feb. 1-20.....	38.6	--	--	--	--	294	--	415	24	--	--	--	--	--	1020	1.39	108	131	0	11	1490	8.7	
Feb. 21-29.....	36.9	--	--	--	--	295	--	407	28	--	--	--	--	--	1030	1.40	103	137	0	11	1510	8.5	
Mar. 1-31.....	33.7	--	--	--	--	299	--	416	20	--	--	--	--	--	991	1.35	90.2	126	0	12	1500	8.6	
Apr. 1-9.....	21.6	--	--	--	--	298	--	413	23	--	--	--	--	--	994	1.35	58.0	139	0	11	1500	8.7	
Apr. 10.....	22	5.3	0.06	30	12	299	7.5	422	20	382	8.0	0.5	0.3	0.34	995	1.35	59.1	125	0	12	1490	8.5	
Apr. 11-30.....	21.8	--	--	--	--	299	--	412	20	--	--	--	--	--	977	1.33	57.5	127	0	12	1480	8.5	
May 1-13, 15-25.....	21.3	--	--	--	--	288	--	445	0	--	--	--	--	--	965	1.31	55.5	122	0	11	1450	7.7	
May 14.....	22	5.1	.05	27	13	290	8.6	447	0	366	7.4	.5	.2	.34	969	1.32	57.6	123	0	12	1460	8.1	
May 26-June 21.	24.3	2.6	--	26	13	288	7.4	450	0	377	6.7	.4	.7	.34	977	1.33	64.1	120	0	12	1470	7.8	
June 22-23.....	28	--	--	--	--	285	--	437	0	--	--	--	--	--	956	1.30	72.3	122	0	11	1440	7.7	
June 24-July 10	29.1	--	--	--	--	244	--	384	0	--	--	--	--	--	849	1.15	66.7	115	0	9.9	1280	7.7	
July 11-29.....	36.7	--	--	--	--	242	--	380	0	--	--	--	--	--	841	1.14	83.3	116	0	9.8	1270	7.8	
July 30-Aug. 16	40.2	--	--	--	--	258	--	386	0	--	--	--	--	--	859	1.17	93.2	119	0	10	1290	7.6	
Aug. 17.....	37	5.5	.05	29	11	244	8.0	388	0	336	5.8	.4	1.4	.32	864	1.18	86.3	117	0	9.8	1300	7.6	25

GRAND RIVER BASIN--Continued

6-3575. GRAND RIVER AT SHADEHILL, S. DAK.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Aug. 18-Sept. 21, 1964.....	40.6	--	--	--	--	250	--	392	0	330	--	--	--	--	866	1.18	94.9	124	0	9.8	1310	7.9	
Sept. 22-30....	39.3	--	--	--	--	256	--	396	0	345	--	--	--	--	881	1.20	93.5	125	0	10	1330	7.8	
Weighted average.....	--	--	--	--	--	273	--	406	--	--	--	--	--	--	942	1.28	117	123	--	11	1390	8.1	
Time-weighted average....	46.0	--	--	--	--	276	--	410	--	--	--	--	--	--	945	--	--	123	--	11	1400	8.0	
Tons per day.	--	--	--	--	--	34	--	50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	

CHEYENNE RIVER BASIN

6-4005. CHEYENNE RIVER NEAR HOT SPRINGS, S. DAK.

LOCATION.--At gaging station, near right bank on downstream side of bridge on State Highway 87, 0.2 mile downstream from Cascade Creek, and 10 miles southwest of Hot Springs, Fall River County.
DRAINAGE AREA.--8,710 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: April 1947 to September 1951.
Water temperatures: July 1947 to September 1949, April 1951 to September 1959.
Sediment records: April 1946 to September 1964.
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, 27,000 ppm July 12; minimum daily, 2 ppm Dec. 12, 13, 15.
Sediment loads: Maximum daily, 76,000 tons June 16; minimum daily, less than 0.50 ton on many days during October to February, August.
EXTREMES, 1946-64.--Sediment concentrations: Maximum daily, 55,000 ppm June 19, 1950; minimum daily, not determined.
Sediment loads: Maximum daily, 612,000 tons June 28, 1952; minimum daily (1946-47, 1959-64), 0.1 ton on many days.

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	18	17	1	22	8	1	22	10	1
2	18	17	1	23	7	T	22	7	T
3	18	24	1	22	6	T	22	7	T
4	18	22	1	21	5	T	24	4	T
5	20	17	1	20	6	T	25	12	1
6	20	16	1	18	10	1	26	14	1
7	19	11	1	18	7	T	24	7	T
8	18	16	1	19	3	T	19	4	T
9	18	13	1	19	6	T	19	5	T
10	17	10	T	16	12	1	17	3	T
11	16	14	1	17	8	T	16	3	T
12	16	23	1	17	7	T	16	2	T
13	16	20	1	15	7	T	16	2	T
14	15	17	1	15	7	T	17	3	T
15	15	18	1	16	11	1	17	2	T
16	16	16	1	17	10	T	18	8	T
17	16	16	1	17	8	T	17	6	T
18	16	16	1	17	6	T	16	3	T
19	16	8	T	17	8	T	17	3	T
20	21	9	1	17	10	T	17	5	T
21	24	24	2	16	8	T	19	6	T
22	22	13	1	16	6	T	18	8	T
23	26	12	1	16	9	T	18	14	1
24	24	5	T	17	11	1	18	14	1
25	22	4	T	16	7	T	20	10	1
26	20	12	1	16	6	T	20	8	T
27	20	8	T	18	6	T	20	10	1
28	20	5	T	18	5	T	20	9	1
29	20	4	T	17	10	T	20	18	1
30	18	7	T	19	8	T	21	14	1
31	22	8	1	--	--	--	20	9	1
Total	585	--	26	532	--	13	601	--	16

T Less than 0.50 ton.

CHEYENNE RIVER BASIN--Continued

6-4005. CHEYENNE RIVER NEAR HOT SPRINGS, S. DAK.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	20	12	1	23	11	1	35	27	2
2..	20	15	1	23	8	1	36	22	2
3..	21	13	1	23	10	1	35	25	2
4..	21	9	1	22	7	T	35	20	2
5..	20	14	1	22	5	T	35	19	2
6..	19	18	1	22	8	1	35	21	2
7..	20	12	1	21	8	T	34	17	2
8..	18	18	1	20	11	1	35	17	2
9..	19	13	1	20	14	1	34	16	1
10..	19	17	1	21	16	1	35	17	2
11..	20	19	1	25	17	1	38	34	3
12..	18	16	1	28	42	3	38	39	4
13..	19	18	1	30	50	4	38	32	3
14..	21	12	1	30	20	2	49	380	50
15..	18	18	1	30	22	2	51	450	62
16..	18	13	1	32	22	2	63	510	87
17..	18	12	1	30	25	2	64	450	78
18..	18	5	T	30	35	3	53	290	41
19..	18	3	T	30	24	2	63	320	54
20..	18	9	T	33	20	2	61	250	41
21..	20	10	1	33	20	2	46	210	26
22..	23	14	1	31	17	1	58	360	56
23..	23	7	T	30	17	1	41	280	31
24..	23	6	T	31	19	2	34	200	18
25..	24	11	1	27	15	1	54	320	47
26..	24	6	T	28	15	1	92	680	170
27..	23	6	T	29	10	1	63	320	54
28..	23	6	T	33	13	1	76	560 S	140
29..	23	6	T	34	16	1	89	630 S	160
30..	23	8	1	--	--	--	86	470	110
31..	23	21	1	--	--	--	100	460	120
Total	635	--	25	791	--	42	1606	--	1374

Day	APRIL			MAY			JUNE		
1..	104	660	180	51	140	19	23	28	2
2..	131	730	260	66	89	16	20	42	2
3..	108	620	180	73	270	53	21	38	2
4..	224	3000 S	2000	68	2000	370	27	40	3
5..	309	6600	5500	73	7500	1500	29	42	3
6..	213	6400	3700	64	3400	590	23	30	2
7..	126	3000	1000	79	2300	490	23	58	4
8..	117	3100	980	45	200	24	33	97	9
9..	106	2600	740	64	800 S	440	64	260 S	58
10..	76	770	160	240	14000	9100	489	9300 S	16000
11..	67	470	85	105	3700	1000	1320	14000	50000
12..	64	350	60	94	1100	280	1950	13000	68000
13..	60	320	52	73	600	120	1160	5000	16000
14..	54	340	50	138	4000 S	1800	438	3800	4500
15..	58	340	53	450	14000	17000	289	3800	3000
16..	49	250	33	188	6400	3200	1300	19000 S	76000
17..	42	200	23	102	2600	720	1500	15000	61000
18..	41	190	21	163	5000 S	2700	1220	11000	36000
19..	41	190	21	158	3900	1700	800	9400	20000
20..	50	220	30	77	2200	460	938	13000	33000
21..	66	260	46	55	410	61	888	14000	34000
22..	122	3300 S	1400	34	290	27	608	7800	13000
23..	147	7200	2800	30	190	15	406	5000	5500
24..	98	6400	1700	31	100	8	289	5000	3900
25..	34	1000	92	29	48	4	247	4800	3200
26..	31	230	19	30	48	4	210	3900 A	2200
27..	33	310	28	31	110	9	177	1500	720
28..	40	290	31	30	72	6	140	600 A	230
29..	30	280	23	43	190	22	104	420	120
30..	43	400	46	34	120	11	90	330	80
31..	--	--	--	27	23	2	--	--	--
Total	2684	--	21313	2745	--	41751	14826	--	446535

S Computed by subdividing day.
T Less than 0.50 ton.
A Computed from partly estimated concentration graph.

CHEYENNE RIVER BASIN--Continued

6-4005. CHEYENNE RIVER NEAR HOT SPRINGS, S. DAK.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	86	330	77	17	18	1	15	28	1
2	383	11000	S 15000	17	12	1	15	40	2
3	387	11000	11000	16	15	1	16	50 B	2
4	220	4900	2900	17	30	B 1	16	40 B	2
5	156	3300	1400	17	50	B 2	16	40 B	2
6	111	1800	540	17	70	B 3	16	40 B	2
7	88	870	210	16	80	B 3	16	40 B	2
8	71	460	88	16	90	B 4	17	50 B	2
9	64	340	59	16	90	B 4	17	50 B	2
10	52	240	34	17	100	B 4	19	50 B	2
11	59	5200	S 1500	16	100	B 4	22	60 B	4
12	119	27000	8700	16	95	A 4	19	60 B	3
13	65	8100	1400	15	88	4	17	50 B	2
14	40	1300	140	16	80	3	21	50 B	3
15	31	420	35	16	64	A 3	23	60 B	4
16	24	230	15	17	45	2	21	50 B	3
17	25	110	7	26	130	9	18	40 B	2
18	16	100	4	16	25	1	18	40 B	2
19	23	50	3	31	94	S 9	21	50 B	3
20	21	45	2	24	79	5	19	40 B	2
21	18	51	2	19	64	3	17	40 B	2
22	14	29	1	18	52	2	17	40 B	2
23	14	31	1	17	36	2	16	40 B	2
24	14	35	1	16	21	1	19	69	4
25	14	25	1	17	30	1	17	60 B	3
26	12	31	1	15	8	T	16	40 B	2
27	12	30	1	14	5	T	18	40 B	2
28	15	40	2	15	7	T	21	40 B	2
29	16	22	1	12	15	1	19	40 B	2
30	15	19	1	14	10	T	24	50 B	3
31	16	24	1	14	15	1	--	--	--
Total	2201	--	43127	530	--	80	546	--	71

Total discharge for year (cfs-days)..... 28282
Total load for year (tons)..... 554373

S Computed by subdividing day.
T Less than 0.50 ton.
A Computed from partly estimated concentration graph.
B Computed from estimated concentration graph.

CHEYENNE RIVER BASIN--Continued

6-4005. CHEYENNE RIVER NEAR HOT SPRINGS, S. DAK.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Apr. 22, 1964.....	1630	65		171	5150	2380	72	84	93	98	98	100	--	--	--			SPWC
Apr. 23.....	1815	62		164	10400	4600	--	--	--	--	--	100	--	--	--			S
May 5.....	1630	57		74	7260	1400	73	88	94	96	98	--	--	--	--			PWC
May 10.....	1830	68		168	11600	5260	68	84	93	95	97	--	--	--	--			PWC
May 13.....	1230	--		73	576	110	--	--	--	--	--	98	98	99	100			V
May 18.....	1630	75		232	7750	4850	77	84	93	--	--	100	--	--	--			SPWC
June 10.....	0930	--		478	9550	12300	60	66	89	93	97	98	99	100	--			VPWC
June 18.....	0900	62		1270	11300	38700	49	61	70	77	82	86	92	98	100			VPWC
June 22.....	1400	67		608	7420	12200	65	--	89	94	97	98	99	100	--			VPWC

PONCA CREEK BASIN

6-4535. PONCA CREEK AT ANOKA, NEBR.

LOCATION.--At gaging station at bridge on U.S. Highway 281, 0.5 mile southwest of Anoka, Boyd County, and 0.5 mile upstream from Dry Creek.
DRAINAGE AREA.--410 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1963 to September 1964 (discontinued).
Sediment records: February 1951 to September 1952.

Chemical analyses, in parts per million, December 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Dec. 10, 1963	4.0	17		0.02	--	148	37	31	9.2	354	0	268	8.6	0.2	2.5	0.13	738	523	233	0.6	1030	7.4	--
Jan. 15, 1964	7.6	20		.02	0.00	132	34	32	9.0	360	0	221	7.8	.3	1.2	.11	664	468	173	.6	953	7.7	--
Feb. 19.....	14	19		.01	.01	80	27	27	7.4	232	0	156	8.8	.3	1.0	.08	464	312	122	.7	686	7.9	--
Mar. 23.....	38	18		.03	--	81	21	24	9.4	240	0	130	8.7	.3	2.8	.07	440	288	91	.6	657	7.7	--
Apr. 7.....	102	17		.02	--	76	17	26	8.0	230	0	114	8.4	.3	3.1	.01	393	260	71	.7	602	7.3	20
May 23.....	33	18		.06	--	110	25	37	15	308	0	196	11	.4	.6	.09	585	378	125	.8	856	7.9	20
June 9.....	11	18		.02	.23	114	34	35	13	282	0	253	11	.5	.2	.14	645	425	194	.7	910	8.1	3
June 18.....	62	16		.02	.12	72	18	24	12	203	0	130	6.8	.6	1.0	.09	399	252	85	.7	596	7.5	16
July 7.....	6.6	19		.02	--	121	32	30	13	268	0	261	9.6	.3	.6	.13	663	432	212	.6	916	7.9	5
Aug. 12.....	.6	18		.03	.03	121	41	32	13	177	0	380	6.2	.3	1.0	.17	745	472	327	.6	988	8.0	--
Sept. 2.....	.6	20		.01	.08	160	38	33	12	262	0	383	8.2	.3	2.0	.16	825	554	339	.6	1130	8.0	--

NIOBRARA RIVER BASIN

6-4565. NIOBRARA RIVER NEAR HAY SPRINGS, NEBR.

LOCATION.--At gaging station at bridge on State Highway 87, 4 miles upstream from Box Butte Creek, and 14 miles south of Hay Springs, Sheridan County.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964 (discontinued).

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 4, 1963.	25	53		0.02	--	48	10	26	8.6	246	0	18	3.0	0.7	1.1	0.09	288	161	0	0.9	426	7.7	
Dec. 18.....	A14	50		.01	--	52	8.6	24	8.0	244	0	18	3.2	.6	1.9	.05	303	165	0	.8	424	7.8	
Jan. 21, 1964	A26	49		.01	0.00	34	8.8	23	7.4	189	0	16	3.0	.6	1.0	.04	233	121	0	.9	342	7.9	
Feb. 18.....	A26	50		.03	.00	46	12	25	7.4	236	0	18	4.1	.7	1.8	.04	284	165	0	.8	419	7.9	
Mar. 25.....	A30	58		.08	.00	52	8.9	24	7.6	244	0	17	3.9	.6	1.6	.04	292	166	0	.8	431	7.8	
Apr. 15.....	28	46		.16	--	52	8.9	25	8.6	246	0	19	4.0	.7	.8	.01	285	166	0	.8	433	7.5	
May 27.....	13	44		.01	--	54	8.4	24	8.8	248	0	20	3.2	.6	.7	.05	292	169	0	.8	436	7.5	
June 22.....	20	--		--	--	45	--	--	--	215	0	--	--	--	--	--	257	138	0	--	376	7.6	
June 23.....	18	46		.06	--	46	7.8	25	11	230	0	19	3.4	.7	.2	.05	276	147	0	.9	402	7.8	
July 21.....	15	49		.03	.07	47	8.6	28	11	243	0	18	4.7	.8	1.0	.06	284	153	0	1.0	422	7.7	
Aug. 24.....	19	48		.16	.03	57	4.4	28	9.4	240	4	18	4.0	.7	1.9	.06	296	160	0	1.0	426	8.3	
Sept. 21.....	26	49		.18	--	46	8.3	28	9.8	233	0	19	4.0	.7	2.7	.06	279	149	0	1.0	415	7.7	

A Daily mean discharge.

6-4592. SNAKE RIVER ABOVE MERRITT RESERVOIR, NEBR.

LOCATION.--Temperature recorder at gaging station, on left bank 5 feet upstream from steel piling control at Merritt Reservoir, Cherry County, 1,200 feet upstream from Shelbourn Bridge, 0.7 mile northwest of Swanson Camp, 8.5 miles southeast of headquarters of Nebraska National Forest (Niobrara Division), and 10 miles upstream from Boardman Creek.
RECORDS AVAILABLE.--Water temperatures: October 1963 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 86°F July 5; minimum, freezing point on many days during December to March.
REMARKS.--Recorder stopped Dec. 19-26.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October																																
Maximum	--	--	--	--	--	--	--	--	--	66	65	65	64	65	63	63	64	64	62	60	59	59	60	58	57	55	53	51	50	51	49	--
Minimum	--	--	--	--	--	--	--	--	--	60	58	58	58	60	58	57	56	56	56	59	58	53	54	54	50	49	47	45	42	47	44	--
November																																
Maximum	47	48	48	48	49	48	48	47	46	47	46	43	40	41	48	48	44	43	42	43	41	35	36	38	39	40	44	42	36	36	--	43
Minimum	40	41	43	43	45	43	44	43	43	44	44	39	35	36	40	44	42	40	39	39	35	34	34	36	37	37	39	36	33	34	--	39
December																																
Maximum	36	36	37	38	39	39	38	32	32	32	32	37	32	32	32	32	32	32	--	--	--	--	--	--	--	--	32	32	32	32	32	--
Minimum	34	33	34	34	36	37	32	32	32	32	32	32	32	32	32	32	32	32	--	--	--	--	--	--	--	--	32	32	32	32	32	--
January																																
Maximum	36	38	37	34	34	34	34	34	33	33	32	32	32	32	32	32	32	32	33	36	38	38	36	32	32	33	33	33	38	37	38	34
Minimum	32	36	34	32	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	34	35	32	32	32	33	33	33	33	33	35	33
February																																
Maximum	39	39	38	37	39	36	32	33	35	37	37	38	39	39	36	37	38	37	33	33	35	35	33	39	37	33	34	38	42	--	--	36
Minimum	34	38	37	34	36	32	32	32	32	34	33	37	34	35	33	33	33	33	33	33	33	33	33	33	33	32	32	32	33	--	--	34
March																																
Maximum	42	41	37	42	42	39	36	42	44	42	46	48	47	44	46	47	49	50	47	33	43	45	45	33	33	39	39	41	44	50	56	43
Minimum	35	37	32	32	35	35	34	35	35	39	37	38	42	38	38	40	41	42	33	33	33	34	33	33	33	33	36	33	33	35	42	36
April																																
Maximum	57	54	46	39	42	42	38	51	55	55	60	55	45	53	62	63	58	55	54	53	55	59	62	56	64	58	52	56	64	66	--	54
Minimum	47	45	38	38	36	38	37	36	44	47	48	42	39	40	47	52	47	47	50	51	46	50	51	55	55	51	41	41	49	53	--	45
May																																
Maximum	58	63	56	59	67	61	70	61	64	73	66	65	66	74	76	73	76	72	75	75	77	75	76	72	73	66	60	62	58	60	62	67
Minimum	53	53	51	48	53	49	54	53	50	57	55	51	53	56	52	62	64	63	59	61	61	63	62	55	57	60	57	54	54	53	52	56
June																																
Maximum	65	69	73	74	70	76	77	76	66	67	74	78	79	73	71	72	78	76	81	79	78	72	75	80	78	78	78	78	83	84	--	75
Minimum	54	55	59	64	62	62	65	66	56	57	61	62	65	67	66	64	67	67	63	67	68	65	60	65	65	63	64	63	65	70	--	63
July																																
Maximum	84	78	80	81	86	83	82	82	83	78	75	78	79	76	80	83	82	82	83	82	84	85	80	76	77	80	81	78	77	85	82	81
Minimum	67	65	63	70	69	71	67	65	69	70	66	63	65	65	68	70	69	68	68	67	71	68	69	66	63	68	66	68	64	67	71	67
August																																
Maximum	83	80	80	83	80	76	79	77	82	77	69	73	66	64	78	75	79	82	75	70	64	64	72	67	71	75	70	71	67	71	76	74
Minimum	68	70	69	66	68	68	64	63	68	69	58	57	58	60	63	66	68	67	67	63	58	58	57	62	59	60	60	56	62	58	63	63
September																																
Maximum	79	80	74	74	76	80	69	76	78	73	67	68	72	69	64	69	72	70	65	64	68	65	60	63	68	62	59	62	62	64	--	69
Minimum	68	68	67	61	63	67	65	64	69	66	58	55	61	62	61	60	60	62	56	53	56	59	56	54	57	52	48	50	54	56	--	60

NIOBRARA RIVER BASIN--Continued

6-4620. NIOBRARA RIVER NEAR NORDEN, NEBR.

LOCATION.--At gaging station at county road bridge, 1.5 miles downstream from Fairfield Creek, and 6 miles south of Norden, Keya Paha County.
RECORDS AVAILABLE.--Chemical analyses: November 1963 to September 1964.
REMARKS.--Some spectrographic and radiochemical data available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, November 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Nov. 6, 1963.	920	54		0.03	0.00	30	3.9	8.6	5.9	131	0	7.2	1.3	0.4	1.2	0.03	187	91	0	0.4	227	7.6	2
Dec. 10.....	473	62		.04	--	34	4.4	9.5	5.6	143	0	8.2	1.6	.3	2.0	.05	199	103	0	.4	256	7.5	--
Jan. 16, 1964	A1080	64		.01	.00	32	4.4	9.4	5.8	136	0	6.3	1.4	.4	1.3	.02	189	98	0	.4	243	7.1	--
Feb. 19.....	1080	56		.04	.01	31	5.0	8.7	5.2	130	0	6.8	1.1	.4	1.0	.02	185	98	0	.4	230	7.2	4
Mar. 23.....	1090	54		.05	--	30	4.4	8.4	5.5	129	0	6.0	1.4	.4	1.3	.00	189	93	0	.4	230	7.4	--
Apr. 13.....	1080	51		.06	--	34	3.2	10	6.6	141	0	10	1.7	.5	1.1	.00	197	98	0	.4	252	7.4	--
May 12.....	1120	47		.01	.00	34	4.4	12	7.1	155	0	7.2	1.2	.5	.4	.03	201	103	0	.5	257	7.7	15
June 9.....	568	58		.04	.13	33	4.3	10	6.8	148	0	6.8	1.4	.4	.2	.03	195	100	0	.4	247	7.9	5
July 7.....	606	54		.07	--	30	4.2	8.4	7.1	135	0	6.0	1.7	.4	.7	.04	194	92	0	.4	227	7.5	--
Aug. 4.....	645	59		.09	--	30	4.2	8.7	7.1	133	0	7.0	1.5	.4	.4	.03	186	92	0	.4	220	8.0	--
Sept. 2.....	390	59		.02	.01	32	3.9	9.7	7.1	140	0	6.0	1.2	.4	.2	.02	191	96	0	.4	242	7.9	--

A Daily mean discharge.

NIOBRARA RIVER BASIN--Continued

6-4620. NIOBRARA RIVER NEAR NORDEN, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Nov. 6, 1963.....	1000	44		879	816	1940						16	56	91	99	100		V
Jan. 16, 1964.....	0950	32		D 1080	450	1310						3	15	81	99	100		V
Feb. 19.....	1520	32		866	784	1830						8	18	88	100	--		V
Mar. 23.....	1640	36		1090	911	2680						28	54	93	100	--		V
Apr. 13.....	1525	50		1080	890	2600						--	--	--	--	--		
May 12.....	1440	65		1120	630	1900						25	47	76	98	100		V
June 9.....	1025	58		568	940	1440						17	37	78	97	100		V
July 7.....	1155	85		612	440	727						41	57	85	100	--		V
July 21.....	1035	83		634	436	746						18	34	74	99	100		V
Aug. 4.....	1245	84		645	380	662						23	44	83	99	100		V
Sept. 2.....	1155	76		390	318	335						25	48	83	100	--		V
Sept. 15.....	0955	56		546	343	506						16	41	89	99	100		V

D Daily mean discharge.

NIOBRARA RIVER BASIN--Continued

6-4655. NIOBRARA RIVER NEAR VERDEL, NEBR.

LOCATION.--Temperature recorder at gaging station at Pishelville bridge, 6 miles south of Verdel, Knox County, and 7 miles upstream from Verdigre Creek.
DRAINAGE AREA.--10,900 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: June 1958 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 101°F July 22; minimum, freezing point on many days during November to March.
EXTREMES, 1958-64.--Water temperatures: Maximum, 101°F July 22, 1964; minimum, freezing point on many days during winter months each year.
REMARKS.--Recorder stopped Jan. 10 to Feb. 13, Mar. 24-27.

Temperature (°F) of water, water year October 1963 to September 1964
(Recorder with temperature attachment, continuous ethyl alcohol-actuated thermograph)

Month	Day																													Average
	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	
October																																
Maximum	70	70	67	72	70	70	71	68	68	69	68	67	69	70	69	65	65	67	71	67	70	69	72	66	63	57	61	55	50	54	56	66
Minimum	56	59	57	58	60	59	60	60	55	59	58	57	58	61	60	59	59	58	60	64	62	58	61	57	53	54	53	49	44	45	45	57
November																																
Maximum	49	51	52	52	51	52	50	51	51	50	47	46	38	36	39	43	44	44	41	42	41	36	33	34	33	38	39	41	38	38	--	43
Minimum	41	40	44	44	44	44	44	45	46	47	44	38	35	34	34	39	42	36	37	36	36	33	32	32	33	33	35	37	34	35	--	39
December																																
Maximum	37	36	36	36	37	38	37	34	33	33	33	33	33	34	34	34	34	34	33	33	33	34	33	32	33	33	33	33	33	33	32	34
Minimum	34	34	33	33	32	33	33	33	33	33	33	32	33	32	33	33	33	32	33	33	33	33	32	32	32	33	32	32	32	32	32	33
January																																
Maximum	32	32	32	33	33	34	34	34	35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	32	32	32	32	32	33	33	33	34	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
February																																
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	33	33	34	34	33	34	34	34	34	34	34	34	34	34	35	34	--	--	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	33	33	33	32	33	33	33	33	33	34	33	33	33	34	33	33	--	--	--
March																																
Maximum	34	34	34	36	34	37	33	33	33	36	36	38	36	38	39	40	40	39	39	38	37	38	37	--	--	--	--	36	37	43	46	37
Minimum	33	34	33	33	32	32	32	32	32	33	33	35	34	35	35	38	38	37	38	35	34	34	36	--	--	--	--	32	33	33	32	34
April																																
Maximum	51	48	44	39	42	41	40	47	56	62	67	56	49	54	64	67	59	53	50	49	49	54	61	58	65	60	57	55	59	59	--	54
Minimum	36	43	39	36	36	39	36	34	40	46	50	45	41	41	45	51	51	46	48	49	48	47	47	50	52	55	53	49	47	50	--	45
May																																
Maximum	56	58	63	64	67	64	74	64	66	73	69	63	67	74	82	81	82	75	83	82	82	83	91	80	85	75	71	68	71	69	71	73
Minimum	53	52	56	55	56	56	54	54	50	54	57	50	49	53	61	63	65	65	61	64	65	65	68	58	60	64	60	58	55	57	52	58
June																																
Maximum	66	74	80	76	79	85	85	83	68	73	75	84	90	75	81	69	71	77	84	85	85	81	75	85	87	86	88	87	84	91	--	80
Minimum	56	53	56	62	61	63	68	69	57	53	61	63	68	69	66	47	57	70	66	69	69	67	66	64	69	67	67	69	68	70	--	64
July																																
Maximum	97	94	89	84	92	88	96	94	92	79	81	84	90	90	89	90	94	95	90	96	99	101	99	96	93	95	98	89	86	85	91	89
Minimum	74	72	72	71	68	76	73	70	74	72	69	68	69	71	73	73	76	76	76	73	79	79	77	75	71	75	78	72	67	68	73	71
August																																
Maximum	88	85	79	88	88	87	88	82	90	89	70	79	62	64	71	87	89	91	87	75	73	68	82	70	82	81	70	80	76	81	76	80
Minimum	73	71	71	68	68	72	67	65	64	71	59	54	58	57	62	61	68	67	70	65	60	60	59	62	56	59	52	58	64	56	62	64
September																																
Maximum	88	89	88	82	72	84	73	75	87	75	62	73	75	75	63	74	73	74	69	71	64	68	61	66	74	66	65	66	67	72	--	73
Minimum	66	70	71	61	62	64	65	65	68	62	56	53	57	59	56	59	59	64	57	53	58	57	53	49	54	50	46	49	52	55	--	58

JAMES RIVER BASIN

6-4690. JAMESTOWN RESERVOIR NEAR JAMESTOWN, N. DAK.

LOCATION.--At gaging station, on right bank 800 feet north of glory hole on west end of Jamestown Dam on James River, 1.9 miles north of Jamestown Post Office, Stutsman County, and 4 miles upstream from Pipestem Creek.
DRAINAGE AREA.--1,670 square miles, approximately, of which about 460 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1959 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Lake content (acre-feet)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 1, 1963.	20994	16		0.06	1.2	45	28	99	18	405	0	88	30	0.3	1.9	0.19	547	226	0	2.9	862	7.8	12
Oct. 30.....	20494	13		.09	1.3	47	29	100	18	412	0	91	31	.3	1.1	.19	556	236	0	2.8	873	7.8	13
Nov. 14.....	20204	11		.01	1.5	41	31	102	18	407	0	89	31	.3	1.2	.21	570	230	0	2.9	874	7.6	--
Dec. 9.....	20204	.0		.03	.02	37	33	110	20	416	0	97	35	.3	.5	.21	568	227	0	3.2	893	7.7	25
Jan. 6, 1964.	19818	1.8		.12	.60	42	35	108	19	432	0	98	32	.4	1.1	.23	581	248	0	3.0	918	8.0	19
Feb. 3.....	19721	5.6		.17	.27	43	35	108	21	406	16	104	39	.3	3.0	.20	619	253	0	3.0	954	8.3	17
Mar. 4.....	19666	6.3		.11	.83	49	35	115	19	463	0	104	36	.3	.2	.23	633	268	0	3.1	991	7.5	17
Apr. 2.....	19763	3.4		.48	.83	26	18	59	10	236	0	54	18	.2	1.3	.07	324	137	0	2.2	534	7.4	15
May 5.....	20673	3.2		.15	1.1	42	32	105	17	418	0	95	33	.2	.3	.16	571	236	0	3.0	897	7.8	17
May 20.....	20190	1.1		.03	.92	42	30	104	17	403	0	92	30	.3	1.5	.16	565	228	0	3.0	874	7.7	10
June 29.....	20177	.9		.07	1.1	40	30	103	17	400	0	91	31	.3	1.4	.20	548	224	0	3.0	856	7.9	10
July 13.....	20425	3.0		.03	.60	40	30	102	19	388	0	91	34	.3	6.9	.19	552	223	0	3.0	862	7.8	15
Aug. 10.....	19970	8.7		.04	1.1	43	28	103	18	402	0	89	33	.3	1.4	.20	549	224	0	3.0	870	7.8	5
Sept. 8.....	19333	14		.06	1.6	45	30	107	23	408	0	53	33	.6	67	.19	582	234	0	3.0	923	7.4	40

JAMES RIVER BASIN--Continued

6-4705. JAMES RIVER AT LA MOURE, N. DAK.

LOCATION.--At gaging station at bridge on State Highway 13, 0.5 mile west of La Moure, La Moure County, and 12 miles upstream from Cottonwood Creek.
DRAINAGE AREA.--5,740 square miles, approximately, of which about 2,800 square miles is probably noncontributing.
RECORDS AVAILABLE.--Water temperatures: June 1953 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 86°F July 16-18; minimum, 33°F on many days during January to April.
EXTREMES, 1953-64.--Water temperatures: Maximum, 91°F July 12, 13, 1957; minimum, freezing point on many days during winter months.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Mar. 19, 1964	14	11		1.01		79	34	100	6.9	383	0	168	52	0.2	0.5	0.35	659	336	22	2.4	994	7.9	
Apr. 3.....	39	11		--		74	29	82	7.3	336	0	154	41	.2	.1	.24	579	304	28	2.0	919	7.6	
May 21.....	36	19		.08	1.5	101	37	114	10	397	0	252	52	.3	1.0	.28	802	404	78	2.5	1210	7.5	
June 23.....	844	15		--		40	18	41	8.6	165	0	104	13	.2	4.3	.14	328	174	39	1.4	516	7.6	
Sept. 15.....	8.8	15		--		62	41	102	10	385	0	167	47	.3	.1	.35	646	323	7	2.5	1010	8.1	

6-4705. JAMES RIVER AT LA MOURE, N. DAK.--Continued

Temperature (°F) of water, water year October 1963 to September 1964
(Recorder with temperature attachment, continuous ethyl alcohol-actuated thermograph)

Month	Day																													Average
	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	
October																																
Maximum	59	59	59	59	61	61	60	61	59	58	58	56	58	58	59	59	59	58	58	58	57	57	58	58	57	55	53	50	48	46	46	57
Minimum	56	58	58	58	59	60	59	58	58	58	56	55	56	58	58	58	58	58	58	57	57	57	57	57	54	53	50	48	46	46	45	56
November																																
Maximum	45	42	42	42	43	43	43	44	44	44	42	40	37	36	37	37	38	38	39	39	38	35	34	34	35	35	36	36	36	38	--	39
Minimum	42	42	42	42	42	43	43	43	44	42	40	37	36	36	36	37	37	38	38	38	35	34	34	34	34	35	35	36	36	36	--	38
December																																
Maximum	37	37	37	38	38	38	38	36	35	34	35	35	35	35	35	35	36	36	36	36	36	36	35	35	34	34	34	34	34	34	34	36
Minimum	37	37	37	37	38	38	36	35	34	34	34	35	35	35	35	35	35	36	36	36	36	35	34	34	34	34	34	34	34	34	34	35
January																																
Maximum	34	34	34	34	34	34	34	34	34	35	36	35	35	35	34	34	34	34	34	34	35	35	35	35	35	35	34	34	34	34	33	34
Minimum	34	34	34	34	34	34	34	34	34	34	35	35	35	34	34	34	34	34	34	34	35	35	35	35	35	34	34	34	34	33	33	34
February																																
Maximum	33	33	33	33	33	34	34	34	34	34	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	--	--	33
Minimum	33	33	33	33	33	34	34	34	34	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	--	--	33
March																																
Maximum	33	33	33	33	33	33	33	33	33	33	33	33	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Minimum	33	33	33	33	33	33	33	33	33	33	33	33	33	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
April																																
Maximum	34	34	35	35	35	34	33	33	33	33	34	34	33	34	39	48	48	47	46	48	48	44	47	52	56	57	59	60	57	56	--	43
Minimum	34	34	34	35	34	33	33	33	33	33	33	33	33	33	34	39	46	46	45	45	44	43	43	47	52	56	57	57	55	54	--	41
May																																
Maximum	54	53	53	55	58	58	61	61	59	62	61	57	58	62	62	65	65	69	71	71	74	74	73	69	69	69	67	66	65	62	62	63
Minimum	53	52	52	52	55	58	57	58	57	58	57	54	56	58	60	61	62	65	67	68	68	72	69	66	67	66	63	63	62	59	59	60
June																																
Maximum	61	63	68	68	68	71	71	69	69	64	64	68	70	71	71	69	68	68	65	67	69	69	65	69	72	74	77	79	79	79	--	70
Minimum	59	60	61	64	65	68	69	69	64	61	61	64	67	70	68	66	65	65	64	64	65	65	63	64	69	72	74	76	77	78	--	67
July																																
Maximum	80	80	80	79	77	79	80	81	81	81	80	82	82	82	83	86	86	86	84	85	85	83	83	83	84	81	79	79	76	74	72	81
Minimum	76	78	77	77	74	75	76	78	79	79	78	79	79	81	81	83	84	84	82	83	83	81	82	80	81	77	75	75	74	72	72	79
August																																
Maximum	78	79	79	79	80	80	79	76	74	75	73	63	63	63	68	71	71	73	74	74	72	70	67	67	68	68	68	70	70	68	66	72
Minimum	72	76	76	77	77	79	74	73	72	73	63	61	60	62	63	68	70	70	72	72	70	67	65	67	65	65	68	66	68	64	65	69
September																																
Maximum	71	75	75	69	66	66	63	61	69	69	64	63	65	64	60	61	65	65	65	65	63	63	62	57	58	58	55	57	57	57	--	64
Minimum	66	71	68	66	64	63	61	61	61	64	62	60	61	60	58	58	61	63	65	62	62	62	57	56	57	55	54	54	56	55	--	61

JAMES RIVER BASIN--Continued

6-4710. JAMES RIVER AT COLUMBIA, S. DAK.

LOCATION.--At county road bridge, 3.5 miles north of Columbia, Brown County, about 5 miles upstream from gaging station, and 0.1 mile downstream from Columbia Road Reservoir.
DRAINAGE AREA.--7,050 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1951 to September 1952, November 1954 to August 1964 (discontinued).

Chemical analyses, in parts per million, October 1963 to August 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Nov. 13, 1963	61	25				76	46	113	14	423	0	190	66	0.4	5.4	0.30	780	379	32	2.5	1160	8.2	
Dec. 5.....	51					82	54	135		461	0	239	76			--	893	428	50	2.8	1340	7.9	
Dec. 20.....	34					92	70	173		536	0	317	102			--	1130	516	76	3.3	1640	8.1	
Jan. 8, 1964.	26					114	69	182		598	0	326	113			--	1200	570	79	3.3	1760	7.9	
Jan. 29.....	2					148	102	261		822	0	454	155			--	1630	788	114	4.0	2370	7.9	
Feb. 19.....	5					114	84	206		566	0	361	129			--	1300	629	165	3.6	1910	8.1	
Mar. 10.....	6					--	--	174		630	0	--	--			--	1100	530	13	3.3	1650	8.1	
Mar. 19.....	5			0.03	0.02	34	19	52		194	0	81	31			--	348	164	5	1.8	570	7.2	
Apr. 2.....	23					22	9.7	27		94	0	53	19			--	207	95	18	1.2	340	6.9	
Apr. 15.....	5.4					59	37	80		251	0	200	57			--	617	299	93	2.0	952	7.4	
May 7.....	542					81	44	100		325	0	--	--			--	740	382	115	2.2	1110	7.4	
Aug. 12.....	65					67	44	137		414	0	202	78			.41	806	348	8	3.2	1220	7.7	

6-4760. JAMES RIVER AT HURON, S. DAK.

LOCATION.--At Chicago and North Western Railway Co. bridge, 135 feet upstream from gaging station, 150 feet upstream from city dam at Huron, Beadle County, and 300 feet upstream from bridge on U.S. Higbway 14.
DRAINAGE AREA.--16,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: April 1950 to September 1951, August 1956 to September 1964.
Water temperatures: August 1956 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 1,510 ppm Jan. 13-31; minimum, 436 ppm July 27-28.
Hardness: Maximum, 623 ppm Jan. 13-31; minimum, 208 ppm July 27 to Aug. 9.
Specific conductance: Maximum daily, 2,270 micromhos Jan. 18-22; minimum daily, 631 micromhos July 18.
Water temperatures: Maximum, 82°F on several days during July; minimum, freezing point on several days during November to January.
EXTREMES, 1956-64.--Dissolved solids (1956-58, 1959-64): Maximum, 1,790 ppm Feb. 28 to Mar. 1, 1961; minimum, 147 ppm Apr. 5-7, 1960.
Hardness: Maximum, 892 ppm Feb. 28 to Mar. 1, 1961; minimum, 63 ppm Apr. 1-4, 1960.
Specific conductance: Maximum daily, 2,640 micromhos Mar. 1, 1959; minimum daily, 176 micromhos Mar. 30, Apr. 2, 1960.
Water temperatures: Maximum, 83°F July 17, 1957, June 30, 1961, July 25, 1963; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance of daily samples and some spectrographic and radiochemical data available in district office at Lincoln, Nebr.
During some periods, all flow is diverted from tbe channel near tbe sampling site and, therefore, does not pass tbe gaging station.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-30, 1963A	--	--	--	--	--	121	--	320	0	184	--	--	--	--	698	0.95	--	278	16	3.1	1060	7.6	
Oct. 31-Nov. 1..	12.4	--	--	--	--	124	--	324	0	185	--	--	--	--	714	.97	23.9	288	22	3.2	1090	7.5	
Nov. 2-14, 16-18, 21-28.....	6.4	--	--	--	--	125	--	328	0	187	--	--	--	--	717	.98	12.4	287	18	3.2	1100	7.9	
Nov. 29-Dec. 1..	8.7	--	--	--	--	130	--	288	0	199	--	--	--	--	701	.95	16.5	258	22	3.5	1080	7.9	
Dec. 2-14.....	34.8	--	--	--	--	150	--	340	0	263	--	--	--	--	862	1.17	81.0	343	64	3.5	1300	7.9	
Dec. 15.....	36	20	0.13	98	74	196	15	440	0	465	111	0.4	8.8	0.44	B1200	1.63	117	549	188	3.6	1770	7.6	
Dec. 16-31.....	39.4	--	--	--	--	190	--	518	0	412	--	--	--	--	1270	1.73	135	587	162	3.4	1800	7.9	
Jan. 1-12, 1964.	33.4	--	--	--	--	218	--	563	0	352	--	--	--	--	1280	1.74	115	543	81	4.1	1880	7.9	
Jan. 13-31.....	24.3	--	--	--	--	261	--	600	0	420	--	--	--	--	1510	2.05	99.1	623	131	4.6	2210	7.9	
Feb. 1-22.....	15.2	--	--	--	--	225	--	625	0	385	--	--	--	--	1370	1.86	56.2	618	105	3.9	1980	8.1	
Feb. 23.....	16	22	.30	113	83	200	16	610	0	373	127	.4	3.4	.49	B1240	1.69	53.6	622	122	3.5	1850	7.8	
Feb. 24-Mar. 9..	14.6	--	--	--	--	200	--	584	0	368	--	--	--	--	1260	1.71	49.7	585	106	3.6	1860	8.2	
Mar. 10-17 A....	--	--	--	--	--	174	--	520	0	340	--	--	--	--	1130	1.54	--	533	107	3.3	1680	8.2	
Mar. 18.....	1.5	15	.09	98	52	150	13	444	0	297	92	.4	4.9	.39	973	1.32	3.94	458	94	3.0	1470	8.0	
Mar. 19-31.....	18.4	--	--	--	--	172	--	476	9	350	--	--	--	--	1100	1.50	54.7	524	119	3.3	1640	8.3	

A Not included in weighted average.
B Calculated from determined constituents.

JAMES RIVER BASIN--Continued

6-4760. JAMES RIVER AT HURON, S. DAK.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Apr. 1-11, 1964.	35.7	--	--	--	--	135	--	373	0	308	--	--	--	--	896	1.22	86.4	423	117	2.9	1350	8.2	
Apr. 12.....	35	7.1	0.32	92	38	121	10	330	0	292	65	0.3	2.9	0.33	848	1.15	80.1	385	114	2.7	1230	8.1	
Apr. 13-30.....	52.9	--	--	--	--	133	--	373	0	281	--	--	--	--	864	1.18	123	402	96	2.9	1320	8.2	
May 1-7.....	56.9	--	--	--	--	183	--	410	0	345	--	--	--	--	1020	1.39	157	429	93	3.8	1550	7.7	
May 8-14.....	150	--	--	--	--	137	--	317	0	258	--	--	--	--	786	1.07	318	334	74	3.3	1220	7.6	
May 15-21.....	271	--	--	--	--	128	--	283	0	240	--	--	--	--	729	.99	533	314	82	3.1	1140	7.5	
May 22.....	440	11	.02	52	30	100	12	248	0	181	54	.4	2.7	.28	607	.83	721	252	49	2.7	939	7.6	22
May 23-June 4...	377	--	--	--	--	105	--	249	0	182	--	--	--	--	574	.78	584	248	44	2.9	963	7.4	
June 5-9.....	161	--	--	--	--	100	--	263	0	169	--	--	--	--	593	.81	258	255	39	2.7	934	7.4	
June 10-25.....	51.6	--	--	--	--	108	--	291	0	201	--	--	--	--	670	.91	93.3	292	53	2.8	1040	7.3	
June 26-27.....	3.0	--	--	--	--	121	--	325	0	226	--	--	--	--	750	1.02	6.08	332	65	2.9	1160	7.4	
June 29-July 5..	48.0	--	--	--	--	126	--	320	0	232	--	--	--	--	763	1.04	98.9	328	65	3.0	1180	7.1	
July 6-10.....	252	--	--	--	--	138	--	352	0	255	--	--	--	--	834	1.13	567	357	68	3.2	1280	7.4	
July 11-26.....	501*	--	--	--	--	71	--	258	0	133	--	--	--	--	508	.69	687	235	23	2.0	802	7.1	
July 27-28.....	605	--	--	--	--	59	--	238	0	102	--	--	--	--	436	.59	712	208	13	1.8	684	7.3	
July 29-Aug. 9..	546	21	--	49	21	60	16	246	0	95	37	.3	.6	.18	441	.60	650	208	6	1.8	680	7.0	
Aug. 10-20.....	323	--	--	--	--	96	--	348	0	138	--	--	--	--	629	.86	549	288	3	2.5	968	7.4	
Aug. 21.....	240	17	.04	82	28	119	17	387	0	162	74	.3	.5	.33	719	.98	466	319	2	2.9	1100	7.6	
Aug. 22-25.....	186	--	--	--	--	123	--	398	0	170	--	--	--	--	725	.99	364	327	1	3.0	1130	7.4	
Aug. 26-Sept. 3.	74.4	--	--	--	--	128	--	406	0	184	--	--	--	--	752	1.02	151	338	5	3.0	1180	7.6	
Sept. 4-12.....	39.6	--	--	--	--	132	--	396	0	197	--	--	--	--	777	1.06	83.1	339	14	3.1	1210	7.5	
Sept. 13-18.....	10.3	--	--	--	--	136	--	376	0	203	--	--	--	--	755	1.03	21.0	324	16	3.3	1190	7.8	
Sept. 19.....	23	--	--	--	--	136	--	377	0	205	--	--	--	--	757	1.03	47.0	323	14	3.3	1200	7.6	
Sept. 20.....	22	7.5	--	63	41	137	18	374	0	197	83	.4	.3	.35	784	1.07	46.6	324	17	3.3	1180	7.2	

Sept. 21-24, 1964.....	19.2	--	--	--	--	136	--	380	0	204	--	--	--	--	758	1.03	39.3	325	13	3.3	1200	7.8						
Sept. 25-29.....	5.9	--	--	--	--	137	--	400	0	207	--	--	--	--	763	1.04	12.2	328	0	3.3	1200	7.6						
Weighted average.....	--	--	--	--	--	101	--	304	--	177	--	--	--	--	640	0.87	203	287	37	2.5	995	7.2						
Time-weighted average.....	C103	--	--	--	--	148	--	402	--	262	--	--	--	--	902	--	--	397	67	3.2	1360	7.5						
Tons per day..	--	--	--	--	--	32	--	96	--	56	--	--	--	--	--	--	--	--	--	--	--	--						

C Mean discharge based on 366 days; mean discharge for 323 days of actual flow, 117 cfs.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	62	63	63	62	62	65	64	61	61	62	61	62	62	62	62	62	63	61	61	63	64	62	62	61	58	56	54	51	49	48	48	60
November.....	44	43	44	45	45	44	44	46	45	45	44	41	36	36	37	39	39	39	40	40	47	32	--	36	36	35	38	38	38	37	--	40
December.....	37	37	39	38	38	38	37	34	33	32	33	35	34	33	33	32	32	33	32	32	32	33	33	35	34	35	34	33	35	33	33	34
January.....	35	35	35	35	37	36	35	35	35	34	32	33	33	34	34	33	35	35	35	36	36	37	34	34	32	33	33	33	35	36	37	35
February.....	36	37	37	37	38	35	35	36	37	35	38	38	36	38	37	38	39	39	38	36	35	39	38	39	37	36	38	39	40	--	--	37
March.....	42	42	43	40	40	38	40	40	41	39	39	42	40	39	40	39	36	38	39	37	37	39	40	35	35	36	39	39	38	39	40	39
April.....	48	43	42	42	41	42	38	39	44	47	52	53	44	47	47	54	54	53	51	53	51	49	52	53	54	61	60	57	55	53	--	49
May.....	55	53	57	57	60	61	61	60	57	62	62	62	57	59	63	62	65	70	72	71	73	73	76	71	71	71	71	66	67	65	60	64
June.....	64	65	65	67	68	71	71	75	70	68	69	69	72	73	70	68	70	72	71	72	73	72	72	73	75	75	75	78	78	78	--	71
July.....	78	80	79	78	77	78	80	80	80	81	79	77	79	78	79	80	82	82	82	80	82	82	82	78	78	77	78	78	77	73	73	79
August.....	78	79	80	79	78	78	78	76	74	78	67	66	70	64	66	68	72	74	75	72	70	68	67	66	66	66	70	69	68	65	68	71
September.....	69	74	76	74	69	68	66	65	70	68	64	64	63	61	61	63	64	65	64	63	62	61	59	58	58	59	56	55	56	56	--	64

JAMES RIVER BASIN--Continued

6-4785. JAMES RIVER NEAR SCOTLAND, S. DAK.

LOCATION.--At gaging station at highway bridge, 500 feet upstream from Dawson Creek and 5 miles northeast of Scotland, Bon Homme County.
DRAINAGE AREA.--21,550 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: August 1956 to September 1964 (discontinued).
Water temperatures: January 1953 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 85°F on several days during July; minimum, freezing point on several days during January to March.
EXTREMES, 1953-64.--Water temperatures: Maximum, 90°F Aug. 1, 2, 1957; minimum, freezing point on many days during winter months.
REMARKS.--Recorder stopped Dec. 28, 29, Jan. 14, Feb. 14, 15, June 23-28.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 7, 1963.	33	--		--	--	154	74	115	--	252	0	--	--	--	--	--	1280	688	481	1.9	1610	7.9	
Oct. 28.....	32	--		--	--	186	69	110	--	316	0	628	43	--	--	--	1340	749	490	1.7	1680	7.8	
Nov. 27.....	35	18		--	--	184	89	128	15	314	0	700	54	0.5	--	--	1520	825	567	1.9	1830	7.4	
Dec. 30.....	46	16		--	--	227	97	222	19	411	0	900	112	.8	9.2	0.64	A1810	965	628	3.1	2490	8.1	
Jan. 21, 1964	57	--		--	--	220	79	295	--	457	0	725	264	--	--	--	1970	874	499	4.3	2690	7.7	
Feb. 13.....	60.0	--		--	--	198	85	200	--	473	0	680	114	--	--	--	1710	844	456	3.0	2210	7.6	
Mar. 18.....	160	--		0.03	0.59	136	55	116	--	278	0	465	66	--	--	--	1090	566	338	2.1	1490	7.5	
Apr. 8.....	169	--		--	--	148	49	105	--	224	0	520	53	--	--	--	1090	571	387	1.9	1460	7.3	
May 20.....	244	7.8		--	--	116	68	172	15	312	0	545	84	.5	1.6	.50	A1160	571	315	3.1	1710	7.2	
May 23.....	315	13		.05	.14	125	62	198	15	374	0	540	105	.6	4.2	.51	A1250	568	261	3.6	1830	7.6	
June 10.....	274	18		--	--	82	32	125	14	272	0	266	81	.5	3.3	.34	780	337	114	3.0	1230	7.3	15
June 29.....	53	--		--	--	104	44	112	--	278	0	348	68	--	--	--	907	441	213	2.3	1290	7.8	
July 17.....	308	--		--	--	113	54	140	--	272	0	450	85	--	--	--	1080	502	279	2.7	1490	7.4	
July 29.....	500	--		--	--	60	28	74	--	245	0	165	43	--	--	--	536	263	62	2.0	836	7.8	
Aug. 19.....	338	12		--	--	66	28	69	16	276	0	155	44	.2	.5	.20	551	278	52	1.8	846	7.9	
Sept. 9.....	100	12		--	--	94	41	117	18	367	0	251	76	.4	.6	.36	838	405	104	2.5	1250	8.2	

A Calculated from determined constituents.

6-4785. JAMES RIVER NEAR SCOTLAND, S. DAK.--Continued

Temperature (°F) of water, water year October 1963 to September 1964
(Recorder with temperature attachment, continuous ethyl alcohol-actuated thermograph)

Month	Day																													Average
	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	
October																																
Maximum	68	69	69	69	73	72	72	70	67	67	67	66	66	67	66	65	64	63	63	64	65	65	66	65	62	60	58	56	52	49	48	64
Minimum	66	68	67	68	69	70	70	67	64	65	66	65	65	66	65	64	63	61	61	63	63	62	63	62	59	58	56	52	49	48	48	62
November																																
Maximum	48	45	44	44	44	44	44	45	46	46	45	45	40	38	37	40	41	41	40	39	39	38	36	35	35	35	36	37	37	36	--	41
Minimum	45	43	44	44	44	44	44	44	45	45	45	40	38	37	37	37	40	40	39	39	38	36	35	35	35	35	35	36	36	35	--	40
December																																
Maximum	35	34	34	34	34	34	34	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	--	--	33	33	33
Minimum	34	34	34	34	34	34	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	--	--	33	33	33
January																																
Maximum	33	32	32	32	32	33	33	33	33	33	33	34	34	--	33	33	33	33	33	33	33	33	33	34	34	34	34	34	34	33	33	33
Minimum	32	32	32	32	32	32	33	33	33	33	33	33	33	--	33	33	33	33	33	33	33	33	33	33	34	34	34	34	33	33	33	33
February																																
Maximum	33	33	33	33	33	33	33	33	33	33	33	33	33	--	--	33	33	32	32	33	33	33	33	33	33	33	33	33	32	--	--	33
Minimum	33	33	33	33	33	33	33	33	33	33	33	33	33	--	--	33	32	32	32	32	33	33	33	32	32	33	33	32	32	--	--	33
March																																
Maximum	32	32	33	33	33	33	33	33	34	33	33	33	33	35	35	35	35	35	35	35	35	35	35	34	34	34	33	34	34	33	37	34
Minimum	32	32	32	33	33	33	33	33	33	33	33	33	33	33	34	34	34	35	35	35	35	34	34	34	34	33	33	33	33	32	32	33
April																																
Maximum	40	40	40	40	38	39	39	39	41	45	49	49	47	47	50	54	54	51	50	50	48	47	51	51	55	55	55	53	52	52	--	47
Minimum	36	39	37	38	37	38	36	35	37	40	45	47	44	44	46	49	51	48	48	48	46	44	47	49	50	55	53	52	50	49	--	45
May																																
Maximum	50	51	55	57	58	58	60	60	59	60	61	61	59	62	64	66	68	68	70	72	73	74	75	75	74	74	73	71	69	68	69	65
Minimum	49	49	51	54	56	57	56	57	56	57	59	57	55	58	61	63	65	67	67	68	71	72	73	71	72	72	70	69	68	67	67	62
June																																
Maximum	68	67	67	68	70	71	72	72	72	72	70	72	73	73	73	72	71	74	74	74	74	74	--	--	--	--	--	--	80	80	--	72
Minimum	67	65	66	67	68	70	71	72	72	70	70	70	72	73	72	71	70	71	73	73	74	74	--	--	--	--	--	--	78	79	--	71
July																																
Maximum	82	82	82	81	81	81	83	83	83	83	82	82	82	83	83	84	85	85	85	85	85	85	85	85	84	82	81	81	81	80	79	83
Minimum	80	81	81	81	79	81	81	82	82	82	82	80	80	81	82	83	84	85	85	84	85	84	84	84	82	80	80	81	80	79	79	82
August																																
Maximum	79	79	79	79	79	79	79	78	77	77	77	76	74	72	70	69	70	71	72	73	73	73	72	71	71	71	71	72	72	72	73	74
Minimum	79	79	79	79	79	79	78	77	77	77	76	74	72	70	69	69	69	70	71	72	73	72	71	71	71	71	71	71	72	72	72	74
September																																
Maximum	74	75	77	77	77	77	77	77	78	78	78	74	72	72	72	70	70	70	69	68	67	66	66	65	63	63	63	61	61	61	--	71
Minimum	73	74	75	77	77	77	77	77	76	78	74	72	72	72	70	70	70	69	68	67	66	66	65	63	63	63	61	61	61	60	--	70

PLATTE RIVER BASIN

6-6300. NORTH PLATTE RIVER ABOVE SEMINOE RESERVOIR, NEAR SINCLAIR, WYO.

LOCATION.--At old bridge 150 feet downstream from new bridge on U.S. Highways 30 and 287, 1.8 miles south of Fort Steele, 6 miles downstream from Pass Creek, 8.2 miles east of Sinclair, Carbon County, and about 13 miles upstream from gaging station.
DRAINAGE AREA.--8,124 square miles upstream from gaging station, of which 4,064 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: December 1960 to September 1964.
Water temperatures: December 1960 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 440 ppm Dec. 11-18; minimum, 110 ppm May 21-31.
Hardness: Maximum, 260 ppm Dec. 11-18; minimum, 68 ppm May 21-31.
Specific conductance: Maximum daily, 691 micromhos Dec. 12; minimum daily, 151 micromhos May 26.
Water temperatures: Maximum, 75°F Aug. 7; minimum, freezing point on many days during November to April.
EXTREMES, 1960-64.--Dissolved solids: Maximum, 481 ppm Feb. 4-6, 1963; minimum, 107 ppm May 12-18, 1963.
Hardness: Maximum, 261 ppm Dec. 22-31, 1962; minimum, 54 ppm May 12-18, 1963.
Specific conductance: Maximum daily, 736 micromhos Feb. 4, 1963; minimum daily, 137 micromhos May 12, 1963.
Water temperatures: Maximum, 75°F Aug. 7, 1964; minimum, freezing point on many days during winter months each year.
REMARKS.--Records of specific conductance of daily samples available in district office at Worland, Wyo. No appreciable inflow between sampling point and gaging station.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-14, 1963.	139	12	0.00	49	13	31	3.0	168	0	87	11	0.6	0.1	0.11	297	0.40	111	176	38	1.0	478	7.4	4
Oct. 15-31.....	197	17	.01	54	14	32	3.0	180	0	95	13	.6	.1	.08	324	.44	172	191	43	1.0	508	7.6	2
Nov. 1-7.....	258	20	.00	55	14	32	2.9	180	0	100	12	.6	.1	.07	346	.47	241	194	46	1.0	523	7.6	5
Nov. 8-20.....	297	19	.00	51	14	30	2.7	167	0	95	10	.6	.1	.07	324	.44	260	185	48	1.0	491	7.4	3
Nov. 21-30.....	266	21	.00	59	16	34	3.1	186	0	116	12	.6	.0	.06	374	.51	269	214	61	1.0	564	7.4	5
Dec. 1-10.....	250	23	.00	71	18	38	3.7	216	0	138	13	.6	.3	.09	435	.59	294	253	76	1.0	643	7.5	3
Dec. 11-18.....	220	24	.00	78	16	38	3.3	224	0	136	15	.6	.2	.08	440	.60	261	260	76	1.0	651	7.5	4
Dec. 19-31.....	213	21	.00	60	16	31	2.9	185	0	112	13	.5	.3	.09	360	.49	207	216	64	.9	550	7.6	1
Jan. 1-31, 1964.	186	21	.00	59	15	30	2.9	179	0	106	12	.4	.2	.06	343	.47	172	208	61	.9	532	7.5	3
Feb. 1-12.....	192	21	.00	59	13	28	2.7	172	0	99	12	.5	.1	.07	335	.46	174	199	58	.9	515	7.7	2
Feb. 13-29.....	195	21	.00	59	13	29	2.9	172	0	99	13	.5	.2	.06	338	.48	178	199	58	.9	516	7.8	2
Mar. 1-16.....	182	21	.05	56	13	27	2.5	166	0	96	12	.4	.2	.06	329	.45	162	194	58	.8	494	7.6	4
Mar. 17-22.....	189	20	.00	54	12	26	2.5	156	0	93	12	.4	.2	.05	315	.43	161	183	55	.8	474	7.8	4
Mar. 23-31.....	257	19	.05	56	14	31	2.9	160	0	112	14	.4	.2	.07	345	.47	239	198	67	1.0	523	7.7	4
Apr. 1-16.....	460	18	.00	45	23	39	5.5	151	0	141	15	.4	7.7	.08	376	.51	467	206	82	1.2	576	7.4	4
Apr. 17-30.....	1522	22	.03	33	20	26	4.5	140	0	93	8.3	.3	.6	.33	293	.40	1200	164	49	.9	443	7.5	13
May 1-10.....	1176	14	.02	40	11	21	2.9	130	0	76	6.7	.5	.0	.03	241	.33	765	147	40	.8	386	7.3	17

May 11-20, 1964.	1871	13	.01	34	8.5	15	2.2	114	0	52	4.7	.3	.1	.02	186	.26	950	120	26	.6	308	7.3	23
May 21-31.....	4171	11	.04	20	4.4	7.7	1.3	67	0	24	2.0	.2	.3	.02	110	.15	1240	68	13	.4	175	6.9	20
June 1-12.....	3857	13	.03	23	6.7	11	1.7	84	0	36	2.6	.3	.1	.05	148	.20	1540	85	16	.5	225	7.6	22
June 13-22.....	3349	13	.02	26	7.3	13	2.1	100	0	40	3.3	.3	.4	.06	171	.23	1550	95	13	.6	245	7.8	22
June 23-30.....	2995	14	.02	32	9.7	16	2.2	120	0	49	3.6	.4	.4	.06	201	.27	1620	120	22	.6	296	7.4	21
July 1-6.....	2598	14	.01	34	7.8	15	1.5	127	0	36	3.6	.3	.4	.03	185	.25	1300	117	13	.6	286	7.0	8
July 7-31.....	844	12	.00	44	9.5	20	1.9	164	0	48	5.0	.4	.4	.03	231	.31	526	149	14	.7	370	7.2	9
Aug. 1-10.....	429	17	.01	33	16	20	2.4	161	0	54	5.4	.5	.4	.06	249	.34	288	150	18	.7	381	7.6	7
Aug. 11-31.....	243	16	.01	46	14	28	2.7	173	0	83	8.8	.5	.2	.07	295	.40	194	173	31	.9	451	7.8	5
Sept. 1-30.....	247	14	.01	48	12	29	2.6	163	0	82	9.4	.7	.1	.06	287	.39	191	170	36	1.0	456	7.2	3
Weighted average.....	--	15	0.02	34	9.9	18	2.3	120	--	57	5.4	0.4	0.5	0.07	212	0.29	469	125	27	0.7	325	7.3	15
Time-weighted average.....	821	17	0.01	48	13	27	2.8	159	--	86	9.6	0.5	0.5	0.07	295	--	--	174	44	0.9	455	7.4	7
Tons per day..	--	32	0.04	75	22	39	5.1	266	--	126	12	0.8	1.0	0.15	--	--	--	--	--	--	--	--	--

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	54	53	51	51	54	52	50	50	50	50	47	49	50	47	46	46	45	46	50	47	45	47	44	47	42	43	41	39	44	40	39	47
November.....	36	35	36	37	37	38	39	34	42	39	38	40	37	41	41	36	34	32	32	32	32	32	32	32	32	32	32	32	33	33	--	35
December.....	34	32	32	32	32	32	34	34	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
January.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	34	32	34	36	33	32	32	32	33	32	32	32
February.....	32	32	32	32	32	32	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	33	33	32
April.....	33	33	32	32	32	32	32	33	33	33	33	33	34	34	36	36	39	44	44	41	38	45	43	44	44	42	39	41	44	55	--	38
May.....	54	46	43	40	43	43	46	45	49	47	44	48	50	51	55	55	54	53	53	56	53	53	54	50	50	51	47	50	50	48	46	49
June.....	49	48	53	54	52	52	54	53	48	53	58	52	51	53	53	55	58	58	54	56	52	52	53	62	61	63	62	65	61	58	--	55
July.....	59	61	61	61	66	69	64	67	68	64	71	66	67	67	69	73	73	69	73	70	73	67	68	66	66	73	68	68	73	68	64	67
August.....	68	65	66	64	66	70	75	66	70	65	60	65	64	69	61	61	59	59	60	57	56	51	52	53	56	63	51	51	50	50	54	61
September.....	57	57	61	64	55	56	60	54	56	55	54	53	54	58	53	61	53	52	51	45	47	53	47	46	53	47	43	42	45	47	--	53

PLATTE RIVER BASIN--Continued

6-6379.1. ROCK CREEK AT ATLANTIC CITY, WYO.

LOCATION.--At gaging station, on left bank 500 feet downstream from Slate Creek and 1.4 miles northwest of Atlantic City, Fremont County.
DRAINAGE AREA.--21.3 square miles.
RECORDS AVAILABLE.--Chemical analyses: April to June 1957, November 1957 to September 1958.
Water temperatures: June to September 1957, May to September 1958, May to September 1959, April 1960 to September 1964.
Sediment records: June 1957 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 68°F July 27; minimum, freezing point on many days during November to March.
Sediment concentrations: Maximum daily, 2,100 ppm June 7; minimum daily, 2 ppm Aug. 26, 30, Sept. 4.
Sediment loads: Maximum daily, 690 tons June 7; minimum daily, less than 0.50 ton on many days during October to December, May, July to September.
EXTREMES, 1957-64.--Water temperatures: Maximum, 73°F July 29, 1961; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 3,800 ppm June 16, 1963; minimum daily, not determined.
Sediment loads: Maximum daily, 6,600 tons June 16, 1963; minimum daily, less than 0.05 ton on many days.
REMARKS.--Flow affected by ice Nov. 22, 23, Nov. 27 to Apr. 18.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	53	52	--	49	50	53	52	49	47	40	42	49	48	49	50	49	48	47	46	45	46	46	45	42	41	39	39	40	42	41	38	46
November	37	37	36	37	36	37	34	35	36	36	35	35	37	38	38	35	34	34	34	34	34	32	32	32	32	33	32	33	33	33	--	35
December	33	33	34	35	35	32	32	32	32	32	32	32	32	32	32	34	34	34	34	34	34	33	34	35	34	33	34	35	34	34	35	33
January	35	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	32	32
February	32	32	32	32	32	32	32	32	32	33	32	32	32	32	32	32	33	32	32	32	32	32	32	32	32	33	32	32	32	--	--	32
March	32	32	32	32	32	33	32	32	32	32	33	32	32	32	32	32	34	34	32	32	32	33	32	32	32	32	32	33	33	36	35	33
April	34	--	--	--	--	--	--	35	34	35	--	--	--	--	35	34	35	35	36	36	--	34	35	36	36	35	36	--	38	39	38	--	--
May	--	--	--	36	35	41	37	38	40	40	38	39	40	40	38	39	38	41	44	47	50	48	48	44	49	45	49	47	42	45	44	42
June	42	45	44	49	47	48	48	44	44	48	44	50	49	47	52	55	48	47	49	50	48	46	56	58	51	59	58	58	60	60	--	50
July	62	61	62	61	60	61	63	61	62	63	62	64	64	62	56	65	66	55	64	62	64	61	65	63	53	60	68	64	65	63	62	62
August	61	62	64	65	63	64	63	64	63	62	60	60	60	59	61	59	62	64	55	53	52	55	56	55	54	53	51	47	48	49	52	58
September	50	49	49	51	49	52	50	52	51	51	52	50	52	52	50	51	51	48	49	52	47	49	49	51	49	42	46	47	48	45	--	49

PLATTE RIVER BASIN--Continued

6-6379.1. ROCK CREEK AT ATLANTIC CITY, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	4.6	30	T	6.2	54	1	4.6	37	T
2	3.6	18	T	5.1	48	1	5.4	50	1
3	4.0	--	T	4.6	46	1	4.4	38	T
4	4.6	30	T	5.6	54	1	4.2	42	T
5	4.6	32	T	5.6	54	1	4.8	84	1
6	4.6	20	T	5.1	50	1	4.4	38	T
7	4.6	30	T	5.6	47	1	4.0	39	T
8	6.8	48	1	5.1	44	1	3.6	32	T
9	4.8	36	T	6.2	60	1	3.4	34	T
10	1.8	12	T	5.6	60	1	3.4	32	T
11	1.9	16	T	5.1	58	1	3.4	48	T
12	4.0	32	T	5.1	50	1	6.0	80	1
13	3.8	32	T	5.6	42	1	9.0	50	1
14	3.8	35	T	5.1	250	3	10	48	1
15	4.0	40	T	4.6	97	1	11	46	1
16	5.1	42	1	6.8	100	2	11	49	1
17	5.1	39	1	5.6	76	1	12	50	2
18	4.6	60	1	4.6	52	1	11	45	1
19	5.1	44	1	5.6	50	1	11	42	1
20	6.8	42	1	6.2	60	1	12	60	2
21	4.6	36	T	6.2	63	1	13	48	2
22	3.4	35	T	3.6	48	1	12	41	1
23	4.0	46	T	2.8	12	T	12	52	2
24	5.1	43	1	1.4	8	T	11	60	2
25	4.6	35	T	2.5	20	T	9.5	46	1
26	4.0	42	T	3.6	46	T	9.0	38	1
27	3.4	40	T	3.2	12	T	9.5	42	1
28	3.4	30	T	3.6	28	T	10	48	1
29	3.6	30	T	3.8	56	1	9.5	42	1
30	4.0	36	T	4.0	52	1	9.0	42	1
31	5.6	43	1	--	--	--	8.0	40	1
Total	133.9	--	16	143.7	--	28	251.1	--	31

Day	JANUARY			FEBRUARY			MARCH		
1	7.5	C 62	1	6.5	C 93	2	5.5	C 79	1
2	6.0	C 62	1	6.0	C 93	2	5.5	C 79	1
3	6.5	C 62	1	6.0	C 93	2	6.0	C 79	1
4	6.5	C 62	1	6.5	C 93	2	6.5	C 79	1
5	6.5	C 62	1	5.5	C 93	1	7.0	C 79	1
6	6.5	C 62	1	5.5	C 93	1	8.0	C 79	2
7	6.5	C 62	1	5.0	C 93	1	8.5	C 79	2
8	6.5	C 62	1	5.0	C 93	1	8.5	C 79	2
9	6.5	C 62	1	5.5	C 93	1	8.0	C 79	2
10	6.5	C 62	1	5.5	C 93	1	8.0	C 79	2
11	6.5	C 62	1	6.0	C 93	2	8.0	C 79	2
12	6.5	C 62	1	6.0	C 93	2	8.0	C 79	2
13	6.5	C 62	1	6.0	C 93	2	8.0	C 79	2
14	7.0	C 62	1	5.5	C 93	1	8.0	C 79	2
15	7.5	C 62	1	5.0	C 93	1	8.5	C 79	2
16	7.5	C 62	1	5.0	C 93	1	9.0	C 79	2
17	7.5	C 62	1	5.5	C 93	1	8.5	C 79	2
18	7.0	C 62	1	5.0	C 93	1	7.5	C 79	2
19	6.5	C 62	1	5.0	C 93	1	7.0	C 79	1
20	7.0	C 62	1	5.0	C 93	1	7.0	C 79	1
21	7.0	C 62	1	5.0	C 93	1	7.5	C 79	2
22	6.5	C 62	1	5.5	C 93	1	8.0	210	5
23	6.5	C 62	1	5.0	C 93	1	9.0	120	3
24	6.5	C 62	1	5.0	C 93	1	8.5	90	2
25	6.0	C 62	1	5.0	C 93	1	8.0	94	2
26	6.5	C 62	1	5.5	C 93	1	7.5	88	2
27	6.5	C 62	1	5.5	C 93	1	8.0	86	2
28	6.5	C 62	1	5.5	C 93	1	8.5	100	2
29	6.5	C 62	1	5.5	C 93	1	9.0	360	9
30	6.5	C 62	1	--	--	--	9.5	120	3
31	6.5	C 62	1	--	--	--	10	68	2
Total	206.5	--	31	158.5	--	36	244.5	--	67

T Less than 0.50 ton.
C Composite period.

PLATTE RIVER BASIN--Continued

6-6379.1. ROCK CREEK AT ATLANTIC CITY, WYO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	11	C 160	5	28	C 230	17	72	1500	290
2	12	C 160	5	22	C 230	14	58	1000	160
3	11	C 160	5	16	C 230	10	76	1300	270
4	10	C 160	4	20	C 230	12	72	1100	210
5	11	C 160	5	10	140	4	80	1300	280
6	10	C 160	4	3.4	40	T	84	1100	250
7	11	C 160	5	9.2	120	3	122	2100	690
8	11	C 160	5	12	120	4	88	1200	290
9	11	C 160	5	14	140	5	72	780	150
10	12	C 160	5	14	210	8	64	510	88
11	13	C 160	6	13	180	6	60	310	50
12	12	C 160	5	13	150	5	52	320	45
13	11	C 160	5	13	230	8	55	230	34
14	12	C 160	5	12	230	7	58	220	34
15	13	C 160	6	19	490	25	55	180	27
16	11	C 160	5	18	710	34	50	160	22
17	11	C 160	5	24	710	46	50	160	22
18	10	C 160	4	26	390	27	58	190	30
19	9.0	C 160	4	26	500	35	48	130	17
20	8.4	C 160	4	28	410	31	42	96	11
21	9.0	C 160	4	35	430	41	42	88	10
22	10	C 160	4	35	330	31	45	110	13
23	19	280	14	25	120	8	40	89	10
24	19	280	14	20	80	4	35	75	7
25	12	C 240	8	19	90	5	30	62	5
26	8.4	C 240	5	19	100	5	28	62	5
27	11	C 240	7	22	280	17	28	55	4
28	15	C 230	9	20	140	8	28	48	4
29	22	C 230	14	30	1100	S 120	26	30	2
30	22	C 230	14	60	1300	210	26	42	3
31	--	--	--	60	1300	210	--	--	--
Total	367.8	--	190	685.6	--	960	1644	--	3033

	JULY			AUGUST			SEPTEMBER		
1	22	34	2	3.8	34	T	1.8	4	T
2	20	38	2	3.2	28	T	1.8	10	T
3	19	30	2	3.6	24	T	1.8	3	T
4	18	25	1	3.6	34	T	1.8	2	T
5	16	27	1	4.6	38	T	1.9	4	T
6	15	20	1	4.6	50	1	1.8	4	T
7	15	21	1	3.8	38	T	1.8	8	T
8	16	20	1	4.6	36	T	1.8	4	T
9	17	22	1	5.1	44	1	1.5	6	T
10	18	21	1	4.0	40	T	3.9	40	T
11	19	30	2	3.8	38	T	7.3	56	1
12	19	34	2	3.2	32	T	6.8	60	1
13	22	27	2	1.8	22	T	6.8	61	1
14	25	40	3	2.1	22	T	5.1	57	1
15	26	57	4	2.1	28	T	3.6	48	T
16	16	160	7	2.7	28	T	3.4	49	T
17	11	70	2	3.6	30	T	3.2	40	T
18	11	54	2	4.6	32	T	3.4	38	T
19	11	32	1	4.0	30	T	3.8	48	T
20	10	21	1	3.8	28	T	2.7	40	T
21	9.0	22	1	3.6	28	T	4.5	54	1
22	7.3	20	T	2.3	11	T	4.8	50	1
23	7.8	22	T	3.0	22	T	5.6	50	1
24	5.1	16	T	3.2	42	T	3.4	40	T
25	3.0	6	T	1.8	9	T	3.6	40	T
26	2.7	7	T	1.6	2	T	3.0	40	T
27	6.7	30	1	1.6	4	T	2.3	40	T
28	7.3	37	1	1.8	6	T	3.2	50	T
29	6.8	53	1	1.9	3	T	3.0	43	T
30	7.8	47	1	1.8	2	T	3.4	50	T
31	5.6	40	1	2.3	8	T	--	--	--
Total	415.1	--	42	97.5	--	8	102.8	--	12

Total discharge for year (cfs-days)..... 4451.0
Total load for year (tons)..... 4454

S Computed by subdividing day.
T Less than 0.50 ton.
C Composite period.

PLATTE RIVER BASIN--Continued

6-6379.1. ROCK CREEK AT ATLANTIC CITY, WYO.--Continued

Particle-size analyses of suspended sediment, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
June 3, 1964.....	0720	41		92	1310			13		27		62	75	84	92	99		VPWC
June 10.....	0950	47		72	465		9	10	13	16	21	33	45	60	76	98		VBWC

PLATTE RIVER BASIN--Continued

6-6468. NORTH PLATTE RIVER NEAR GLENROCK, WYO.

LOCATION.--At Dave Johnston powerplant, 0.2 mile upstream from Sand Creek, 1 mile upstream from gaging station, and 4.8 miles east of Glenrock, Converse County.
DRAINAGE AREA.--17,487 square miles upstream from gaging station, of which 5,123 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: December 1960 to September 1964.
Water temperatures: December 1960 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 832 ppm Apr. 12-21; minimum, 259 ppm May 18-22.
Hardness: Maximum, 368 ppm Apr. 12-21; minimum, 162 ppm May 18-22.
Specific conductance: Maximum daily, 1,380 micromhos May 31; minimum daily, 380 micromhos May 18.
Water temperatures: Maximum, 74°F July 26; minimum, freezing point Dec. 9.
EXTREMES, 1960-64.--Dissolved solids: Maximum, 832 ppm Apr. 12-21, 1964; minimum, 259 ppm May 18-22, 1964.
Hardness: Maximum, 368 ppm Apr. 12-21, 1964; minimum, 162 ppm May 18-22, 1964.
Specific conductance: Maximum daily, 1,380 micromhos May 31, 1964; minimum daily, 380 micromhos May 18, 1964.
Water temperatures: Maximum, 78°F July 10, 1961, July 11, 1962; minimum, freezing point on several days during winter months.
REMARKS.--Daily samples for chemical analysis composited by equal-volume. Records of specific conductance of daily samples available in district office at Worland, Wyo. No appreciable inflow between sampling point and gaging station.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-12, 1963.	1542	14	0.01	58	18	45	3.6	169	0	150	12	0.4	1.2	0.10	405	0.55	1690	220	81	1.3	606	8.1	3
Oct. 13-31.....	1092	12	.00	61	22	54	3.6	176	0	178	15	.4	1.7	.10	461	.63	1360	243	99	1.5	685	7.4	4
Nov. 1-15.....	1105	13	.00	63	20	54	3.7	175	0	182	14	.4	2.0	.10	465	.63	1390	241	97	1.5	695	7.4	5
Nov. 16-30.....	999	12	.00	64	21	56	3.5	173	0	190	14	.4	2.2	.09	475	.65	1280	247	105	1.6	709	7.5	6
Dec. 1-9.....	972	11	.00	59	23	55	2.9	174	0	188	15	.4	.9	--	453	.62	1190	242	99	1.5	688	7.9	--
Dec. 10-13.....	479	14	.01	67	26	62	3.2	196	0	212	18	.5	2.1	--	529	.72	684	274	113	1.6	773	8.1	--
Dec. 14-31.....	1063	13	.01	59	23	53	2.9	176	0	185	14	.4	1.9	--	463	.63	1330	242	98	1.5	683	7.9	--
Jan. 1-16, 1964.	896	13	.00	65	21	54	3.4	179	0	190	15	.4	2.9	.09	475	.65	1150	249	102	1.5	708	7.8	7
Jan. 17-31.....	1087	13	.00	62	21	52	3.4	170	0	181	14	.4	2.0	.09	455	.62	1340	240	101	1.5	682	7.6	5
Feb. 1-16.....	1081	14	.00	63	21	52	3.3	172	0	184	14	.4	1.8	.09	477	.65	1390	242	101	1.4	693	7.6	5
Feb. 17-29.....	1033	14	.00	63	22	53	3.5	175	0	189	16	.5	2.1	.12	483	.66	1350	247	103	1.5	707	7.7	5
Mar. 1-18.....	1128	13	.00	62	22	52	3.4	168	0	190	15	.4	1.6	.10	456	.62	1390	244	106	1.4	687	7.3	7
Mar. 19-31.....	1147	13	.00	68	24	65	3.4	178	0	226	19	.4	2.0	.10	544	.74	1680	268	122	1.7	782	7.3	7
Apr. 1-11.....	1645	13	.00	59	29	63	3.4	175	0	226	15	.4	3.1	.09	516	.70	2290	267	123	1.7	765	7.8	5
Apr. 12-21.....	974	13	.00	72	46	117	4.2	184	0	410	22	.4	8.3	.14	832	1.13	2190	368	217	2.7	1160	7.6	7
Apr. 22-30.....	809	13	.00	54	48	105	4.5	177	0	354	21	.4	7.6	.13	737	1.00	1610	331	186	2.5	1040	7.5	5
May 1-10.....	1088	13	.00	65	15	55	2.9	144	0	198	14	.5	2.2	.15	446	.61	1310	224	106	1.6	667	7.4	15

May 11-17, 1964.	1684	12	.00	47	17	41	3.3	128	0	150	9.8	.4	1.6	.08	351	.48	1600	186	81	1.3	546	7.2	17
May 18-22.....	2612	12	.02	44	13	22	2.7	113	0	100	5.6	.3	.3	.06	259	.35	1830	162	69	.7	408	7.3	27
May 23-31.....	1646	15	.00	64	18	41	3.5	138	0	188	9.2	.4	1.2	.16	422	.57	1880	234	121	1.2	629	7.3	28
June 1-15.....	1244	13	.00	65	25	62	3.0	166	0	233	13	.4	1.3	.12	529	.72	1780	266	130	1.7	768	7.8	4
June 16-30.....	1554	13	.00	64	23	53	3.6	169	0	205	14	.4	.6	.09	490	.67	2060	256	117	1.4	719	7.7	6
July 1-14.....	1693	13	.00	59	25	52	3.3	172	0	189	14	.3	.5	.02	466	.63	2130	250	109	1.4	686	7.8	2
July 15-31.....	1644	12	.01	66	22	55	3.5	170	0	198	15	.3	.5	.06	471	.64	2090	253	114	1.5	707	7.2	5
Aug. 1-14.....	1795	12	.00	61	27	58	3.7	173	0	211	16	.4	.8	.08	492	.67	2380	261	119	1.6	724	8.0	4
Aug. 15-31.....	2737	12	.00	57	26	53	3.9	168	0	192	14	.4	1.0	.08	463	.63	3420	249	111	1.5	685	8.0	2
Sept. 1-30.....	2239	13	.01	60	22	52	3.3	164	0	185	14	.5	.9	.09	447	.61	2700	238	103	1.5	667	7.6	6
Weighted average.....	--	13	0.00	61	23	55	3.4	167	--	196	14	0.4	1.6	0.09	471	0.64	1790	247	109	1.5	698	7.6	7
Time-weighted average.....	1408	13	0.00	62	23	56	3.4	169	--	201	15	0.4	1.9	0.10	482	--	--	250	111	1.5	712	7.6	7
Tons per day..	--	49	0.01	231	88	208	13	636	--	745	54	2.0	6.0	0.35	--	--	--	--	--	--	--	--	--

Temperature (°F) of water, water year October 1963 to September 1964
(Once-daily measurement between 0900 and 1500)

Month	Day																													Average
	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	
October.....	64	64	64	--	--	63	63	56	60	60	60	62	56	--	55	55	55	55	55	55	55	55	55	55	55	52	53	48	48	47	48	56
November.....	--	46	46	48	44	46	44	43	48	48	45	43	41	42	40	50	44	40	40	39	39	39	40	40	41	41	42	41	40	41	--	43
December.....	39	40	40	40	38	39	37	33	32	36	40	42	39	39	39	39	39	39	35	39	39	40	39	39	39	39	--	37	37	39	36	38
January.....	35	34	39	38	35	35	38	38	37	38	36	40	39	39	39	37	39	40	40	39	39	39	39	39	44	48	40	40	39	39	39	39
February.....	35	37	40	38	38	38	39	39	39	35	36	35	37	37	40	40	40	40	40	39	40	40	40	40	40	39	40	38	39	--	--	39
March.....	41	36	36	36	35	36	34	40	38	38	38	37	38	40	38	38	38	35	38	37	41	41	40	38	39	40	43	41	45	50	50	39
April.....	48	38	36	41	43	46	46	46	48	50	50	49	46	46	50	50	50	55	52	48	--	54	56	56	59	48	50	56	56	58	--	49
May.....	58	59	50	58	58	58	53	55	56	58	53	55	58	56	56	55	57	62	62	62	61	60	60	60	--	--	--	--	59	52	52	57
June.....	55	55	--	56	56	62	66	58	58	59	60	60	60	61	62	65	65	62	60	59	59	55	62	62	65	66	63	--	65	65	--	61
July.....	65	65	66	71	68	70	67	67	67	67	68	70	68	68	68	68	68	70	70	69	70	70	70	70	70	74	70	70	69	70	67	69
August.....	68	70	68	68	68	68	68	--	--	--	--	--	--	--	67	67	67	67	67	67	67	58	60	59	58	58	58	60	58	56	58	--
September.....	58	57	58	61	62	63	61	62	62	61	60	59	60	61	60	60	60	59	58	58	57	57	57	57	57	56	--	52	51	51	--	58

PLATTE RIVER BASIN--Continued

6-6773. KIOWA CREEK NEAR LYMAN, NEBR.

LOCATION.--At gaging station at Union Pacific Railroad bridge, 0.8 mile upstream from mouth and 2.2 miles northeast of Lyman, Scotts Bluff County.
RECORDS AVAILABLE.--Chemical analyses: September 1961 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 23, 1963.....	34	60	0.05	30	9.0	292	11	536	0	243	29	0.9	9.1	0.32	986	1.34	90.5	112	0	12	1410	7.9
Nov. 19.....	22	59	.02	32	10	300	11	556	0	253	30	.9	11	.29	A980	1.33	58.2	121	0	12	1450	8.0
Dec. 30.....	11	58	--	36	9.7	298	11	569	0	253	31	.8	10	.32	A988	1.34	29.3	130	0	11	1480	8.1
Feb. 11, 1964.....	11	55	--	35	9.8	292	11	552	0	248	32	.9	14	.37	A970	1.32	28.8	128	0	11	1460	7.7
Mar. 26.....	13	62	.06	36	9.2	294	12	554	0	248	31	.8	12	.32	986	1.34	34.6	128	0	11	1450	8.1
May 6.....	9.2	46	--	30	10	313	12	582	0	275	34	.9	6.9	.34	A1010	1.37	25.1	118	0	13	1530	8.0
June 19.....	108	14	--	60	18	84	5.8	225	0	201	17	.4	2.1	.11	545	.74	159	223	38	2.4	813	7.8
July 14.....	32	35	--	48	10	179	11	368	0	227	23	.6	4.5	.21	740	1.01	63.9	162	0	6.1	1100	7.8
Aug. 19.....	31	43	--	40	16	222	11	440	0	247	26	.7	7.7	.27	871	1.18	72.9	164	0	7.5	1250	8.0
Sept. 11.....	41	42	--	48	15	214	11	432	0	252	28	.7	5.0	.24	854	1.16	94.5	180	0	6.9	1250	7.9

A Calculated from determined constituents.

6-6773. KIOWA CREEK NEAR LYMAN, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 23, 1963.....	1230	59		34	163	15						83	95	100				V
Dec. 30.....	1115	39		11	47	1.4						61	--	--				S
Aug. 19, 1964.....	1000	66		31	50	4.2						43	87	96	100			V

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 23, 1963.....	1230		7	34			5	12	41	82	94	96	97	98	100			SV
Dec. 30.....	1115		--	11			11	16	35	71	88	93	96	98	100			SV
Aug. 19, 1964.....	1000		7	31			1	4	31	75	90	95	98	99	100			SV

PLATTE RIVER BASIN--Continued

6-6787. BROWN CANYON DRAIN NEAR MITCHELL, NEBR.

LOCATION.--At Mitchell-Gering canal, 13 feet upstream from culvert and 2.7 miles southwest of Mitchell, Scotts Bluff County.
RECORDS AVAILABLE.--Chemical analyses: September 1961 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 23, 1963.....	2.1	65	0.03	30	12	193	13	325	6	225	23	0.6	16	0.29	785	1.07	4.45	124	0	7.5	1090	8.3
Nov. 19.....	1.6	65	.02	48	13	196	13	397	0	225	25	.6	18	.31	840	1.14	3.63	172	0	6.5	1170	7.9
Dec. 30.....	1.3	63	--	50	12	198	12	401	0	228	23	.5	21	.27	844	1.15	2.96	174	0	6.5	1180	7.6
Feb. 11, 1964.....	1.8	63	--	50	10	198	12	396	0	234	23	.6	21	.31	843	1.15	4.10	168	0	6.7	1190	7.7
Mar. 25.....	1.4	68	.03	46	10	191	12	379	0	222	22	.5	20	.27	794	1.08	3.00	157	0	6.7	1150	8.0
May 5.....	.9	58	--	36	10	212	13	338	17	241	26	.6	19	.32	815	1.11	1.98	132	0	8.1	1180	8.5
June 19.....	20.5	18	--	62	15	82	6.1	220	0	195	17	.4	2.6	.11	539	.73	29.8	218	38	2.4	796	7.6
July 14.....	7.2	27	--	74	12	91	11	266	0	194	16	.5	4.3	.14	583	.79	11.3	235	17	2.6	846	7.4
Aug. 19.....	6.5	27	--	58	16	103	10	242	0	213	19	.5	6.0	.15	597	.81	10.5	210	11	3.1	865	7.6
Sept. 11.....	8.6	32	--	59	18	115	9.2	266	0	215	20	.6	4.4	.14	627	.85	14.6	219	1	3.4	914	8.2

6-6787. BROWN CANYON DRAIN NEAR MITCHELL, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 23, 1963.....	1110			2.1	82	0.5												
Dec. 30.....	1020			1.3	41	.1						41						S

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 23, 1963.....	1110		5	2.1			42	59	78	90	94	96	98	100				SV
Dec. 30.....	1020			1.3			6	8	9	10	13	19	33	54	81	100		SV

PLATTE RIVER BASIN--Continued

6-6788. DUTCH FLATS DRAIN NEAR MITCHELL, NEBR.

LOCATION.--At gaging station at county road bridge, 0.2 mile upstream from mouth and 2.5 miles northwest of Mitchell, Scotts Bluff County.
RECORDS AVAILABLE.--Chemical analyses: September 1961 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 22, 1963.....	9.4	51	0.04	72	23	58	17	229	0	185	16	0.5	8.6	0.14	582	0.79	14.8	274	86	1.5	792	8.0
Nov. 18.....	6.4	50	.02	101	22	55	15	316	0	184	14	.5	9.5	.14	642	.87	11.1	342	83	1.3	876	7.6
Dec. 30.....	6.7	49	--	103	21	56	15	312	0	178	13	.4	11	.11	629	.86	11.4	344	88	1.3	875	7.5
Feb. 10, 1964.....	7.0	49	--	97	21	54	14	297	0	178	13	.5	11	.12	615	.84	11.6	330	86	1.3	856	7.6
Mar. 25.....	6.1	50	.02	102	21	55	15	310	0	184	15	.4	11	.13	628	.85	10.3	342	88	1.3	892	7.9
May 5.....	6.1	49	--	98	22	56	14	308	0	186	16	.5	9.0	.15	618	.84	10.2	336	83	1.3	881	7.9
June 19.....	18	20	--	75	19	56	7.6	214	0	188	15	.4	3.1	.09	507	.69	24.6	267	91	1.5	750	8.0
July 14.....	18	24	--	78	18	56	8.6	218	0	188	13	.4	5.9	.11	521	.71	25.3	268	89	1.5	750	7.6
Aug. 20.....	18	32	--	84	22	60	10	251	0	196	17	.4	5.8	.08	575	.78	28.0	300	94	1.5	835	7.7
Sept. 11.....	20	32	--	88	20	63	10	252	0	198	17	.5	3.9	.10	582	.79	31.4	301	94	1.6	828	8.0

6-6786. DUTCH FLATS DRAIN NEAR MITCHELL, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 22, 1963.....	1300			9.4	198	5.0						32	50	65	87	100		V
Dec. 30.....	1250			6.7	164	3.0						45	93	100				V

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters										Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 22, 1963.....	1300		5	9.4			5	19	40	67	92	98	100					SV
Dec. 30.....	1250			6.7			14	49	81	92	96	96	100					SV

PLATTE RIVER BASIN--Continued

6-6807. WINTER CREEK AT TRI-STATE CANAL, NEAR SCOTTSBLUFF, NEBR.

LOCATION.--At gaging station, on left bank 15 feet upstream from culvert under Tri-State Canal and 5 miles northeast of Scottsbluff, Scotts Bluff County.
RECORDS AVAILABLE.--Chemical analyses: July 1961 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 24, 1963.....	41	64	0.03	53	17	58	7.6	168	0	164	16	0.5	6.9	0.17	491	0.67	54.4	203	65	1.8	656	7.7
Nov. 18.....	35	64	.04	85	13	58	7.2	244	0	157	16	.5	6.8	.15	553	.75	52.3	267	67	1.5	751	7.4
Dec. 30.....	29	64	--	79	17	59	6.6	247	0	156	15	.4	7.1	.14	556	.76	43.5	265	62	1.6	748	7.3
Feb. 10, 1964.....	23	64	--	58	15	59	6.8	184	0	154	15	.5	9.7	.15	507	.69	31.5	207	56	1.8	676	7.6
Mar. 24.....	20	76	.02	76	16	59	6.6	244	0	156	16	.4	8.9	.15	541	.74	29.2	256	56	1.6	752	7.7
May 5.....	22	63	--	64	16	60	6.5	208	0	156	15	.4	8.3	.14	513	.70	30.5	225	54	1.7	704	8.2
June 15.....	21	54	--	77	15	60	7.0	244	0	155	17	.5	7.4	.14	553	.75	31.4	253	53	1.6	747	7.7
July 17.....	30	57	--	78	15	60	16	240	0	160	24	.5	7.5	.15	560	.76	45.4	256	59	1.6	778	8.1
Aug. 20.....	49	60	--	82	16	59	7.1	245	0	167	17	.5	9.6	.12	570	.78	75.4	272	71	1.6	765	8.1
Sept. 10.....	48	64	--	82	16	59	7.1	244	0	163	16	.6	7.2	.13	557	.76	72.2	271	71	1.6	754	8.2

PLATTE RIVER BASIN--Continued

6-6807. WINTER CREEK AT TRI-STATE CANAL, NEAR SCOTTSBLUFF, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 24, 1963.....	0940			41	39	4.3												
Dec. 30.....	1450			29	374	29						20	69	96	100			V

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 24, 1963.....	0940		6	41			6	20	44	78	88	91	95	99	100			SV
Dec. 30.....	1450			29			16	50	80	86	90	92	95	97	100			SV

PLATTE RIVER BASIN--Continued

6-6808. HALE DRAIN NEAR SCOTTSBLUFF, NEBR.

LOCATION.--At Tri-State Canal, 135 feet downstream from culvert and 3 miles northeast of Scottsbluff, Scotts Bluff County.
RECORDS AVAILABLE.--Chemical analyses: September 1961 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 24, 1963.....	7.0	65	0.03	72	16	88	9.2	288	0	166	16	0.4	9.2	0.19	606	.82	11.5	244	8	2.4	844	7.8
Nov. 18.....	4.8	65	.02	64	16	87	8.6	269	0	165	17	.4	8.6	.20	584	.79	7.57	224	3	2.5	815	7.7
Dec. 30.....	3.3	62	--	48	15	90	8.2	223	0	161	17	.3	9.1	.17	550	.75	4.90	181	0	2.9	755	7.9
Feb. 10, 1964.....	1.7	63	--	64	16	66	8.0	272	0	160	17	.4	8.6	.19	588	.60	2.70	224	1	2.5	811	7.7
Mar. 24.....	2.3	74	.02	55	16	84	7.6	246	0	160	16	.3	7.4	.19	541	.74	3.36	203	1	2.6	772	7.7
May 5.....	2.6	59	--	54	17	83	7.8	236	0	161	16	.4	7.4	.16	539	.73	3.78	204	10	2.5	764	7.6
June 15.....	2.7	55	--	64	16	86	8.0	273	0	160	18	.4	7.9	.18	587	.80	4.28	224	0	2.5	812	7.9
July 17.....	7.7	44	--	72	13	79	9.0	252	0	173	16	.4	7.1	.16	551	.75	11.5	234	27	2.3	791	7.7
Aug. 20.....	18	48	--	67	20	80	8.5	253	0	182	16	.4	9.1	.15	576	.78	28.0	248	40	2.2	608	7.7
Sept. 10.....	11.0	58	--	73	17	88	8.6	277	0	177	18	.4	6.7	.18	600	.82	17.8	251	24	2.4	847	7.8

PLATTE RIVER BASIN--Continued

6-6808. HALE DRAIN NEAR SCOTTSBLUFF, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 24, 1963.....	1105			7.0	27	0.5												
Dec. 30.....	1350			3.3	36	.3						47						S

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 24, 1963.....	1105		5	7.0				0	1	2	3	5	8	15	40	100		SV
Dec. 30.....	1350			3.3				0	1	3	8	12	18	28	48	100		SV

PLATTE RIVER BASIN--Continued

6-6813. GERING DRAIN AT MITCHELL-GERING CANAL, NEAR GERING, NEBR.

LOCATION.--At Mitchell-Gering Canal, 2.8 miles southwest of Gering, Scotts Bluff County.
RECORDS AVAILABLE.--Chemical analyses: July 1961 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 23, 1963.....	19.3	62	0.03	33	10	182	12	337	0	207	26	0.6	12	0.43	733	1.00	38.2	125	0	7.1	1030	8.1
Nov. 7.....	15.2	--	--	66	13	170	11	404	0	224	24	--	--	--	792	1.08	32.5	216	0	5.0	1120	7.9
Nov. 19.....	15.9	62	.01	62	11	178	11	412	0	204	27	.6	13	.40	799	1.09	34.3	201	0	5.5	1130	7.9
Dec. 30.....	12.2	62	--	49	10	200	11	430	0	197	24	.6	17	.44	820	1.12	27.0	164	0	6.8	1160	7.7
Feb. 11, 1964.....	12.0	62	--	46	9.5	206	11	430	0	197	28	.7	18	.43	823	1.12	26.7	154	0	7.2	1180	7.8
Mar. 25.....	9.8	70	.02	50	9.0	195	11	424	0	197	26	.6	18	.42	799	1.09	21.1	162	0	6.7	1160	7.9
May 5.....	8.3	64	--	23	9.1	230	12	420	0	205	28	.8	16	.50	814	1.11	18.2	95	0	10	1180	8.1
June 19.....	37.3	25	--	59	16	109	7.3	260	0	196	19	.5	6.4	.23	593	.81	59.7	212	0	3.2	868	7.7
July 14.....	27.2	32	--	60	12	114	10	275	0	194	19	.5	9.3	.20	594	.81	43.6	199	0	3.5	881	7.7
Aug. 19.....	33	30	--	68	18	96	8.1	252	0	207	20	.5	6.3	.18	611	.83	54.4	242	35	2.7	874	7.6
Sept. 10.....	31.8	41	--	58	15	137	9.6	314	0	207	21	.6	7.7	.28	672	.91	57.7	208	0	4.1	979	8.1

6-6822. ALLIANCE DRAIN NEAR MINATARE, NEBR.

LOCATION.--At gaging station, on right bank 50 feet north of county road, 0.1 mile downstream from Tri-State Canal, and 4.5 miles north of Minatare, Scotts Bluff County.
RECORDS AVAILABLE.--Chemical analyses: July 1961 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 22, 1963.....	18	51	0.02	72	17	59	10	201	0	190	17	0.7	2.5	0.12	542	0.74	26.3	249	84	1.6	740	8.0
Nov. 18.....	15	47	.02	84	17	61	10	231	0	191	17	.6	2.7	.14	565	.77	22.9	278	89	1.6	781	7.4
Dec. 31.....	10	43	--	80	18	50	9.4	224	0	187	6.2	.4	2.0	.12	553	.75	14.9	272	88	1.3	769	7.2
Feb. 10, 1964.....	8.7	41	--	80	15	60	9.0	228	0	190	16	.5	1.5	.11	559	.76	13.1	263	76	1.6	783	7.1
Mar. 24.....	7.8	39	.03	78	17	58	8.8	220	0	182	16	.5	1.0	.10	525	.71	11.1	265	85	1.6	765	7.7
May 5.....	6.8	44	--	84	14	59	9.0	230	0	186	17	.5	1.0	.07	548	.75	10.1	268	79	1.6	775	8.0
June 15.....	8.0	45	--	83	14	60	9.2	229	0	183	17	.5	1.5	.11	561	.76	12.1	264	76	1.6	768	7.6
July 17.....	24	48	--	93	16	64	11	252	0	197	17	.5	1.3	.13	597	.81	38.7	296	89	1.6	835	7.5
Aug. 20.....	32	53	--	84	17	61	11	241	0	188	16	.6	3.3	.12	574	.78	49.6	278	80	1.6	790	8.0
Sept. 10.....	28	56	--	83	17	61	10	238	0	192	17	.6	2.5	.13	574	.78	43.4	277	82	1.6	786	7.7

PLATTE RIVER BASIN--Continued

6-6822. ALLIANCE DRAIN NEAR MINATARE, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 22, 1963.....	1100			18	72	3.5						65	100					V
Dec. 31.....	1120			10	23	.6						82						S

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 22, 1963.....	1100		6	18			5	15	28	40	46	51	66	79	87	100		SV
Dec. 31.....	1120			10			5	12	23	33	40	46	57	69	81	100		SV

PLATTE RIVER BASIN--Continued

6-6823. NINEMILE DRAIN NEAR MINATARE, NEBR.

LOCATION.--At gaging station at county highway bridge, 0.5 mile downstream from Tri-State Canal and 6.5 miles northeast of Minatare, Scotts Bluff County.
RECORDS AVAILABLE.--Chemical analyses: July 1961 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 22, 1963.....	34	64	0.03	57	16	48	8.0	153	0	154	16	0.6	5.9	0.16	470	0.64	43.2	206	80	1.4	630	7.8
Nov. 7.....	26.2	--	--	85	14	48	8.0	229	0	161	14	--	--	--	526	.72	37.2	270	82	1.3	720	7.8
Nov. 18.....	23	63	.03	83	15	49	8.2	228	0	157	15	.6	7.8	.14	532	.72	33.0	270	83	1.3	716	7.9
Dec. 31.....	19	63	--	81	16	47	7.6	225	0	153	15	.5	6.3	.10	539	.73	27.7	268	83	1.2	715	6.9
Feb. 10, 1964.....	18	63	--	81	16	47	7.4	225	0	153	16	.5	8.5	.14	538	.73	26.2	268	83	1.2	722	7.5
Mar. 24.....	15	69	.06	82	14	47	7.4	225	0	153	15	.6	8.2	.13	523	.71	21.2	263	78	1.3	722	7.6
May 5.....	14	63	--	88	11	48	7.4	226	0	152	16	.5	7.2	.13	515	.70	19.5	264	79	1.3	713	8.0
June 15.....	75	31	--	73	19	57	6.2	215	0	174	17	.5	4.6	.10	512	.70	104	259	83	1.5	734	7.7
July 17.....	40	60	--	83	13	52	7.9	232	0	161	16	.6	5.3	.16	532	.72	57.5	262	72	1.4	728	7.8
Aug. 20.....	60	63	--	81	16	52	8.3	234	0	161	15	.6	7.4	.12	539	.73	87.3	268	76	1.4	731	7.9
Sept. 10.....	52	64	--	82	17	52	8.2	233	0	163	16	.6	5.9	.13	546	.74	76.7	274	83	1.4	738	7.9

PLATTE RIVER BASIN--Continued

6-6823. NINEMILE DRAIN NEAR MINATARE, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 22, 1963.....	0920			34	78	7.2						40	72	98	100			V
Dec. 31.....	1230			19	19	1.0						73						S

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 22, 1963.....	0920		7	34			11	32	52	61	66	68	70	82	100			SV

PLATTE RIVER BASIN--Continued

6-7142. BURLINGTON DITCH BELOW HEADGATE, AT DENVER, COLO.

LOCATION.--At York Street bridge in Denver, Denver County, about 0.7 mile below headgate.
RECORDS AVAILABLE.--Chemical analyses: June 1962 to September 1964.
REMARKS.--Discharge data supplied by the State Engineer of Colorado.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 16, 1963.....	30	17	0.48	91	27	142	9.2	460		127	125	2.1	1.5	0.49	754	1.03	61.1	340	0	3.4	1250	7.3
Nov. 15.....	A 100	15	.29	77	28	170	9.1	598		42	170	2.0	1.3	.30	778	1.06	210	308	0	4.2	1440	7.8
Dec. 17.....	A 175	16	--	66	28	157	10	393		118	172	2.7	.4	.41	743	1.01	351	280	0	4.1	1340	7.6
Jan. 14, 1964.....	--	14	.15	66	24	175	15	188		105	191	1.2	--	.28	859	1.17	--	264	110	4.7	1340	7.2
Feb. 24.....	77	18	.44	45	29	189	15	194		160	209	1.5	3.9	.57	811	1.10	169	232	73	5.4	1500	7.5
Mar. 19.....	232	18	.42	54	9.0	94	7.0	186		91	98	1.1	1.7	.22	476	.65	298	172	19	3.1	775	7.4
Apr. 17.....	253	16	.40	59	18	130	9.2	222		93	132	2.1	--	.32	646	.88	414	219	37	3.8	997	7.2
May 15.....	27	14	--	57	18	122	7.5	228		98	126	2.3	19	.29	594	.81	43.3	215	28	3.6	959	7.3
June 16.....	27	13	.19	64	18	99	6.1	190		157	84	1.3	22	.23	565	.77	41.2	232	76	2.8	869	7.8
July 15.....	36	12	.15	69	19	108	6.1	216		157	96	1.3	22	.25	602	.82	58.8	250	73	3.0	941	7.4
Aug. 10.....	26	8.5	.20	53	21	85	3.7	172		119	98	.7	6.0	.12	488	.66	34.3	221	80	2.5	799	7.4
Sept. 18.....	--	16	.24	61	23	160	11	369		104	146	2.3	.5	.54	712	.97	--	247	0	4.4	1210	7.1

A Daily mean discharge.

PLATTE RIVER BASIN--Continued

6-7205. SOUTH PLATTE RIVER AT HENDERSON, COLO.

LOCATION.--At bridge on State Highway 22, 1,200 feet downstream from gaging station, and 0.2 mile west of Henderson, Adams County.
DRAINAGE AREA.--4,713 square miles.
RECORDS AVAILABLE.--Chemical analyses: July 1955 to September 1957, June 1962 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 16, 1963.....	94	17	0.78	87	28	149	9.3	450		130	140	2.1	1.4	0.39	778	1.06	147	334	0	3.5	1310	7.2
Nov. 15.....	21	17	.21	129	31	140	6.7	311		263	150	1.3	--	.30	956	1.30	54.2	450	195	2.9	1420	7.8
Dec. 17.....	73	18	.85	102	28	157	9.1	292		249	140	1.9	15	.41	906	1.23	179	368	129	3.6	1430	7.0
Jan. 14, 1964.....	65	17	.80	114	26	146	9.9	310		285	112	1.6	--	.44	924	1.26	162	390	136	3.2	1330	7.4
Feb. 24.....	103	18	.34	88	28	185	9.2	253		223	198	.7	14	.32	931	1.27	259	336	129	4.4	1450	7.8
Mar. 19.....	222	16	.68	88	21	118	9.8	332		162	103	1.3	.3	.39	698	.95	418	305	33	2.9	1080	7.6
Apr. 17.....	31	18	.96	117	34	160	9.2	287		293	154	.6	13	.34	980	1.33	82.0	430	195	3.4	1430	7.8
May 15.....	164	12	.44	70	19	100	7.5	200		170	102	1.3	10	.27	600	.82	266	252	88	2.8	950	7.2
June 16.....	268	14	1.2	63	19	98	6.6	204		175	81	1.5	.6	.31	584	.79	423	235	68	2.8	868	7.0
July 15.....	225	13	.57	71	19	109	7.0	208		169	104	1.3	18	.28	622	.85	378	252	82	3.0	968	7.5
Aug. 10.....	663	8.9	.50	61	21	90	4.6	170		147	108	.9	9.8	.10	548	.75	937	240	101	2.5	855	7.4
Sept. 18.....	A 96	15	.07	95	24	128	9.1	266		224	121	1.5	--	.30	796	1.08	206	335	117	3.0	1190	7.5

A Daily mean discharge.

6-7525. CACHE LA POUDRE RIVER NEAR GREELEY, COLO.

LOCATION.--At gaging station at highway bridge, 3 miles east of courthouse in Greeley, Weld County, and 3 miles upstream from mouth.
DRAINAGE AREA.--1,877 square miles.
RECORDS AVAILABLE.--Chemical analyses: November 1951 to September 1952, August 1954 to August 1956, December 1963 to September 1964.

Chemical analyses, in parts per million, December 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Dec. 17, 1963.....	94	20	0.41	170	103	132	16	1060	0	323	38	0.7	0.6	0.42	1360	1.85	345	850	0	2.0	2110	8.0
Jan. 21, 1964.....	90	17	.52	210	96	170	17	763	0	547	104	.8	13	.29	1600	2.18	389	920	294	2.4	2080	8.1
Feb. 20.....	56	17	1.4	186	98	164	7.5	398	0	772	88	1.2	18	.27	1670	2.27	253	870	544	2.4	2000	7.9
Mar. 18.....	86	14	.47	184	106	170	7.2	405	0	816	87	1.0	10	.30	1730	2.35	402	895	563	2.5	2040	7.9
Apr. 16.....	94	11	.78	181	134	172	7.0	336	0	964	64	.5	5.1	.31	1840	2.50	467	1000	728	2.4	2120	7.5
May 14.....	6.4	11	.32	180	83	138	6.9	368	0	730	40	.6	8.9	.26	1450	1.97	25.1	790	488	2.1	1740	7.8
June 16.....	62	12	.72	144	74	120	5.4	294	0	614	57	.7	3.6	.24	1240	1.69	208	665	424	2.0	1560	7.8
July 15.....	9.0	15	.10	190	77	137	7.5	409	0	714	37	.6	13	.26	1460	1.99	35.5	790	455	2.1	1750	8.1
Aug. 13.....	45	3.5	.34	169	100	199	6.8	283	28	759	142	.2	11	.29	1670	2.27	203	834	556	3.0	2080	8.5
Sept. 19.....	A 46	8.2	.16	158	79	138	5.3	339	0	648	70	.8	5.1	.23	1360	1.85	169	720	442	2.2	1710	8.1

A Daily mean discharge.

PLATTE RIVER BASIN--Continued

6-7540. SOUTH PLATTE RIVER NEAR KERSEY, COLO.

LOCATION.--At gaging station, at bridge on State Highway 37, 1.9 miles north of railroad in Kersey, Weld County, and 2.5 miles downstream from Cache la Poudre River.
DRAINAGE AREA.--9,598 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1949 to September 1953, August 1954 to August 1957, June 1962 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 16, 1963.....	402	14	0.11	220	55	152	8.3	350		706	49	1.0	7.3	0.25	1430	1.94	1550	775	488	2.4	1890	7.4
Nov. 19.....	420	15	.31	168	92	148	9.2	411		682	44	1.0	2.7	.30	1420	1.93	1610	800	463	2.3	1820	7.2
Dec. 17.....	420	16	.58	170	80	142	9.2	454		625	48	.8	4.4	.31	1380	1.88	1560	755	383	2.2	1770	7.5
Jan. 21, 1964.....	462	15	.24	172	78	150	9.7	454		622	71	.6	5.6	.34	1420	1.93	1770	750	378	2.4	1820	7.8
Feb. 20.....	529	15	.49	132	63	163	7.2	344		523	97	1.3	13	.35	1190	1.62	1700	590	308	2.9	1640	7.6
Mar. 18.....	378	13	.12	152	75	174	6.1	354		674	84	.7	9.3	.32	1420	1.93	1450	690	400	2.9	1820	7.7
Apr. 16.....	391	9.8	.07	156	92	182	6.3	352		762	79	.7	4.5	.38	1530	2.08	1620	770	481	2.9	1920	7.5
May 14.....	55	14	.34	168	73	148	7.4	312		726	46	.8	11	.25	1410	1.92	209	720	464	2.4	1740	7.9
June 25.....	203	15	1.1	152	68	131	6.4	312		620	40	.8	12	.23	1240	1.69	680	660	404	2.2	1580	7.6
July 15.....	90	17	.13	172	71	142	7.0	334		693	42	.9	11	.24	1360	1.85	330	720	446	2.3	1720	7.6
Aug. 13.....	121	5.8	.20	156	88	142	6.8	355		706	39	.6	3.2	.25	1430	1.94	467	750	459	2.3	1730	7.5
Sept. 19.....	A 179	11	.00	168	78	134	6.1	348		680	41	.8	10	.24	1340	1.82	648	740	455	2.1	1670	7.6

A Daily mean discharge.

6-7540. SOUTH PLATTE RIVER NEAR KERSEY, COLO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 16, 1963.....	1505	62		402	65	71						36	42	63	95	100		V
Nov. 6.....	1515	53		467	123	160												
Nov. 6.....	1535	53		467	134	170												
Nov. 19.....	1130	43		420	146	170												
Dec. 2.....	1525	43		358	206	200												
Jan. 6, 1964.....	1305	34		394	126	130												
Jan. 21.....	1530	43		462	156	190												
Feb. 8.....	1305	38		529	227	320												
Feb. 17.....	1015	34		419	209	240												
Mar. 7.....	1515	42		447	116	140												
Mar. 18.....	1620	56		378	60	61												
Apr. 16.....	1610	64		391	84	89												
May 1.....	1520	65		234	100	63												
June 2.....	1210	59		1270	503	1700												
July 30.....	1150	74		155	132	55												
Aug. 13.....	1450	78		121	62	20												
Sept. 29.....	1600	66		176	64	30												

6-7580. KIOWA CREEK AT ELBERT, COLO.

LOCATION.--At gaging station, 0.2 mile southeast of Elbert, Elbert County, and 0.5 mile upstream from West Kiowa Creek.
DRAINAGE AREA.--28.6 square miles.
RECORDS AVAILABLE.--Sediment records: April 1956 to September 1964.
EXTREMES, 1956-64.--Sediment concentrations: Maximum daily, 6,500 ppm July 31, 1957; minimum daily, no flow on many days each year.
Sediment loads: Maximum daily, 1,400 tons Mar. 24, 1960; minimum daily, 0 tons on many days each year.
REMARKS.--No flow during 1964 during 1964 water year.

PLATTE RIVER BASIN--Continued

6-7581. WEST KIOWA CREEK AT ELBERT, COLO.

LOCATION.--At gaging station 260 feet downstream from bridge on State Highway 217, 0.2 mile south of Elbert, Elbert County, and 0.5 mile upstream from mouth.
DRAINAGE AREA.--35.9 square miles.
RECORDS AVAILABLE.--Sediment records: October 1962 to September 1964.
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, not determined; minimum daily, no flow on many days.
Sediment loads: Maximum daily, (estimated) 50 tons Aug. 4; minimum daily, 0 tons on many days.
EXTREMES, 1962-64.--Sediment concentrations: Maximum daily, 2,700 ppm Sept. 7, 1963; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 980 tons Aug. 13, 1963; minimum daily, 0 ton on many days.

Suspended sediment, water year October 1963 to September 1964
(Where no concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1				0		0	0.1		T
2				0		0	.1		T
3				0		0	.2		T
4				0		0	.1		T
5				0		0	.1		T
6				0		0	.2		T
7				0		0	.1		T
8				0		0	.1		T
9				0		0	.2		T
10				0		0	.1		T
11				0		0	.1		T
12				0		0	.1		T
13				.1		T	.1		T
14				.1		T	.1		T
15				.1		T	.1		T
16				.1		T	.1		T
17				.2		T	.1		T
18				.2		T	.1		T
19				.2		T	.1		T
20				.2		T	.1		T
21				.2		T	.1		T
22				.2		T	.1		T
23				.2		T	.1		T
24				.2		T	.1		T
25				.2		T	.1		T
26				.2		T	.1		T
27				.2		T	.1		T
28				.2		T	.1		T
29				.1		T	.1		T
30				.2		T	.2		T
31				--		--	.2		T
Total	0		0	3.1	--	.4	3.6	--	.2

T Less than 0.05 ton.

PLATTE RIVER BASIN--Continued

6-7581. WEST KIOWA CREEK AT ELBERT, COLO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0.2		T	0.2		T	0		0
2	.2		T	.1		T	.1		T
3	.2		T	.1		T	.1		T
4	.2		T	.3		.1	.1		T
5	.2		T	.2		T	.1		T
6	.2		T	.3		.1	.1		T
7	.1		T	.3		.1	.1		T
8	.1		T	.3		.1	.1		T
9	.1		T	.2		T	.2		T
10	.1		T	.2		T	.1		T
11	.1		T	.3		.1	.2		T
12	.1		T	.3		.1	.2		T
13	.1		T	.3		.1	.2		T
14	.1		T	.2		T	.2		T
15	.1		T	.2		T	.2		T
16	.1		T	.2		T	.4		.2
17	.1		T	.1		T	.6		.7
18	.1		T	.1		T	1.1		3
19	.1		T	.1		T	1.1		3
20	.2		T	.1		T	.9		2
21	.2		T	.1		T	.2		T
22	.2		T	0		0	.8		1
23	.2		T	0		0	.9		2
24	.2		T	.1		T	.6		.7
25	.2		T	.1		T	.5		.4
26	.2		T	0		0	.3		.1
27	.2		T	0		0	.4		.2
28	.2		T	0		0	.3		.1
29	.2		T	0		0	.8		1
30	.2		T	--		--	.9		2
31	.2		T	--		--	.6	43	.7
Total	4.9		.5	4.4		.9	12.4	--	17.3

Day	APRIL			MAY			JUNE		
1	0.3		0.1	0.1		T	0.3		0.1
2	.3		.1	.1		T	.4		.2
3	.4		.2	.1		T	.3		.1
4	.4		.2	.1		T	.3		.1
5	.3		.1	.1		T	.2		T
6	.3		.1	.1		T	.1		T
7	.2		T	.1		T	.1		T
8	.3		.1	.1		T	.1		T
9	.3	120	.1	.1		T	0		0
10	.4		.2	.1		T	0		0
11	.4		.2	.1		T	0		0
12	.3		.1	.2		T	0		0
13	.3		.1	.1		T	0		0
14	.3		.1	.2		T	.5		.4
15	.3		.1	.1		T	.1		T
16	.2		T	.1		T	0		0
17	.1		T	.1		T	0		0
18	.1		T	0		0	0		0
19	.1		T	0		0	0		0
20	.1		T	0		0	0		0
21	.1		T	0		0	0		0
22	.1		T	0		0	0		0
23	.1		T	0		0	0		0
24	.1		T	0		0	0		0
25	.1		T	0		0	0		0
26	.1		T	0		0	0		0
27	.1		T	.1		T	0		0
28	.1		T	.1		T	0		0
29	.1		T	.2		T	0		0
30	.1		T	.8		1	0		0
31	--		--	.4		.2	--		
Total	6.4	--	1.9	3.5	--	1.3	2.4	--	.9

T Less than 0.05 ton.

PLATTE RIVER BASIN--Continued

6-7581. WEST KIOWA CREEK AT ELBERT, COLO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1				0		0			
2				0		0			
3				0		0			
4				3.7		E 50			
5				.1		T			
6				0		0			
7				0		0			
8				0		0			
9				0		0			
10				0		0			
11				0		0			
12				0		0			
13				0		0			
14				0		0			
15				0		0			
16				0		0			
17				0		0			
18				0		0			
19				0		0			
20				0		0			
21				0		0			
22				0		0			
23				0		0			
24				0		0			
25				0		0			
26				0		0			
27				0		0			
28				0		0			
29				0		0			
30				0		0			
31				0		0			
Total	0		0	3.8	--	50	0		0

Total discharge for year (cfs-days)..... 44.5
Total load for year (tons)..... 73.4

T Less than 0.05 ton.
E Estimated.

6-7581. WEST KIOWA CREEK AT ELBERT, COLO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							Percent finer than size indicated, in millimeters											
							0.002	0.004	0.008	0.016	0.031	0.082	0.125	0.250	0.500	1.000	2.000	
Mar. 31, 1964.....	1405	58		0.6	470	0.8						87	88	97	100			V
Apr. 9.....	1500	59		.2	46	T												

T Less than 0.05 ton.

PLATTE RIVER BASIN--Continued

6-7582. KIOWA CREEK AT KIOWA, COLO.

LOCATION.--At gaging station at cableway, 0.7 mile upstream from bridge on State Highway 86, and 0.7 mile south of Kiowa, Elbert County.
DRAINAGE AREA.--111 square miles.
RECORDS AVAILABLE.--Sediment records: April 1956 to September 1964.
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, 4,600 ppm Aug. 5; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 480 tons Aug. 4; minimum daily, 0 ton on many days.
EXTREMES, 1956-64.--Sediment concentrations: Maximum daily, 15,000 ppm Aug. 1, 1956; minimum daily, no flow on many days each year.
Sediment loads: Maximum daily, 43,000 tons July 31, 1956; minimum daily, 0 ton on many days.
REMARKS.--Flow affected by ice Dec. 25 to Jan. 3, Jan. 7, 8, Jan. 18 to Feb. 1, Feb. 5-14, Mar. 5, 6, 11-22.

Suspended sediment, water year October 1963 to September 1964
(Where no concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1				0		0	C 0.1		T
2				0		0	C .1		T
3				0		0	C .1		T
4				0		0	C .1		T
5				0		0	C .1		T
6				0		0	C .1		T
7				0		0	C .1		T
8				0		0	C .1		T
9				0		0	C .1		T
10				0		0	C .1		T
11				0		0	C .1		T
12				0		0	C .1		T
13				0		0	C .1		T
14				0		0	C .1		T
15				0		0	C .1		T
16				0		0	C .1		T
17				.2		T	C .1		T
18				.1		T	C .1		T
19				0		--	C .1		T
20				.1		T	C .1		T
21				.1		T	C .1		T
22				.1		T	C .1		T
23				.1		T	C .1		T
24				.2		T	C .1		T
25				.1		T	C .1		T
26				.1		T	C .1		T
27				.2		T	C .1		T
28				.1		T	C .1		T
29				.1		T	C .1		T
30				.1		T	C .1		T
31				--		--	C .1		T
Total	0		0	1.6	--		3.1	--	

T Less than 0.05 ton.
C Composite period.

PLATTE RIVER BASIN--Continued

6-7552. KIOWA CREEK AT KIOWA, COLO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	C 0.1		T	C 0.1		T	2.3		0.4
2	C .1		T	C .1		T	2.3		.4
3	C .1		T	C .1		T	1.2		.1
4	C .1		T	C .1		T	1.0		.1
5	C .1		T	C .1		T	1.0		.1
6	C .1		T	C .1		T	.8		T
7	C .1		T	C .1		T	.6		T
8	C .1		T	C .1		T	.6		T
9	C .1		T	C .1		T	.4		T
10	C .1		T	C .1		T	.5		T
11	C .1		T	C .1		T	.8		T
12	C .1		T	C .1		T	3.4		1.2
13	C .1		T	C .1		T	4.0		1.7
14	C .1		T	C .1		T	3.8		1.5
15	C .1		T	C .1		T	3.6		1.3
16	C .1		T	C .1		T	3.6		1.3
17	C .1		T	C .1		T	10		17
18	C .1		T	C .1		T	13		34
19	C .1		T	C .1		T	13		34
20	C .1		T	C .1		T	6.8		6.6
21	C .1		T	C .1		T	8.6		12
22	C .1		T	C .1		T	12		28
23	C .1		T	C .1		T	9.0		13
24	C .1		T	C .1		T	7.0		7.0
25	C .1		T	C .1		T	5.8		4.4
26	C .1		T	C .1		T	6.4		5.6
27	C .1		T	C .1		T	6.8		6.6
28	C .1		T	C .1		T	10		17
29	C .1		T	C .1		T	14		40
30	C .1		T	--		--	17		65
31	C .1		T	--		--	16	1300	56
Total	3.1	--	T	2.9	--	T	185.3	--	354.4

Day	APRIL			MAY			JUNE		
1	12		28	1.4		0.1	3.2		1.0
2	7.5		8.4	1.2		.1	4.1		1.9
3	7.0		7.0	1.1		.1	4.1		1.9
4	6.6		6.0	.8		T	3.4		1.2
5	5.9		4.6	.5		T	3.0		.8
6	7.5		8.4	.8		T	3.2		1
7	7.5		8.4	.8		T	2.5		.5
8	6.3		5.5	1.1		.1	2.1		.3
9	5.2	240	3.4	.4		T	.8		T
10	5.6		4.0	.1		T	.7		T
11	5.2		3.4	0		0	.7		T
12	3.4		1.2	.1		T	.8		T
13	3.4		1.2	0		0	1.9		.3
14	4.1		1.9	0		0	2.1		.3
15	3.8		1.5	0		0	.7		T
16	3.8		1.5	0		0	.2		T
17	4.1		1.9	0		0	0		0
18	4.1		1.9	0		0	0		0
19	3.4		1.2	0		0	0		0
20	3.8		1.5	0		0	0		0
21	4.5		2.3	0		0	0		0
22	3.4		1.2	0		0	0		0
23	2.7		.6	0		0	0		0
24	3.0		.8	0		0	0		0
25	2.3		.4	0		0	0		0
26	2.5		.5	0		0	0		0
27	2.5		.5	0		0	0		0
28	2.1		.3	0		0	0		0
29	2.1		.3	3.3	110	1	0		0
30	1.6		.2	6.3		5.5	0		0
31	--		--	4.1		1.9	--		
Total	136.9	--	108.0	22.0	--	8.9	33.5	--	9.3

T Less than 0.05 ton.
C Composite period.

PLATTE RIVER BASIN--Continued

6-7582. KIOWA CREEK AT KIOWA, COLO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1				0	--	0			
2				0	--	0			
3				0	--	0			
4				12	3300	S 480			
5				31	4600	380			
6				5.9	--	4.6			
7				2.3	--	.4			
8				.7	--	T			
9				0	--	0			
10				0	--	0			
11				0	--	0			
12				0	--	0			
13				0	--	0			
14				0	--	0			
15				0	--	0			
16				0	--	0			
17				0	--	0			
18				0	--	0			
19				0	--	0			
20				0	--	0			
21				0	--	0			
22				0	--	0			
23				0	--	0			
24				0	--	0			
25				0	--	0			
26				0	--	0			
27				0	--	0			
28				0	--	0			
29				0	--	0			
30				0	--	0			
31				0	--	0			
Total	0		0	51.9	--	865.0	0		0

Total discharge for year (cfs-days)..... 440.3
Total load for year (tons)..... 1,345.6

S Computed by subdividing day.
T Less than 0.05 ton.

6-7582. KIOWA CREEK AT KIOWA, COLO.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Mar. 31, 1964.....	1240	--		D 16	1460	63	--	--		--		--	--	--	--			
Mar. 31.....	1300	59		D 16	1320	57	46	55		--		90	95	99	100			VPWC
Apr. 9.....	1405	66		5.6	282	4	--	--		--		--	--	--	--			
May 29.....	1930	--		12	1370	44	--	--		--		78	87	97	100			V
Aug. 4.....	1830	58		41	7640	850	56	59		80		95	98	100	--			VPWC
Aug. 4.....	1905	58		30	5890	480	58	63		83		97	98	100	--			VPWC
Aug. 4.....	2000	57		40	8850	960	66	70		81		96	97	100	--			VPWC
Aug. 5.....	0030	57		65	20600	3600	64	69		80		87	94	98	100			VPWC
Aug. 5.....	0700	--		50	3570	480	75	83		90		96	98	100	--			VPWC
Aug. 5.....	1555	--		31	1450	120	--	--		--		--	--	--	--			
Aug. 5.....	1945	--		26	1280	90	--	--		--		--	--	--	--			

D Daily mean discharge.

PLATTE RIVER BASIN--Continued

6-7600. SOUTH PLATTE RIVER AT BALZAC, COLO.

LOCATION.--At gaging station, just upstream from highway bridge at Balzac siding, Morgan County, 2.8 miles northeast of Union, and 7.0 miles downstream from Beaver Creek.
DRAINAGE AREA.--16,852 square miles.
RECORDS AVAILABLE.--Chemical analyses: January 1950 to September 1951, August 1954 to September 1957, June 1962 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 17, 1963.....	30	17	0.16	194	68	160	9.8	316		754	61	0.8	2.0	0.23	1480	2.01	120	765	506	2.5	1890	7.3
Nov. 18.....	15	13	.19	182	69	158	8.9	286		750	59	.8	1.2	.25	1450	1.97	58.7	740	505	2.5	1830	7.4
Dec. 16.....	23	20	.07	198	69	163	10	346		784	60	.8	4.1	.25	1580	2.12	96.9	780	496	2.5	1940	8.2
Jan. 21, 1964.....	14	13	.13	180	63	157	8.1	306		705	62	.6	.2	.25	1420	1.43	53.7	710	459	2.6	1750	7.7
Feb. 20.....	13	18	.61	180	62	159	8.4	292		744	58	.6	.9	.19	1440	1.96	50.5	705	466	2.6	1790	7.5
Mar. 18.....	10	11	.55	160	62	155	8.4	232		724	56	.2	.4	.20	1350	1.84	36.4	655	465	2.6	1690	7.8
Apr. 14.....	20	21	1.2	164	64	155	8.6	242		733	56	.8	1.6	.21	1380	1.88	74.5	675	477	2.6	1720	7.4
May 14.....	140	16	.51	202	69	170	10	328		806	62	.8	2.3	.24	1570	2.14	593	790	521	2.6	1930	7.7
June 16.....	264	14	.08	154	68	146	8.3	272		676	50	.8	4.5	.24	1330	1.81	948	665	442	2.5	1680	8.1
July 15.....	118	14	.44	176	75	182	11	280		831	64	.8	1.9	.27	1570	2.14	500	750	520	2.9	1910	7.8
Aug. 13.....	180	4.8	.12	160	78	174	9.7	262		803	60	.8	.3	.25	1480	2.01	719	720	505	2.8	1830	8.0
Sept. 19.....	165	13	.04	184	73	162	9.2	314		777	57	.8	2.2	.21	1480	2.01	659	760	503	2.6	1820	7.5

6-7640. SOUTH PLATTE RIVER AT JULESBURG, COLO.

LOCATION.--At gaging station at bridge on U.S. Highway 385, 0.9 mile southeast of Julesburg, Sedgwick County, 3 miles upstream from Colorado-Nebraska State line, and 8 miles downstream from Lodgepole Creek.
DRAINAGE AREA.--23,138 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1964.
Water temperatures: October 1945 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 1,720 ppm Jan. 1-31; minimum, 1,420 ppm July 9-31.
Hardness: Maximum, 852 ppm Dec. 1-31; minimum, 662 ppm July 9-31.
Specific conductance: Maximum daily, 2,300 micromhos Jan. 14; minimum daily, 1,440 micromhos July 9.
Water temperatures: Maximum, 88°F July 26; minimum, freezing point Dec. 7, 14, 16.
EXTREMES, 1945-64.--Dissolved solids: Maximum, 1,860 ppm Apr. 13, 1955; minimum, 429 ppm June 16, 1956.
Hardness: Maximum, 860 ppm Dec. 1, 1960; minimum, 173 ppm Mar. 1-12, 1947.
Specific conductance: Maximum daily, 3,000 micromhos Dec. 28, 30, 1962; minimum daily, 617 micromhos Aug. 19, 1953.
Water temperatures: Maximum (1946-49, 1950-64), 93°F July 28, Aug. 1, 1953, July 7, 18, 1963; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 1-31, 1963...	200	--	--	--	--	186	--	320	0	--	--	--	--	--	1560	2.12	842	761	499	2.9	2000	7.5
Nov. 1-30.....	211	--	--	--	--	196	--	349	0	--	--	--	--	--	1660	2.26	946	796	510	3.0	2110	7.5
Dec. 1-31.....	217	29	0.01	92	151	200	18	377	0	810	75	0.6	4.0	0.26	A1560	2.31	914	852	543	3.0	2130	7.5
Jan. 1-31, 1964...	250	--	--	--	--	196	--	410	0	--	--	--	--	--	1720	2.34	1160	850	514	2.9	2180	7.5
Feb. 1-11.....	259	--	--	--	--	196	--	396	0	--	--	--	--	--	1700	2.31	1190	830	505	3.0	2140	7.7
Feb. 12-29.....	248	--	--	--	--	196	--	330	0	--	--	--	--	--	1660	2.26	1110	793	522	3.0	2100	7.7
Mar. 1-31.....	194	27	.03	210	60	195	14	311	0	792	76	.7	3.7	.26	A1530	2.08	801	769	514	3.1	2050	7.9
Apr. 1-30.....	196	--	--	--	--	204	--	278	0	--	--	--	--	--	1640	2.23	868	752	524	3.2	2070	8.2
May 1-31.....	60.9	--	--	--	--	191	--	261	0	--	--	--	--	--	1560	2.12	256	722	508	3.1	1980	8.0
June 1-30.....	49.9	15	.04	196	56	195	16	259	0	775	73	.6	.7	.25	A1450	1.97	195	720	508	3.0	1970	7.4
July 1-7.....	28.6	--	--	--	--	180	--	268	0	--	--	--	--	--	1520	2.07	117	709	489	2.9	1910	7.2
July 8.....	40	30	.00	197	50	182	18	252	0	760	74	.7	.0	.23	A1440	1.96	156	698	491	3.0	1910	7.4
July 9-31.....	48.7	--	--	--	--	169	--	249	0	--	--	--	--	--	1420	1.93	187	662	458	2.9	1810	7.5

A Calculated from determined constituents.

PLATTE RIVER BASIN--Continued

6-7640. SOUTH PLATTE RIVER AT JULESBURG, COLO.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Aug. 1-31, 1964...	14.1	--	--	--	--	191	--	257	0	--	--	--	--	--	1530	2.08	58.2	716	505	3.1	1930	7.0
Sept. 1-30.....	9.5	29	0.00	198	57	192	18	264	0	768	75	0.6	0.0	0.25	A1470	2.00	37.7	729	513	3.1	1960	7.8
Weigbted average	--	--	--	--	--	195	--	337	--	--	--	--	--	--	1610	2.19	614	791	515	3.0	2080	7.6
Time-weighted average.....	141	--	--	--	--	193	--	308	--	--	--	--	--	--	1570	--	--	762	510	3.0	2030	7.5
Tons per day....	--	--	--	--	--	74	--	129	--	--	--	--	--	--	--	--	--	--	--	--	--	--

A Calculated from determined constituents.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	63	67	68	69	68	68	70	68	65	67	65	64	65	65	64	66	66	65	65	65	68	65	64	62	64	60	59	59	60	57	50	64
November	50	--	51	52	59	54	53	49	52	53	53	47	41	44	49	49	48	47	43	44	38	39	40	44	44	42	43	--	41	40	--	47
December	42	43	41	42	40	39	32	34	37	33	33	34	33	32	--	32	33	35	35	33	33	38	37	38	--	38	36	37	38	38	40	36
January.....	--	39	39	37	37	35	35	33	33	33	33	33	35	35	36	36	39	39	38	43	41	37	37	35	37	41	42	38	38	39	39	37
February.....	37	37	36	40	40	36	36	38	34	42	37	37	36	34	34	--	39	35	34	34	34	35	38	43	33	34	35	35	39	--	--	36
March.....	45	46	35	38	39	36	33	35	45	41	41	42	42	44	44	49	52	54	39	35	36	48	47	35	36	--	45	47	39	59	60	43
April.....	58	48	38	43	53	44	44	54	61	62	61	46	50	57	63	67	55	54	54	52	62	62	62	63	62	48	41	62	65	67	--	55
May.....	64	55	--	53	61	64	68	61	65	61	65	68	68	70	73	71	81	64	67	77	74	74	74	68	76	59	56	63	55	54	60	66
June	61	73	65	58	62	78	72	71	68	69	--	72	69	72	74	72	77	72	69	76	72	63	72	82	82	67	74	76	73	79	--	71
July.....	80	76	80	--	77	79	82	84	74	81	75	80	79	77	76	80	76	82	78	75	72	75	73	70	64	88	78	75	71	81	71	77
August.....	74	73	82	78	72	79	--	74	73	66	59	69	70	71	69	70	76	68	70	68	62	65	68	66	63	78	61	62	60	--	69	69
September.....	72	65	62	62	65	72	79	68	73	60	61	65	61	69	60	63	68	62	68	58	--	61	57	59	61	64	52	57	57	58	--	63

6-7657. SUPPLY CANAL (TRI-COUNTY DIVERSION) NEAR MAXWELL, NEBR.

LOCATION.--At gaging station at Parshall Flume in sec. 28, T. 13 N., R. 29 W., near Maxwell, Lincoln County.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1964.
Water temperatures: March 1951 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 697 ppm May 22-31; minimum, 451 ppm Sept. 17-30.
Hardness: Maximum, 310 ppm May 22-31; minimum, 188 ppm Aug. 20-21.
Specific conductance: Maximum daily, 1,100 micromhos May 21; minimum daily, 646 micromhos Mar. 19.
Water temperatures: Maximum, 81°F July 20; minimum, 33°F on many days during November to March.
EXTREMES, 1951-64.--Dissolved solids: Maximum, 1,070 ppm Jan. 1-31, 1962; minimum, 368 ppm May 15, 1951.
Hardness: Maximum, 530 ppm Jan. 1-31, 1962; minimum, 171 ppm May 15, 1951.
Specific conductance: Maximum daily, 1,680 micromhos Jan. 23, 1962; minimum daily, 403 micromhos Jan. 9, 1957.
Water temperatures: Maximum, 85°F June 13, 15, 1952, July 27, 31, 1957; minimum, freezing point on many days during winter months.
REMARKS.--Composite periods normally identical to those of Platte River at Brady, Nebr. Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Records of discharge given in reports of State Engineer.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 1-31, 1963...	876	--	--	--	--	67	--	220	0	--	--	--	--	--	505	0.69	1190	231	51	1.9	731	7.7
Nov. 1-30.....	882	--	--	--	--	65	--	212	0	--	--	--	--	--	486	.66	1160	221	47	1.9	714	7.7
Dec. 1-16.....	869	24	0.01	70	21	75	11	232	0	199	25	0.5	1.9	0.13	560	.76	1310	262	72	2.0	825	7.4
Dec. 17-31.....	1155	--	--	--	--	81	--	234	0	--	--	--	--	--	616	.84	1920	281	89	2.1	895	7.6
Jan. 1-31, 1964...	1061	--	--	--	--	79	--	233	0	--	--	--	--	--	609	.83	1740	279	88	2.1	880	7.7
Feb. 1-29.....	1027	--	--	--	--	76	--	236	0	--	--	--	--	--	618	.84	1710	288	94	1.9	885	7.6
Mar. 1-20.....	1016	--	--	--	--	62	--	228	0	--	--	--	--	--	583	.79	1600	289	102	1.6	848	8.1
Mar. 21-28.....	1026	--	--	--	--	70	--	218	0	--	--	--	--	--	548	.75	1520	262	83	1.9	788	8.0
Mar. 29-Apr. 30...	1082	--	--	--	--	62	--	215	0	--	--	--	--	--	525	.71	1530	246	70	1.7	762	7.5
May 1-21.....	1148	--	--	--	--	85	--	212	0	--	--	--	--	--	620	.84	1920	285	111	2.2	904	8.2
May 22-31.....	1778	--	--	--	--	99	--	219	0	--	--	--	--	--	897	.95	3350	310	130	2.4	1020	7.5
June 1-20.....	1470	9.0	.00	65	19	81	11	213	0	210	25	.5	1.6	.15	557	.76	2210	242	67	2.3	836	7.3
June 21-30.....	1503	--	--	--	--	74	--	210	0	--	--	--	--	--	488	.66	1980	208	36	2.2	742	7.4
July 1-5.....	1778	--	--	--	--	78	--	216	0	--	--	--	--	--	491	.67	2360	204	27	2.4	740	7.0
July 6-9.....	2025	--	--	--	--	80	--	220	0	--	--	--	--	--	502	.68	2740	208	28	2.4	753	6.9
July 10-13.....	2042	--	--	--	--	71	--	220	0	--	--	--	--	--	470	.64	2590	200	20	2.2	710	7.0
July 14-23.....	2045	--	--	--	--	78	--	218	0	--	--	--	--	--	476	.65	2630	196	17	2.4	732	7.4
July 24-31.....	2065	--	--	--	--	80	--	214	0	--	--	--	--	--	478	.65	2670	190	14	2.5	734	7.3
Aug. 1-17.....	2110	--	--	--	--	82	--	220	0	--	--	--	--	--	479	.65	2730	193	13	2.6	733	7.6
Aug. 18-19.....	2060	--	--	--	--	76	--	228	0	--	--	--	--	--	477	.65	2650	197	10	2.4	724	7.5

PLATTE RIVER BASIN--Continued

6-7657. SUPPLY CANAL (TRI-COUNTY DIVERSION) NEAR MAXWELL, NEBR.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Aug. 20-21, 1964..	1970	--	--	--	--	75	--	217	0	--	--	--	--	--	469	0.64	2490	188	10	2.4	709	7.3
Aug. 22-31.....	1455	--	--	--	--	72	--	223	0	--	--	--	--	--	474	.64	1860	204	21	2.2	721	6.7
Sept. 1-15.....	1509	--	--	--	--	77	--	220	0	--	--	--	--	--	460	.63	1870	196	16	2.4	725	6.8
Sept. 16.....	1450	25	0.01	56	15	70	10	220	0	158	20	0.6	1.1	0.12	472	.64	1850	201	21	2.1	703	7.4
Sept. 17-30.....	1333	--	--	--	--	73	--	216	0	--	--	--	--	--	451	.61	1620	195	18	2.3	701	6.9
Weighted average	--	--	--	--	--	76	--	221	--	--	--	--	--	--	535	0.73	1820	238	57	2.1	793	7.3
Time-weighted average.....	1261	--	--	--	--	74	--	221	--	--	--	--	--	--	541	--	--	244	62	2.0	797	7.3
Tons per day....	--	--	--	--	--	257	--	751	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	60	67	61	68	62	68	61	69	57	68	62	69	58	68	57	67	57	67	56	62	58	65	57	59	52	60	57	56	48	52	--	61
November.....	51	45	52	46	51	45	50	44	52	42	51	41	45	36	47	41	46	38	45	38	41	33	41	34	40	36	43	38	42	37	--	43
December.....	40	35	40	35	40	36	39	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34
January.....	34	37	34	37	33	38	35	34	33	34	33	33	33	36	33	36	34	38	35	39	34	37	34	34	33	36	33	35	33	38	34	35
February.....	35	33	35	33	38	34	34	33	35	34	36	34	37	34	33	33	36	34	33	33	36	33	33	33	33	33	34	33	36	--	--	34
March.....	34	36	34	34	34	35	33	38	34	39	34	42	38	37	35	42	39	49	35	33	33	37	34	33	33	34	33	36	34	47	42	36
April.....	56	50	45	38	46	40	40	36	47	45	52	47	47	42	59	53	52	46	50	47	53	49	58	54	63	54	45	43	60	54	--	49
May.....	55	51	59	53	62	52	56	51	63	57	62	51	52	56	71	67	72	67	73	66	74	66	75	65	74	66	62	60	67	61	63	62
June.....	59	65	60	65	59	72	68	73	67	73	67	73	68	72	67	75	69	72	66	71	65	70	62	77	68	73	68	73	68	74	--	69
July.....	69	78	69	79	74	80	76	78	76	80	71	78	75	76	73	78	74	77	72	81	76	80	77	79	71	77	73	78	72	79	74	76
August.....	79	73	78	75	79	74	78	72	79	72	73	67	69	66	68	66	68	63	71	67	63	59	63	61	65	61	70	62	66	60	69	69
September.....	66	74	66	69	66	70	65	72	68	69	66	68	65	69	65	63	58	66	60	64	58	65	57	63	58	59	50	59	52	66	--	64

6-7660. PLATTE RIVER AT BRADY, NEBR.

LOCATION.--At gaging station at highway bridges, 0.5 mile and 2.5 miles south of Brady, Lincoln County, and 18 miles downstream from confluence of North Platte and South Platte Rivers.
DRAINAGE AREA.--56,900 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: November 1950 to September 1964.
Water temperatures: March 1951 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 480 ppm July 6-9; minimum, 398 ppm May 1-21.
Hardness: Maximum, 242 ppm Dec. 1-16; minimum, 184 ppm Aug. 20-21.
Specific conductance: Maximum daily, 860 micromhos June 3 (chan. 4); minimum daily, 400 micromhos Mar. 19 (chan. 1).
Water temperatures: Maximum, 87°F July 5 (chan. 1); minimum, freezing point on many days during December to March.
EXTREMES, 1951-64.--Dissolved solids: Maximum, 896 ppm Feb. 19-22, 1953; minimum, 270 ppm June 21, 1960.
Hardness: Maximum, 404 ppm Mar. 1-4, 1958; minimum, 133 ppm June 21, 1960.
Specific conductance: Maximum daily, 1,460 micromhos Jan. 22, 1962 (chan. 1); minimum daily, 305 micromhos Jan. 13, 1956, Jan. 10, 1957 (chan. 1).
Water temperatures: Maximum, 90°F July 19, 20, 1951 (chan. 1); minimum, freezing point on many days during winter months.
REMARKS.--Composite periods normally identical to those of Supply Canal (Tri-County Diversion) near Maxwell, Nebr. Records of specific conductance of daily samples, taken at each of the two major channels, available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C): Parts per million	Dissolved solids (residue at 180°C): Tons per acre-foot	Dissolved solids (residue at 180°C): Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
Oct. 1-31, 1963...	159	--	--	--	--	55	--	229	0	--	--	--	--	--	461	0.63	198	222	34	1.6	673	7.6
Nov. 1-30.....	155	--	--	--	--	54	--	225	0	--	--	--	--	--	463	.63	194	223	38	1.6	651	7.7
Dec. 1-16.....	192	40	0.01	70	16	55	10	240	0	137	18	0.5	2.5	0.10	478	.65	248	242	45	1.5	698	7.4
Dec. 17-31.....	222	--	--	--	--	46	--	218	0	--	--	--	--	--	428	.58	257	209	30	1.4	610	7.9
Jan. 1-31, 1964...	203	--	--	--	--	50	--	222	0	--	--	--	--	--	439	.60	241	220	38	1.5	635	7.7
Feb. 1-29.....	192	--	--	--	--	42	--	212	0	--	--	--	--	--	412	.56	214	207	33	1.3	589	7.6
Mar. 1-20.....	208	--	--	--	--	39	--	211	0	--	--	--	--	--	399	.54	224	205	32	1.2	585	8.1
Mar. 21-28.....	374	--	--	--	--	41	--	223	0	--	--	--	--	--	414	.56	418	212	29	1.2	603	8.1
Mar. 29-Apr. 30...	293	--	--	--	--	43	--	227	0	--	--	--	--	--	429	.58	339	216	30	1.3	622	7.7
May 1-21.....	175	--	--	--	--	45	--	221	0	--	--	--	--	--	398	.54	188	214	33	1.3	627	7.7
May 22-31.....	273	--	--	--	--	58	--	218	0	--	--	--	--	--	454	.62	335	217	38	1.7	671	7.6
June 1-20.....	165	18	.01	65	16	56	10	224	0	144	18	.5	1.3	.11	473	.64	211	226	42	1.6	696	7.6
June 21-30.....	243	--	--	--	--	47	--	212	0	--	--	--	--	--	415	.56	272	203	29	1.4	612	7.5
July 1-5.....	158	--	--	--	--	60	--	221	0	--	--	--	--	--	464	.63	198	213	32	1.8	683	7.9
July 6-9.....	822	--	--	--	--	68	--	231	0	--	--	--	--	--	480	.65	1070	209	20	2.0	709	7.7
July 10-13.....	1428	--	--	--	--	65	--	229	0	--	--	--	--	--	451	.61	1740	198	10	2.0	669	6.7
July 14-23.....	692	--	--	--	--	67	--	234	0	--	--	--	--	--	457	.62	854	200	8	2.1	683	7.0
July 24-31.....	1125	--	--	--	--	71	--	236	0	--	--	--	--	--	465	.63	1410	199	5	2.2	699	7.3
Aug. 1-17.....	1153	--	--	--	--	71	--	240	0	--	--	--	--	--	465	.63	1450	199	2	2.2	702	7.4
Aug. 18-19.....	700	--	--	--	--	68	--	233	0	--	--	--	--	--	452	.61	854	194	3	2.1	681	6.8

PLATTE RIVER BASIN--Continued

6-7660. PLATTE RIVER AT BRADY, NEBR.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Aug. 20-21, 1964..	452	--	--	--	--	57	--	212	0	--	--	--	--	--	412	0.56	503	184	10	1.8	617	7.0
Aug. 22-31.....	142	--	--	--	--	61	--	240	0	--	--	--	--	--	467	.64	179	216	19	1.8	691	7.4
Sept. 1-15.....	124	--	--	--	--	59	--	232	0	--	--	--	--	--	436	.59	146	224	34	1.7	669	7.6
Sept. 16.....	148	35	0.01	64	16	61	11	238	0	138	21	0.6	1.7	0.12	478	.65	191	226	31	1.8	704	7.7
Sept. 17-30.....	126	--	--	--	--	57	--	226	0	--	--	--	--	--	441	.60	150	215	30	1.7	672	7.4
Weighted average	--	--	--	--	--	58	--	228	--	--	--	--	--	--	447	0.61	362	209	22	1.7	661	7.3
Time-weighted average.....	299	--	--	--	--	52	--	225	--	--	--	--	--	--	442	--	--	215	31	1.5	648	7.5
Tons per day....	--	--	--	--	--	47	--	185	--	--	--	--	--	--	--	--	--	--	--	--	--	--

CHANNEL 1

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	58	60	60	58	59	58	59	58	54	58	58	52	55	58	58	54	55	56	55	61	57	54	56	55	51	53	51	44	44	44	45	55
November.....	40	36	44	41	43	41	43	42	41	43	45	40	34	34	38	41	41	38	36	38	38	34	34	35	36	35	37	37	34	34	--	38
December.....	36	34	34	34	34	34	35	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	32	34	33	32	32	33
January.....	34	34	34	33	33	33	33	33	32	33	32	32	32	32	32	32	32	32	32	34	34	33	33	32	33	33	32	32	34	34	33	33
February.....	34	34	33	34	33	33	32	33	33	33	33	33	33	--	32	34	32	32	32	32	32	32	32	32	32	32	32	32	32	33	--	33
March.....	34	34	33	34	34	34	33	33	33	34	34	34	36	35	35	38	36	37	39	38	36	35	35	33	32	33	35	33	34	34	36	35
April.....	50	51	49	51	49	42	38	35	43	46	46	50	39	40	48	51	49	47	46	49	46	48	50	49	56	56	51	44	52	54	--	48
May.....	55	55	57	50	56	54	56	59	50	57	57	51	51	57	62	66	65	67	69	67	68	68	70	68	69	65	58	57	57	54	52	60
June	54	56	62	63	63	66	70	69	66	58	64	65	70	70	65	67	72	72	68	69	70	67	65	68	73	70	70	71	68	72	--	67
July.....	75	75	72	73	87	77	77	74	75	77	73	72	72	72	72	75	74	75	72	75	78	77	75	74	71	76	75	78	71	74	75	75
August.....	75	76	76	76	76	77	76	72	72	75	67	64	62	62	63	64	67	67	71	66	60	59	59	60	58	61	64	58	68	57	63	67
September.....	65	68	66	--	--	65	66	64	68	66	57	54	59	60	59	59	59	62	59	50	58	58	56	52	56	54	48	50	53	57	--	59

PLATTE RIVER BASIN--Continued

6-7660. PLATTE RIVER AT BRADY, NEBR.--Continued

CHANNEL 4

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	59	60	60	59	60	59	59	59	56	58	58	54	57	59	59	56	56	58	56	61	58	55	58	57	53	55	53	48	47	47	48	56
November	43	39	47	45	45	44	46	46	45	47	48	44	37	37	41	44	44	41	36	40	42	38	38	38	40	39	41	40	38	36	--	42
December	39	37	37	37	37	38	38	36	35	34	33	32	32	32	32	32	32	32	32	32	32	32	32	32	34	36	34	37	36	35	37	34
January	38	38	38	36	37	36	37	36	34	35	34	32	32	32	32	32	34	34	35	37	36	36	35	33	33	34	36	34	35	37	36	35
February	37	37	36	37	36	35	33	35	35	36	35	35	34	--	33	32	33	34	33	34	34	34	33	34	34	34	34	35	36	--	--	35
March	37	37	36	39	40	38	36	37	36	38	38	39	41	39	40	43	42	42	44	43	39	39	41	37	36	35	40	40	39	41	41	39
April	53	54	52	52	52	45	41	38	46	49	50	53	42	44	49	53	51	48	49	50	47	50	53	52	56	56	53	44	52	55	--	50
May	54	55	58	54	56	54	56	59	53	59	58	54	53	58	62	64	64	65	67	66	66	66	68	72	68	68	58	54	58	55	52	60
June	55	55	60	63	61	64	68	69	65	60	63	65	68	68	66	67	70	70	67	69	70	65	64	64	71	69	70	69	68	70	--	66
July	73	74	73	73	86	77	75	74	74	76	71	70	71	71	70	74	74	74	72	74	76	75	74	74	70	76	74	76	70	73	75	74
August	73	75	76	75	74	75	76	70	70	73	65	61	61	62	63	64	65	67	70	68	60	60	60	62	60	63	66	60	65	60	65	67
September	67	68	67	--	--	65	67	66	68	66	60	56	60	62	61	59	60	62	60	52	59	58	58	54	56	57	50	52	54	59	--	60

PLATTE RIVER BASIN--Continued

6-7680. PLATTE RIVER NEAR OVERTON, NEBR.

LOCATION.--At gaging station at highway bridge, 4 miles south of Overton, Dawson County, and 4 miles downstream from Plum Creek.
DRAINAGE AREA.--58,400 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1951 to September 1952, November 1958 to September 1964.
Water temperatures: November 1958 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 577 ppm June 1-30; minimum, 493 ppm Oct. 1-31, Sept. 16.
Hardness: Maximum, 272 ppm May 1-31; minimum, 212 ppm Sept. 16.
Specific conductance: Maximum daily, 976 micromhos Jan. 19 (south chan.); minimum daily, 627 micromhos Apr. 29 (south chan.).
Water temperatures: Maximum, 97°F July 1 (north chan.); minimum, freezing point on several days during December to March.
EXTREMES, 1958-64.--Dissolved solids: Maximum, 866 ppm Feb. 1-17, 1962; minimum, 270 ppm Aug. 13, 1961.
Hardness: Maximum, 433 ppm Feb. 1-17, 1962; minimum, 141 ppm Jan. 1-10, 1963.
Specific conductance: Maximum daily, 1,420 micromhos Feb. 8, 1962 (south chan.); minimum daily, 299 micromhos Aug. 31, 1963 (south chan.).
Water temperatures: Maximum, 98°F June 13, 1959 (south chan.), July 9, 1960 (north chan.); minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance of daily samples, taken at each of the two major channels, and some spectrographic and radiochemical data available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 1-31, 1963...	959	--	--	--	--	67	--	225	0	156	--	--	--	--	493	0.67	1280	216	31	2.0	738	7.4
Nov. 1-30.....	960	--	--	--	--	64	--	227	0	160	--	--	--	--	498	.68	1290	228	42	1.8	745	7.4
Dec. 1-31.....	1106	11	--	72	15	64	11	235	0	173	21	0.5	1.5	0.15	518	.70	1550	243	50	1.8	777	7.6
Jan. 1-31, 1964...	1205	--	--	--	--	69	--	244	0	187	--	--	--	--	560	.76	1820	264	64	1.8	828	8.1
Feb. 1-29.....	1149	--	--	--	--	69	--	236	0	196	--	--	--	--	569	.77	1770	270	76	1.8	835	8.1
Mar. 1-31.....	1256	--	--	--	--	63	--	236	0	179	--	--	--	--	542	.74	1840	263	69	1.7	798	8.1
Apr. 1-11.....	1329	--	--	--	--	61	--	234	0	171	--	--	--	--	535	.73	1920	256	64	1.7	774	8.0
Apr. 12.....	1180	33	0.02	75	19	60	11	242	0	164	20	0.5	1.9	0.10	533	.72	1700	264	65	1.6	769	7.8
Apr. 13-30.....	1100	--	--	--	--	59	--	227	0	166	--	--	--	--	518	.70	1540	251	65	1.6	764	7.6
May 1-31.....	498	--	--	--	--	65	--	238	0	184	--	--	--	--	545	.74	733	272	77	1.7	796	7.5
June 1-30.....	532	12	--	72	21	75	12	220	0	217	26	.5	.8	.14	577	.78	829	264	84	2.0	862	7.4
July 1-10.....	211	--	--	--	--	71	--	212	0	193	--	--	--	--	529	.72	301	242	68	2.0	794	7.3
July 11-14.....	618	--	--	--	--	70	--	236	0	167	--	--	--	--	506	.69	844	233	39	2.0	761	7.4
July 15-18.....	371	--	--	--	--	72	--	240	0	178	--	--	--	--	524	.71	525	242	45	2.0	776	7.5
July 19-31.....	142	--	--	--	--	75	--	221	0	196	--	--	--	--	543	.74	208	244	63	2.1	816	7.2
Aug. 1-31.....	442	--	--	--	--	75	--	232	0	172	--	--	--	--	516	.70	616	226	36	2.2	769	7.4
Sept. 1-15.....	334	--	--	--	--	77	--	231	0	180	--	--	--	--	512	.70	462	226	37	2.2	780	7.5

Sept. 16, 1964....	511	20	.03	55	18	78	12	232	0	172	22	.6	1.1	.13	493	.67	680	212	22	2.3	748	7.9
Sept. 17-30.....	574	--	--	--	--	78	--	232	0	179	--	--	--	--	494	.67	766	226	36	2.3	779	7.5
Weighted average	--	--	--	--	--	67	--	233	--	178	--	--	--	--	532	0.72	1200	249	58	1.8	789	7.6
Time-weighted average.....	832	--	--	--	--	68	--	231	--	180	--	--	--	--	531	--	--	247	57	1.8	790	7.5
Tons per day....	--	--	--	--	--	150	--	523	--	400	--	--	--	--	--	--	--	--	--	--	--	--

NORTH CHANNEL

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	74	62	72	67	70	61	72	60	69	59	72	69	69	62	72	62	73	62	70	52	66	62	67	62	66	52	--	52	54	52	53	64
November	46	57	53	53	48	55	48	54	49	57	55	50	42	39	43	46	47	50	43	50	42	41	41	--	36	45	41	39	45	36	--	47
December	43	35	43	36	45	38	36	32	33	34	33	34	33	33	33	34	33	33	33	33	33	32	32	33	34	33	33	32	33	33	33	34
January.....	33	34	38	33	35	33	38	33	33	33	32	32	33	34	33	33	34	36	33	40	33	38	33	35	33	47	33	35	33	44	35	35
February.....	43	36	35	35	42	33	37	34	42	37	38	36	42	35	40	32	42	34	38	34	43	33	43	33	35	33	43	34	43	--	--	37
March.....	36	45	37	44	37	39	34	43	37	43	38	49	44	48	42	51	44	38	48	32	36	43	41	36	33	45	40	46	40	42	47	41
April.....	60	52	42	40	49	45	44	44	56	52	64	51	47	56	52	67	50	57	51	53	52	58	54	59	61	65	49	58	55	69	--	54
May.....	56	68	68	66	65	71	65	63	65	69	66	70	63	70	70	79	78	79	71	79	72	83	73	75	75	63	60	67	61	60	64	69
June	--	64	70	63	74	71	75	67	74	67	76	78	76	75	75	72	86	73	86	86	80	81	82	81	84	89	84	75	78	78	--	77
July.....	97	94	92	88	95	84	85	78	95	77	84	76	88	76	86	75	79	79	85	94	75	89	81	84	74	79	76	89	75	81	80	84
August.....	81	78	80	78	87	83	79	78	81	81	81	69	70	83	69	70	69	73	82	70	73	66	72	69	71	66	66	67	78	83	78	75
September	74	80	74	81	65	76	73	88	76	72	59	77	62	77	61	67	63	78	64	73	63	72	59	87	65	64	59	65	58	66	--	70

PLATTE RIVER BASIN--Continued

6-7680. PLATTE RIVER NEAR OVERTON, NEBR.--Continued

SOUTH CHANNEL

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Aver-age
	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	
October	72	62	71	65	69	62	71	60	69	59	70	69	68	61	70	64	70	62	69	52	65	60	66	62	66	52	--	52	56	52	53	63
November	46	56	53	53	48	54	48	54	48	58	54	50	41	38	44	48	48	48	43	49	42	42	41	--	37	44	40	39	45	36	--	46
December	42	36	43	36	43	38	36	32	33	33	33	34	43	33	33	--	--	--	--	--	--	--	--	--	33	32	34	32	35	33	34	--
January	38	35	38	33	35	33	38	33	34	33	32	32	32	--	--	36	35	42	35	42	34	39	33	36	33	42	33	37	33	43	35	36
February	42	36	34	33	40	35	38	34	43	37	39	36	42	34	41	32	41	34	39	33	41	32	43	33	32	33	41	33	41	--	--	37
March	35	43	36	41	37	38	33	41	36	40	38	46	43	45	40	48	42	32	46	32	36	44	40	35	33	43	39	44	39	42	45	40
April	54	51	42	40	46	43	43	42	53	50	58	56	45	52	50	68	48	56	50	52	50	56	52	58	60	63	48	56	53	64	--	52
May	55	66	64	64	63	79	63	61	63	67	64	68	60	68	68	78	80	78	68	80	70	83	71	76	72	63	59	69	60	59	62	68
June	--	61	69	62	73	68	74	65	73	73	75	74	77	72	76	69	88	70	84	86	79	78	79	77	82	87	83	73	80	82	--	75
July	92	92	89	89	94	80	84	75	93	76	82	75	86	74	83	74	80	76	85	93	75	85	77	85	72	80	74	87	73	83	78	82
August	82	75	79	76	88	79	80	75	82	77	79	65	70	82	68	62	69	70	80	70	71	64	70	67	70	64	66	65	75	80	75	73
September	72	78	72	80	73	78	71	84	74	70	58	75	63	75	60	67	62	76	62	71	61	70	58	84	62	62	57	63	60	64	--	69

6-7975. ELKHORN RIVER AT EWING, NEBR.

LOCATION.--At bridge on State Highway 108, 350 feet upstream from gaging station, 0.8 mile north of Ewing, Holt County, and 1.5 miles upstream from South Fork Elkhorn River.
DRAINAGE AREA.--1,400 square miles, approximately, of which about 740 square miles contributes directly to surface runoff.
RECORDS AVAILABLE.--Chemical analyses: September 1960 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 15, 1963	57	38		0.04	--	28	3.7	9.2	5.9	125	0	5.2	2.3	0.4	0.1	0.04	161	85	0	0.4	209	7.6	4
Nov. 5.....	71	43		.05	--	28	3.2	9.1	5.9	120	0	8.0	2.6	.4	.4	.02	164	83	0	.4	207	7.6	1
Dec. 11.....	41	53		.07	--	32	4.1	11	6.0	137	0	7.2	2.8	.3	4.0	.03	191	97	0	.5	252	6.9	--
Jan. 15, 1964	52	54		.05	--	30	3.9	9.5	5.6	132	0	4.5	1.8	.4	.3	.02	172	91	0	.4	227	7.3	--
Feb. 20.....	78	44		.06	--	26	3.4	8.5	4.6	113	0	5.2	2.0	.4	1.5	.04	162	79	0	.4	202	7.2	--
Mar. 24.....	137	37		.09	--	24	3.4	9.4	5.7	106	0	6.2	2.4	.3	.9	.02	151	74	0	.5	193	7.1	--
Apr. 14.....	202	37		.15	--	30	3.2	12	6.3	130	0	7.8	2.8	.5	1.3	.00	179	88	0	.6	229	7.3	--
May 18.....	190	39		.09	--	34	5.1	14	7.2	153	0	8.0	2.7	.5	1.8	.05	213	106	0	.6	275	7.6	--
June 9.....	50	43		.06	--	30	3.4	9.6	6.0	128	0	5.8	2.8	.4	1.0	.02	179	89	0	.4	225	6.8	--
June 18.....	205	38		.05	0.13	28	2.2	8.1	5.5	114	0	6.0	2.5	.3	2.2	.05	163	79	0	.4	196	7.3	25
July 7.....	126	43		.08	--	29	3.3	10	5.9	128	0	6.0	3.8	.4	1.2	.02	172	86	0	.5	226	7.3	--
Aug. 4.....	50	44		.05	--	31	3.6	9.0	6.5	133	0	6.0	2.9	.4	1.2	.03	177	92	0	.4	230	7.7	--
Sept. 1.....	66	39		.09	.00	27	3.1	9.3	6.1	117	0	5.2	2.2	.3	.3	.03	149	80	0	.5	205	7.6	--

PLATTE RIVER BASIN--Continued

6-7980. SOUTH FORK ELKHORN RIVER AT EWING, NEBR.

LOCATION.--At gaging station at bridge on U.S. Highway 275 at southeast limits of Ewing, Holt County, 0.8 mile above mouth.
DRAINAGE AREA.--320 square miles, approximately, of which about 190 square miles contributes directly to surface runoff.
RECORDS AVAILABLE.--Chemical analyses: September 1960 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
																		Calcium, magnesium	Noncarbonate				
Oct. 15, 1963	31	42		.04	--	25	4.0	6.8	4.5	110	0	5.2	1.1	0.2	0.0	0.02	147	79	0	0.3	185	7.5	2
Nov. 5.....	39	44		.05	--	24	3.2	6.7	4.1	105	0	5.5	.9	.3	.0	.01	144	73	0	.3	176	7.2	2
Dec. 11.....	A21	52		.05	--	28	3.2	7.9	4.8	117	0	5.2	1.6	.1	2.0	.08	167	83	0	.4	208	7.2	--
Jan. 15, 1964	20	48		.03	--	25	2.8	6.7	4.0	104	0	2.8	1.8	.3	1.3	.02	140	74	0	.3	184	7.5	--
Feb. 20.....	36	49		.06	--	25	3.6	6.8	3.8	107	0	4.5	1.1	.2	.7	.01	158	77	0	.3	187	7.5	--
Mar. 24.....	37	46		.07	--	29	3.6	8.5	4.4	122	0	5.0	1.9	.2	.6	.02	170	87	0	.4	210	7.9	--
Apr. 14.....	57	42		.07	--	27	3.1	8.4	4.5	116	0	5.2	1.6	.3	.9	.00	159	80	0	.4	199	7.0	--
May 18.....	49	41		.05	--	27	2.8	7.3	4.7	114	0	5.0	1.4	.3	.8	.02	154	79	0	.4	195	7.6	--
June 9.....	27	44		.05	--	27	3.3	7.1	4.2	116	0	4.0	1.4	.3	.8	.01	158	81	0	.3	196	7.2	--
June 18.....	57	40		.06	0.03	26	3.2	7.2	4.5	111	0	5.0	1.5	.3	1.2	.03	160	78	0	.4	190	7.3	20
July 7.....	45	44		.07	--	26	2.2	6.8	5.0	109	0	4.0	2.2	.3	.4	.01	154	74	0	.3	187	7.4	--
Aug. 4.....	31	42		.04	--	26	2.2	6.5	4.0	110	0	4.2	1.4	.3	.5	.01	144	74	0	.3	183	7.6	--
Sept. 1.....	35	41		.04	.00	22	2.7	6.5	4.6	97	0	4.2	.9	.2	.1	.01	134	66	0	.3	167	7.4	--

A Daily mean discharge.

6-7980. SOUTH FORK ELKHORN RIVER AT EWING, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Sept. 24, 1963.....	1540	77		50	140	19						20	49	98	100			V
Nov. 5.....	1420	55		39	181	19						16	46	97	100			V
Dec. 11.....	1040	32		D 21	68	3.8						0	26	85	100			V
Jan. 15, 1964.....	1405	32		20	16	.9						--	--	--	--			
Feb. 20.....	1000	32		36	14	1.4						--	--	--	--			
Mar. 24.....	0950	32		37	569	57						6	18	89	100			V
Apr. 14.....	1005	47		57	246	38						28	58	98	100			V
May 18.....	1655	79		49	228	30						16	30	92	100			V
June 9.....	1405	70		27	125	9.1						29	49	97	100			V
July 7.....	1530	91		45	82	10						--	--	--	--			
July 21.....	1340	95		33	88	7.8						39	60	99	100			V
Aug. 4.....	0925	70		31	120	10						--	--	--	--			
Sept. 1.....	1715	83		35	186	18						17	44	95	100			V
Sept. 14.....	1645	71		31	130	11						8	25	93	99	100		V

D Daily mean discharge.

PLATTE RIVER BASIN--Continued

6-7980. SOUTH FORK ELKHORN RIVER AT EWING, NEBR.--Continued

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters										Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Sept. 24, 1963.....	1540		31	50			0	5	62	94	99	100	--					SV
Nov. 5.....	1420		24	39			1	11	65	95	100	--	--					V
Dec. 11.....	1040		8	D 21			1	12	62	93	99	100	--					SV
Jan. 15, 1964.....	1405		7	20			0	2	47	84	97	99	100					SV
Feb. 20.....	1000		7	36			0	4	56	89	99	100	--					SV
Mar. 24.....	0950		8	37			0	5	85	100	--	--	--					V
Apr. 14.....	1005		11	57			0	6	50	92	99	100	--					SV
May 18.....	1655		13	49			0	3	69	96	99	100	--					SV
June 9.....	1405		10	27			0	3	58	96	100	--	--					V
June 18.....	1455		6	57			0	3	70	97	98	99	100					SV
July 7.....	1530		21	45			0	3	64	98	100	--	--					V
July 21.....	1340		15	33			0	4	60	94	98	99	100					SV
Aug. 4.....	0925		15	31			0	7	66	97	99	100	--					SV
Sept. 1.....	1715		16	35			0	8	52	90	99	100	--					SV
Sept. 14.....	1645		12	31			0	4	49	92	98	100	--					SV

D Daily mean discharge.

PLATTE RIVER BASIN--Continued

6-7990. ELKHORN RIVER NEAR NORFOLK, NEBR.

LOCATION.--At gaging station at county road bridge, 3.5 miles west-southwest of Norfolk, Madison County, and 7 miles upstream from North Fork Elkhorn River.
DRAINAGE AREA.--2,790 square miles, approximately, of which about 1,790 square miles contributes directly to surface runoff.
RECORDS AVAILABLE.--Chemical analyses: September 1960 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 14, 1963	196	40		0.03	--	47	7.4	8.9	7.2	200	0	8.0	1.6	0.4	0.1	0.03	225	148	0	0.3	325	7.4	2
Nov. 4.....	278	42		.03	--	46	7.5	8.8	6.6	197	0	9.5	1.8	.3	.5	.02	219	146	0	.3	322	7.5	1
Dec. 12.....	116	51		.05	--	64	9.4	11	8.2	261	0	10	2.4	.3	3.2	.06	287	198	0	.3	434	7.4	--
Jan. 15, 1964	244	47		.02	--	53	7.3	9.6	6.6	214	0	8.2	2.2	.4	1.7	.04	237	162	0	.3	349	7.9	--
Feb. 18.....	340	41		.02	--	44	6.8	8.6	5.6	182	0	7.0	1.8	.3	1.0	.03	211	138	0	.3	303	7.5	--
Mar. 24.....	490	38		.06	--	44	7.3	10	6.7	185	0	8.2	2.7	.3	1.4	.02	225	140	0	.4	316	7.3	--
Apr. 14.....	400	37		.07	--	44	5.4	11	7.0	180	0	9.0	2.9	.5	1.3	.00	215	132	0	.4	304	7.2	--
May 18.....	540	38		.05	--	45	6.2	12	8.0	194	0	8.5	2.5	.5	1.2	.05	231	138	0	.4	319	8.0	--
June 8.....	244	41		.04	--	46	6.6	9.5	7.0	192	0	8.8	2.0	.4	.5	.03	226	142	0	.3	323	6.7	--
June 18.....	1240	21		.15	0.13	33	4.8	5.6	8.2	132	0	8.5	2.2	.3	3.0	.04	171	102	0	.2	239	7.4	25
July 6.....	760	32		.07	--	35	3.0	6.9	6.7	137	0	8.0	2.6	.3	2.4	.03	179	100	0	.3	239	7.7	--
Aug. 3.....	185	39		.02	--	39	7.9	8.8	7.1	176	0	8.5	2.7	.4	1.3	.04	256	130	0	.3	298	7.5	--
Sept. 1.....	238	40		.02	.02	46	6.1	8.7	6.9	188	0	7.8	2.8	.3	.9	.03	210	140	0	.3	307	7.8	--

PLATTE RIVER BASIN--Continued

6-7990. ELKHORN RIVER NEAR NORFOLK, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Aug. 23, 1961.....	1115	74		207	203	113						66	74	99	100			V
May 20, 1963.....	1810	66		320	284	245						45	62	98	100			V
Sept. 10.....	1440	74		196	171	90						--	--	--	--			
June 18, 1964.....	0900	73		1240	1980	6630	49	51	55	59	65	74	84	99	100			VPWC

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
June 18, 1964.....	0900		4	1240			0	14	89	100								V

6-7991. NORTH FORK ELKHORN RIVER NEAR PIERCE, NEBR.

LOCATION.--At gaging station, on left downstream wingwall of county road bridge, 2.5 miles southeast of Pierce, Pierce County.
DRAINAGE AREA.--520 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: September 1960 to September 1964 (discontinued).

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 14, 1963...	34	34	0.02	64	11	12	5.5	258	0	18	2.3	0.3	2.7	0.04	277	0.38	25.4	204	0	0.4	433	7.8	1
Nov. 4.....	34	34	.02	61	11	12	4.9	249	0	18	2.5	.3	3.4	.03	270	.37	24.8	199	0	.4	425	7.6	2
Dec. 11.....	21	36	.03	68	12	12	5.4	269	0	20	3.4	.2	6.4	.06	296	.40	16.8	220	0	.4	470	7.3	--
Jan. 14, 1964...	35	40	.02	71	12	12	5.2	279	0	20	2.8	.4	5.2	.03	303	.41	28.6	228	0	.3	475	7.5	--
Feb. 18.....	42	33	.03	60	12	11	4.0	236	0	16	2.8	.3	5.0	.02	268	.36	30.4	197	3	.3	410	7.9	--
Mar. 24.....	64	32	.06	62	15	20	7.1	264	0	31	5.3	.5	7.8	.07	328	.45	56.7	216	0	.6	483	8.2	--
Apr. 14.....	76	33	.03	71	13	17	5.8	286	0	28	3.4	.5	4.3	.01	322	.44	66.1	230	0	.5	498	7.4	--
May 18.....	66	25	.02	72	15	18	6.8	280	0	49	3.9	.4	5.3	.04	338	.46	60.2	243	13	.5	536	7.7	--
June 6.....	40	33	.03	61	12	13	6.0	248	0	20	3.6	.4	5.2	.03	279	.38	30.1	200	0	.4	435	7.2	--
June 18.....	1170	11	.11	23	3.6	3.1	8.8	92	0	7.5	2.3	.2	2.8	.04	149	.20	471	72	0	.2	175	7.0	--
July 6.....	100	25	.04	56	9.4	12	11	210	0	33	4.6	.4	5.6	.01	266	.36	71.8	178	6	.4	421	7.6	--
Aug. 3.....	33	33	.01	59	10	12	7.7	234	0	20	3.7	.4	6.1	.05	273	.37	24.3	188	0	.4	417	7.4	--
Sept. 1.....	41	34	.02	63	8.5	11	5.3	238	0	16	3.2	.3	3.1	.04	264	.36	29.2	192	0	.3	406	7.7	--

PLATTE RIVER BASIN--Continued

6-7991. NORTH FORK ELKHORN RIVER NEAR PIERCE, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment										Method of analysis
							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	
Oct. 14, 1963	1640	65		34	94	8.6	--	--		--	--	99	--	--				S
Nov. 4	1630	48		34	42	3.8	--	--		--	--	98	--	--				S
Dec. 11	1630	32		21	60	3.4	--	--		--	--	--	--	--				
Jan. 14, 1964	1700	32		35	6	.6	--	--		--	--	91	--	--				S
Feb. 18	0925	32		42	30	3.4	--	--		--	--	--	--	--				
Mar. 24	1620	32		62	438	73	50	62		73	83	95	98	100				VPWC
Apr. 14	1605	55		76	116	24	--	--		--	--	--	--	--				
May 18	1405	72		66	176	31	--	--		--	--	--	--	--				
June 8	1410	81		40	142	15	--	--		--	--	--	--	--				
June 18	1010	73		1170	1340	4230	71	75	79	82	87	95	97	99	100			VPWC
July 6	1410	86		101	420	114	--	--		--	--	--	--	--				
July 20	1325	81		40	199	21	--	--		--	--	--	--	--				
Aug. 3	1400	77		33	255	23	--	--		--	--	--	--	--				
Sept. 1	1340	75		41	129	14	--	--		--	--	99	100	--				V
Sept. 14	1315	64		37	122	12	--	--		--	--	--	--	--				

PLATTE RIVER BASIN--Continued

6-7991. NORTH FORK ELKHORN RIVER NEAR PIERCE, NEBR.--Continued

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters										Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 14, 1963	1640		15	34			19	28	58	94	100	--	--	--	--			V
Nov. 4	1630		15	34			15	22	54	93	99	99	100	--	--			SV
Dec. 11	1630		10	21			0	6	40	95	100	--	--	--	--			V
Jan. 14, 1964	1700		6	35			0	1	36	93	99	100	--	--	--			SV
Feb. 18	0925		8	42			2	4	28	91	100	--	--	--	--			V
Apr. 14	1605		10	76			14	24	58	96	100	--	--	--	--			V
June 8	1410		10	40			4	6	48	90	95	96	98	100	--			SV
July 6	1410		14	101			0	2	34	92	96	97	99	100	--			SV
July 20	1325		14	40			4	6	36	83	89	91	95	98	100			SV
Aug. 8	1400		11	33			21	24	53	91	94	94	96	99	100			SV
Sept. 1	1340		11	41			4	5	34	89	94	95	97	100	--			SV
Sept. 14	1315		13	37			2	4	34	84	90	91	94	98	100			SV

PLATTE RIVER BASIN--Continued

6-7994.5. LOGAN CREEK AT PENDER, NEBR.

LOCATION.--At hridge on State Highway 94 at east edge of Pender, Thurston County.
RECORDS AVAILABLE.--Chemical analyses: January to September 1964.

Chemical analyses, in parts per million, January to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Jan. 14, 1964	40.0	27		0.02	0.30	116	26	24	5.8	390	0	109	4.4	0.3	4.1	0.08	516	396	76	0.5	802	7.4	--
Feb. 17.....	60.4	23		.00	.38	100	25	21	4.8	348	0	97	5.8	.3	3.3	.06	467	352	67	.5	712	7.8	--
Mar. 25.....	11.5	25		.01	--	108	28	24	5.7	383	0	111	5.4	.3	5.3	.09	513	384	70	.5	779	8.0	--
Apr. 15.....	180	20		.03	--	104	24	28	6.8	357	0	116	6.0	.3	6.7	.04	492	357	64	.6	762	7.7	10
May 18.....	65.4	22		.02	--	106	27	27	8.2	381	0	112	5.2	.3	2.7	.08	508	374	61	.6	776	8.0	5
June 8.....	410	17		.01	.42	93	23	23	7.6	321	0	108	4.2	.3	1.7	.08	446	328	65	.6	715	7.8	4
June 18.....	56.3	18		.01	.18	72	17	18	10	254	0	74	8.8	.5	6.6	.08	360	251	43	.5	583	7.6	6
July 6.....	96.7	18		.04	--	88	16	18	10	281	0	90	4.6	.4	3.3	.07	406	286	55	.5	618	8.0	48
Aug. 3.....	46.2	23		.00	--	84	28	23	7.3	324	0	101	5.0	.3	1.0	.08	447	324	58	.6	682	7.5	3
Sept. 1.....	64	19		.02	.10	84	23	21	6.3	310	0	89	5.2	.3	.4	.07	409	306	52	.5	648	7.7	--

6-7994.5. LOGAN CREEK AT PENDER, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Jan. 14, 1964.....	1200	32		40	22	2.4	--	--	--	--	--	84	--	--	--			S
Feb. 17.....	1340	32		60	24	3.9	--	--	--	--	--	--	--	--	--			
Mar. 25.....	1005	32		12	145	4.7	--	--	--	--	--	62	69	82	100			V
Apr. 15.....	1100	59		180	89	43	--	--	--	--	--	99	100	--	--			V
May 18.....	0955	68		65	247	43	--	--	--	68	--	84	--	--	--			SPWC
June 8.....	1000	74		410	252	280	34	39	40	49	75	93	95	98	100			VPWC
June 18.....	2210	75		56	600	91	71	--	82	89	94	98	--	--	--			SPWC
July 6.....	0950	81		97	576	150	42	47	--	49	73	99	--	--	--			SPWC
July 20.....	0945	76		52	124	17	--	--	--	--	--	86	88	92	100			V
Aug. 3.....	1025	81		46	100	12	--	--	--	--	--	--	--	--	--			
Sept. 1.....	0920	69		64	82	14	--	--	--	--	--	95	100	--	--			V
Sept. 14.....	1000	62		44	40	4.8	--	--	--	--	--	--	--	--	--			

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters										Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Jan. 14, 1964.....	1200		10	40			1	2	22	80	98	99	100					SV
Feb. 17.....	1340		17	60			2	3	25	84	99	100	--					SV
Mar. 25.....	1005		10	12			0	4	30	83	98	99	100					SV
Apr. 15.....	1100		10	180			0	5	23	86	98	99	100					SV
May 18.....	0955		11	65			9	12	33	87	99	100	--					SV
July 6.....	0950		17	97			7	10	33	90	99	100	--					SV
July 20.....	0945		14	52			2	3	23	90	98	99	100					SV
Aug. 3.....	1025		14	46			1	2	18	87	98	100	--					SV
Sept. 1.....	0920		13	64			1	2	18	85	98	100	--					SV
Sept. 14.....	1000		13	44			2	2	15	76	96	98	99	100				SV

MISSOURI RIVER MAIN STEM

6-8070. MISSOURI RIVER AT NEBRASKA CITY, NEBR.

LOCATION.--At gaging station at Waubonsie Highway Bridge at Nebraska City, Otoe County.
DRAINAGE AREA.--414,400 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: January 1951 to September 1964.
Water temperatures: May 1951 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 617 ppm July 15 to Aug. 18; minimum, 240 ppm June 17-18.
Hardness: Maximum, 291 ppm Dec. 12-31; minimum, 111 ppm June 17-18.
Specific conductance: Maximum daily, 978 micromhos Dec. 16; minimum daily, 273 micromhos June 17.
Water temperatures: Maximum, 83°F July 24, 25; minimum, freezing point on many days during December to March.
EXTREMES, 1951-64.--Dissolved solids: Maximum, 617 ppm July 15 to Aug. 18, 1964; minimum, 217 ppm Mar. 31, 1960.
Hardness: Maximum, 344 ppm Jan. 1-10, 1952; minimum, 111 ppm June 17-18, 1964.
Specific conductance: Maximum daily, 994 micromhos Dec. 17, 1962; minimum daily, 273 micromhos June 17, 1964.
Water temperatures: Maximum, 85°F July 25, 1952; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
Oct. 1-31, 1963	33120	--	--	--	--	71	--	192	0	--	--	--	--	--	513	0.70	45870	246	88	2.0	768	7.4	
Nov. 1-13.....	33390	--	--	--	--	70	--	190	0	--	--	--	--	--	506	.69	45620	242	86	2.0	767	7.5	
Nov. 14.....	35100	11	0.01	66	21	69	5.4	196	0	211	18	0.5	0.0	0.10	517	.70	49000	252	91	1.9	773	7.6	
Nov. 15-28.....	31840	--	--	--	--	69	--	192	0	--	--	--	--	--	515	.70	44270	244	86	1.9	765	7.6	
Nov. 29-Dec. 11	14570	--	--	--	--	69	--	223	0	--	--	--	--	--	526	.72	20690	259	76	1.9	785	7.8	
Dec. 12-31.....	9425	18	.01	78	23	79	6.6	249	0	206	34	.5	4.4	.14	594	.81	15120	291	87	2.0	891	7.5	
Jan. 1-31, 1964	12110	--	--	--	--	70	--	228	0	--	--	--	--	--	536	.73	17530	271	84	1.9	798	7.8	
Feb. 1-29.....	14400	--	--	--	--	60	--	212	0	--	--	--	--	--	471	.64	18310	240	66	1.7	713	7.9	
Mar. 1-18.....	13950	--	--	--	--	56	--	215	0	--	--	--	--	--	455	.62	17140	232	56	1.6	694	8.0	
Mar. 19.....	12900	26	.04	65	16	52	7.1	215	0	126	30	.5	3.2	.08	443	.60	15430	227	51	1.5	678	7.7	
Mar. 20-23.....	20180	--	--	--	--	54	--	210	0	--	--	--	--	--	445	.61	24250	224	52	1.6	683	7.9	
Mar. 24-31.....	31480	--	--	--	--	52	--	182	0	--	--	--	--	--	430	.58	36550	212	63	1.6	647	9.0	
Apr. 1-20.....	33020	--	--	--	--	61	--	196	0	--	--	--	--	--	480	.65	42790	234	73	1.7	726	7.4	
Apr. 21-23.....	39570	--	--	--	--	60	--	198	0	--	--	--	--	--	476	.65	50860	233	71	1.7	725	7.3	
Apr. 24-26.....	31500	--	--	--	--	59	--	196	0	--	--	--	--	--	471	.64	40060	234	73	1.7	715	7.6	
Apr. 27-30.....	39680	--	--	--	--	57	--	192	0	--	--	--	--	--	455	.62	48750	225	67	1.7	698	7.4	
May 1-6.....	33950	--	--	--	--	61	--	198	0	--	--	--	--	--	474	.64	43450	241	79	1.7	718	7.5	
May 7-9.....	44870	--	--	--	--	55	--	214	0	--	--	--	--	--	451	.61	54640	243	67	1.5	698	7.5	
May 10-24.....	33110	--	--	--	--	60	--	198	0	--	--	--	--	--	480	.65	42910	244	82	1.7	731	7.1	
May 25, 27-29..	49880	--	--	--	--	45	--	188	0	--	--	--	--	--	400	.54	53870	220	66	1.3	623	7.4	

May 26, 1964...	69800	12	.02	53	17	45	6.5	164	0	140	11	.5	2.3	.09	392	.53	73680	201	66	1.4	590	7.3	30
May 30-June 11.	34100	--	--	--	--	69	--	204	0	--	--	--	--	--	511	.69	47050	252	85	1.9	761	7.3	
June 12-14.....	41600	--	--	--	--	59	--	184	0	--	--	--	--	--	456	.62	51220	225	74	1.7	703	7.5	
June 15-16.....	57000	--	--	--	--	48	--	166	0	--	--	--	--	--	382	.52	58790	191	55	1.5	596	7.5	
June 17-18.....	100100	5.5	.08	30	8.8	21	7.2	110	0	55	6.7	.3	4.7	.06	240	.33	64660	111	21	.9	332	7.1	
June 19-25.....	49790	--	--	--	--	44	--	173	0	--	--	--	--	--	377	.51	50680	200	58	1.4	589	7.3	
June 26-July 14	35790	--	--	--	--	56	--	187	0	--	--	--	--	--	451	.61	43560	230	77	1.6	686	6.7	
July 15-Aug. 18	34170	--	--	--	--	73	--	197	0	--	--	--	--	--	617	.84	56920	248	66	2.0	793	7.4	
Aug. 19.....	34600	10	.03	65	19	78	6.0	198	0	216	19	.5	.9	.12	533	.72	49790	241	79	2.2	806	7.3	
Aug. 20-Sept. 30.....	34830	--	--	--	--	69	--	162	0	--	--	--	--	--	523	.71	49180	234	101	2.0	754	7.4	
Weighted average....	--	--	--	--	--	64	--	191	--	--	--	--	--	--	497	0.68	38310	237	80	1.8	730	7.3	
Time-weighted average....	28550	--	--	--	--	65	--	199	--	--	--	--	--	--	506	--	--	243	80	1.8	746	7.3	
Tons per day.	--	--	--	--	--	4900	--	14710	--	--	--	--	--	--	--	--	--	--	--	--	--	--	

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	65	65	64	65	66	66	65	66	66	64	65	65	65	65	65	65	65	64	64	65	64	65	65	65	64	64	62	56	50	53	51	63
November.....	49	48	49	50	50	50	50	50	50	50	49	47	44	42	42	44	44	43	44	45	45	44	41	39	39	38	40	41	39	38	--	45
December.....	38	36	35	35	35	37	38	35	35	34	34	32	32	32	32	32	32	32	32	32	32	32	32	32	33	34	33	33	33	32	32	33
January.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	36	38	39	36	36	35	35	34	33	33	33	32	32	32	33
February.....	33	33	33	33	32	33	32	32	32	32	32	33	33	33	33	33	33	33	34	33	32	32	32	32	32	32	32	32	33	--	--	33
March.....	34	36	37	37	34	36	34	33	33	32	34	36	41	46	46	47	44	42	43	41	35	35	39	39	36	33	33	33	33	33	36	37
April.....	40	44	46	42	41	41	42	39	42	46	48	50	49	49	49	52	55	54	54	53	54	51	54	54	56	58	58	56	54	54	--	50
May.....	56	56	56	64	64	64	65	66	62	64	65	63	59	61	63	66	70	72	71	72	72	72	71	71	70	72	69	69	68	67	66	66
June	65	64	65	65	65	67	69	71	73	71	69	68	71	74	72	72	68	70	74	74	74	74	73	72	74	76	76	76	78	77	--	71
July.....	78	78	78	77	77	78	80	79	82	82	80	78	76	78	78	79	80	80	81	80	82	82	82	83	83	81	80	80	81	79	79	80
August.....	78	80	79	79	79	79	76	76	75	74	73	70	69	68	66	67	67	67	73	74	72	70	69	69	68	67	70	69	69	68	70	72
September.....	70	73	75	74	73	70	70	73	75	76	69	69	67	66	66	66	65	65	65	64	64	65	63	61	62	63	59	59	69	69	--	68

NISHNABOTNA RIVER BASIN

6-8080. MULE CREEK NEAR MALVERN, IOWA

LOCATION.--At gaging station on left bank at county highway bridge, 1.8 miles upstream from mouth and 4.4 miles south of Malvern, Mills County.
DRAINAGE AREA.--10.6 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1958 to September 1964.
Sediment records: July 1954 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 86°F July 20; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 9,500 ppm May 26; minimum daily, 2 ppm Jan. 1, 7.
Sediment loads: Maximum daily, 9,100 tons May 26; minimum daily, less than 0.05 ton on many days during October to March, August and September.
EXTREMES, 1954-64.--Water temperatures (1958-64): Maximum, 88°F Aug. 3, 1959, July 23, 1963; minimum, freezing point on many days each year.
Sediment concentrations: Maximum daily, 14,000 ppm June 17, 1957; minimum daily, no flow Jan. 20-25, 1956.
Sediment loads: Maximum daily, 22,000 tons Aug. 21, 1954; minimum daily, 0 tons Jan. 20-25, 1956.
REMARKS.--Flow affected by ice Dec. 1 to Jan. 18, Jan. 24-30, Feb. 22-29, Mar. 8-10, 26-29.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Aver-age
	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	
October	66	68	64	64	62	60	60	64	64	64	66	60	66	62	68	60	66	68	68	62	66	68	68	64	64	62	58	50	48	54	48	62
November	46	46	42	--	56	51	50	54	52	44	46	40	40	40	48	48	46	38	44	48	52	46	34	36	40	42	40	40	38	38	--	44
December	36	32	32	40	38	38	38	--	32	32	32	32	33	34	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	34	32	33
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	32	32	32	32	32	32	32	32	32	32	32	32	36	32
February	36	32	32	36	32	32	32	32	32	32	32	32	34	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March	40	40	48	38	42	38	38	32	32	32	--	48	52	--	50	44	44	44	44	38	32	32	46	36	32	32	40	36	40	44	54	40
April	50	64	46	38	42	54	43	42	56	58	56	52	50	56	--	66	54	60	52	54	54	50	58	60	56	59	56	54	58	50	--	53
May	54	54	60	72	70	75	74	66	70	74	64	56	50	70	74	64	68	78	66	76	78	72	76	60	78	70	64	62	60	64	56	67
June	62	--	68	--	66	64	64	78	72	68	64	68	70	70	68	68	70	72	68	72	70	70	68	64	66	68	66	68	80	80	--	69
July	70	76	74	80	72	80	72	72	81	78	72	72	66	82	72	82	--	80	78	86	74	82	80	84	78	70	74	76	72	--	--	76
August	--	--	--	--	--	--	73	76	64	76	68	70	69	60	64	62	62	66	68	68	76	64	62	62	68	72	70	64	68	64	68	67
September	68	72	78	66	66	68	80	76	82	70	64	62	66	66	64	66	64	64	72	62	64	68	60	62	66	62	52	48	58	60	--	66

NISHNABOTNA RIVER BASIN--Continued

6-8080. MULE CREEK NEAR MALVERN, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	2.2	10	0.1	1.6	7	T	1.2	18	0.1
2	2.0	12	.1	1.6	13	0.1	1.1	23	.1
3	2.0	8	T	1.6	17	.1	1.0	11	T
4	2.0	18	.1	1.6	13	.1	1.0	13	T
5	2.0	8	T	1.8	11	.1	1.1	13	T
6	1.8	6	T	1.6	18	.1	1.1	15	T
7	1.8	8	T	1.5	9	T	1.1	12	T
8	1.6	7	T	1.5	11	T	1.1	--	.1
9	1.5	9	T	1.5	48	.2	1.1	70	.2
10	1.5	9	T	1.5	82	.3	1.1	95	.3
11	1.5	5	T	1.5	44	.2	1.0	11	T
12	1.5	6	T	1.5	33	.1	1.0	71	.2
13	1.5	7	T	1.3	19	.1	.9	200	.5
14	1.5	7	T	1.2	11	T	.9	60	.1
15	1.5	6	T	1.5	10	T	.8	320	.7
16	1.5	6	T	1.5	16	.1	.8	600	1
17	1.6	9	T	1.6	12	.1	.8	1600	3
18	1.6	10	T	1.5	11	T	.7	2000	4
19	1.6	19	.1	1.5	13	.1	.7	1400	3
20	1.6	10	T	2.2	14	.1	.7	160	.3
21	2.7	15	.1	2.2	17	.1	.7	14	T
22	2.2	16	.1	2.7	20	.1	.7	18	T
23	2.0	16	.1	1.6	13	.1	.7	8	T
24	2.0	13	.1	1.6	13	.1	.7	9	T
25	2.0	9	T	1.6	18	.1	.7	60	.1
26	2.0	6	T	1.6	19	.1	.8	120	.3
27	1.8	10	T	1.5	19	.1	.8	11	T
28	1.6	14	.1	1.8	25	.1	.8	5	T
29	1.6	9	T	1.3	23	.1	.8	5	T
30	1.6	11	T	1.3	23	.1	.8	5	T
31	1.6	10	T	--	--	--	.8	3	T
Total	54.9	--	1.7	48.3	--	3.0	27.5	--	14.4

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	.8	2	T	1.5	9	T	1.1	17	0.1
2	.8	9	T	1.5	18	0.1	1.2	12	T
3	.8	6	T	1.5	17	.1	1.5	18	.1
4	.8	3	T	1.2	12	T	1.5	14	.1
5	.8	9	T	1.3	9	T	1.2	18	.1
6	.8	4	T	1.3	9	T	1.1	15	T
7	.8	2	T	1.3	11	T	1.3	16	.1
8	.8	3	T	1.3	6	T	1.1	22	.1
9	.8	4	T	1.3	10	T	1.2	26	.1
10	.8	6	T	1.5	5	T	1.2	10	T
11	.7	3	T	1.2	9	T	1.6	21	.1
12	.8	6	T	1.3	9	T	1.6	38	.2
13	.9	4	T	1.2	23	.1	1.6	56	.2
14	1.0	34	0.1	1.1	31	.1	1.5	38	.2
15	1.1	33	.1	1.2	13	T	1.3	25	.1
16	1.2	26	.1	1.1	24	.1	1.5	41	.2
17	1.3	45	.2	1.2	--	.1	1.2	32	.1
18	1.4	--	.2	1.3	16	.1	1.2	33	.1
19	1.5	30	.1	1.3	13	T	2.4	180	1
20	1.5	27	.1	1.1	15	T	4.8	220	3
21	1.8	25	.1	.9	14	T	2.9	81	.6
22	2.0	36	.2	.9	10	T	1.8	31	.2
23	1.8	28	.1	1.0	13	T	2.4	48	.3
24	1.5	30	.1	1.0	14	T	2.0	19	.1
25	1.3	31	.1	1.0	10	T	1.6	44	.2
26	1.2	28	.1	1.0	27	.1	1.7	55	.3
27	1.1	23	.1	1.0	7	T	1.7	55	.3
28	1.1	45	.1	1.0	8	T	1.7	140	.6
29	1.1	22	.1	1.0	45	.1	1.5	42	.2
30	1.3	16	.1	--	--	--	1.3	43	.2
31	1.6	9	T	--	--	--	1.5	19	.1
Total	35.2	--	2.2	34.5	--	1.6	51.2	--	9.1

T Less than 0.05 ton.

NISHNABOTNA RIVER BASIN--Continued

6-8080. MULE CREEK NEAR MALVERN, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	1.6	51	0.2	3.5	67	0.6	2.7	77	0.6
2	2.0	55	.3	3.5	53	.5	2.7	94	.7
3	1.8	26	.1	3.5	36	.4	1.6	100	.4
4	1.5	14	.1	3.2	30	.3	1.6	55	.2
5	2.0	34	.2	3.5	92	.9	1.6	48	.2
6	1.8	15	.1	5.8	300	5	1.5	21	.1
7	2.0	13	.1	3.5	180	2	4.1	110	1
8	1.5	30	.1	5.1	360	5	4.1	92	1
9	1.3	47	.2	2.2	51	.3	4.1	38	.4
10	1.3	28	.1	1.8	22	.1	38	1000 B	100
11	2.2	41	.2	1.8	17	.1	3	3800	310
12	12	5300 S	560	2.9	82	.6	22	3000	180
13	8.6	1500	35	2.2	26	.2	11	350	10
14	2.7	80	.6	1.8	55	.3	164	7300 S	4800
15	2.0	110	.6	1.8	40	.2	35	1500	140
16	2.0	61	.3	2.7	130	.9	7.8	1000	21
17	2.0	71	.4	1.8	57	.3	15	3300	130
18	1.5	320	1	1.6	24	.1	5.0	700	9
19	2.0	400	2	1.5	56	.2	4.8	1200	16
20	8.2	2200	49	1.5	--	.2	64	7500	1300
21	6.9	640	12	1.5	43	.2	6.2	1900	32
22	2.9	75	.6	1.6	96	.4	14	1700	64
23	2.9	62	.5	2.2	140	.8	6.9	690	13
24	2.4	57	.4	3.2	210	2	6.1	340	6
25	2.4	56	.4	1.5	720	3	5.6	240	4
26	9.4	2000 S	73	172	9500 S	9100	5.4	210	3
27	12	880	29	8.6	1100	26	5.4	160	2
28	6.1	180	3	5.1	260	4	5.4	120	2
29	4.5	77	.9	3.8	200	2	5.4	91	1
30	3.8	78	.8	4.1	140	2	5.6	68	1
31	--	--	--	3.2	110	1	--	--	--
Total	113.3	--	771.2	262.0	--	9159.6	486.6	--	7148.6

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	5.8	73	1	1.5	11	T	2.1	12	0.1
2	6.0	57	.9	1.5	18	0.1	1.8	14	.1
3	7.2	150	3	1.5	17	.1	1.5	10	T
4	6.1	81	1	1.5	30	.1	1.3	10	T
5	5.6	95	1	1.5	17	.1	6.0	--	5
6	4.9	59	.8	1.5	25	.1	2	--	24
7	4.4	54	.6	1.5	21	.1	3.5	--	.7
8	3.9	18	.2	1.5	14	.1	3.0	17	.1
9	3.5	25	.2	1.5	20	.1	2.6	23	.2
10	3.5	12	.1	2.0	21	.1	2.3	17	.1
11	25	6800	460	1.6	13	.1	2.1	8	T
12	8.4	1000	23	1.4	12	T	2.4	8	.1
13	2.5	250	2	1.4	11	T	2.1	15	.1
14	2.1	100	.6	1.7	20	.1	2.0	7	T
15	2.0	95	.5	1.7	13	.1	2.8	4	T
16	1.9	58	.3	1.7	18	.1	3.3	8	.1
17	1.8	--	.3	1.7	17	.1	4.0	21	.2
18	1.8	51	.2	2.0	15	.1	2.6	18	.1
19	1.8	54	.3	1.8	14	.1	2.2	5	T
20	1.9	49	.3	1.8	18	.1	3.5	14	.1
21	1.8	35	.2	2.7	55	.4	3.0	7	.1
22	1.7	38	.2	2.2	26	.2	7.0	--	13
23	1.6	93	.4	2.1	15	.1	4.5	--	1
24	1.6	75	.3	2.1	22	.1	3.0	9	.1
25	1.6	56	.2	2.2	23	.1	2.0	9	T
26	1.6	46	.2	2.2	11	.1	1.9	9	T
27	1.6	29	.1	2.2	42	.2	1.9	32	.2
28	1.7	19	.1	4.2	110	1	1.9	8	T
29	1.6	18	.1	3.1	42	.4	1.7	9	T
30	1.6	27	.1	2.7	45	.3	1.8	11	.1
31	1.6	20	.1	2.4	14	.1	--	--	--
Total	118.1	--	498.3	6.4	--	4.8	99.8	--	45.9

Total discharge for year (cfs-days)..... 1391.8
Total load for year (tons)..... 17660.4

S Computed by subdividing day.
T Less than 0.05 ton.
B Computed from estimated-concentration graph.

NISHNABOTNA RIVER BASIN--Continued

6-8080. MULE CREEK NEAR MALVERN, IOWA--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
June 14, 1964.....	1225	70		666	11000	20000	34	36	40	57	82	99	100					VPWC
June 14.....	1225	70		666	11000	20000	15	22	34	47		99	100					VPN
June 20.....	--	--		D 64	22000	--	24	31	38	50		99	100					VPWC
July 11.....	0900	72		D 25	14000	--	30	35	--	51		100	--					VPWC

D Daily mean discharge.

NISHNABOTNA RIVER BASIN--Continued

6-8090. DAVIDS CREEK NEAR HAMLIN, IOWA

LOCATION.--At gaging station on left bank at bridge on State Highway 64, 5.2 miles east of Hamlin, Audubon County, and 8 miles upstream from mouth.
DRAINAGE AREA.--26.0 square miles.
RECORDS AVAILABLE.--Water temperatures: July 1952 to September 1953.
Sediment records: July 1952 to September 1964.
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, 13,000 ppm June 22, 23; minimum daily, 12 ppm Oct. 13, Aug. 23.
Sediment loads: Maximum daily, 46,000 tons June 22; minimum daily, less than 0.05 ton on several days in October and December.
EXTREMES, 1952-64.--Sediment concentrations: Maximum daily, 13,000 ppm June 22, 23, 1964; minimum daily, no flow on many days in 1953-56.
Sediment loads: Maximum daily, 99,000 tons July 2, 1958; minimum daily, 0 tons on many days in 1953-56.
REMARKS.--Flow affected by ice Nov. 29 to Mar. 14, Mar. 19 to Apr. 1.

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0.5	72	0.1	0.4	99	0.1	0.8	--	0.1
2	.5	69	.1	.4	72	.1	1.0	450 A	1
3	.5	71	.1	.7	64	.1	1.0	--	.5
4	.4	87	.1	.8	100	.2	1.0	120	.3
5	.4	83	.1	.7	93	.2	.9	--	.2
6	.4	27	T	.6	48	.1	1.0	81	.2
7	.4	30	T	.6	51	.1	.9	64	.2
8	.4	--	T	.6	60	.1	.5	--	.1
9	.5	31	T	.7	47	.1	.4	--	T
10	.5	53	.1	.6	49	.1	.4	35	T
11	.4	20	T	.6	62	.1	.6	--	.1
12	.4	18	T	.6	77	.1	.7	--	.1
13	.4	12	T	.6	38	.1	.8	--	.1
14	.4	22	T	.7	47	.1	.8	--	.2
15	.4	22	T	.7	37	.1	.8	150	.3
16	.5	30	T	.7	38	.1	.8	--	.2
17	.9	200	.5	.7	38	.1	.8	--	.2
18	1.8	380	2	.7	50	.1	.8	--	.2
19	.6	120	.2	.7	46	.1	.8	--	.2
20	.6	78	.1	1.1	46	.1	.8	--	.2
21	1.1	110	.3	1.1	--	.2	.8	90	.2
22	.7	97	.2	5.9	1200	19	.8	--	.1
23	.6	100	.2	1.3	260	.9	.7	170	.3
24	.5	93	.1	1.2	120	.4	.8	--	.3
25	.5	--	.1	1.1	100	.3	.8	--	.2
26	.5	73	.1	1.0	70	.2	.8	70	.2
27	.4	89	.1	.9	72	.2	.9	--	.2
28	.4	67	.1	.8	43	.1	.9	100	.2
29	.4	71	.1	.8	43	.1	1.0	--	.3
30	.4	81	.1	.9	53	.1	1.1	--	.3
31	.4	99	.1	--	--	--	1.2	100	.3
Total	16.8	--	5.2	28.2	--	23.7	25.4	--	7.1

T Less than 0.05 ton.
A Computed from partly estimated-concentration graph.

NISHNABOTNA RIVER BASIN--Continued

6-8090. DAVIDS CREEK NEAR HAMLIN, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	1.3	--	0.4	0.9	140	0.3	1.3	--	0.1
2	1.4	--	.4	.9	--	.4	1.2	170	.6
3	1.5	89	.4	1.0	--	.4	1.0	150	.4
4	1.6	--	.5	1.0	180	.5	.9	160	.4
5	1.6	--	.6	1.0	--	.5	.8	--	.3
6	1.6	160	.7	1.1	--	.5	.8	170	.4
7	1.5	--	.6	1.1	--	.4	1.0	55	.1
8	1.4	--	.6	1.2	140	.5	1.6	--	.3
9	1.2	--	.5	1.2	--	.5	2.0	--	.4
10	1.0	160	.4	1.3	--	.5	1.5	73	.3
11	.9	120	.3	1.3	130	.5	1.4	190	.7
12	.8	--	.3	1.4	--	.5	1.7	270	1
13	.7	--	.2	1.4	160	.6	1.4	160	.6
14	.7	140	.3	1.5	190	.8	1.1	160	.5
15	.6	170	.3	1.5	180	.7	.9	--	.3
16	.6	110	.2	1.4	--	.5	1.0	120	.3
17	.6	--	.2	1.4	89	.3	.8	--	.2
18	.6	260	.4	1.4	110	.4	.9	52	.1
19	.6	--	.3	1.4	84	.3	1.0	--	.2
20	.6	140	.2	1.5	--	.5	1.2	100	.3
21	.6	120	.2	1.5	250	1	.9	100	.2
22	.7	--	.2	1.5	180	.7	1.1	100 B	.3
23	.8	--	.3	1.5	--	.9	1.4	330	1
24	.9	140	.3	1.4	78	.3	1.7	400 B	2
25	.8	91	.2	1.3	120	.4	2.2	150	.9
26	.8	--	.2	1.2	--	.3	3.0	--	.7
27	.7	--	.2	1.2	90	.3	4.5	80	1
28	.7	180	.3	1.3	71	.2	4.1	83	.9
29	.7	--	.3	1.3	76	.3	3.7	--	.9
30	.8	190	.4	--	--	--	3.2	100	.9
31	.8	130	.3	--	--	--	2.8	--	.8
Total	29.1	--	10.7	37.1	--	14.0	52.1	--	17.1

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	2.5	320	2	16	340	15	12	200	6
2	218	11000 S	13000	15	310	13	11	170	5
3	26	3600	250	13	330	12	9.9	150	4
4	14	950	36	13	1200	42	9.4	160	4
5	11	670	20	12	--	8	9.2	110	3
6	9.7	540	14	14	2500 S	110	8.7	110	3
7	8.7	420	10	48	3600 S	1500	8.7	200	5
8	7.6	580	12	27	5000 S	380	8.5	--	5
9	7.1	400	8	16	960	41	10	1600	43
10	6.6	340	6	14	320	12	8.0	270	6
11	6.6	300	5	13	--	14	11	1200	36
12	81	1100 B	240	14	510	19	20	3300 S	230
13	177	4300	2100	13	220	8	11	500	15
14	26	1500	110	12	200	6	34	3800 S	600
15	19	730	37	11	330	10	60	5100 S	1100
16	14	500	19	9.7	210	5	26	600	42
17	12	460	15	8.9	160	4	22	520	31
18	10	410	11	8.2	150	3	19	400	21
19	9.9	500	13	7.8	150	3	21	1100 S	250
20	29	7500 S	720	7.6	160	3	258	9700 S	14000
21	36	2000	190	7.1	93	2	36	700	68
22	13	560	20	7.1	110	2	736	13000 S	46000
23	12	380	12	8.8	350 S	20	155	13000 S	10000
24	10	310	8	22	3700 S	270	35	1400	130
25	9.4	260	7	25	690 S	250	26	300	21
26	51	5300 S	1500	75	4700 S	1300	23	260	16
27	41	2200 S	290	21	550	31	20	190	10
28	23	670	42	17	330	15	17	190	9
29	18	540	26	15	290	12	15	160	6
30	17	340	16	14	240	9	14	110	4
31	--	--	--	12	340	11	--	--	--
Total	948.6	--	18739	517.2	--	4130	1654.4	--	72673

S Computed by subdividing day.
B Computed from estimated-concentration graph.

NISHNABOTNA RIVER BASIN--Continued

6-8090. DAVIDS CREEK NEAR HAMLIN, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	14	140	5	7.6	260	5	4.3	100	1
2..	13	92	3	6.6	280	5	3.8	32	.3
3..	45	3100	S 800	6.3	240	4	14	230	S 15
4..	15	300	12	9.4	590	15	6.9	190	4
5..	17	800	37	6.6	180	3	4.9	94	1
6..	12	300	B 10	6.3	150	3	61	1200	S 290
7..	28	3000	S 450	6.0	170	3	9.2	270	7
8..	11	280	8	5.6	120	2	6.5	190	3
9..	10	390	11	6.0	73	1	5.3	82	1
10..	17	1800	S 130	6.0	120	2	5.5	120	2
11..	74	3100	S 1200	7.0	120	2	4.9	120	2
12..	22	400	24	5.6	32	.5	4.0	51	.6
13..	16	210	9	5.6	38	.6	4.0	77	.8
14..	12	160	5	5.8	65	1	3.8	87	.9
15..	10	160	4	5.4	49	.7	3.7	94	.9
16..	9.9	150	4	4.8	19	.2	3.6	99	1
17..	8.7	200	5	5.0	29	.4	5.3	100	1
18..	7.8	390	8	4.8	79	1	5.5	100	1
19..	7.4	170	3	4.2	50	.6	4.5	34	.4
20..	7.4	170	3	3.8	44	.5	4.0	70	.8
21..	6.9	330	6	5.6	49	.7	3.6	27	.3
22..	6.3	210	4	4.1	52	.6	27	1200	S 200
23..	6.3	220	4	4.4	12	.1	14	440	S 17
24..	5.6	--	4	6.5	190	S 6	7.1	150	3
25..	5.2	230	3	7.1	260	.5	5.8	120	2
26..	5.0	240	3	4.2	23	.3	5.1	120	2
27..	4.8	230	3	5.5	43	S 3	4.3	78	.9
28..	4.4	190	2	14	250	S 15	4.3	75	.9
29..	4.1	210	2	5.8	100	2	4.0	130	1
30..	4.4	190	2	6.6	140	2	3.7	140	1
31..	8.5	660	15	4.2	83	.7	--	--	--
Total	418.7	--	2779	186.4	--	81.6	244.0	--	561.8

Total discharge for year (cfs-days)..... 4158.0
Total load for year (tons)..... 99042.2

S Computed by subdividing day.
B Computed from estimated-concentration graph.

NISHNABOTNA RIVER BASIN--Continued

6-8090. DAVIDS CREEK NEAR HAMLIN, IOWA--Continued

Periodic determinations of suspended-sediment discharge and particle size, May 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
May 4, 1963.....	0600	50		252	12000	8200	--	41	--	63	86	93	96	99	100			SPWC
Apr. 2,.1964.....	1215	46		804	--	--	27	35	41	57	75	88	96	100	--			VPWC
Apr. 2.....	1515	41		846	12000	27000	42	50	--	71	--	92	95	99	100			VPWC
Apr. 3.....	1545	46		21	2000	110	36	49	--	78	--	99	99	100	--			VPWC
Apr. 8.....	1100	38		8.9	480	12	43	52	--	84	--	98	--	--	--			SPWC
Apr. 13.....	0945	41		98	4900	1300	--	39	46	64	--	98	99	100	--			VPWC
Apr. 20.....	1000	50		61	14000	2300	39	52	--	79	--	99	100	--	--			VPWC
May 26.....	0545	60		88	7300	1700	36	--	47	68	68	97	99	100	--			VPWC
May 26.....	0545	60		88	7300	1700	19	26	--	54	83	97	99	100	--			VPN
June 20.....	0730	64		480	--	--	55	67	78	88	--	98	98	100	--			VPWC
June 20.....	0730	64		480	--	--	30	47	67	79	93	98	96	100	--			VPN
June 22.....	0800	63		310	23000	19000	31	40	--	65	--	98	99	100	--			VPWC
July 7.....	0935	74		48	5600	730	65	78	--	91	--	100	--	--	--			VPWC
Sept. 22.....	1645	60		51	3800	520	45	50	59	72	93	100	--	--	--			VPWC
Sept. 22.....	1645	60		51	3800	520	9	--	29	55	86	100	--	--	--			VPN

NISHNABOTNA RIVER BASIN--Continued

6-8095. EAST NISHNABOTNA RIVER AT RED OAK, IOWA

LOCATION.--At bridge on county road at Red Oak, Montgomery County, 0.5 mile downstream from gaging station, and 0.4 mile upstream from Red Oak Creek.
DRAINAGE AREA.--894 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1962 to September 1964.
Sediment records: October 1962 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 90°F July 24, 28; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 47,000 ppm May 26; minimum daily, 4 ppm Jan. 18, 19.
Sediment loads: Maximum daily, 970,000 tons May 26; minimum daily, 0.4 tons Jan. 18, 19.
EXTREMES, 1962-64.--Water temperatures: Maximum, 94°F July 20, 1963; minimum, freezing point on many days each year.
Sediment concentrations: Maximum daily, 47,000 ppm May 26, 1964; minimum daily, 4 ppm Jan. 18, 19, 1964.
Sediment loads: Maximum daily, 970,000 tons May 26, 1964; minimum daily, 0.4 tons Jan. 18, 19, 1964.
REMARKS.--No appreciable inflow between sampling point and gaging station. Flow affected by ice Dec. 8 to Feb. 29, Mar. 25-27.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	68	78	70	74	78	82	74	76	70	80	74	74	74	74	76	72	74	76	76	70	72	72	70	70	72	70	62	56	56	64	60	71
November	62	46	42	50	60	52	60	62	60	56	60	40	44	48	48	48	48	50	50	46	48	41	41	40	42	36	48	40	41	42	--	48
December	36	36	38	38	38	38	36	34	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	32	33
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February	34	34	34	34	34	34	34	34	34	34	34	36	36	40	34	38	40	34	40	34	34	36	34	38	32	32	34	42	44	--	--	36
March	50	54	52	38	46	36	34	32	32	32	44	54	56	50	42	52	52	48	42	34	36	38	50	38	34	34	38	36	36	36	44	42
April	60	52	48	48	42	52	44	50	56	60	56	60	48	50	62	70	58	60	58	45	56	52	64	60	68	66	56	56	52	54	--	55
May	56	60	68	74	72	72	74	68	64	70	64	60	66	72	76	80	76	80	78	80	80	78	74	78	80	66	66	68	67	66	68	71
June	66	62	72	68	72	74	78	--	76	66	66	80	78	72	70	76	74	78	--	70	64	76	70	72	78	82	82	80	76	82	--	74
July	82	86	82	80	78	74	84	84	78	80	70	70	76	80	80	80	84	89	86	88	88	84	84	90	82	86	87	90	86	80	80	82
August	83	86	86	88	86	75	88	82	74	82	70	68	58	64	68	77	68	78	70	72	70	64	70	68	74	68	76	76	80	--	75	75
September	82	82	84	76	70	68	74	80	82	70	64	70	68	70	60	68	70	72	74	66	66	66	64	64	60	60	64	60	62	66	--	69

NISHNABOTNA RIVER BASIN--Continued

6-8095. EAST NISHNABOTNA RIVER AT RED OAK, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	48	25	3	44	12	1	50	19	3
2..	45	19	2	44	31	4	48	26	3
3..	44	13	2	45	14	2	45	49	6
4..	44	16	2	45	11	1	45	8	1
5..	42	14	2	47	12	2	50	9	1
6..	41	9	1	47	12	2	50	19	3
7..	39	19	2	45	15	2	50	--	4
8..	41	18	2	45	12	1	45	40	6
9..	41	15	2	44	12	1	35	45	4
10..	41	--	2	42	11	1	25	42	3
11..	41	--	2	42	11	1	22	23	1
12..	42	21	2	42	16	2	20	31	2
13..	41	15	2	41	14	2	19	30	2
14..	39	19	2	41	18	2	18	56	3
15..	38	14	1	42	11	1	18	--	3
16..	38	15	2	45	14	2	18	--	2
17..	41	21	2	44	13	2	18	--	2
18..	44	42	5	44	12	1	18	--	1
19..	85	42	10	45	18	2	18	20	1
20..	79	45	10	51	14	2	18	34	2
21..	60	36	6	53	14	2	16	21	1
22..	58	29	5	68	36	7	18	16	.8
23..	55	35	5	66	40	7	18	43	2
24..	53	20	3	81	45	10	21	70	4
25..	50	21	3	75	18	4	24	27	2
26..	48	8	1	63	23	4	26	58	4
27..	45	18	2	58	18	3	26	27	2
28..	44	13	2	56	22	3	28	10	.8
29..	44	15	2	53	20	3	25	10	.7
30..	44	12	1	51	15	2	22	12	.7
31..	44	13	2	--	--	--	22	14	.8
Total	1459	--	90	1509	--	79	880	--	71.8
	JANUARY			FEBRUARY			MARCH		
1..	25	15	1	65	10	2	66	44	8
2..	28	8	.6	70	30	6	77	42	9
3..	30	8	.6	74	27	5	87	39	9
4..	32	14	1	76	27	6	99	200	53
5..	34	16	1	78	38	8	95	81	21
6..	36	26	3	80	47	10	83	39	9
7..	38	74	8	80	26	6	71	30	6
8..	38	41	4	80	22	5	65	77	14
9..	38	12	1	80	56	12	65	62	11
10..	35	34	3	80	35	8	56	51	8
11..	32	24	2	75	34	7	61	27	4
12..	30	38	3	70	29	5	65	61	11
13..	29	35	3	66	25	4	56	34	5
14..	28	45	3	64	20	3	65	64	11
15..	28	24	2	70	25	5	71	57	11
16..	28	22	2	75	67	14	70	44	8
17..	30	8	.6	70	28	5	60	16	3
18..	34	4	.4	68	22	4	53	19	3
19..	38	4	.4	66	25	4	61	36	6
20..	42	6	.7	64	35	6	68	39	7
21..	46	6	.7	55	49	7	68	24	4
22..	50	27	4	50	51	7	65	25	4
23..	55	8	1	45	51	6	65	26	5
24..	55	12	2	40	52	6	63	29	5
25..	50	6	.8	35	31	3	70	18	3
26..	45	17	2	35	13	1	78	61	17
27..	45	21	2	40	27	3	76	150	31
28..	45	25	3	50	33	4	73	67	13
29..	50	17	2	60	69	11	70	45	9
30..	55	14	2	--	--	--	70	70	13
31..	60	34	6	--	--	--	73	71	14
Total	1209	--	65.8	1861	--	173	2165	--	335

NISHNABOTNA RIVER BASIN--Continued

6-8095. EAST NISHNABOTNA RIVER AT RED OAK, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL				MAY				JUNE			
	Mean discharge (cfs)	Suspended sediment			Mean discharge (cfs)	Suspended sediment			Mean discharge (cfs)	Suspended sediment		
		Mean concentration (ppm)		Tons per day		Mean concentration (ppm)		Tons per day		Mean concentration (ppm)		Tons per day
1	79	48		10	394	920		980	418	550		620
2	3360	18000	S	400000	394	890		950	381	530		550
3	2040	22000	S	150000	340	730		670	365	450		440
4	501	6800		9200	324	750		660	349	800		750
5	288	2100		1600	391	2400		2500	482	980	A	1300
6	254	700		480	637	7600	S	16000	324	330		290
7	223	600		360	751	11000	S	25000	309	370		310
8	178	400		190	536	5800	S	9800	324	1200	A	1000
9	153	300		120	1020	20000		55000	267	350		250
10	150	290		120	540	6600		9600	327	400		350
11	153	500		210	375	1800		1800	262	850		600
12	153	1300		540	356	1200		1200	340	1600		1500
13	5510	16000	S	320000	388	1300		1400	482	4800		6200
14	1340	11000		40000	372	1100		1100	1550	11000	S	59000
15	520	3700		5200	315	730		620	2610	13000		92000
16	398	1500		1600	297	590		470	1450	8000		31000
17	353	920		880	289	540		420	715	2800		5400
18	322	650		570	267	440		320	602	1500		2400
19	340	520		480	256	480		330	634	1500	B	2600
20	395	1700		1800	448	6500	S	8400	8540	21200	S	520000
21	763	7000		14000	294	1300		1000	3190	9000	S	86000
22	463	4000		5000	280	500		380	2780	6260	S	79000
23	331	1000		890	275	390		290	1x460	21000	S	650000
24	300	670		540	481	8300	S	19000	2020	7400	S	44000
25	277	540		400	584	13000	S	22000	1090	2700		7900
26	426	5100	S	11000	6120	47000	S	970000	815	1500		3300
27	1790	19000		92000	1460	8200	S	36000	692	1000		1900
28	865	8000		19000	765	2600		5400	602	820		1300
29	540	2400		3500	625	960		1600	520	700		980
30	445	1300		1600	520	920		1300	445	570		680
31	--	--		--	482	630		820	--	--		--
Total	22910	--		108129	20576	--		1195010	43285	--		1601820

Day	JULY				AUGUST				SEPTEMBER			
	Mean discharge (cfs)	Suspended sediment			Mean discharge (cfs)	Suspended sediment			Mean discharge (cfs)	Suspended sediment		
		Mean concentration (ppm)		Tons per day		Mean concentration (ppm)		Tons per day		Mean concentration (ppm)		Tons per day
1	428	540		620	327	290		260	272	900		660
2	428	700		810	312	330		280	264	660		470
3	2530	14000	S	130000	272	360		260	238	550		350
4	1480	8100		32000	294	220		170	844	5400	S	16000
5	1200	6400	A	21000	580	3700		5800	445	7600		9100
6	1480	3500	A	14000	315	1300		1100	2370	11000		70000
7	1180	4000	S	20000	264	500		360	1310	4200	S	16000
8	1840	9000	S	50000	256	370		260	482	1400		1800
9	765	3200		6600	241	280		180	364	650		670
10	1630	9800	S	60000	238	260		170	340	400		370
11	6360	20000		340000	238	120		77	324	370		320
12	4080	10000	S	120000	289	660		510	315	370		310
13	1630	3700		16000	231	680		420	292	240		190
14	1180	1700		5400	224	280		170	280	980		740
15	975	1200		3200	228	290		180	275	920		680
16	840	860		2000	216	210		120	267	610		440
17	740	820		1600	210	190		110	267	550		400
18	670	660		1200	207	190		110	286	580		430
19	602	630		1000	205	260		140	324	680		590
20	560	560		850	207	220		120	275	300		220
21	540	530		770	356	2100		2000	262	300		210
22	482	440		570	278	1500		1100	328	2800	A	2500
23	464	430		540	200	550		300	648	2800	S	5500
24	428	400		460	194	400		210	564	2500		3800
25	411	370		410	486	2900	S	6000	309	1300		1100
26	388	360		380	394	3800		4000	297	440		330
27	375	310		310	241	1400		910	309	320		270
28	362	290		280	259	1600		1100	259	220		150
29	340	270		250	445	3300		4000	231	240		150
30	318	260		220	1140	6000	S	23000	224	230		140
31	309	260		220	493	3800	S	5600	--	--		--
Total	35015	--		830690	9840	--		59017	13285	--		135910

Total discharge for year (cfs-days)..... 153994
Total load for year (tons)..... 3931190.6

S Computed by subdividing day.
A Computed from partly estimated-concentration graph.
B Computed from estimated-concentration graph.

NISHNABOTNA RIVER BASIN--Continued

6-8095. EAST NISHNABOTNA RIVER AT RED OAK, IOWA--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Apr. 2, 1964.....	1640	52		6980	32000	630000	28	38	--	63	--	93	96	99	100			VPWC
Apr. 3.....	1220	43		1270	18000	62000	40	53	61	76	93	98	99	100	--			VPWC
Apr. 3.....	1220	43		1270	18000	62000	16	25	36	53	90	98	99	100	--			VPN
Apr. 13.....	1200	48		7480	32000	670000	40	41	--	69	--	97	98	99	100			VPWC
Apr. 13.....	1800	46		9500	18000	460000	38	45	--	67	--	94	96	99	100			VPWC
Apr. 27.....	1700	56		2240	17000	100000	32	41	--	62	--	98	98	100	--			VPWC
May 26.....	1000	66		11300	35000	1100000	39	44	54	69	89	99	100	--	--			VPWC
May 26.....	1000	66		11300	35000	1100000	17	27	36	56	85	99	100	--	--			VPN
June 14.....	1500	72		2780	16000	120000	36	40	47	60	86	96	98	99	100			VPWC
June 14.....	1500	72		2780	16000	120000	--	18	29	45	81	96	98	99	100			VPN
June 15.....	1000	70		3260	11000	97000	37	42	--	60	--	95	97	99	100			VPWC
June 20.....	0145	70		2400	15000	97000	39	45	--	69	--	99	100	--	--			VPWC
June 20.....	1200	68		11900	27000	870000	39	49	50	62	84	96	97	99	100			VPWC
June 20.....	1200	68		11900	27000	870000	17	25	38	51	81	96	97	99	100			VPN
June 22.....	2000	73		--	9800	--	36	44	--	64	--	99	100	--	--			VPWC
June 23.....	1700	74		8500	15000	340000	36	44	51	62	--	96	98	100	--			VPWC
July 3.....	1600	82		4800	21000	270000	32	38	--	61	--	97	98	100	--			VPWC
July 11.....	0900	70		6400	17000	290000	38	43	50	63	86	97	98	100	--			VPWC
Aug. 30.....	1500	--		1770	7900	38000	33	41	51	67	--	96	97	100	--			VPWC
Sept. 6.....	1300	68		3180	10000	86000	32	37	43	55	81	92	95	99	100			VPWC
Sept. 6.....	1300	68		3180	10000	86000	10	16	25	44	74	92	95	99	100			VPN
Sept. 23.....	1830	64		1090	4600	14000	33	37	--	54	--	92	96	99	100			VPWC

KANSAS RIVER BASIN

6-8340. FRENCHMAN CREEK AT PALISADE, NEBR.

LOCATION.--At gaging station, on right bank at downstream side of bridge on U.S. Highway 6, 0.4 mile upstream from Chicago, Burlington and Quincy Railroad bridge, 1 mile west of Palisade, Hayes County, and 2 miles upstream from Stinking Water Creek.
DRAINAGE AREA.--1,500 square miles, approximately, of which about 980 square miles contributes directly to surface runoff.
RECORDS AVAILABLE.--Water temperatures: February to September 1964.
Sediment records: February to September 1964.
EXTREMES, February to September 1964.--Water temperatures: Maximum, 86°F May 22, 23, Aug. 1, 4; minimum, freezing point on several days during February and March.
Sediment concentrations: Maximum daily, 9,300 ppm June 22; minimum daily, 19 ppm Mar. 7, 15.
Sediment loads: Maximum daily, 15,000 tons June 22; minimum daily, 2 tons on several days during February and March.
REMARKS.--Flow affected by ice Feb. 26-28, Mar. 20, 21, 25-27.

Temperature (°F) of water, February to September 1964

Month	Day																													Average
	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	
February	38	33	33	39	42	32	32	35	36	39	36	40	34	34	33	35	34	36	35	32	34	34	32	33	32	42	34	36	34	--	--	35
March	42	44	36	38	33	36	32	32	41	40	40	41	46	42	36	46	54	42	46	37	37	34	39	32	34	36	43	39	39	42	49	40
April	56	51	44	41	39	46	42	41	52	55	59	48	49	54	54	62	49	54	50	51	54	64	54	58	64	62	44	49	56	67	--	52
May	53	64	62	59	62	64	53	64	--	64	65	60	59	65	77	72	74	78	74	74	83	86	86	76	73	66	61	59	58	57	54	67
June	68	70	68	64	63	72	82	74	68	68	73	73	69	73	--	80	75	--	--	--	--	--	--	--	--	--	78	72	76	78	--	--
July	79	78	76	74	78	79	78	76	78	81	76	74	79	78	--	79	78	76	72	76	82	84	84	76	76	81	81	77	81	71	84	78
August	86	82	81	86	79	79	78	79	77	79	75	77	68	67	72	71	73	72	73	69	68	69	67	65	66	68	66	65	69	67	69	73
September	72	74	72	69	66	68	71	72	74	69	64	64	67	63	62	60	60	76	67	64	62	72	59	70	61	64	58	59	62	62	--	66

KANSAS RIVER BASIN--Continued

6-8340. FRENCHMAN CREEK AT PALISADE, NEBR.--Continued

Suspended sediment, February to September 1964

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1				42	63	7	41	24	3
2				41	42	5	41	34	4
3				41	27	3	42	33	4
4				42	30	3	42	25	3
5				42	40	4	42	26	3
6				40	50	5	42	24	3
7				39	58	6	42	19	2
8				42	59	7	42	20	2
9				41	63	7	42	22	2
10				41	66	7	43	32	4
11				40	52	6	44	43	5
12				41	36	4	43	42	5
13				41	25	3	42	22	2
14				41	25	3	42	20	2
15				42	40	4	42	19	2
16				42	34	4	42	20	2
17				42	25	3	41	22	2
18				41	29	3	42	24	3
19				41	26	3	48	140	18
20				42	21	2	38	200 A	20
21				41	22	2	48	190 A	25
22				42	23	3	44	160 A	19
23				40	25	3	44	78	9
24				42	36	4	41	52	6
25				41	62	7	39	83	9
26				35	36	3	40	86	9
27				40	36	4	41	63	7
28				40	25	3	41	57	6
29				41	23	2	41	52	6
30				--	--	--	40	47	5
31				--	--	--	40	41	4
Total				1186	--	120	1302	--	196

	APRIL			MAY			JUNE		
1	40	54	6	54	88	13	55	120	18
2	41	100	11	52	84	12	49	110	14
3	44	150	18	51	83	11	46	98	12
4	46	210	26	49	110	14	41	88	10
5	46	150	19	47	80	10	38	79	8
6	46	110	14	44	47	6	38	73	7
7	44	100	12	44	68	8	37	67	7
8	44	67	8	43	85	10	35	63	6
9	45	63	8	43	91	10	35	60	6
10	45	88	11	43	88	10	34	57	5
11	45	110	13	42	110	12	46	140	17
12	46	120 A	15	40	81	9	56	210	32
13	46	120 A	15	40	68	7	88	350	83
14	46	120 A	15	39	78	8	146	1100 S	670
15	45	120 A	15	39	76	8	115	2000	620
16	45	100	12	39	65	7	91	640	160
17	44	77	9	37	72	7	90	380	92
18	44	64	8	37	74	7	81	320	70
19	45	120	14	37	65	6	78	280	59
20	58	530 S	94	36	63	6	70	250	47
21	45	370	45	36	63	6	73	340	67
22	46	190	24	46	120	15	544	9300 S	15000
23	43	140	16	48	210	27	150	3900	1600
24	43	110	13	49	170	22	84	600	140
25	49	120	16	68	180	33	68	440	81
26	57	200	31	82	280	62	57	310	48
27	67	330	60	98	580	150	52	240 A	34
28	66	360	64	94	310	79	47	220 A	28
29	67	150	27	80	240	52	46	320 A	40
30	58	96	15	75	200	40	62	1900	320
31	--	--	--	64	150	26	--	--	--
Total	1446	--	654	1596	--	693	2452	--	19301

S Computed by subdividing day.
A Computed from partly estimated concentration graph.

KANSAS RIVER BASIN--Continued

6-8340. FRENCHMAN CREEK AT PALISADE, NEBR.--Continued

Suspended sediment, February to September 1964--Continued

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	92	1200	300	331	1500	1300	216	690	400
2..	110	1000 A	300	333	1500	1300	230	750	460
3..	144	1100	430	351	1500	1400	240	890	580
4..	163	1200	530	375	2100	2100	232	850	530
5..	184	1500 A	740	369	1800	1800	237	720	460
6..	216	1700	990	364	1600	1600	237	600	380
7..	248	2000	1300	362	1500	1500	226	590	360
8..	285	2800	2200	344	1500	1400	216	660	380
9..	317	2900	2500	337	1500	1400	214	720	420
10..	319	2200	1900	333	1600	1400	202	720	390
11..	326	2600	2300	328	1800	1600	188	680	340
12..	301	2500	2000	319	2000	1700	174	630	300
13..	276	2000	1500	319	1900	1600	169	530	240
14..	259	1700	1200	324	1500	1300	100	320	86
15..	230	1600	990	322	930	810	74	230	46
16..	213	1500	860	319	780	670	68	210	38
17..	222	1400	840	324	790	690	60	180	29
18..	221	1400	840	331	1600	1400	56	160	24
19..	243	1700 A	1100	315	2200	1900	53	140	20
20..	288	2200 A	1700	319	--	E 2000	50	130	18
21..	299	1800 A	1400	259	1600	1100	49	120	16
22..	312	1700	1400	207	1500	840	48	110	14
23..	326	1600	1400	190	1400	720	46	100	12
24..	328	1600	1400	186	1100	550	43	96	11
25..	326	1600	1400	181	880	430	43	95	11
26..	328	1700	1500	193	870	450	41	95	10
27..	337	1800	1600	198	980	520	39	94	10
28..	348	1900	1800	211	980	560	39	92	10
29..	355	2000	1900	211	890	510	39	82	9
30..	342	1900	1800	213	800	460	38	59	6
31..	333	1600	1400	213	740	420	--	--	--
Total	8291	--	41520	8981	--	35430	3667	--	5610

Total discharge for period Feb. 1 to Sept. 30 (cfs-days)..... 28921
Total load for period Feb. 1 to Sept. 30 (tons)..... 103524

E Estimated.
A Computed from partly estimated concentration graph.

6-8340. FRENCHMAN CREEK AT PALISADE, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 28, 1963	1335	53		27	150	11	--	--	--	--	--	94	98	100	--	--		V
Nov. 20	1125	38		37	70	7.0	--	--	--	--	--	46	73	97	100	--		V
Jan. 22, 1964	1750	32		D 48	222	29	--	--	--	--	--	68	88	100	--	--		V
Feb. 10	1300	40		41	66	7.3	--	--	--	--	--	66	88	100	--	--		V
Feb. 25	1220	33		41	69	7.6	--	--	--	--	--	65	85	100	--	--		V
Mar. 11	1655	49		44	44	5.2	--	--	--	--	--	85	96	100	--	--		V
Apr. 11	1720	68		45	120	14	--	--	--	--	--	68	92	99	100	--		V
Apr. 22	1235	61		46	187	23	--	--	--	--	--	77	93	97	100	--		V
Apr. 23	0855	54		44	148	18	--	--	--	--	--	74	93	100	--	--		V
May 11	1350	70		42	111	12	--	--	--	--	--	79	96	99	100	--		V
June 16	1335	80		91	541	130	--	--	--	--	--	88	97	99	100	--		V
June 17	1700	75		88	396	94	--	--	--	--	--	80	95	99	100	--		V
June 22	0630	--		745	13200	26600	38	46	56	67	79	93	98	99	99	100		VPWC
June 22	1930	--		390	7960	8380	24	36	50	61	71	92	98	99	100	--		VPWC
July 9	1955	77		326	3680	3240	8	9	14	21	29	84	95	98	99	100		VPWC
Aug. 12	1230	73		317	2010	1720	7	8	10	14	24	72	94	98	100	--		VPWC
Aug. 13	1420	73		319	1930	1660	7	8	10	14	23	75	95	99	100	--		VPWC
Sept. 28	1745	63		39	94	9.9	--	--	--	--	--	44	71	95	100	--		V

D Daily mean discharge.

KANSAS RIVER BASIN--Continued

6-8340. FRENCHMAN CREEK AT PALISADE, NEBR.--Continued

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 28, 1963	1335		8	27			0	1	14	55	83	92	97	100	--			SV
Nov. 20	1125		7	37			0	2	8	54	89	96	99	100	--			SV
Jan. 22, 1964	1750		12	D 48			--	0	5	47	83	93	97	99	100			SV
Feb. 10	1300		7	41			0	1	14	61	90	95	98	100	--			SV
Feb. 25	1220		9	41			0	4	19	58	88	95	98	99	100			SV
Mar. 11	1655		3	44			1	3	17	61	90	97	100	--	--			SV
Apr. 11	1720		14	45			1	2	15	62	90	96	99	100	--			SV
Apr. 22	1235		13	46			1	4	16	57	85	93	98	100	--			SV
Apr. 23	0855		12	44			5	10	22	62	89	95	99	100	--			SV
May 11	1350		9	42			0	1	16	62	91	97	99	100	--			SV
June 16	1335		13	91			4	9	18	55	84	93	98	100	--			SV
June 17	1700		14	88			2	5	20	56	87	95	100	--	--			SV
July 9	1955		4	326			1	4	28	74	88	93	97	99	100			SV
July 10	1525		5	310			2	10	44	84	94	98	100	--	--			SV
Aug. 12	1230		13	317			1	3	14	49	84	93	98	100	--			SV
Aug. 13	1420		17	319			1	4	18	55	82	90	97	100	--			SV
Sept. 28	1745		19	39			1	3	10	51	87	95	99	100	--			SV

D Daily mean discharge.

6-8449. SOUTH FORK SAPPA CREEK NEAR ACHILLES, KANS.

LOCATION.--At gaging station at highway bridge, 5.5 miles southeast of Achilles, Decatur County, 14 miles southwest of Oberlin, and 20.2 miles upstream from confluence with North Fork.
DRAINAGE AREA.--434 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. No flow Oct. 1 to Mar. 22, Mar. 25, 26, Apr. 19 to June 12, July 3-10, July 17 to Sept. 30.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
June 15, 1964.....	246	12		40	6.8	9.6	18	171	0	14	3.0	0.4	5.8	.16	192	0.26	128	128	0	0.4	320	7.4
June 17.....	22	22		46	6.6	13	20	193	0	23	7.0	.5	3.0	.16	235	.32	14.0	142	0	.5	360	7.7
June 19.....	6.1	23		61	11	23	21	264	0	29	11	.5	2.2	.16	325	.44	5.35	197	0	.7	500	7.6

KANSAS RIVER BASIN--Continued

6-8450. SAPPA CREEK NEAR OBERLIN, KANS.

LOCATION.--At bridge on U.S. Highway 83 at Oberlin, Decatur County, 4.1 miles downstream from gaging station.
DRAINAGE AREA.--1,040 square miles, approximately, upstream from gaging station, of which an unknown portion is noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1962 to September 1964.
Water temperatures: October 1962 to September 1963.
Sediment records: October 1962 to September 1964.
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, 3,900 ppm June 14; minimum daily, no flow on many days during November, December, February to September.
Sediment loads: Maximum daily, 4,800 tons June 14; minimum daily, 0 tons on many days during November, December, February to September.
EXTREMES, 1962-64.--Sediment concentrations: Maximum daily, 5,000 ppm July 15, 1963; minimum daily, no flow on many days each year.
Sediment loads: Maximum daily, 4,800 tons June 14, 1964; minimum daily, 0 tons on many days each year.
REMARKS.--Flow affected by ice Mar. 19-21.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Feb. 18, 1964 A...	0.1	25		128	25	61	21	466	0	150	37	0.7	0.4	0.19	676	0.92	0.18	422	40	1.3	1010	7.7
June 14.....	672	18		40	4.4	3.1	13	156	0	5.8	2.1	1.0	2.6	.17	183	.25	332	118	0	.1	277	7.3
June 15.....	226	19		41	3.5	4.3	15	157	0	8.2	2.6	.3	4.9	.06	196	.27	120	117	0	.2	285	7.1
June 17.....	47	22		39	4.7	7.7	18	169	0	12	3.6	.4	.5	.06	218	.30	27.7	117	0	.3	308	6.8

A Chemical analysis by Kansas State Department of Health, Topeka, Kans.

KANSAS RIVER BASIN--Continued

6-8450. SAPPA CREEK NEAR OBERLIN, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	1.0	620	2.0	0.1		T	0		0
2	.6	440	.7	.1		T	0		0
3	.5	240	.3	.1		T	0		0
4	.4	160	.2	.1		T	0		0
5	.4	140	.2	.1		T	0		0
6	.3	130	.1	.1		T	0		0
7	.3	130	.1	0		0	0		0
8	.3	100	.1	0		0	0		0
9	.3	99	.1	0		0	0		0
10	.2	100	.1	0		0	0		0
11	.2	98	.1	0		0	0		0
12	.2	--	.1	0		0	0		0
13	.2	--	.1	.1		T	0		0
14	.2	--	.1	0		0	0		0
15	.2	--	T	0		0	0		0
16	.2	--	T	0		0	0		0
17	.2	--	T	.1		T	0		0
18	.1	--	T	0		0	0		0
19	.1	--	T	0		0	0		0
20	.1	--	T	0		0	0		0
21	.1	--	T	0		0	0		0
22	.1	--	T	0		0	0		0
23	.1	--	T	0		0	.1		T
24	.1	--	T	0		0	.1		T
25	.1	--	T	0		0	.1		T
26	.1	--	T	0		0	.1		T
27	.1	--	T	0		0	.1		T
28	.1	--	T	0		0	.1		T
29	.1	--	T	0		0	.1		T
30	.1	--	T	0		0	.1		T
31	.1	--	T	--		--	.1		T
Total	7.1	--	4.6	0.8		0.1	0.9		0.1

Day	JANUARY			FEBRUARY			MARCH		
1	0.1		T	0.2		T	0.2		T
2	.1		T	.2		T	.1		T
3	.1		T	.2		T	.1		T
4	.1		T	.2		T	.1		T
5	.1		T	.2		T	.1		T
6	.1		T	.1		T	.1		T
7	.1		T	.1		T	.1		T
8	.1		T	.1		T	.1		T
9	.1		T	0		0	.1		T
10	.1		T	0		0	.1		T
11	.1		T	0		0	.1		T
12	.1		T	0		0	.1		T
13	.1		T	0		0	.1		T
14	.1		T	0		0	0		0
15	.1		T	.1		T	.1		T
16	.1		T	0		0	.1		T
17	.1		T	0		0	.1		T
18	.1		T	.1		T	.1		T
19	.1		T	.1		T	.1		T
20	.1		T	.1		T	.1		T
21	.1		T	.1		T	.1		T
22	.1		T	.2		T	.2		T
23	.1		T	.2		T	.4		.1
24	.1		T	.2		T	.5		.1
25	.1		T	.2		T	.2		T
26	.1		T	.2		T	.2		T
27	.1		T	.2		T	.2		T
28	.1		T	.2		T	.2		T
29	.1		T	.2		T	.2		T
30	.1		T	--		--	.3		T
31	.1		T	--		--	.2		T
Total	3.1		0.3	3.4		0.3	4.7		0.4

T Less than 0.05 ton.

KANSAS RIVER BASIN--Continued

6-8450. SAPPA CREEK NEAR OBERLIN, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0.4		T	0.2		T	0	--	0
2	.4		T	.1		T	0	--	0
3	.4		T	.1		T	.1	--	T
4	.6		0.1	0		0	.2	--	T
5	.8		.2	0		0	.1	--	T
6	.8		.2	0		0	0	--	0
7	.5		.1	0		0	0	--	0
8	.4		.1	.1		T	0	--	0
9	.4		.1	.2		T	.2	--	T
10	.3		T	.1		T	.1	--	T
11	.3		T	0		0	0	--	0
12	.4		.1	0		0	0	--	0
13	.4		.1	0		0	17	--	200
14	.2		T	0		0	458	3900	4800
15	.1		T	0		0	190	1900	970
16	.1		T	0		0	159	1900	820
17	0		0	0		0	45	1000	120
18	0		0	0		0	21	630	36
19	0		0	0		0	12	390	13
20	0		0	0		0	5.0	270	3.6
21	.1		T	0		0	56	--	400
22	.1		T	0		0	99	2000	S 620
23	.1		T	0		0	45	1300	160
24	.1		T	0		0	18	960	47
25	.1		T	0		0	8.8	910	22
26	.1		T	0		0	3.7	560	5.6
27	.2		T	0		0	2.2	420	2.5
28	.2		T	0		0	1.1	280	.8
29	.2		T	.1		T	.8	230	.5
30	.2		T	.1		T	.6	130	.2
31	--		--	.1		T	--	--	
Total	7.9		1.4	1.1		0.1	1142.9	--	8221.3

Day	JULY			AUGUST			SEPTEMBER		
1	0.3	77	0.1						
2	.2	59	T						
3	.2	68	T						
4	.1	42	T						
5	.1	20	T						
6	0	--	0						
7	0	--	0						
8	0	--	0						
9	0	--	0						
10	0	--	0						
11	.4	640	.7						
12	10	910	S 140						
13	38	3400	350						
14	16	1400	60						
15	3.8	970	10						
16	1.6	830	3.6						
17	.5	670	.9						
18	.2	650	.4						
19	0	--	0						
20	0	--	0						
21	0	--	0						
22	0	--	0						
23	0	--	0						
24	0	--	0						
25	0	--	0						
26	0	--	0						
27	0	--	0						
28	0	--	0						
29	0	--	0						
30	0	--	0						
31	0	--	0						
Total	71.4	--	565.8	0		0	0		0

Total discharge for year (cfs-days)..... 1243.3
Total load for year (tons)..... S794.4

S Computed by subdividing day.
T Less than 0.05 ton.

6-8450. SAPPA CREEK NEAR OBERLIN, KANS.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
June 14, 1964.....	0630	63		672	4940	8960	61	73		92		100						VPWC
June 14.....	0630	63		672	4940	8960	37	59		90		100						VPN
June 15.....	0630	63		226	1950	1190	79	82		90		100						VPWC
June 17.....	1130	71		47	986	120	--	85		92		100						PWC
June 22.....	0630	69		130	2890	1010	60	76		93		100						VPWC
June 23.....	0630	68		57	1660	260	--	88		95		100						PWC
July 12.....	2030	70		49	4890	650	50	58		80		100						VPWC
July 13.....	0700	70		37	3460	340	86	95		99		100						PWC
July 13.....	0700	70		37	3460	340	65	85		98		100						PN
July 16.....	0630	69		2.1	829	47	93	93		96		100						PWC

KANSAS RIVER BASIN--Continued

6-8465. BEAVER CREEK AT CEDAR BLUFFS, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 83, 0.2 mile north of Cedar Bluffs, Decatur County, and 1.2 miles south of Kansas-Nebraska State line.
DRAINAGE AREA.--1,710 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1962, October 1963 to September 1964.
Water temperatures: October 1961 to September 1964.
Sediment records: October 1961 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 78°F June 8; minimum, freezing point on many days during November to March.
Sediment concentrations: Maximum daily, 6,100 ppm July 11; minimum daily, no flow on many days during August and September.
Sediment loads: Maximum daily, 5,200 tons Aug. 20; minimum daily, 0 tons on many days during August and September.
EXTREMES, 1961-64.--Water temperatures: Maximum, 78°F June 8, 1964; minimum, freezing point on many days during winter months each year.
Sediment concentrations: Maximum daily, 7,230 ppm July 31, 1962; minimum daily, no flow on many days each year.
Sediment loads: Maximum daily, 8,490 tons Aug. 4, 1962; minimum daily, 0 tons on many days each year.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. Flow affected by ice Dec. 9 to Mar. 29.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 30, 1963	3.0	34		--	--	78	20	41	21	324	26	56	14	0.9	1.8	0.19	449	276	0	1.1	670	8.5	
Nov. 19.....	4.4	33		--	--	78	26	48	18	395	0	62	17	1.1	.5	.19	476	302	0	1.2	680	8.0	
Dec. 23.....	.9	39		--	--	131	27	76	25	600	0	100	28	1.8	.4	.31	712	438	0	1.6	1090	7.9	
Jan. 29, 1964	5.9	29		--	--	69	29	62	20	354	24	80	22	1.3	.4	.27	532	291	0	1.6	820	8.4	
Feb. 17.....	4.0	25		--	--	69	17	51	15	276	38	60	16	1.3	.4	.21	412	242	0	1.4	650	8.4	
Mar. 10.....	11.0	20		--	--	56	18	47	13	312	0	53	15	1.3	.4	.19	381	214	0	1.4	620	8.1	
Apr. 22.....	11.0	19		--	--	74	22	55	17	381	0	64	18	1.5	.2	.23	455	275	0	1.4	740	8.0	
May 5.....	11.0	22		0.02	0.00	78	24	59	18	410	0	65	20	1.6	4.3	.27	501	293	0	1.5	790	7.8	
May 12.....	9.4	27		--	--	69	26	60	19	393	0	65	21	1.4	1.5	.19	478	279	0	1.6	770	7.8	
June 15.....	8.2	27		--	--	47	1.7	11	15	183	0	9.0	5.0	.5	2.6	.08	206	124	0	.4	300	7.3	
June 19.....	117	30		--	--	47	7.5	16	19	205	0	23	6.0	.7	4.2	.08	245	148	0	.6	380	7.4	
July 6.....	3.9	28		--	--	74	19	42	25	351	0	62	14	1.2	1.2	.27	432	262	0	1.1	660	7.5	
July 12.....	210	19		--	--	48	3.9	4.1	14	176	0	12	3.0	.5	5.8	.12	188	136	0	.2	300	7.3	
Sept. 8.....	.1	26		.04	.00	86	13	34	22	366	0	43	17	.6	3.9	.19	420	268	0	.9	660	7.4	

6-8465. BEAVER CREEK AT CEDAR BLUFFS, KANS.--Continued

Temperature (°F) of water, water year October 1963 to September 1964
(Once-daily measurement, between 0600 and 0900)

Month	Day																													Aver-age
	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	
October	55	57	59	58	59	59	59	55	54	56	57	56	58	58	56	55	55	56	56	60	58	56	57	51	50	51	52	50	40	40	41	54
November	40	40	40	40	41	42	42	42	40	40	40	40	40	41	40	40	41	40	37	37	37	36	35	34	34	33	33	34	35	32	--	38
December	32	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
January	33	34	34	34	34	33	34	33	32	32	32	32	32	32	32	32	32	34	34	33	33	32	33	32	32	32	32	32	33	34	--	33
February	34	34	33	32	32	32	32	32	33	33	32	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March	32	32	33	32	32	32	32	32	32	32	33	34	34	34	34	34	34	34	35	33	33	34	34	34	32	32	33	33	34	36	39	33
April	44	50	49	45	38	39	40	36	40	45	49	46	44	45	47	50	53	49	49	49	48	--	50	55	58	55	--	47	47	52	--	47
May	54	55	55	55	57	53	54	58	--	53	53	53	49	56	58	65	64	65	64	64	65	67	67	63	64	67	60	55	57	55	53	59
June	52	52	56	60	56	60	66	78	62	61	60	64	61	64	64	65	68	71	68	67	--	65	62	64	65	66	67	67	68	68	--	64
July	70	71	69	--	--	--	--	68	64	70	68	70	65	68	69	70	71	70	68	68	72	71	70	70	69	70	69	72	67	71	70	69
August	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	56	62	63	65	62	60	60	62	57	60	65	54	64	63	63	--
September	65	67	65	56	--	--	65	64	--	--	--	--	--	--	59	57	56	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

KANSAS RIVER BASIN--Continued

6-8465. BEAVER CREEK AT CEDAR BLUFFS, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	17	520	24	3.1	170	1	4.5	93	1
2	13	440	15	2.9	120	1	3.7	96	1
3	11	420	12	2.9	120	1	4.1	90	1
4	9.8	380	10	2.9	120	1	3.4	84	1
5	9.1	310	8	3.2	120	1	3.5	85	1
6	7.4	280	6	3.2	130	1	3.9	69	1
7	6.6	300	5	3.4	110	1	4.5	110	1
8	5.5	240	4	3.3	110	1	4.0	100	1
9	4.5	240	3	3.4	110	1	3.6	130	1
10	4.2	160	2	3.4	110	1	3.2	150	1
11	4.1	190	2	3.5	120	1	2.8	150	1
12	3.7	160	2	3.2	110	1	2.6	130	1
13	3.6	130	1	3.3	93	1	2.2	120	1
14	3.6	130	1	3.3	96	1	2.0	150	1
15	3.4	110	1	3.4	130	1	1.6	120	1
16	3.1	92	1	3.4	100	1	1.4	200	1
17	4.0	91	1	3.6	110	1	1.2	160	1
18	3.2	140	1	4.5	110	1	1.2	160	1
19	1.5	150	1	4.3	120	1	1.0	170	T
20	1.8	100	T	4.2	100	1	1.0	180	T
21	2.9	100	1	4.7	91	1	.8	190	T
22	5.7	110	2	4.6	110	1	.8	190	T
23	11	89	3	6.0	110	2	.8	170	T
24	4.6	220	3	6.3	120	2	1.0	180	T
25	5.1	300	4	6.0	140	2	1.2	140	T
26	5.4	270	4	5.4	100	1	1.6	170	1
27	5.3	290	4	5.1	96	1	2.0	140	1
28	4.1	280	3	5.0	110	1	2.2	190	1
29	3.5	140	1	4.5	140	2	2.2	110	1
30	2.9	180	1	4.3	97	1	2.4	79	1
31	2.8	180	1	---	---	---	2.6	68	T
Total	173.4	--	128	120.3	--	34	73.0	--	27
	JANUARY			FEBRUARY			MARCH		
1	2.8	69	1	6.4	120	2	5.4	14	T
2	3.0	68	1	6.6	17	T	5.8	18	T
3	3.4	55	1	7.0	14	T	7.0	21	T
4	4.0	67	1	6.8	19	T	6.6	21	T
5	4.4	65	1	6.6	37	1	6.0	18	T
6	4.2	63	1	6.2	26	T	8.0	18	T
7	4.0	31	T	5.8	26	T	7.4	40	1
8	4.0	38	T	5.2	49	1	7.0	56	1
9	3.8	40	T	4.6	87	1	7.6	19	T
10	3.6	56	1	4.6	32	T	11	17	1
11	3.4	50	T	4.4	20	T	11	44	1
12	3.4	63	1	4.4	18	T	12	25	1
13	3.2	35	T	4.4	38	T	13	18	1
14	3.2	76	1	4.4	18	T	12	17	1
15	3.4	76	1	4.2	20	T	11	16	T
16	3.6	91	1	3.8	23	T	12	16	1
17	4.0	88	1	3.6	14	T	13	16	1
18	4.2	64	1	3.8	46	T	12	33	1
19	4.4	73	1	4.0	53	1	13	25	1
20	4.2	96	1	4.0	78	1	11	20	1
21	4.6	56	1	3.6	36	T	9.0	20	T
22	5.4	79	1	4.0	29	T	10	29	1
23	5.2	80	1	4.2	65	1	11	43	1
24	5.0	43	1	4.4	37	T	9.0	71	2
25	4.8	56	1	4.6	50	1	7.0	76	1
26	5.2	130	2	4.2	43	T	8.6	84	2
27	6.0	120	2	4.0	14	T	10	90	2
28	5.8	130	2	4.6	41	1	13	150	5
29	5.8	140	2	5.0	11	T	14	65	2
30	5.8	120	2	---	---	---	16	190	8
31	6.0	130	2	---	---	---	14	510	19
Total	133.8	--	34	139.4	--	16	313.4	--	58

T Less than 0.50 ton.

KANSAS RIVER BASIN--Continued

6-8465. BEAVER CREEK AT CEDAR BLUFFS, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	16	130	6	11	110	3	5.4	210	3
2	17	140	6	13	120	4	5.3	310	4
3	17	80	4	13	130	5	5.8	190	3
4	16	75	3	12	160	5	8.0	260	6
5	18	70	3	11	100	3	14	180	7
6	18	49	2	11	230	7	18	210	10
7	18	61	3	13	230	8	36	1400	S 170
8	19	54	3	12	220	7	56	1400	210
9	20	50	3	10	260	7	27	970	71
10	20	54	3	10	230	6	15	550	22
11	19	180	9	9.8	150	4	9.4	500	13
12	18	80	4	9.6	150	4	8.5	760	S 44
13	17	96	4	9.8	170	4	74	4100	S 900
14	12	96	3	10	150	4	50	2400	S 350
15	11	120	4	11	140	4	13	2600	91
16	17	90	3	11	140	4	4.7	670	8
17	12	64	2	11	110	3	5.0	720	S 29
18	11	130	4	10	180	5	165	3700	S 1500
19	10	260	7	8.9	170	4	122	1800	590
20	10	130	4	8.7	190	4	94	960	260
21	11	200	6	8.4	180	4	89	2000	S 510
22	10	120	3	7.5	240	5	58	1400	220
23	10	120	3	6.7	220	4	47	710	90
24	10	140	4	5.5	200	3	77	1900	390
25	12	140	5	5.0	190	3	56	1500	230
26	12	100	3	4.7	180	2	31	1300	110
27	13	120	4	4.6	200	2	21	1200	68
28	14	160	6	4.5	250	3	16	740	32
29	16	200	9	5.0	230	3	13	700	24
30	13	110	4	5.5	220	3	11	680	20
31	--	--	--	5.5	220	3	--	--	--
Total	432	--	127	278.7	--	130	1155.1	--	4985

	JULY			AUGUST			SEPTEMBER		
1	9.2	660	16	0	--	0	0.4	130	T
2	8.0	600	13	0	--	0	.3	130	T
3	7.4	570	11	0	--	0	.1	87	T
4	6.4	600	10	0	--	0	.1	75	T
5	5.1	600	8	0	--	0	0	--	0
6	4.3	670	8	0	--	0	0	--	0
7	4.1	890	10	0	--	0	.1	98	T
8	3.2	440	4	0	--	0	.1	94	T
9	25	4000	S 420	0	--	0	0	--	0
10	44	4000	S 1000	0	--	0	0	--	0
11	290	6100	S 4200	0	--	0	0	--	0
12	238	3900	S 3400	0	--	0	0	--	0
13	23	1400	87	0	--	0	0	--	0
14	33	2000	180	0	--	0	0	--	0
15	20	950	51	0	--	0	.6	71	T
16	15	860	35	7.2	910	S 110	.6	85	T
17	12	520	17	206	2800	S 1900	.1	100	T
18	10	400	11	8.1	1100	24	0	--	0
19	9.2	360	9	27	1300	S 580	0	--	0
20	7.4	510	10	434	4400	5200	0	--	0
21	6.0	420	7	185	2800	1400	0	--	0
22	4.8	420	5	13	2000	70	0	--	0
23	3.8	380	4	3.8	860	9	0	--	0
24	3.1	320	3	4.8	860	11	0	--	0
25	2.5	350	2	2.2	510	3	0	--	0
26	2.0	330	2	1.3	340	1	0	--	0
27	1.4	320	1	.9	220	1	0	--	0
28	1.3	310	1	.7	200	T	0	--	0
29	1.0	330	1	.6	200	T	0	--	0
30	.5	320	T	.4	140	T	0	--	0
31	.3	270	T	.3	140	T	--	--	--
Total	801.0	--	9527	895.3	--	9310	2.4	--	1

Total discharge for year (cfs-days)..... 4,517.8
Total load for year (tons)..... 24,377

S Computed by subdividing day.
T Less than 0.50 ton.

KANSAS RIVER BASIN--Continued

6-8465. BEAVER CREEK AT CEDAR BLUFFS, KANS.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							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	
June 15, 1964.....	1350	64		8.2	3250	72	90	97		98		100	--					PWC
June 19.....	0830	71		117	1910	603	87	92		98		100	--					PWC
July 9.....	0600	64		45	5850	710	64	76		94		100	--					VPWC
July 9.....	0600	64		45	5850	710	22	49		93		100	--					VPN
July 10.....	0600	70		9.8	3110	82	89	95		96		100	--					PWC
July 11.....	0805	68		217	6460	3780	52	62		77		100	--					VPWC
July 12.....	1150	71		210	2610	1480	73	82		91		100	--					PWC
Aug. 17.....	0600	56		401	2760	2990	55	65		84		99	100					VPWC
Aug. 20.....	0600	65		458	4520	5590	59	65		84		99	100					VPWC

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material											Method of analysis
							Percent finer than size indicated, in millimeters											
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
July 8, 1964.....	0900		3	3.3			97	100										V
Sept. 8.....	2200		2	.1			53	57	75	93	96	97	99	100				SV

KANSAS RIVER BASIN--Continued

6-8479. PRAIRIE DOG CREEK ABOVE NORTON RESERVOIR, KANS.

LOCATION.--At gaging station at county road bridge, 4 miles east of Clayton, Norton County, and 85.3 miles upstream from mouth.
DRAINAGE AREA.--580 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. No flow Aug. 3 to Sept. 30.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 25, 1963	1.5	36				78	15	11	14	320	0	18	9.0	0.4	1.8	0.10	346	256	0	0.3	550	7.8	
Oct. 29.....	.9	27				74	12	14	14	310	0	16	11	.4	.4	.13	324	234	0	.4	510	8.3	
Nov. 18.....	2.4	25				75	20	12	14	327	0	22	11	.4	.4	.13	349	269	1	.3	540	8.3	
Dec. 20.....	.3	30				99	21	13	12	400	0	27	11	.4	.5	.13	419	334	6	.3	630	8.1	
Jan. 28, 1964	2.4	23				74	13	19	11	310	0	25	13	.5	.4	.10	338	238	0	.5	510	8.0	
Mar. 9.....	5.4	22				62	18	18	11	285	0	23	12	.5	.4	.12	306	228	0	.5	500	7.6	
Apr. 9.....	4.4	21				75	14	32	13	312	0	21	40	.5	.4	.10	372	244	0	.9	610	7.9	
Apr. 21.....	1.9	21				75	18	18	13	327	0	18	15	.5	.4	.12	346	261	0	.5	560	7.9	
May 6.....	1.8	29		0.11	0.06	88	16	18	14	361	0	16	17	.5	.4	.16	387	286	0	.5	610	7.8	
June 15.....	80.0	19				46	4.6	6.7	16	185	0	8.0	4.0	.5	4.2	.13	211	134	0	.3	330	7.3	
July 6.....	.4	31				74	14	16	17	315	0	16	12	.5	6.2	.18	338	242	0	.4	530	7.6	
July 11.....	438	22				52	4.0	1.8	14	193	0	5.8	4.0	.4	3.6	.13	195	146	0	.1	310	7.3	
July 12.....	60	22				40	6.8	1.8	14	161	0	7.0	2.0	.4	2.4	.16	170	128	0	.1	250	7.2	

KANSAS RIVER BASIN--Continued

6-8530. *REPUBLICAN RIVER NEAR GUIDE ROCK, NEBR.*

LOCATION.--At gaging station, 300 feet upstream from Willow Creek, 0.2 mile downstream from Courtland diversion dam, and 2 miles southwest of Guide Rock, Webster County.
DRAINAGE AREA.--22,060 square miles, approximately, of which a large area does not contribute directly to surface runoff.
RECORDS AVAILABLE.--Chemical analyses: November 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chlorids (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 14, 1963	305	12		--	--	67	12	22	14	254	0	46	11	0.5	0.9	0.15	308	216	8	0.7	480	8.3	
Dec. 2.....	305	13		--	--	64	14	22	13	259	0	45	11	.5	.9	.18	310	217	5	.7	480	8.2	
Dec. 23.....	175	16		--	--	67	13	25	15	276	0	48	15	.5	.4	.15	338	220	0	.7	550	7.6	
Jan. 13, 1964	125	25		--	--	81	19	25	15	273	24	57	16	.4	1.8	.15	403	280	16	.7	620	8.3	
Feb. 18.....	415	15		--	--	74	6.7	21	14	256	0	43	12	.5	.4	.15	320	212	2	.6	500	7.5	
Mar. 16.....	109	19		--	--	74	16	23	11	276	0	63	15	.4	.8	.10	361	250	24	.6	560	7.9	
Apr. 28.....	92	20		--	--	69	15	23	11	259	0	58	15	.4	.9	.10	334	234	22	.7	530	7.9	
May 5.....	40	21		0.00	0.00	70	14	23	12	254	0	60	16	.4	.5	.07	360	232	24	.7	540	7.8	
May 19.....	14	24		--	--	80	13	23	12	303	0	46	16	.4	1.1	.13	380	253	5	.6	610	7.5	
June 14.....	244	21		--	--	56	9.8	20	13	210	0	45	10	.5	1.6	.18	287	180	8	.6	450	7.4	
July 21.....	16	11		--	--	56	14	23	16	244	0	44	12	.6	1.6	.21	308	197	0	.7	470	7.3	
Aug. 10.....	223	8.6		--	--	53	16	22	17	234	0	45	12	.6	1.9	.19	288	198	6	.7	460	7.5	
Sept. 9.....	1700	4.2		.01	.00	54	13	22	17	229	0	41	11	.7	1.6	.19	285	188	0	.7	460	7.5	

6-8558. BUFFALO CREEK NEAR JAMESTOWN, KANS.

LOCATION.--At gaging station at highway bridge, 1.1 miles north of Jamestown, Cloud County, and 21 miles upstream from mouth.
DRAINAGE AREA.--330 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to Septemher 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Chemical analyses by Kansas State Department of Health, Topeka, Kans. No flow Aug. 5-10.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 16, 1963	3.8	19		--	--	179	22	216	15	612	0	174	238	0.3	1.6	0.19	1170	537	35	4.1	1790	8.0	
Dec. 3.....	5.3	12		--	--	133	24	186	13	398	0	185	234	.2	2.3	.15	974	430	104	3.9	1520	8.1	
Jan. 14, 1964	2.7	17		--	--	190	30	155	12	573	0	258	152	.3	6.2	.21	1100	598	128	2.8	1690	7.5	
Feb. 26.....	3.8	9.5		--	--	168	25	152	10	498	0	223	159	.2	1.9	.18	A994	522	113	2.9	1560	7.7	
Mar. 18.....	4.1	1.5		--	--	133	27	236	11	386	0	220	308	.3	.4	.18	1130	443	126	4.9	1910	7.6	
Apr. 28.....	6.2	10		--	--	141	31	271	17	324	0	243	395	.5	4.9	.15	1270	480	214	5.4	2160	7.6	
May 5.....	3.9	14		0.11	0.00	149	25	181	14	488	0	183	211	.4	4.4	.21	1020	475	75	3.6	1660	7.6	
May 20.....	2.0	23		--	--	154	16	153	14	522	0	159	140	.4	8.9	.21	920	450	22	3.1	1460	7.5	
June 9.....	5.4	19		--	--	112	9.8	115	13	356	0	113	126	.5	7.1	.16	682	320	28	2.8	1130	7.8	
July 22.....	.8	8.2		--	--	133	17	493	26	105	0	412	700	.8	9.7	.18	1850	402	316	11	3040	6.9	
Aug. 11.....	.1	5.4		--	--	110	20	358	21	171	0	272	515	.5	7.5	.21	1390	356	216	8.2	2300	7.1	
Aug. 19.....	135	11		--	--	82	19	194	20	132	0	200	283	.5	1.4	.13	890	282	174	5.0	1460	6.9	
Sept. 9.....	4.4	13		.13	.00	90	9.6	206	17	207	0	152	287	.5	4.4	.19	890	264	94	5.5	1480	7.2	

A Calculated from determined constituents.

KANSAS RIVER BASIN--Continued

6-8560. REPUBLICAN RIVER AT CONCORDIA, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 81, 1 mile north of Concordia, Cloud County, 3.4 miles downstream from Buffalo Creek, and at mile 102.4.
DRAINAGE AREA.--23,540 square miles, approximately, of which a large part is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 15, 1963	368	15		--	--	72	15	30	15	278	0	56	21	0.5	0.4	0.16	371	241	13	0.8	550	8.1	
Dec. 3.....	332	15		--	--	75	14	34	14	283	0	58	25	.5	1.3	.13	386	244	12	.9	580	8.3	
Dec. 24.....	232	18		--	--	84	16	32	17	310	0	59	28	.6	2.4	.13	418	276	22	.8	630	8.2	
Jan. 14, 1964	157	21		--	--	92	20	45	16	359	0	79	39	.5	1.6	.15	511	312	18	1.1	750	8.2	
Feb. 25.....	343	15		--	--	82	18	61	15	281	0	82	78	.5	.9	.15	490	278	47	1.6	790	7.9	
Mar. 17.....	177	16		--	--	82	16	44	13	295	0	83	37	.4	.4	.12	435	270	28	1.2	700	7.8	
Apr. 29.....	152	16		--	--	83	14	48	13	288	0	79	45	.4	.4	.13	438	264	28	1.3	710	7.7	
May 5.....	118	19		0.00	0.00	78	23	56	14	300	0	88	56	.5	.6	.16	484	289	43	1.4	780	7.8	
May 20.....	145	20		--	--	69	13	53	16	259	0	82	45	.5	.6	.16	438	226	14	1.5	710	7.5	
June 9.....	152	15		--	--	59	16	38	15	244	0	67	29	.5	.7	.18	357	213	13	1.1	590	7.4	
July 22.....	141	11		--	--	66	15	38	16	254	0	67	27	.6	1.4	.21	373	226	18	1.1	600	7.5	
Aug. 11.....	305	8.2		--	--	56	12	29	16	224	0	57	18	.5	2.3	.21	314	189	5	.9	500	7.3	
Sept. 9.....	1670	8.2		.18	.00	53	14	21	17	222	0	45	13	.6	1.9	.21	288	190	8	.7	470	7.6	
Sept. 10.....	1970	6.8		--	--	53	16	22	16	229	0	51	12	.6	.5	.15	305	198	10	.7	470	7.4	

6-8570. REPUBLICAN RIVER AT MILFORD, KANS.

LOCATION.--At gaging station at highway bridge at southwest city limits of Milford, Geary County, at mile 18.6.
DRAINAGE AREA.--24,900 square miles, approximately, of which a large area is noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1955 to September 1958, October 1961 to September 1964 (discontinued).
Water temperatures: October 1955 to September 1958.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 10, 1963	602	12				68	14	26	15	249	0	57	20	0.5	0.5	0.12	344	227	23	0.8	560	7.7	
Dec. 11.....	150	16				91	21	38	15	322	0	84	36	.4	1.3	.18	468	314	50	.9	730	7.8	
Jan. 8, 1964.	390	15				78	20	39	12	278	0	80	39	.4	1.1	.15	428	276	48	1.0	670	8.1	
Feb. 5.....	480	15				72	17	34	13	266	0	67	30	.4	1.7	.18	372	250	32	.9	600	8.1	
Mar. 5.....	395	15				70	17	38	13	266	0	75	33	.5	.4	.18	392	244	26	1.1	620	7.9	
Apr. 1.....	340	14				83	18	51	12	295	0	94	47	.5	.4	.12	460	281	39	1.3	750	7.9	
May 1.....	360	16				77	14	51	12	271	0	74	54	.4	1.6	.10	445	250	28	1.4	710	7.7	
June 2.....	153	18				94	21	102	14	295	0	135	123	.4	.1	.13	658	321	79	2.5	1070	7.7	
June 3.....	153	18				96	20	96	15	300	0	129	115	.4	.0	.16	647	322	76	2.3	1040	7.8	
July 10.....	226	18				90	18	46	15	281	0	113	45	.7	1.2	.21	486	298	67	1.2	790	7.5	
Aug. 18.....	247	12				70	19	46	16	264	0	89	42	.6	1.0	.23	436	252	35	1.3	720	7.5	
Aug. 21.....	700	12				55	9.0	41	14	193	0	56	45	.5	5.3	.18	344	174	16	1.4	530	7.3	
Sept. 22.....	780	15		0.00	0.00	50	17	35	14	212	0	63	34	.6	.4	.18	343	195	21	1.1	550	7.7	

KANSAS RIVER BASIN--Continued

6-8620. SMOKY HILL RIVER AT CEDAR BLUFF DAM, KANS.

LOCATION.--At gaging station, 0.2 mile downstream from Cedar Bluff Dam, Trego County, and 14 miles southwest of Ellis.
DRAINAGE AREA.--5,530 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. Flow regulated by Cedar Bluff Reservoir. No flow Dec. 31 to May 26.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 15, 1963	0.9	5.5		0.15	0.00	94	26	32	17	127	0	279	18	0.6	0.4	0.21	536	342	238	0.8	770	7.7	
Nov. 13.....	.5	10		--	--	112	21	33	15	146	0	303	19	.7	.4	.19	610	366	246	.8	810	8.2	
Dec. 10.....	.6	8.0		--	--	120	24	35	16	168	0	309	20	.6	.4	.18	606	398	260	.8	840	8.1	
June 22, 1964	158	4.5		--	--	107	15	33	17	146	0	266	22	.6	.0	.24	558	328	208	.8	840	7.5	
June 26.....	588	4.5		--	--	106	18	29	16	146	0	262	18	.7	.0	.23	523	338	218	.7	800	7.5	
July 9.....	11	5.8		--	--	104	22	30	16	156	0	270	18	.6	.0	.27	545	350	222	.7	820	7.4	
Aug. 19.....	11	6.4		--	--	99	22	29	16	144	0	264	18	.7	.0	.27	539	338	220	.7	800	7.5	
Sept. 8.....	.9	11		.09	.00	117	24	36	15	178	0	304	21	.8	.0	.24	608	390	244	.8	870	7.4	
Sept. 21.....	.8	9.8		--	--	120	23	38	15	171	0	316	22	.8	.5	.16	642	394	254	.8	900	7.5	

6-8635. BIG CREEK NEAR HAYS, KANS.

LOCATION.--At gaging station at county highway bridge, 0.5 mile upstream from Custer Island Park Dam, 3 miles southeast of Hays, Ellis County, and 49 miles upstream from mouth.
DRAINAGE AREA.--542 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 15, 1963	6.3	24		1.3	0.17	91	11	44	16	259	0	86	44	0.4	13	0.30	462	272	60	1.2	710	8.3	
Nov. 12.....	4.6	19		--	--	76	17	59	14	212	17	93	57	.5	18	.31	490	260	58	1.6	720	8.3	
Dec. 9.....	7.0	16		--	--	78	14	60	14	232	0	91	62	.5	24	.27	484	252	62	1.6	750	8.1	
Jan. 15, 1964	5.7	19		--	--	102	16	57	15	256	0	102	70	1.1	41	.30	572	320	110	1.4	890	7.6	
Jan. 29.....	6.3	12		--	--	74	17	44	10	232	0	72	50	.1	21	.23	432	254	64	1.2	650	7.7	
Feb. 18.....	7.9	11		--	--	74	12	45	11	210	0	74	52	.6	17	.24	413	234	62	1.3	670	7.3	
Mar. 11.....	5.7	8.5		--	--	72	11	58	12	205	0	89	58	.7	31	.23	447	224	56	1.7	730	7.2	
Apr. 21.....	3.6	10		--	--	69	14	59	14	205	0	95	58	.7	19	.21	461	230	62	1.7	720	7.6	
May 1.....	5.7	19		.01	.00	82	17	64	15	256	0	96	62	.8	26	.24	539	274	64	1.7	830	7.4	
May 26.....	1.0	26		--	--	77	14	115	22	234	0	165	88	1.0	31	.46	676	250	58	3.2	1040	7.2	
June 18.....	7.0	18		--	--	50	8.0	41	18	173	0	58	38	.7	14	.36	347	158	16	1.4	550	7.2	
July 16.....	1.0	20		--	--	66	22	105	20	188	0	196	83	1.0	20	.50	638	255	101	2.9	1020	7.2	
Aug. 20.....	7.0	20		--	--	54	15	121	20	129	0	201	95	1.2	28	.60	630	196	90	3.8	1020	7.0	
Sept. 8.....	1.0	18		.05	.00	47	7.1	55	17	132	0	88	44	.6	25	.37	399	146	38	2.0	590	7.0	
Sept. 17.....	4.0	21		--	--	51	13	105	19	134	0	153	78	.8	62	.40	587	180	70	3.4	880	6.8	

KANSAS RIVER BASIN--Continued

6-8640. SMOKY HILL RIVER NEAR RUSSELL, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 281, 0.2 mile upstream from Landon Creek, 7.7 miles south of Russell, Russell County, and at mile 287.0.
DRAINAGE AREA.--6,965 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1951, October 1961 to September 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 14, 1963	A24	13		0.26	0.15	158	34	480	19	256	0	294	775	0.4	0.8	0.32	1900	534	324	9.0	3190	8.1	
Nov. 18.....	26	11		--	--	154	30	384	16	198	22	283	610	.5	.4	.23	1610	508	309	7.4	2640	8.4	
Dec. 9.....	8.8	10		--	--	189	42	550	18	324	0	342	875	.5	.5	.23	2190	644	378	9.4	3520	7.9	
Jan. 7, 1964.	42	10		--	--	152	26	228	13	268	0	234	365	.4	2.7	.23	1160	486	266	4.5	1980	7.6	
Feb. 19.....	33	9.0		--	--	154	24	250	14	264	0	237	418	.5	1.6	.21	1240	482	265	4.9	2120	7.8	
Mar. 26.....	24	8.0		--	--	152	29	243	15	264	0	204	430	.4	.5	.18	1210	498	281	4.7	2120	8.1	
Apr. 21.....	380	12		--	--	70	4.3	25	10	161	0	78	38	.4	2.0	.07	326	192	60	.8	510	7.6	
May 1.....	42	10		.03	.00	132	25	257	15	229	0	219	421	.5	.6	.18	1190	432	244	5.4	2070	7.7	
May 28.....	23	9.8		--	--	191	27	432	22	234	0	256	785	.6	.9	.28	1840	588	396	7.8	3380	7.5	
June 19.....	56	16		--	--	105	13	98	14	200	0	172	142	.6	.6	.28	656	316	152	2.4	1130	7.4	
July 17.....	39	14		--	--	137	28	272	19	244	0	290	405	.7	.3	.24	1290	457	257	5.5	2230	7.4	
Aug. 20.....	56	11		--	--	139	26	313	18	183	0	290	495	.7	.2	.28	1380	454	304	6.4	2450	7.5	
Sept. 8.....	36	14		.15	.00	130	23	303	18	220	0	216	490	.5	.3	.19	1300	419	239	6.4	2220	7.4	
Sept. 15.....	18	14		--	--	168	32	478	20	251	0	272	800	.5	.4	.24	1910	550	344	8.9	3250	7.4	

A Daily mean discharge.

6-8645. SMOKY HILL RIVER AT ELLSWORTH, KANS.

LOCATION.--At gaging station at bridge on State Highway 14 in Ellsworth, Ellsworth County, 2 miles downstream from Turkey Creek and at mile 238.0.
DRAINAGE AREA.--7,580 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: September 1957 to September 1959, October 1961 to September 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 15, 1963	42	12		--	--	146	23	343	17	244	0	220	570	0.4	0.4	0.24	1450	458	258	7.0	2460	8.3	
Nov. 4.....	51	13		--	--	139	29	271	15	229	22	204	454	.5	.9	.18	1260	466	241	5.5	2110	8.3	
Dec. 11.....	A12	11		--	--	154	30	263	15	271	22	206	434	.4	4.9	.21	1270	508	249	5.1	2110	8.3	
Jan. 14, 1964	A25	12		--	--	205	31	321	16	368	0	270	555	.5	4.9	.24	1600	639	337	5.5	2680	7.6	
Feb. 6.....	52	9.0		--	--	154	23	249	13	281	0	214	420	.5	2.7	.19	1220	478	247	5.0	2010	8.0	
Mar. 9.....	40	1.0		--	--	146	29	265	12	256	0	228	451	.5	.4	.18	1260	483	273	5.2	2260	7.9	
Apr. 9.....	36	3.5		--	--	147	30	280	14	239	0	227	485	.5	.4	.19	1310	490	294	5.5	2260	8.0	
May 1.....	57	11		0.01	0.00	132	19	198	16	244	0	180	331	.5	.5	.18	1010	408	208	4.3	1750	7.7	
May 12.....	42	12		--	--	146	27	294	16	259	0	221	477	.5	.1	.23	1320	475	263	5.9	2230	7.6	
May 20.....	26	10		--	--	150	27	343	19	229	0	246	565	.5	.9	.28	1470	485	297	6.8	2670	7.6	
June 11.....	768	11		--	--	75	6.1	106	11	173	0	78	165	.5	1.8	.15	547	212	70	3.2	970	7.5	
July 6.....	300	8.2		--	--	110	21	37	17	161	0	266	31	.6	.8	.21	590	361	229	.8	880	7.5	
Aug. 12.....	25	11		--	--	112	22	230	16	178	0	194	390	.5	.4	.21	1060	370	224	5.2	1900	7.4	
Sept. 3.....	988	15		.19	.00	59	5.1	18	9.3	190	0	30	26	.4	.3	.18	260	168	12	.6	390	7.3	
Sept. 21.....	44	12		--	--	135	17	257	16	220	0	178	432	.5	.4	.23	1160	407	227	5.5	2000	7.5	

A Daily mean discharge.

KANSAS RIVER BASIN--Continued

6-8655. SMOKY HILL RIVER NEAR LANGLEY, KANS.

LOCATION.--At gaging station at county highway bridge, 0.5 mile downstream from Kanopolis Dam, 5 miles north of Langley, Ellsworth County, and at mile 207.2.
DRAINAGE AREA.--7,857 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 17, 1963	94	4.5		--	--	89	17	136	13	156	0	144	231	0.3	0.5	0.16	740	292	164	3.5	1250	8.3	
Nov. 7.....	78	5.0		--	--	85	20	132	14	168	0	139	224	.3	.8	.15	730	294	156	3.3	1140	8.2	
Dec. 13.....	51	5.5		--	--	92	21	140	14	178	0	142	237	.4	.5	.16	750	316	170	3.4	1240	7.8	
Jan. 7, 1964.	42	5.0		--	--	99	17	147	14	178	0	151	253	.4	1.1	.13	812	317	171	3.6	1340	8.0	
Feb. 7.....	46	4.0		--	--	101	16	147	13	181	0	146	250	.5	.4	.18	802	318	170	3.6	1310	8.0	
Mar. 2.....	42	3.0		--	--	102	16	151	14	176	0	142	260	.5	.4	.13	818	320	176	3.7	1380	7.8	
Apr. 9.....	144	7.5		--	--	99	20	158	13	178	0	156	275	.4	.4	.12	854	329	183	3.8	1450	7.9	
May 1.....	101	1.0		0.00	0.00	103	15	170	14	178	0	158	281	.5	.4	.12	870	318	172	4.1	1460	7.7	
May 12.....	64	2.0		--	--	104	18	170	13	176	0	160	281	.5	.0	.18	880	334	190	4.0	1490	7.5	
May 18.....	35	3.0		--	--	96	22	170	13	168	0	156	281	.4	.2	.16	864	330	192	4.1	1460	7.5	
June 22.....	108	2.2		--	--	94	19	158	15	161	0	151	271	.5	1.2	.15	840	312	180	3.9	1450	7.5	
July 6.....	442	4.0		--	--	85	18	140	14	159	0	136	232	.5	1.0	.13	732	286	156	3.6	1310	7.3	
Aug. 17.....	35	2.2		--	--	91	19	122	14	163	0	160	206	.5	.2	.19	712	305	171	3.0	1260	7.3	
Sept. 15.....	218	.7		.00	.04	83	16	115	14	146	0	149	190	.5	.4	.10	664	273	153	3.0	1120	7.4	

6-8665. SMOKY HILL RIVER NEAR MENTOR, KANS.

LOCATION.--At gaging station at highway bridge, 3.6 miles southeast of Salina City Hall, 4 miles north of Mentor, Saline County, and at mile 131.5.
DRAINAGE AREA.--8,230 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 29, 1963	198	6.0		--	--	90	21	129	13	159	12	140	219	0.4	0.9	0.16	718	311	161	3.2	1220	8.3	
Nov. 27.....	91	8.0		--	--	102	21	114	13	227	0	137	192	.3	.4	.18	723	341	155	2.7	1200	6.2	
Dec. 10.....	A55	5.5		--	--	102	17	118	13	224	0	142	195	.5	.4	.13	744	324	140	2.8	1240	8.1	
Jan. 27, 1964	A75	7.5		--	--	97	23	102	10	239	0	125	169	.4	1.5	.18	662	336	140	2.4	1100	8.1	
Feb. 14.....	63	6.5		--	--	113	19	118	12	205	19	146	197	.4	.9	.18	734	360	160	2.7	1200	8.3	
Mar. 13.....	60	4.0		--	--	101	25	118	11	234	0	148	197	.4	.5	.16	730	355	163	2.7	1240	8.1	
Apr. 10.....	144	3.0		0.03	0.00	102	22	152	12	188	0	155	260	.4	.4	.13	840	345	191	3.6	1410	8.2	
May 11.....	74	5.0		--	--	101	24	143	13	217	0	153	243	.5	.4	.16	830	350	172	3.3	1380	7.8	
June 15.....	1030	6.4		--	--	50	6.1	22	8.6	159	0	31	31	.4	5.3	.07	234	150	20	.8	350	7.6	
June 16.....	1620	9.0		--	--	46	5.6	25	9.0	151	0	34	34	.4	5.8	.08	240	138	14	.9	360	7.6	
July 6.....	862	5.4		--	--	93	11	150	14	166	0	139	242	.5	1.3	.18	758	277	141	3.9	1330	7.4	
Aug. 18.....	49	4.0		--	--	90	22	97	12	190	0	142	165	.4	.0	.19	633	315	159	2.4	1080	7.4	
Sept. 10.....	130	1.1		.03	.00	88	21	125	15	161	0	168	205	.5	.1	.15	704	306	174	3.1	1190	7.4	

A Daily mean discharge.

KANSAS RIVER BASIN--Continued

6-8669. SALINE RIVER NEAR WAKEENEY, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 283, 1 mile upstream from Trego Creek and 5 miles north of Wakeeney, Trego County.
DRAINAGE AREA.--696 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1955 to September 1958, October 1961 to September 1964.
Water temperatures: October 1955 to September 1959.
Sediment records: October 1955 to September 1959.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. No flow July 6, 7, July 31 to Aug. 19, Aug. 22-30, Sept. 7-15, 19-30.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 16, 1963	2.6	22		0.49	0.08	96	19	15	13	305	0	79	20	0.5	0.4	0.15	436	318	68	0.4	660	8.3	
Oct. 29.....	2.6	21		--	--	95	22	14	11	320	0	68	23	.5	.4	.16	439	328	65	.3	660	8.1	
Nov. 12.....	3.6	21		--	--	101	16	21	11	327	0	79	23	.5	.4	.15	440	318	50	.5	650	8.0	
Dec. 11.....	1.8	25		--	--	118	22	25	13	383	0	94	27	.5	.4	.15	530	385	71	.6	750	8.0	
Jan. 16, 1964	A2.5	25		--	--	98	20	26	11	322	0	88	27	.5	.4	.15	476	326	62	.6	740	8.1	
Jan. 29.....	13	19		--	--	78	18	17	8.1	266	0	57	20	.5	.4	.10	363	268	50	.5	540	8.0	
Feb. 17.....	7.4	20		--	--	81	20	20	9.5	293	0	63	23	.5	.4	.15	381	284	44	.5	590	7.9	
Mar. 11.....	7.6	21		--	--	75	20	21	9.5	227	22	66	22	.6	.4	.08	363	269	46	.6	560	8.3	
Apr. 29.....	6.9	17		--	--	93	17	23	12	320	0	65	23	.6	.4	.12	420	302	39	.6	650	8.0	
May 1.....	7.8	17		.01	.00	80	17	21	11	295	0	57	21	.6	.4	.12	380	270	28	.6	610	7.8	
May 26.....	.8	23		--	--	91	12	30	13	283	0	86	29	.5	.6	.18	430	276	44	.8	680	7.6	
June 25.....	1.8	23		--	--	74	18	16	16	281	0	47	19	.5	.7	.21	374	258	27	.4	580	7.7	
July 16.....	1.5	22		--	--	62	10	19	15	220	0	43	18	.5	2.3	.24	315	196	16	.6	490	7.5	
Aug. 20.....	1.5	11		--	--	114	14	17	13	146	0	239	22	.5	1.2	.21	502	342	222	.4	750	7.5	

A Daily mean discharge.

6-8670. SALINE RIVER NEAR RUSSELL, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 281, 2 miles downstream from Salt Creek and 5 miles north of Russell, Russell County.
DRAINAGE AREA.--1,502 square miles.
RECORDS AVAILABLE.--Chemical analyses: January 1946 to September 1949, October 1961 to September 1964.
Water temperatures: January 1946 to September 1951.
Sediment records: May 1946 to September 1951.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 2, 1963.	60	16		--	--	119	23	162	16	215	0	215	255	0.4	0.4	0.19	950	392	216	3.6	1470	8.3	
Oct. 29.....	24	14		--	--	166	47	370	17	256	0	402	580	.5	.4	.28	1720	607	397	6.5	2770	8.0	
Nov. 26.....	24	12		--	--	154	45	395	17	198	0	431	610	.5	.4	.28	1760	569	407	7.2	2790	7.9	
Dec. 27.....	A15	12		--	--	186	65	660	21	273	0	560	980	.5	1.1	.32	2620	731	507	11	4150	7.8	
Jan. 29, 1964	A38	12		--	--	168	41	286	15	278	0	368	450	.5	.8	.30	1480	588	360	5.1	2320	7.8	
Mar. 10.....	31	11		--	--	150	41	345	16	217	0	393	525	.5	.4	.24	1590	542	364	6.4	2610	7.8	
Apr. 13.....	32	10		--	--	155	40	365	18	239	0	389	550	.6	.4	.24	1650	551	355	6.8	2750	8.0	
May 1.....	42	12		0.00	0.00	142	40	321	17	234	0	350	492	.6	.4	.28	1490	519	327	6.1	2490	7.7	
May 21.....	9.7	13		--	--	182	53	592	24	259	0	525	860	.7	.4	.38	2380	672	460	9.9	4060	7.4	
June 10.....	8.8	11		--	--	179	62	718	25	266	0	583	1050	.7	.4	.44	2760	702	484	12	4720	7.6	
July 6.....	2.5	13		--	--	192	102	1470	31	298	0	892	2110	.9	.0	.54	4960	898	654	21	8400	7.5	
Aug. 5.....	.5	9.0		--	--	214	147	2560	40	281	0	1260	3670	.9	.0	.75	8040	1140	909	33	13400	7.1	
Aug. 24 B....	1.1	8.6		.09	.14	171	115	1790	18	250	0	942	2640	.7	2.2	.75	5810	899	694	26	11300	7.6	
Sept. 2.....	420	12		--	--	109	13	52	11	212	0	158	76	.5	2.4	.13	516	326	152	1.3	790	7.2	
Sept. 16.....	24	13		--	--	162	49	716	20	290	0	468	1040	.6	.6	.36	2610	606	368	13	4330	7.3	
Sept. 17 H...	27	17		.02	.14	162	58	843	12	278	0	525	1220	.6	.3	.39	2980	643	415	15	5350	7.5	
Sept. 28.....	13	12		--	--	157	63	824	22	217	0	592	1200	.7	.4	.38	2980	650	472	14	5000	7.5	

A Daily mean discharge.
B Chemical analysis by U.S. Geological Survey, Lincoln, Nebr.

KANSAS RIVER BASIN--Continued

6-8670. SALINE RIVER NEAR RUSSELL, KANS.--Continued

Particle-size analysis of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters										Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Sept. 17, 1964.....	1430		7	27			1	1	3	37	75	88	95	100				SV

6-8695. SALINE RIVER AT TESCOTT, KANS.

LOCATION.--At gaging station at highway bridge, 0.5 mile south of Tescott, Ottawa County, 0.5 mile upstream from Dry Creek, and at mile 54.5.
DRAINAGE AREA.--2,820 square miles.
RECORDS AVAILABLE.--Chemical analyses: December 1949 to September 1953, October 1961 to September 1964.
Water temperatures: April 1950 to September 1953, August 1959 to September 1964.
Sediment records: August 1959 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 2,240 ppm Dec. 26-31.
Hardness: Maximum, 560 ppm Dec. 26-31; minimum, 120 ppm Aug. 19.
Specific conductance: Maximum daily, 4,230 micromhos July 4, 5; minimum daily, 330 micromhos Aug. 19.
Water temperatures: Maximum, 86°F July 9; minimum, freezing point on several days during December to February.
Sediment concentrations: Maximum daily, 5,600 ppm Sept. 2; minimum daily, not determined.
Sediment loads: Maximum daily, 19,000 tons Sept. 4; minimum daily, 1 ton Dec. 12, 13, Jan. 12.
EXTREMES, 1950-53, 1959-64.--Dissolved solids (1950-53, 1961-64): Maximum, 3,180 ppm Sept. 12-30, 1953; minimum (1950-53, 1959-63), 170 ppm June 8-10, 1951.
Hardness (1950-53, 1981-64): Maximum, 656 ppm Jan. 1-16, 1953; minimum, 120 ppm July 20, 1950, Aug. 19, 1964.
Specific conductance (1950-53, 1961-64): Maximum daily, 5,670 micromhos Sept. 4, 1963; minimum daily, 253 micromhos June 8, 1951.
Water temperatures: Maximum, 86°F July 9, 1964; minimum, freezing point on many days during winter months.
Sediment concentrations (1959-64): Maximum daily, 10,900 ppm July 24, 1961; minimum daily (1959-63), 10 ppm Dec. 6, 31, 1959, Jan. 7, 1961, Nov. 19, 1962.
Sediment loads (1959-64): Maximum daily, 69,000 tons Mar. 25, 1960; minimum daily, 1 ton Dec. 12, 13, 1963, Jan. 12, 1964.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Maximum observed during water year: Hardness, 565 ppm Dec. 5. Chemical analyses by Kansas State Department of Health, Topeka, Kans. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in Project Office at Topeka, Kans. Additional samples were collected for more comprehensive definition of water quality at this station. Flow affected by ice Dec. 10 to Jan. 21, Jan. 24 to Feb. 3, Feb. 27.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 1-5, 1963....	144			70	22	171		166		150	242				770	1.05	299	265	129	4.6	1300	
Oct. 6-19.....	78.4			94	19	237		212		199	315				1020	1.39	216	312	138	5.8	1730	
Oct. 21-25.....	245			73	14	145		173		119	202				679	.92	449	240	98	4.1	1150	
Oct. 26-31.....	65.0			95	20	237		200		194	330				1040	1.41	183	319	155	5.8	1730	
Nov. 1-30.....	46.7			124	33	471		266		332	640				1790	2.43	226	445	227	9.7	2950	
Dec. 1-10.....	43.3			132	48	590		268		415	820				2210	3.01	258	527	307	11	3580	
Dec. 26-31.....	39.2			139	52	604		303		448	820				2240	3.05	237	560	311	11	3580	
Jan. 1-31, 1964...	47.4			114	49	580		212		434	790				2130	2.90	273	486	312	11	3490	
Feb. 1-29.....	65.8			114	50	556		207		419	770				2070	2.82	368	490	320	11	3430	
Mar. 1-31.....	55.0			115	50	556		229		423	760				2100	2.86	312	492	304	11	3530	
Apr. 1-30.....	58.6			128	49	546		246		423	755				2110	2.87	334	521	319	10	3530	
May 1-31.....	56.5			122	42	512		246		384	700				1950	2.65	297	477	275	10	3290	
June 1-12.....	58.7			101	40	492		217		348	670				1800	2.45	285	416	238	11	3030	
June 13-20.....	194			74	16	213		176		153	291				862	1.17	452	250	106	5.9	1510	
June 21-30.....	68.8			126	38	588		224		385	825				2130	2.90	396	470	286	12	3640	

KANSAS RIVER BASIN--Continued

6-8695. SALINE RIVER AT TESCOTT, KANS.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
July 1, 1964.....	94			50	10	113		129		70	165				--	--	--	166	60	3.8	900	
July 2-30.....	25.7			107	45	603		220		398	828				2170	2.95	151	452	272	12	3740	
July 31-Aug. 6....	19.7			51	9	96		185		66	108				448	.61	23.8	164	12	3.3	780	
Aug. 7-18.....	19.8			79	21	273		205		195	358				1070	1.46	57.2	284	116	7.1	1850	
Aug. 19.....	386			37	6.7	23		142		25	19				--	--	--	120	4	.9	330	
Aug. 20.....	200			80	10	212		181		135	293				--	--	--	240	92	5.9	1500	
Aug. 21-29.....	46.9			56	7.9	77		185		62	88				418	.57	52.9	172	20	2.6	700	
Aug. 30-Sept. 1...	16.7			77	16	135		195		121	188				687	.93	31.0	258	98	3.7	1140	
Sept. 2.....	175			45	6.7	29		168		30	25				--	--	--	140	2	1.1	380	
Sept. 3-4.....	1040			83	16	365		151		218	508				1300	1.77	3650	273	149	9.6	2280	
Sept. 5-15.....	417			66	12	214		146		145	290				830	1.13	935	214	94	6.4	1440	
Weighted average	--			95	30	378		198		274	518				1480	2.01	312	358	196	8.3	2440	
Time-weighted average.....	A76.1			107	38	457		221		335	625				1750	--	--	421	239	9.3	2900	
Tons per day....	--			20	6.2	80		42		58	109				--	--	--	--	--	--	--	

A Mean discharge based on 366 days; mean discharge for 335 days of chemical analyses, 78.1 cfs.

KANSAS RIVER BASIN--Continued

6-8695. SALINE RIVER AT TESCOTT, KANS.--Continued

Additional analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (calculated)	Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
																		Calcium, magnesium	Noncarbonate				
Oct. 21, 1963	264	10		--	--	86	16	211	14	173	0	176	308	0.5	2.1	0.16	A928	280	138	5.5	1530	8.1	
Nov. 12.....	B46	12		--	--	134	34	429	18	307	0	317	600	.4	2.5	.27	1700	474	222	8.6	2820	8.2	
Dec. 5.....	B42	9.0		--	--	154	44	590	18	324	0	424	830	.5	1.1	.36	2230	565	299	11	3470	7.8	
Jan. 6, 1964.	B45	9.5		--	--	142	48	540	16	317	0	410	755	.4	4.9	.44	2080	552	292	10	3240	7.9	
Feb. 13.....	66	7.5		--	--	145	46	493	14	303	0	401	700	.5	.4	.32	1960	551	302	9.1	2990	7.9	
Mar. 13.....	54	4.5		--	--	134	49	560	15	281	0	434	780	.5	1.2	.31	2120	536	305	11	3550	7.8	
Apr. 3.....	66	4.5		0.11	0.00	134	47	560	18	261	0	445	790	.5	.4	.28	2130	528	314	11	3630	7.8	
May 4.....	65	7.0		--	--	130	46	520	19	264	0	409	730	.5	1.0	.38	1990	514	297	10	3410	7.6	
June 5.....	45	9.5		--	--	105	25	349	16	232	0	270	473	.5	.2	.30	1360	365	175	7.9	2360	7.6	
July 24.....	14	5.4		--	--	94	46	606	21	229	0	392	820	.5	1.1	.34	2100	424	236	13	3580	7.2	
Aug. 10.....	11	4.0		--	--	90	21	303	17	222	0	220	400	.4	.4	.27	1170	311	129	7.5	2000	7.4	
Sept. 3.....	371	8.2		.13	.00	104	28	417	19	212	0	248	613	.5	3.2	.21	1550	374	200	9.4	2680	7.3	
Sept. 4.....	2085	10		--	--	82	14	321	15	190	0	188	443	.5	4.9	.18	1170	262	106	8.6	2010	7.3	

A Residue at 180°C.
B Daily mean discharge.

352-691 O - 69 - 24

KANSAS RIVER BASIN--Continued

6-8695. SALINE RIVER AT TESCOTT, KANS.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Aver-age
	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	
October	64	66	66	65	68	66	65	65	65	66	65	64	63	64	66	68	65	67	67	--	64	65	67	67	64	65	61	57	53	52	52	64
November	49	48	49	51	51	51	50	51	52	52	50	47	41	40	43	48	47	45	43	45	48	48	45	41	41	39	39	42	38	39	--	46
December	38	36	35	35	36	35	38	35	34	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	34	33	35	32	32	32	--
January	32	35	36	34	33	35	33	34	34	32	32	--	32	35	32	35	33	38	34	35	34	35	32	34	35	33	33	35	35	38	34	34
February	33	36	37	37	36	36	35	36	36	38	35	38	38	36	37	33	36	37	36	34	34	34	35	34	34	34	32	34	--	--	--	35
March	--	--	--	--	--	--	42	39	38	36	39	39	42	46	43	46	46	45	--	42	43	40	47	43	37	34	40	42	39	38	39	--
April	51	57	51	45	48	48	48	43	42	52	56	56	53	50	55	59	64	55	58	61	60	59	62	61	63	66	58	53	53	58	--	55
May	60	58	64	62	70	67	69	68	61	65	66	62	61	63	66	70	74	74	72	78	74	72	73	73	74	77	--	66	65	62	60	68
June	62	62	65	71	65	63	78	75	76	70	78	77	74	73	75	69	75	78	79	80	78	83	72	73	75	74	71	72	71	79	--	73
July	77	81	82	85	83	80	80	79	86	82	80	80	74	77	76	76	79	81	81	83	--	83	84	83	84	82	84	82	82	82	81	81
August	84	82	82	82	81	83	85	75	78	78	73	70	71	66	66	68	69	72	70	74	71	70	69	72	69	75	72	68	74	74	75	74
September	82	77	80	73	73	73	76	76	79	78	73	61	67	66	68	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

KANSAS RIVER BASIN--Continued

6-8695. SALINE RIVER AT TESCOTT, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	198	--	400	49	--	7	46	--	6
2	164	--	200	48	--	7	44	--	5
3	137	--	100	46	--	6	44	--	5
4	117	--	100	46	--	6	44	--	5
5	103	--	70	46	--	6	42	40	4
6	92	--	60	45	51	6	43	--	5
7	82	--	40	44	--	5	43	--	5
8	75	200	40	45	--	6	43	--	5
9	70	--	30	44	--	5	44	--	5
10	66	--	30	45	--	6	40	--	4
11	63	--	20	46	--	6	35	--	3
12	62	--	20	46	--	6	25	--	1
13	60	120	20	44	--	5	27	14	1
14	64	--	20	45	50	6	32	--	2
15	68	--	30	47	--	6	36	30	3
16	78	--	40	46	--	6	40	--	4
17	98	--	60	47	--	6	41	--	4
18	74	150	30	48	--	7	36	--	3
19	145	--	200	48	--	7	38	--	3
20	400	1600	1700	47	--	6	37	--	3
21	361	--	1300	48	--	7	35	--	3
22	193	--	300	52	60	8	33	--	2
23	293	--	900	48	--	7	36	--	3
24	255	870	600	48	--	7	38	--	3
25	121	--	100	49	--	7	40	--	4
26	90	--	60	47	--	6	42	--	5
27	74	--	30	46	--	6	40	--	4
28	65	120	20	48	--	7	39	--	4
29	58	--	20	48	--	7	38	31	3
30	53	--	10	46	50	6	36	--	3
31	50	--	10	--	--	--	40	--	4
Total	3829	--	6560	1402	--	189	1197	--	114

	JANUARY			FEBRUARY			MARCH		
1	42	--	5	70	--	20	61	--	10
2	44	--	5	73	--	20	59	--	10
3	46	--	6	76	--	20	55	--	10
4	47	--	6	76	100	20	53	--	9
5	46	--	6	75	--	20	49	61	8
6	45	--	6	75	--	20	49	--	8
7	48	--	7	74	--	20	50	--	8
8	46	50	6	74	--	20	52	--	8
9	40	--	4	70	--	20	53	--	9
10	34	--	2	72	--	20	53	--	9
11	30	--	2	68	--	20	54	--	9
12	27	--	1	68	--	20	54	--	10
13	30	--	2	66	110	20	55	67	10
14	35	--	3	65	--	20	55	--	10
15	45	--	6	67	--	20	53	--	9
16	48	--	7	65	--	20	52	--	9
17	52	--	8	65	--	20	49	--	8
18	48	--	7	65	--	20	48	--	7
19	50	--	8	65	--	20	51	58	8
20	54	--	9	65	--	20	56	--	10
21	58	--	10	64	60	10	59	--	10
22	56	130	20	62	--	10	60	--	10
23	56	--	10	61	--	10	57	--	10
24	50	--	8	60	--	10	55	--	10
25	51	--	8	58	--	10	58	--	10
26	55	--	10	55	--	10	60	61	10
27	57	--	10	51	--	8	58	--	10
28	53	--	9	52	59	8	57	--	10
29	50	--	8	52	--	9	58	--	10
30	60	--	10	--	--	--	60	--	10
31	65	--	20	--	--	--	62	--	10
Total	1468	--	229	1909	--	485	1705	--	289

KANSAS RIVER BASIN--Continued

6-8695. SALINE RIVER AT TESCOTT, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	65	--	20	51	--	8	52	--	50
2..	67	--	20	56	--	20	47	--	50
3..	67	95	17	63	--	20	46	--	50
4..	68	--	20	65	150	26	47	--	50
5..	68	--	20	67	--	30	46	350	43
6..	65	--	20	91	--	50	46	--	40
7..	64	--	20	112	--	90	51	--	50
8..	65	--	20	83	--	40	50	--	50
9..	64	--	20	66	--	30	44	--	30
10..	62	--	10	57	--	20	41	--	30
11..	62	--	10	56	--	20	44	--	30
12..	62	60	10	55	--	*20	190	1700	S 960
13..	60	--	10	52	--	10	286	2700	2100
14..	58	--	10	49	76	10	164	2500	1100
15..	55	--	10	45	--	10	312	1800	1500
16..	54	--	9	45	--	10	365	2600	2600
17..	52	--	9	45	--	10	175	2500	1200
18..	52	--	9	43	--	10	99	1700	450
19..	53	--	9	42	--	10	81	720	160
20..	52	--	9	42	--	10	73	470	93
21..	51	--	8	41	--	10	66	430	77
22..	52	--	9	40	--	10	64	470	81
23..	56	--	10	39	--	10	98	2400	620
24..	62	61	10	41	90	10	74	2200	440
25..	58	--	10	41	--	10	61	1200	200
26..	56	--	10	44	--	10	55	500	74
27..	55	--	10	58	--	20	57	410	63
28..	52	--	9	56	--	20	54	350	51
29..	51	--	8	57	--	20	49	280	37
30..	49	--	8	84	--	100	110	1300	S 580
31..	--	--	--	67	--	70	--	--	--
Total	1757	--	374	1753	--	744	2947	--	12859

Day	JULY			AUGUST			SEPTEMBER		
1..	94	1600	S 480	32	--	9	24	730	S 80
2..	43	430	50	21	--	5	175	5600	2600
3..	38	230	24	15	--	3	531	5200	S 10000
4..	37	160	16	13	--	2	1550	4500	19000
5..	34	160	15	11	--	2	1450	1500	5900
6..	31	--	10	10	--	2	1030	980	2700
7..	29	--	10	10	--	2	688	790	1500
8..	27	--	9	11	--	2	450	630	760
9..	27	--	9	9.7	--	2	290	650	510
10..	25	--	6	11	69	2	193	550	290
11..	23	97	6	9.7	--	2	143	520	200
12..	23	--	6	26	--	7	108	400	120
13..	22	--	6	20	--	5	87	--	60
14..	20	--	5	14	--	5	76	--	40
15..	19	--	5	13	--	5	69	--	30
16..	18	--	5	13	--	5	66	--	30
17..	17	110	5	13	--	5	68	--	30
18..	16	--	4	87	1600	S 1600	69	160	30
19..	16	--	4	386	5100	S 6400	68	--	30
20..	16	--	4	200	2100	1100	64	--	30
21..	15	--	4	218	5300	S 3100	61	--	20
22..	14	--	3	62	5400	900	57	--	20
23..	14	--	3	32	2100	180	52	--	10
24..	14	--	3	22	810	48	48	--	10
25..	13	85	3	20	500	27	44	84	10
26..	12	--	3	18	380	18	41	--	9
27..	16	--	4	17	--	10	38	--	9
28..	33	--	10	17	--	10	36	--	9
29..	20	--	8	16	--	10	35	--	8
30..	112	--	90	14	--	10	31	--	8
31..	36	--	20	12	--	8	--	--	--
Total	874	--	830	1373.4	--	13486	7642	--	44053

Total discharge for year (cfs-days)..... 27856.4
Total load for year (tons)..... 80212

S Computed by subdividing day.

6-8695. SALINE RIVER AT TESCOTT, KANS.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
June 15, 1964.....	1945	78		410	1910	2110	62	72		87		100						VPWC
Aug. 19.....	0800	--		572	5880	9080	78	82		95		100						VPWC
Sept. 3.....	0915	78		371	2100	2100	65	71		89		100						PWC
Sept. 3.....	0915	78		371	2100	2100	9	26		87		100						PN
Sept. 4.....	0825	--		1570	5090	21600	72	80		91		100						VPWC
Sept. 4.....	1045	76		1610	3980	17300	73	82		93		99	100					VPWC

6-8699.5. MULBERRY CREEK NEAR SALINA, KANS.

LOCATION.--At county highway bridge, 2 miles downstream from Spring Creek, 2.2 miles west of Salina, Saline County, and 9 miles upstream from mouth.
DRAINAGE AREA.--250 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964 (discontinued).
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 21, 1963	13.0	12		--	--	9.6	4.9	6.4	5.9	46	0	14	6.0	0.3	4.9	0.10	96	44	6	0.4	120	7.6	
Nov. 12.....	1.1	16		--	--	76	16	37	9.2	300	0	74	21	.3	.4	.23	400	256	10	1.0	630	7.7	
Nov. 19.....	.8	15		--	--	77	21	44	9.8	315	0	80	25	.4	1.0	.18	422	278	20	1.1	650	8.1	
Dec. 5.....	1.8	13		--	--	83	27	49	7.6	327	0	108	32	.3	.4	.19	495	318	50	1.2	720	7.9	
Jan. 6, 1964.	4.1	11		--	--	83	20	73	6.0	278	0	120	78	.3	.4	.19	545	289	61	1.9	820	7.7	
Feb. 13.....	3.5	6.5		--	--	63	21	37	3.3	234	0	94	24	.2	.4	.15	374	244	52	1.0	580	7.7	
Mar. 13.....	3.7	3.5		--	--	70	20	48	4.7	251	0	114	30	.4	.7	.13	412	256	50	1.3	640	7.8	
Apr. 9.....	4.1	4.0		0.01	0.00	67	22	44	5.0	261	0	96	29	.4	.7	.12	400	258	44	1.2	650	7.8	
May 4.....	2.3	12		--	--	74	22	51	6.3	307	0	89	30	.5	.4	.16	446	275	23	1.3	710	7.6	
June 5.....	10.7	19		--	--	83	19	62	9.5	337	0	94	37	.5	2.2	.18	494	285	9	1.6	800	7.5	
June 12.....	23.5	13		--	--	28	3.4	11	11	93	0	29	9.0	.4	2.8	.10	142	84	8	.5	220	7.0	
July 6.....	2.0	12		--	--	27	3.0	7.6	12	85	0	21	10	.5	4.4	.07	145	80	10	.4	210	7.1	
Sept. 17.....	.1	20		.39	.38	61	12	44	90	303	0	48	68	.5	15	.21	598	202	0	1.3	860	7.1	

KANSAS RIVER BASIN--Continued

6-8701. SALINE RIVER NEAR NEW CAMBRIA, KANS.

LOCATION.--At county highway bridge, about 1.5 miles west of New Camhria, Saline County.
RECORDS AVAILABLE.--Chemical analyses: October 1962 to Septemher 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted.

Chemical analyses, in parts per million, water year Octoher 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 19, 1963	80.0	14		0.55	0.01	72	14	134	8.8	183	0	122	184	0.6	2.5	0.15	678	236	86	3.8	1120	8.1	
Nov. 12.....	56.4	16		.05	.02	126	29	325	9.6	304	0	240	459	.6	.9	.21	1360	435	186	6.8	2320	7.9	
Dec. 5.....	63.0	13		.03	.00	124	40	475	9.2	276	0	332	674	.5	.1	.25	1800	473	247	9.5	3120	7.9	
Jan. 31, 1964	81.0	12		.03	.07	144	38	425	7.4	328	0	331	600	.5	2.9	.24	1720	514	245	8.1	2940	7.6	
Feb. 13.....	75.2	10		.01	.03	144	38	445	7.6	308	0	348	628	.5	.1	.23	1770	516	263	8.5	3030	7.7	
Mar. 13.....	66.0	9.1		.03	.17	130	45	480	8.0	296	0	371	682	.4	.1	.24	1870	509	266	9.3	3210	7.8	
Apr. 9.....	68.9	6.9		.14	.33	129	46	509	8.9	264	0	387	708	.4	.1	.25	1930	510	293	9.8	3290	7.6	
May 4.....	62.9	10		.06	.18	128	37	445	10	282	0	350	596	.4	.1	.27	1720	473	242	8.9	2950	7.6	
June 5.....	89	9.8		.02	.16	74	18	198	8.0	187	0	154	272	.4	1.5	.19	873	257	104	5.4	1500	7.3	
June 16.....	302	13		.49	.05	68	11	135	9.8	167	0	106	185	.4	4.9	.10	648	213	76	4.0	1110	7.6	
July 6.....	--	11		.09	.00	65	8.3	109	13	172	0	79	157	.3	4.5	.07	560	196	55	3.4	961	7.6	
July 27.....	21.7	9.5		.08	.03	111	40	500	12	268	0	342	692	.4	3.1	.32	1840	440	220	10	3220	7.6	
Aug. 17.....	20.3	8.2		.04	.04	89	22	250	10	248	0	193	334	.4	1.2	.16	1030	312	109	6.2	1810	7.3	
Sept. 5.....	1100	13		.06	.01	63	9.5	84	9.4	192	0	62	112	.4	4.8	.08	484	196	38	2.6	811	7.3	
Sept. 9.....	593	9.9		.07	.00	85	.7	171	9.2	151	0	134	232	.4	2.3	.10	736	215	91	5.1	1270	7.5	

6-8702. SMOKY HILL RIVER AT NEW CAMBRIA, KANS.

LOCATION.--At gaging station at county highway bridge, 3 miles southeast of New Cambria, Saline County, 7.4 miles upstream from Gypsum Creek, and about 15.4 miles upstream from Solomon River.
DRAINAGE AREA.--11,730 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1962 to September 1964.
Water temperatures: October 1962 to September 1964.
Sediment records: October 1962 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 92°F July 25, Aug. 5; minimum, freezing point on many days during December and January.
Sediment concentrations: Maximum daily, 4,300 ppm Sept. 5; minimum daily, 2 ppm Jan. 2-5, Feb. 8.
Sediment loads: Maximum daily, 18,000 tons June 16; minimum daily, 1 ton on several days during January and February.
EXTREMES, 1962-64.--Water temperatures: Maximum, 92°F July 6, 1963, July 25, Aug. 5, 1964; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 4,700 ppm Aug. 2, 1963; minimum daily, 2 ppm Jan. 2-5, Feb. 8, 1964.
Sediment loads: Maximum daily, 22,000 tons July 11, 1963; minimum daily, 1 ton on several days in 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Flow affected by ice Dec. 10, 11, Dec. 26 to Jan. 22.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 22, 1963	1130	13		0.31	0.00	70	9.8	67	6.2	207	0	64	90	0.2	1.7	0.09	439	215	45	2.0	752	7.4	
Nov. 14.....	147	14		.04	.01	113	21	193	9.6	252	0	177	304	.6	4.2	.18	A961	369	162	4.4	1670	8.2	
Dec. 3.....	138	12		.32	.01	121	27	285	9.4	269	0	225	409	.5	3.2	.18	1220	412	191	6.1	2100	8.0	
Jan. 3, 1964.	135	11		.02	.06	122	27	265	8.2	285	0	222	377	.5	5.7	.18	1180	417	183	5.7	2040	8.0	
Feb. 12.....	142	10		.02	.04	128	31	300	8.4	280	0	253	442	.6	3.6	.20	1310	447	217	6.2	2270	7.7	
Mar. 6.....	121	8.7		.01	.12	117	36	352	9.0	264	0	297	480	.5	.8	.20	1430	442	225	7.3	2460	7.6	
Apr. 8.....	229	6.1		.03	.12	129	15	268	9.2	218	0	213	397	.4	.0	.16	1140	385	206	6.0	2040	7.6	
May 5.....	189	7.2		.05	.08	112	24	268	10	222	0	230	382	.5	1.1	.20	1140	380	198	6.0	2030	7.5	
June 12.....	161	8.9		.03	.05	76	15	152	8.9	186	0	134	217	.4	3.9	.15	737	252	99	4.2	1260	7.6	
June 15:																							
At 0905....	500	14		.14	.02	69	6.8	32	8.1	200	0	39	47	.4	3.3	.05	328	200	36	1.0	552	7.3	
At 1815....	864	15		.09	.03	82	17	111	9.6	208	0	110	164	.4	1.5	.11	624	275	104	2.9	1050	7.4	
July 1.....	938	9.7		.07	.00	92	14	125	9.8	194	0	122	208	.4	1.4	.09	708	286	127	3.2	1190	7.2	
July 6.....	920	7.4		.09	.00	95	17	136	10	184	0	132	229	.4	.9	.10	770	307	156	3.4	1280	7.3	
July 31.....	77	5.6		.07	.00	79	24	232	11	187	0	192	316	.4	7.3	.19	963	296	143	5.9	1660	7.3	
Sept. 9.....	787	8.9		.08	.00	71	14	176	9.8	150	0	143	257	.4	2.8	.11	782	236	113	5.0	1350	7.2	

A Calculated from determined constituents.

KANSAS RIVER BASIN--Continued

6-8702. SMOKY HILL RIVER AT NEW CAMBRIA, KANS.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	68	60	71	72	72	68	70	68	71	70	70	70	69	70	69	66	78	70	69	66	67	69	68	68	69	68	63	68	54	55	54	67
November	55	55	59	55	55	57	58	57	55	51	52	51	46	44	58	56	50	51	46	49	53	47	46	46	42	44	49	45	43	40	--	50
December	42	42	42	42	43	44	40	37	35	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	37	33	34	34	32	36	35
January	40	38	35	34	35	34	36	35	34	35	33	32	32	32	32	35	35	35	39	41	40	44	39	37	40	35	35	35	39	40	42	36
February	39	41	42	44	46	40	36	39	42	40	39	39	41	41	39	39	40	40	41	37	39	41	40	41	34	38	40	40	42	--	--	40
March	43	50	47	47	47	46	42	39	43	43	48	52	54	53	59	54	57	56	50	43	45	49	54	42	38	42	42	46	46	49	56	48
April	61	77	57	48	54	56	48	53	56	56	58	65	58	60	65	68	67	68	67	70	70	65	66	71	72	70	55	59	65	65	--	62
May	65	70	75	75	73	73	75	70	72	73	72	68	68	69	75	76	78	82	81	82	79	82	80	80	85	83	66	69	67	65	69	74
June	70	75	71	70	67	76	79	81	82	81	80	82	79	81	77	76	81	84	85	89	87	83	81	85	83	83	84	85	85	84	--	80
July	84	84	87	86	83	80	85	85	87	83	81	82	79	82	81	83	85	88	82	84	88	90	90	90	92	90	90	91	85	88	86	86
August	81	85	90	90	92	90	86	86	85	91	82	82	66	66	68	68	68	80	84	77	76	74	76	78	71	76	76	76	76	77	79	79
September	82	80	84	80	76	77	78	80	81	70	71	67	69	74	68	66	68	71	73	69	70	73	70	68	70	66	63	64	65	67	--	72

KANSAS RIVER BASIN--Continued

6-8702. SMOKY HILL RIVER AT NEW CAMBRIA, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	368	1400	1400	268	280	200	144	14	5
2..	342	910	840	260	250	180	144	11	4
3..	315	740	630	255	150	100	138	6	2
4..	278	650	490	255	170	120	138	7	3
5..	270	450	330	251	200	140	136	10	4
6..	278	400	300	221	190	110	136	12	4
7..	262	390	280	185	160	80	134	13	5
8..	247	360	240	173	120	60	142	15	6
9..	243	300	200	169	110	50	134	16	6
10..	231	250	160	165	94	42	115	--	3
11..	221	200	120	157	94	40	90	--	2
12..	197	190	100	157	88	37	70	--	2
13..	173	180	84	151	88	36	75	--	2
14..	161	180	78	147	57	23	90	--	2
15..	161	170	74	149	56	22	100	--	3
16..	288	760	590	153	100	41	110	--	3
17..	255	840	580	151	130	53	115	--	3
18..	239	820	530	149	42	17	100	--	3
19..	217	570	330	142	39	15	105	--	3
20..	191	300	150	149	120	48	105	--	3
21..	1170	1800	S 6700	151	79	32	105	--	3
22..	1250	2000	6800	153	120	50	105	--	3
23..	962	2200	5700	149	100	40	115	--	3
24..	476	1800	2300	144	40	16	120	--	3
25..	470	1800	2300	144	34	13	130	--	2
26..	380	1100	1100	144	30	12	140	6	2
27..	282	870	660	142	25	10	145	9	4
28..	270	800	580	144	20	8	145	11	4
29..	292	800	630	146	22	9	140	22	8
30..	285	610	470	140	16	6	135	10	4
31..	278	440	330	--	--	--	145	5	2
Total	11052	--	35076	5164	--	1610	3746	--	106

Day	JANUARY			FEBRUARY			MARCH		
1..	155	6	2	149	8	3	136	26	10
2..	160	2	1	144	19	7	121	28	9
3..	165	2	1	161	28	12	116	28	9
4..	160	2	1	163	24	10	128	25	9
5..	150	2	1	157	24	10	124	21	7
6..	140	5	2	151	18	7	121	22	7
7..	125	3	1	144	8	3	117	47	15
8..	120	8	2	140	2	1	119	21	7
9..	115	13	4	140	5	2	128	22	8
10..	105	20	6	142	10	4	122	13	4
11..	90	15	4	140	10	4	121	20	7
12..	75	10	2	142	31	12	121	38	12
13..	80	5	1	140	24	9	122	48	16
14..	95	5	1	138	25	9	119	48	15
15..	110	10	3	142	21	8	119	35	11
16..	115	15	5	142	25	10	119	42	13
17..	125	12	4	142	22	8	116	33	10
18..	125	12	4	136	19	7	117	31	10
19..	135	46	17	138	21	8	128	45	16
20..	145	8	3	134	20	7	189	69	35
21..	155	11	5	131	19	7	179	120	58
22..	155	12	5	131	16	6	153	48	20
23..	144	5	2	129	15	5	151	48	20
24..	151	13	5	129	29	10	144	33	13
25..	133	10	4	131	20	7	142	23	9
26..	140	3	1	117	28	9	134	12	4
27..	138	29	11	121	29	9	134	12	4
28..	116	5	2	122	36	12	136	20	7
29..	116	13	4	126	37	12	142	27	10
30..	136	14	5	--	--	--	133	21	8
31..	146	15	6	--	--	--	131	30	11
Total	4020	--	115	4022	--	218	4082	--	394

S Computed by subdividing day.

KANSAS RIVER BASIN--Continued

6-8702. SMOKY HILL RIVER AT NEW CAMBRIA, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	131	35	12	211	160	91	124	140	47
2	140	29	11	203	110	60	138	170	63
3	138	48	18	191	120	62	121	180	59
4	159	24	10	183	130	64	116	180	56
5	173	49	23	187	110	56	147	290	120
6	225	100	61	191	170	88	128	200	69
7	229	65	40	181	290	140	113	150	46
8	231	50	31	197	370	200	113	140	43
9	227	40	24	205	430	240	129	160	56
10	227	67	41	193	380	200	163	450	200
11	225	84	51	171	350	160	147	440	170
12	223	99	60	157	290	120	165	490	220
13	223	52	31	151	250	100	207	680	380
14	219	57	34	147	250	99	338	1300	1200
15	219	70	41	142	250	96	626	2100 S	4000
16	215	71	41	129	160	56	1710	4000	18000
17	215	81	47	121	170	56	1160	2700	8500
18	205	56	31	116	170	53	593	1700	2700
19	209	67	38	114	180	55	335	1400	1300
20	215	64	37	109	170	50	235	1100	700
21	217	72	42	106	180	52	215	560	320
22	215	52	30	103	200	56	207	500	280
23	211	64	36	98	180	48	219	400	240
24	185	57	28	98	210	56	205	400	220
25	153	68	28	97	180	47	201	430	230
26	153	100	41	98	170	45	183	220	110
27	165	110	49	114	280	86	159	230	99
28	205	98	54	167	240	110	151	210	86
29	207	54	30	134	220	80	262	470	330
30	209	110	62	133	180	65	440	800	950
31	--	--	--	124	110	37	--	--	--
Total	5968	--	1082	4571	--	2728	9050	--	40794

	JULY			AUGUST			SEPTEMBER		
1	770	1200	2500	133	160	57	117	290	92
2	1060	1300	3700	88	150	36	82	180	40
3	864	940	2200	75	120	24	69	160	30
4	467	560	710	61	96	16	151	850	350
5	843	980	2200	51	80	11	665	4300 S	9000
6	955	990	2600	45	76	9	1540	3800	16000
7	677	620	1100	42	72	8	1440	1800	7000
8	425	430	490	40	62	7	1100	1100	3300
9	362	320	310	37	58	6	804	830	1800
10	209	220	120	40	30	3	566	670	1000
11	147	120	48	43	79	9	407	580	640
12	149	160	64	38	48	5	318	510	440
13	183	180	89	39	58	6	268	400	290
14	155	180	75	59	110	18	253	330	220
15	119	76	24	80	120	26	262	520	370
16	105	56	16	70	120	23	265	320	230
17	96	49	13	68	120	22	285	320	250
18	85	72	16	70	98	18	285	290	220
19	77	37	8	68	90	16	268	270	200
20	69	58	11	182	460 S	310	310	690	580
21	64	51	9	470	2600	3300	320	500	430
22	60	59	10	401	2700	2900	330	1100	980
23	54	47	7	362	1700	1700	251	570	390
24	51	36	5	191	1100	570	239	330	210
25	48	35	5	121	1200	390	229	300	180
26	45	34	4	96	570	150	221	270	160
27	48	36	5	87	190	45	209	200	110
28	129	90	31	96	190	49	175	150	71
29	96	74	19	121	190	62	144	150	58
30	80	62	13	124	360	120	134	150	54
31	94	100	25	124	280	94	--	--	--
Total	8586	--	16427	3522	--	10010	11707	--	44695

Total discharge for year (cfs-days)..... 75490
Total load for year (tons)..... 153255

S Computed by subdividing day.

6-8702. SMOKY HILL RIVER AT NEW CAMBRIA, KANS.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 1, 1963.....	1815	68		365	1240	1220	69	80		97		99	100					PWC
Oct. 16.....	1800	66		355	1280	1230	66	78		96		100	--					PWC
Oct. 18.....	1750	70		249	988	664	74	87		96		100	--					PWC
Oct. 22.....	1200	68		1170	1790	5650	57	68		86		98	100					PWC
Oct. 22.....	1740	69		1130	2540	7750	64	76		89		99	100					PWC
Oct. 29.....	1715	54		290	898	703	82	91		100		--	--					PWC
June 15, 1964.....	2215	76		1120	3620	10900	54	65		83		100	--					VPWC
June 16.....	0830	74		1750	4080	19300	49	56		71		99	100					VPWC
June 16.....	1400	75		1840	4370	21700	59	67		84		99	100					VPWC
June 16.....	1400	75		1840	4370	21700	21	46		83		99	100					PN
June 18.....	1245	81		584	1600	2520	72	80		91		99	100					VPWC
July 1.....	1545	83		938	1500	3800	54	63		77		99	100					VPWC
Sept. 5.....	1145	77		620	4900	8200	72	83		93		100	--					VPWC
Sept. 5.....	1145	77		620	4900	8200	8	22		94		100	--					PN
Sept. 6.....	1140	77		1570	3900	16500	70	76		90		100	--					VPWC
Sept. 9.....	1205	79		787	824	1750	67	72		87		99	100					VPWC

KANSAS RIVER BASIN--Continued

6-8702. SMOKY HILL RIVER AT NEW CAMBRIA, KANS.--Continued

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters										Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Nov. 14, 1963	1150		10	149			--	0	20	72	94	98	100	--	--	--		SV
Dec. 3	1100		10	138			1	1	22	69	92	99	100	--	--	--		SV
Jan. 3, 1964	1540		10	135			2	4	37	80	96	98	99	100	--	--		SV
Feb. 12	1515		8	142			1	4	30	63	80	89	97	100	--	--		SV
Mar. 6	1520		8	121			7	11	42	62	69	74	80	83	86	100		SV
Apr. 8	1440		7	229			7	12	32	50	58	66	76	88	97	100		SV
May 5	0930		9	189			5	10	31	60	78	85	91	96	100	--		SV
June 12	1545		15	161			3	6	29	58	75	85	92	96	100	--		SV
June 15	1800		4	864			9	14	28	44	54	60	70	81	95	100		SV
June 16	0830		3	1750			3	6	19	39	55	66	79	93	100	--		SV
June 18	1245		3	584			1	5	40	65	83	91	95	96	100	--		SV
July 1	1545		8	938			15	22	33	42	48	53	61	67	87	100		SV
July 6	1550		5	920			7	11	30	49	64	71	78	88	100	--		SV
July 31	1050		5	77			2	2	31	81	94	98	99	100	--	--		SV
Sept. 9	1205		4	787			1	7	31	51	61	66	71	74	88	100		SV

6-8710. NORTH FORK SOLOMON RIVER AT GLADE, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 183, 0.5 mile southb of Glade, Phillips County.
DRAINAGE AREA.--849 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. No flow Dec. 14-28, May 23-30, June 10-13, July 3-11, July 22 to Sept. 30.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 23, 1963.....	5.1	25		100	16	23	16	271	0	108	33	0.5	0.4	0.13	459	0.62	6.32	316	94	0.6	670	8.3
Nov. 13.....	3.3	25		105	21	25	12	281	0	130	35	.4	.4	.13	500	.68	4.46	348	117	.6	730	8.1
Dec. 30.....	.5	19		114	23	31	15	242	10	195	36	.4	1.0	.16	590	.80	.80	379	164	.7	860	8.3
Jan. 22, 1964.....	9.3	16		91	15	21	10	249	0	96	29	.4	.4	.13	410	.56	10.3	288	84	.5	610	8.0
Feb. 11.....	16	18		101	16	22	11	239	29	93	26	.4	1.1	.15	463	.63	20.0	318	74	.5	670	8.3
Mar. 27.....	19	21		94	12	19	11	285	0	74	21	.5	.6	.13	408	.55	20.9	284	50	.5	620	7.9
Apr. 13.....	11	19		96	15	22	13	288	0	88	26	.5	.4	.13	436	.59	13.0	301	65	.6	670	7.9
May 11.....	6.1	28		103	17	26	14	303	0	106	28	.5	.4	.18	483	.66	7.96	327	78	.6	760	7.7
June 24.....	30	23		50	6.6	5.0	15	178	0	19	8.0	.5	5.3	.12	229	.31	18.6	152	6	.2	370	7.3
July 12.....	238	21		58	4.7	9.6	13	217	0	14	4.0	.4	2.3	.16	243	.33	156	164	0	.3	360	7.3

KANSAS RIVER BASIN--Continued

6-8725. NORTH FORK SOLOMON RIVER NEAR DOWNS, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 24, 3 miles west of Downs, Osborne County, 4.5 miles upstream from Oak Creek, and at mile 16.4.
DRAINAGE AREA.--2,390 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 22, 1963	43	25		--	--	126	19	54	15	356	0	161	38	0.2	4.9	0.19	634	392	100	1.2	910	7.9	
Nov. 12.....	40	17		--	--	121	24	56	14	351	0	176	40	.3	5.8	.21	640	400	112	1.2	910	8.1	
Jan. 2, 1964.	63	20		--	--	115	16	54	12	307	0	175	40	.3	11	.18	632	353	101	1.3	920	8.1	
Jan. 21.....	46	18		--	--	133	17	48	11	349	0	172	40	.2	11	.18	646	402	116	1.0	940	8.0	
Feb. 12.....	40	15		--	--	128	24	51	12	356	0	185	43	.3	8.0	.19	654	418	126	1.1	950	7.9	
Mar. 24.....	46	10		--	--	112	18	52	14	278	0	188	42	.3	5.8	.15	609	354	126	1.2	910	8.0	
Apr. 13.....	36	15		--	--	114	23	57	16	307	0	190	43	.3	6.2	.16	632	379	127	1.3	940	8.0	
May 6.....	32	21		0.03	0.04	122	20	59	16	337	0	178	44	.4	5.8	.18	650	386	110	1.3	940	7.7	
May 21.....	38	26		--	--	94	16	41	16	276	0	124	34	.4	3.9	.18	510	300	74	1.0	790	7.4	
June 10.....	22	27		--	--	100	21	56	16	305	0	157	38	.4	4.0	.24	590	336	86	1.3	920	7.5	
July 23.....	18	12		--	--	50	16	45	16	151	0	132	33	.5	.2	.21	402	191	67	1.4	600	7.1	
Aug. 12.....	16	14		--	--	78	14	61	15	237	0	149	34	.4	1.6	.24	476	252	58	1.7	700	7.4	
Sept. 10.....	25	17		.07	.00	98	12	50	16	261	0	152	33	.4	4.2	.24	510	294	80	1.3	760	7.4	

6-8730. SOUTH FORK SOLOMON RIVER ABOVE WEBSTER RESERVOIR, KANS.

LOCATION.--At gaging station at highway bridge, 4 miles north of Damar, 7 miles downstream from Wild Horse Creek, and 11 miles upstream from Webster Dam, Rooks County.
DRAINAGE AREA.--1,040 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Chemical analyses by Kansas State Department of Health, Topeka, Kans. No flow July 4-10, Aug. 2, 3, Aug. 5 to Sept. 15, Sept. 17-19, 29, 30.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Nov. 18, 1963.....	20	21		114	23	37	11	261	0	184	46	0.5	0.7	0.16	582	0.79	31.4	379	165	0.8	840	8.2
Dec. 20.....	9.5	25		134	25	55	12	249	0	252	67	.5	2.3	.15	710	.97	18.2	438	234	1.1	1060	8.1
Jan. 10, 1964.....	27	25		120	23	35	11	242	14	186	47	.5	1.9	.16	610	.83	44.5	394	172	.8	870	8.3
Feb. 20.....	40	24		118	19	33	9.8	283	0	156	41	.5	1.3	.15	554	.75	59.8	372	140	.7	780	8.0
Mar. 23.....	64	25		112	19	36	10	254	0	161	48	.6	1.8	.12	558	.76	96.4	358	150	.8	820	7.7
Apr. 22.....	40	25		101	22	34	11	261	0	149	43	.7	1.2	.12	540	.73	58.3	342	128	.8	790	8.1
May 21.....	9.6	30		110	22	44	13	239	0	196	51	.7	.3	.18	578	.78	14.9	365	169	1.0	920	7.6
June 23.....	10	30		108	20	41	14	254	0	172	48	.7	1.2	.16	564	.77	15.2	352	144	1.0	870	7.9
July 9.....	.4	27		153	31	151	18	266	0	344	205	.7	.0	.21	1060	1.44	1.14	509	291	2.9	1620	7.3
July 13.....	262	20		35	20	5.0	11	185	0	19	7.0	.5	4.9	.08	225	.31	159	170	18	.2	340	7.3

KANSAS RIVER BASIN--Continued

6-8740. SOUTH FORK SOLOMON RIVER AT OSBORNE, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 281, 0.5 mile south of Osborne, Osborne County, 0.6 mile downstream from Covert Creek, and at mile 26.1.
DRAINAGE AREA.--2,024 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 22, 1963	22	19		--	--	122	19	53	13	305	0	163	57	0.3	3.9	0.19	614	382	132	1.2	880	8.2	
Nov. 12.....	20	15		--	--	120	17	54	11	283	0	167	59	.3	4.0	.18	613	370	138	1.2	880	8.3	
Jan. 2, 1964.	25	17		--	--	136	22	51	10	324	0	193	63	.3	9.3	.16	696	430	164	1.1	950	8.2	
Jan. 21.....	26	17		--	--	138	17	55	8.9	322	0	175	62	.3	8.0	.19	656	414	150	1.2	950	7.8	
Feb. 12.....	26	12		--	--	130	20	59	9.8	312	0	185	62	.3	6.2	.18	647	406	150	1.3	950	7.8	
Mar. 24.....	27	7.5		--	--	115	17	59	13	246	0	195	65	.4	4.9	.15	626	357	155	1.4	930	7.8	
Apr. 13.....	67	13		--	--	102	21	45	15	217	0	189	55	.5	5.3	.13	558	341	163	1.1	840	7.9	
May 6.....	25	15		0.00	0.00	118	18	52	15	266	0	188	60	.5	5.3	.15	614	368	150	1.2	920	7.7	
May 21.....	16	18		--	--	110	15	56	15	261	0	176	51	.5	5.8	.24	587	336	122	1.3	930	7.2	
June 10.....	24	18		--	--	114	14	52	15	259	0	169	58	.5	5.3	.19	592	342	130	1.2	920	7.6	
July 24.....	6.0	16		--	--	90	16	53	15	200	0	174	55	.5	5.8	.21	528	290	126	1.4	800	7.2	
Aug. 12.....	11	13		--	--	85	20	54	15	190	0	184	55	.5	4.2	.24	530	294	138	1.4	790	7.4	
Sept. 10.....	27	16		.03	.00	96	12	44	14	217	0	156	45	.5	4.9	.21	520	289	111	1.1	750	7.4	

KANSAS RIVER BASIN--Continued

6-8760. SOLOMON RIVER AT BELOIT, KANS.

LOCATION.--At bridge on State Highway 14 in Beloit, Mitchell County, 8.5 miles upstream from gaging station, about 1.5 miles upstream from Leban Creek, and 300 feet downstream from dam at city waterplant.
DRAINAGE AREA.--5,430 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1949 to September 1952, September 1957 to September 1958, October 1959 to September 1964.
Water temperatures: February 1949 to September 1952, September 1957 to September 1956.
Sediment records: May 1948 to September 1952.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Dec. 3, 1963.	107	12		--	--	133	21	105	13	351	0	205	110	0.3	4.4	0.18	790	418	130	2.2	1190	8.1	
Dec. 24.....	82	19		--	--	162	26	121	15	423	0	245	133	.3	10	.24	930	511	164	2.3	1410	7.7	
Jan. 14, 1964	83	18		--	--	166	27	118	14	434	0	243	132	.3	6.6	.24	952	525	169	2.2	1410	7.8	
Feb. 26.....	103	7.5		--	--	138	19	97	12	334	0	219	105	.3	7.1	.21	785	424	150	2.1	1220	7.9	
Mar. 18.....	96	1.0		--	--	111	23	99	15	288	0	214	109	.4	1.6	.16	714	372	136	2.2	1150	7.7	
Apr. 30.....	152	13		--	--	109	20	75	16	256	0	195	65	.5	5.3	.16	670	354	144	1.7	1010	7.5	
May 6.....	114	12		0.00	0.00	94	22	80	16	234	0	195	67	.5	4.0	.18	634	325	133	1.9	990	7.5	
May 20.....	76	21		--	--	109	24	114	17	295	0	197	124	.4	5.3	.23	766	370	128	2.6	1250	7.4	
June 9.....	115	19		--	--	108	22	88	16	276	0	195	92	.5	4.0	.21	686	360	134	2.0	1110	7.5	
July 23.....	8.9	6.8		--	--	82	24	216	20	254	0	212	260	.5	1.7	.32	964	303	95	5.4	1590	7.2	
Aug. 11.....	.7	3.6		--	--	68	30	340	20	237	0	246	436	.5	4.4	.27	1270	293	99	6.6	2170	7.2	
Sept. 10.....	144	13		.09	.00	76	14	36	15	176	0	142	39	.5	4.9	.23	432	252	106	1.0	660	7.4	

KANSAS RIVER BASIN--Continued

6-8769. SOLOMON RIVER AT NILES, KANS.

LOCATION.--At gaging station at county highway bridge, 0.8 mile west of Niles, Ottawa County, and at mile 16.9.
DRAINAGE AREA.--6,770 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1958 to September 1964.
Water temperatures: October 1961 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 944 ppm Dec. 1-31, Jan. 14-31; minimum, 148 ppm July 1-27.
Hardness: Maximum, 400 ppm Nov. 1-30; minimum, 84 ppm July 1-27.
Specific conductance: Maximum daily, 1,970 micromhos Aug. 10; minimum daily, 207 micromhos July 22.
Water temperatures: Maximum, 86°F Aug. 10; minimum, freezing point on many days during December to February.
EXTREMES, 1961-64.--Dissolved solids: Maximum, 1,100 ppm Jan. 1-26, 1962; minimum, 148 ppm July 1-27, 1964.
Hardness: Maximum, 498 ppm Dec. 1-31, 1961; minimum, 84 ppm July 1-27, 1964.
Specific conductance: Maximum daily, 1,970 micromhos Aug. 10, 1964; minimum daily, 207 micromhos July 22, 1964.
Water temperatures: Maximum, 86°F Aug. 10, 1964; minimum, freezing point on many days during winter months.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Maximum observed during water year: Dissolved solids, 1,030 ppm July 24; hardness, 406 ppm Feb. 13. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in Project Office at Topeka, Kans. Additional samples were collected for more comprehensive definition of water quality at this station.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 1-19, 1963...	199	18		86	14	85	11	255	0	103	98	0.5	1.1	0.10	554	0.75	298	272	63	2.2	916	7.7
Oct. 20-25.....	386	12		50	17	75	9.0	186	0	83	93	.5	1.0	.11	450	.61	469	196	43	2.3	748	7.8
Oct. 26-31.....	171	16		90	14	110	9.8	263	0	123	129	.4	.3	.12	637	.87	294	284	68	2.8	1050	7.6
Nov. 1-30.....	144	20		122	23	162	10	358	0	188	194	.3	1.2	.18	931	1.27	362	400	106	3.5	1500	8.1
Dec. 1-31.....	118	16		86	27	190	10	251	0	217	227	.3	2.8	.19	944	1.28	301	324	118	4.6	1530	8.0
Jan. 1-10, 1964...	146	--		83	26	181	9.8	237	0	217	214	--	--	--	915	1.24	361	313	119	4.4	1540	7.6
Jan. 11-12.....	110	--		48	17	100	5.7	140	0	128	112	--	--	--	532	.72	158	188	73	3.2	874	7.6
Jan. 13.....	90	--		63	45	169	9.4	268	0	222	195	--	--	--	916	1.25	223	343	123	4.0	1460	7.6
Jan. 14-31.....	156	--		102	27	178	9.2	292	0	223	204	--	--	--	944	1.28	398	365	125	4.1	1520	7.6
Feb. 1-29.....	143	--		73	25	160	8.4	208	0	211	187	--	--	--	803	1.09	310	283	112	4.1	1320	7.5
Mar. 1-31.....	136	--		77	25	180	9.0	220	0	216	200	--	--	--	851	1.16	312	293	113	4.6	1420	7.6
Apr. 1-30.....	158	--		87	23	185	11	247	0	208	196	--	--	--	841	1.14	359	312	109	4.1	1380	7.5
May 1-7.....	202	--		93	23	154	12	254	0	206	183	--	--	--	834	1.13	455	327	119	3.7	1350	7.9
May 8-9.....	295	--		55	10	74	10	161	0	94	86	--	--	--	438	.60	349	178	46	2.4	738	7.3
May 10-31.....	120	--		99	23	180	12	294	0	203	209	--	--	--	910	1.24	295	342	101	4.2	1490	7.8
June 1-12.....	162	--		81	21	168	11	248	0	164	201	--	--	--	805	1.09	352	288	85	4.3	1340	7.4
June 13.....	516	--		66	12	96	9.8	200	0	103	111	--	--	--	488	.66	680	214	50	2.9	881	7.2
June 14.....	399	--		42	7.1	63	8.9	132	0	58	75	--	--	--	328	.45	353	134	26	2.4	581	7.5

June 15-22, 1964..	396	--		59	9.7	78	9.8	168	0	90	92	--	--	--	444	.60	475	187	49	2.5	756	7.6
June 25-30.....	203	--		43	5.5	37	9.8	148	0	37	41	--	--	--	254	.35	139	130	9	1.4	455	7.1
July 1-27.....	105	--		29	2.8	15	7.0	103	0	12	14	--	--	--	148	.20	42.0	84	0	.7	252	7.3
July 28-29.....	796	--		74	14	142	12	230	0	110	180	--	--	--	681	.93	1460	243	54	4.0	1170	7.5
July 30-Aug. 12...	69.4	--		72	17	182	10	247	0	118	239	--	--	--	795	1.08	149	248	45	5.0	1440	7.1
Aug. 13-16.....	57.8	--		58	13	150	9.4	196	0	87	194	--	--	--	638	.87	99.6	196	35	4.6	1150	7.5
Aug. 17-31.....	211	--		66	12	107	9.6	207	0	96	127	--	--	--	546	.74	311	214	44	3.2	955	7.1
Sept. 1-7.....	178	--		57	92	72	11	164	0	84	85	--	--	--	429	.58	206	180	45	1.4	748	7.1
Sept. 8.....	1270	13	.06	49	5.2	20	8.1	176	0	28	13	.4	2.5	.04	259	.35	888	144	0	.7	379	7.3
Sept. 9-13.....	808	--		48	5.1	18	8.9	142	0	39	16	--	--	--	239	.33	521	141	25	.7	382	7.2
Sept. 14-21.....	129	--		61	9.5	57	9.8	172	0	81	66	--	--	--	402	.55	140	191	50	1.8	660	7.4
Sept. 22-30.....	130	--		95	20	144	11	275	0	160	175	--	--	--	783	1.06	275	318	92	3.5	1280	7.4
Weighted average	--	--		76	19	123	9.8	225	--	143	145	--	--	--	662	0.90	305	260	76	3.1	1090	7.4
Time-weighted average.....	A178	--		79	21	137	9.8	234	--	157	162	--	--	--	718	--	--	275	83	3.4	1190	7.4
Tons per day....	--	--		35	8.9	57	4.5	104	--	66	67	--	--	--	--	--	--	--	--	--	--	--

A Mean discharge based on 366 days; mean discharge for 364 days of chemical analyses, 171 cfs.

KANSAS RIVER BASIN--Continued

6-8769. SOLOMON RIVER AT NILES, KANS.--Continued

Additional analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 18, 1963	163	20		0.10	0.10	86	18	134	11	244	0	153	161	0.5	1.9	0.13	723	288	88	3.4	1180	8.0	
Nov. 12	138	23		.02	.00	118	26	170	10	356	0	188	204	.3	1.5	.16	941	400	108	3.7	1510	8.2	
Dec. 5	136	15		.05	.07	90	25	168	9.4	261	5	195	199	.3	.3	.17	865	328	104	4.0	1420	8.3	
Jan. 31, 1964	160	17		.03	.12	109	23	154	8.6	304	0	196	177	.3	5.3	.16	875	365	116	3.5	1400	8.2	
Feb. 13	141	14		.02	.09	124	23	160	8.2	350	0	197	189	.4	3.8	.17	928	408	119	3.5	1490	8.1	
Mar. 19	132	4.3		.04	.12	108	22	179	9.0	303	0	213	202	.4	.3	.16	917	360	111	4.1	1510	7.6	
Apr. 9	125	6.1		1.3	.21	108	26	195	10	298	0	237	228	.3	.1	.18	987	377	133	4.4	1610	7.6	
Apr. 16	219	--		--	--	97	29	200	--	273	--	240	226	--	--	--	--	361	137	4.6	1590	--	
Apr. 18	162	--		--	--	94	24	169	--	259	--	230	174	--	--	--	--	333	121	4.0	1410	--	
Apr. 23	270	--		--	--	85	16	142	--	205	--	200	148	--	--	--	--	278	110	3.7	1180	--	
Apr. 26	169	--		--	--	83	27	209	--	249	--	208	248	--	--	--	--	318	114	5.1	1600	--	
May 6	186	12	0.1	.10	.02	88	22	140	11	242	0	186	165	.4	2.3	.15	783	308	109	3.5	1260	7.7	7
May 19	116	17		.10	.05	100	28	193	12	294	0	214	234	.4	2.0	.21	979	364	123	4.4	1610	8.0	
June 5	136	15		.04	.03	90	23	198	11	290	0	186	231	.4	1.8	.18	915	320	82	4.8	1530	7.8	
July 24	35	19		.06	.01	108	23	232	12	355	0	181	280	.3	.5	.21	1030	364	73	5.3	1760	7.8	
Aug. 17	40	12		.13	.11	49	11	103	7.8	181	0	65	127	.0	2.8	.09	478	167	19	3.5	853	7.2	
Sept. 3	370	11		.10	.00	32	6.3	35	8.7	111	0	39	39	.3	5.9	.06	265	106	15	1.5	403	7.0	
Sept. 8	600	--		--	--	78	12	104	12	218	0	122	127	--	--	--	608	243	64	2.9	982	7.7	

KANSAS RIVER BASIN--Continued

6-8769. SOLOMON RIVER AT NILES, KANS.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	64	65	67	67	65	65	68	68	68	68	67	65	65	66	65	65	66	64	68	64	65	66	66	67	66	67	64	59	55	54	54	65
November	49	48	49	52	50	51	51	52	52	51	51	48	45	41	42	42	46	45	44	45	48	50	42	42	41	41	41	42	39	38	--	46
December	--	37	36	36	37	38	39	36	33	33	32	32	32	32	32	32	32	32	33	33	32	33	32	32	32	32	33	32	32	32	32	33
January	33	33	33	33	33	32	33	32	32	32	32	33	32	32	32	32	32	32	32	32	32	32	32	32	32	33	32	32	32	32	33	32
February	34	36	39	36	37	37	33	34	35	41	35	38	35	34	32	34	36	37	36	35	33	33	35	34	36	32	33	33	36	--	--	35
March	37	36	41	41	37	41	40	39	38	38	39	40	47	47	46	47	46	47	51	41	39	41	42	46	38	35	40	41	43	42	45	42
April	52	57	58	48	41	56	51	46	48	59	56	57	54	54	54	60	64	54	60	62	63	63	60	62	65	67	61	54	55	60	--	57
May	59	60	65	68	70	67	69	68	65	66	67	65	62	65	66	70	--	73	75	76	75	79	73	74	76	78	73	65	67	65	62	69
June	62	64	64	67	66	61	71	75	73	70	76	75	75	73	74	75	75	77	79	81	81	80	75	70	73	75	77	78	79	81	--	73
July	78	81	85	82	81	79	80	79	80	83	79	75	75	76	75	77	78	79	80	79	78	81	82	82	84	81	78	76	77	79	80	79
August	81	78	79	81	80	81	79	77	76	86	78	65	70	65	65	67	69	72	75	77	70	70	69	71	72	70	71	70	74	74	73	74
September	75	78	76	74	73	74	75	76	73	75	68	66	66	66	69	66	68	65	68	68	67	68	62	66	64	66	60	53	59	60	--	68

KANSAS RIVER BASIN--Continued

6-8769. SOLOMON RIVER AT NILES, KANS.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 18, 1963	1640	--		163	634	279	10	40		74		--	--					PWC
Nov. 12	1555	49		138	20	7.4	--	--		--		--	--					
Dec. 5	1540	42		136	296	109	--	--		--		--	--					
Jan. 31, 1964	1130	34		160	36	16	--	--		--		--	--					
Feb. 13	1235	38		141	39	15	--	--		--		--	--					
Mar. 13	1115	47		132	65	23	--	--		--		--	--					
Apr. 9	1400	--		125	83	28	--	--		--		--	--					
Apr. 23	1355	62		272	475	349	9	44		80		99	100					VPN
Apr. 23	1355	62		272	475	349	--	70		83		99	100					VPWC
May 4	1320	70		185	272	136	--	--		--		--	--					
May 19	0950	74		116	370	116	--	--		--		--	--					
June 5	1400	67		136	440	162	--	--		--		--	--					
June 14	1030	76		420	2440	2770	75	83		96		100	--					VPWC
June 17	0830	75		670	2770	5010	69	78		93		100	--					VPWC
July 24	1440	90		35	218	21	--	--		--		--	--					
Aug. 17	1600	73		40	446	48	--	--		--		--	--					
Sept. 3	1130	79		360	4020	3910	81	89		98		100	--					PWC
Sept. 8	2225	74		2150	9770	56700	74	82		94		100	--					VPWC
Sept. 8	2225	74		2150	9770	56700	39	65		95		100	--					VPN

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters										Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
May 19, 1964	0950		10	116			11	16	28	50	76	90	97	100				SV
June 5	1400		6	136			10	15	22	39	78	91	98	100				SV
July 24	1440		8	35			10	12	35	70	86	94	98	100				SV
Sept. 3	1130		6	360			18	21	36	64	84	93	98	99	100			SV
Sept. 8	2225		9	2150			18	20	31	62	84	93	98	100				SV

6-8776. SMOKY HILL RIVER AT ENTERPRISE, KANS.

LOCATION.--At gaging station at bridge on State Highway 43 in Enterprise, Dickinson County, 18.6 miles upstream from Chapman Creek, and at mile 55.4.
DRAINAGE AREA.--19,200 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1955 to September 1958, October 1961 to September 1964.
Water temperatures: October 1955 to September 1964.
Sediment records: October 1957 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 1,630 ppm Aug. 3-20; minimum, 490 ppm Oct. 19-31.
Hardness: Maximum, 482 ppm Dec. 1-31, Mar. 1-31; minimum, 176 ppm July 30 to Aug. 2.
Specific conductance: Maximum daily, 3,930 micromhos Aug. 13; minimum daily, 468 micromhos June 25.
Water temperatures: Maximum, 84°F July 23-26, Aug. 4; minimum, freezing point on several days during December and January.
Sediment concentrations: Maximum daily, 5,200 ppm Sept. 10; minimum daily, 5 ppm Dec. 1.
Sediment loads: Maximum daily, 34,000 tons Sept. 10; minimum daily, 5 tons Dec. 1.
EXTREMES, 1955-64.--Dissolved solids (1955-58, 1961-64): Maximum, 3,220 ppm Jan. 22-24, 1957; minimum, 199 ppm May 17-22, 1957.
Hardness (1955-58, 1961-64): Maximum, 652 ppm Jan. 22-24, 1957; minimum, 124 ppm Oct. 5-7, 1955.
Specific conductance (1955-58, 1961-64): Maximum daily, 5,340 micromhos Jan. 24, 1957; minimum daily, 292 micromhos May 20, 1957.
Water temperatures: Maximum, 88°F June 21, 1956; minimum, freezing point on many days during winter months.
Sediment concentrations (1957-64): Maximum daily, 9,300 ppm Sept. 26, 1963; minimum daily, 4 ppm Dec. 6, 22, 1958.
Sediment loads (1957-64): Maximum daily, 254,000 tons Mar. 27, 1960; minimum daily, 5 tons Dec. 6, 22, 1958, Dec. 1, 1963.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Maximum observed during water year: Hardness, 515 ppm Jan. 3. Minimum observed during water year: Dissolved solids, 359 ppm June 24. Chemical analyses by Kansas State Department of Health, Topeka, Kans. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in Project Office at Topeka, Kans. Additional samples were collected for more comprehensive definition of water quality at this station.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 1-18, 1963...	591			90	22	162		205		161	233				804	1.09	1280	315	147	4.0	1360	
Oct. 19-31.....	1025			66	9.1	95		166		89	126				490	.67	1360	202	66	2.9	840	
Nov. 1-30.....	378			140	28	291		307		244	417				1310	1.78	1340	464	212	5.9	2200	
Dec. 1-31.....	276			139	33	386		278		317	540				1600	2.18	1190	482	254	7.6	2550	
Jan. 1-31, 1964...	307			117	35	335		237		307	460				1410	1.92	1170	436	242	7.0	2360	
Feb. 1-29.....	349			128	36	331		303		291	450				1410	1.92	1330	468	219	6.7	2340	
Mar. 1-31.....	317			134	36	342		283		302	480				1460	1.99	1250	482	250	6.8	2420	
Apr. 1-30.....	420			122	30	296		249		276	410				1280	1.74	1450	428	224	6.2	2170	
May 1-31.....	339			119	31	325		266		270	448				1360	1.85	1240	424	206	6.9	2290	
June 1-10.....	310			116	32	373		268		278	513				1500	2.04	1260	421	201	7.9	2500	
June 11-14.....	734			86	22	196		202		192	260				894	1.22	1770	305	139	4.9	1510	
June 15-25.....	1582			72	13	81		173		119	102				500	.68	2140	233	91	2.3	830	
June 26-30.....	592			69	15	142		166		116	202				660	.90	1050	233	97	4.0	1120	
July 1-11.....	863			85	14	150		166		142	221				716	.97	1670	270	134	4.0	1240	
July 12-28.....	213			101	27	305		207		227	440				1230	1.67	707	363	193	7.0	2120	

KANSAS RIVER BASIN--Continued

6-8776. SMOKY HILL RIVER AT ENTERPRISE, KANS.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
July 30-Aug. 2, 1964	341			58	7.7	131		156		86	172				554	0.75	510	176	48	4.3	950	
Aug. 3-20	137			99	28	470		222		234	680				1630	2.22	603	362	180	11	2880	
Aug. 21-31	576			77	15	138		168		144	186				664	.90	1030	254	116	3.8	1140	
Sept. 1-2	448			138	21	128		210		286	170				916	1.25	1110	431	259	2.7	1400	
Sept. 3-8	814			59	9.5	121		166		80	164				554	.75	1220	186	50	3.9	950	
Sept. 9	2210			82	12	202		198		125	284				903	1.23	5390	254	92	5.5	1490	
Sept. 13-30	460			78	14	136		171		132	192				590	.80	733	252	112	3.7	1010	
Weighted average	--			101	23	229		223		204	318				1010	1.37	1230	347	164	5.1	1700	
Time-weighted average	A459			111	27	280		240		237	391				1190	--	--	387	190	6.1	2000	
Tons per day	--			122	28	278		270		247	386				--	--	--	--	--	--	--	

A Mean discharge based on 366 days; mean discharge for 362 days of chemical analyses, 449 cfs.

6-8776. SMOKY HILL RIVER AT ENTERPRISE, KANS.--Continued

Additional analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 22, 1963	2340	8.5		--	--	66	9.6	56	8.5	190	0	70	75	0.5	1.4	0.15	A396	204	48	1.7	640	7.9	
Nov. 14.....	335	15		--	--	140	31	312	17	327	0	253	454	.3	3.2	.30	1390	477	209	6.2	2300	8.2	
Dec. 3.....	340	11		--	--	148	34	350	15	342	0	278	505	.3	1.9	.32	1510	508	227	6.7	2330	7.8	
Jan. 3, 1964.	315	12		--	--	147	36	360	15	307	0	320	510	.3	5.3	.24	1560	515	263	6.9	2500	8.2	
Feb. 12.....	350	8.5		--	--	146	36	321	12	327	0	291	460	.3	2.7	.27	1440	512	244	6.2	2320	7.9	
Mar. 6.....	320	6.0		--	--	146	33	350	15	307	0	311	493	.4	2.1	.27	1510	500	248	6.8	2490	7.8	
Apr. 8.....	425	4.0		0.01	0.00	125	34	258	14	264	0	293	365	.4	1.0	.21	1230	452	235	5.3	2080	7.8	
May 5.....	410	5.5		--	--	111	31	264	16	234	0	258	383	.5	2.0	.21	1190	404	212	5.7	2030	7.6	
May 8.....	545	7.0		.01	.00	114	35	272	17	251	0	270	395	.5	1.5	.18	1240	428	222	5.7	2150	7.6	
June 11.....	515	9.0		--	--	74	12	164	13	188	0	145	202	.4	3.8	.15	A700	234	80	4.7	1200	7.4	
June 22.....	2080	13		--	--	59	10	52	9.3	161	0	72	70	.5	4.4	.16	A382	188	56	1.6	630	7.3	
June 24.....	2740	16		--	--	59	8.0	43	9.3	178	0	60	50	.5	5.8	.12	A359	180	34	1.4	580	7.4	
July 15.....	402	6.8		--	--	101	20	229	18	234	0	210	320	.3	1.2	.24	1020	334	142	5.4	1810	7.5	
Aug. 14.....	92	9.4		--	--	114	23	385	17	295	0	230	532	.4	1.4	.27	1460	379	137	8.6	2540	7.3	
Sept. 10.....	2540	11		.03	.00	66	5.7	70	11	185	0	68	87	.5	3.4	.16	A419	188	36	2.2	640	7.4	

A Residue at 180°C.

KANSAS RIVER BASIN--Continued

6-8776. SMOKY HILL RIVER AT ENTERPRISE, KANS.--Continued

Temperature (°F) of water, water year October 1963 to September 1964
(Once-daily measurement, at 0700)

Month	Day																													Aver-age
	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	
October	61	62	65	66	67	68	65	65	67	67	67	66	65	64	65	67	63	65	65	66	65	65	67	64	65	67	62	57	55	55	56	64
November	50	50	50	55	52	53	52	54	53	54	54	48	43	42	43	46	48	47	46	48	49	52	43	43	43	43	42	43	39	39	--	47
December	40	36	37	38	38	38	41	38	34	34	33	32	32	32	32	32	33	32	32	32	32	32	32	33	36	39	44	39	38	37	36	35
January	37	36	--	41	39	37	36	36	35	38	35	32	32	32	33	34	35	38	43	42	45	45	46	38	37	36	39	38	37	36	38	38
February	37	42	43	43	46	44	41	40	39	39	42	40	39	43	42	39	40	41	39	38	37	37	36	37	38	39	38	39	40	--	--	40
March	41	42	49	48	46	49	47	48	--	46	44	45	46	47	48	49	48	47	48	46	40	42	45	42	41	39	39	40	41	--	--	45
April	42	52	57	53	50	51	49	46	45	48	53	55	53	51	54	56	61	60	59	62	62	59	60	61	71	63	60	59	53	54	--	55
May	53	56	58	59	65	66	67	69	67	66	66	63	61	62	--	65	66	67	69	70	70	71	71	72	--	73	70	65	61	60	63	65
June	62	61	62	61	--	63	63	64	69	71	--	82	73	74	73	72	73	74	75	80	80	78	74	73	72	75	76	77	77	78	--	72
July	76	78	79	80	--	80	80	82	79	80	76	76	75	73	77	77	78	79	80	81	82	83	84	84	84	84	79	81	82	79	80	80
August	82	82	83	84	73	83	82	82	78	79	78	72	75	65	65	71	72	73	74	74	72	--	71	70	69	71	70	68	74	73	71	75
September	70	69	78	74	73	76	75	77	78	75	69	68	65	67	69	68	66	66	67	62	67	69	66	63	65	67	62	58	48	62	--	68

KANSAS RIVER BASIN--Continued

6-8776. SMOKY HILL RIVER AT ENTERPRISE, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	860	1600	3700	515	360	500	345	5	5
2	780	1400	2900	515	250	350	345	23	21
3	700	1100	2100	538	190	280	345	10	9
4	626	780	1300	500	200	270	345	9	8
5	582	560	880	455	250	310	335	20	18
6	538	440	640	448	220	270	325	10	9
7	538	360	520	432	230	270	320	26	22
8	530	260	370	380	210	220	315	37	31
9	515	330	460	365	200	200	310	72	60
10	485	280	370	355	210	200	265	55	39
11	455	280	340	355	170	160	189	53	27
12	448	250	300	350	160	150	150	45	18
13	432	200	230	350	140	130	245	39	26
14	380	180	180	350	81	76	249	30	20
15	355	190	180	345	52	48	261	29	20
16	590	820	1300	340	85	78	265	25	18
17	830	1600	3600	335	99	90	261	41	29
18	990	1900	5100	330	84	75	257	33	23
19	935	2200	5600	325	56	49	257	48	33
20	750	960	1900	325	52	46	257	32	22
21	1710	2400	S 13000	330	47	42	257	27	19
22	2630	4400	31000	345	72	67	253	44	30
23	1660	2100	9400	340	97	89	253	29	20
24	1270	2100	7200	340	35	32	249	45	30
25	891	1900	4600	340	35	32	249	39	26
26	790	1100	2300	340	52	48	257	61	42
27	626	1000	1700	345	30	28	265	58	41
28	538	570	830	345	17	16	275	29	22
29	515	450	620	350	25	24	280	56	42
30	508	410	560	345	17	16	285	45	35
31	500	450	610	--	--	--	285	49	38
Total	23957	--	103790	11328	--	4166	8549	--	803
	JANUARY			FEBRUARY			MARCH		
1	285	24	18	345	40	37	315	38	32
2	290	24	19	355	40	38	320	32	28
3	315	66	56	360	43	42	320	34	29
4	320	52	45	365	31	30	305	33	27
5	335	44	40	365	36	35	300	54	44
6	330	31	28	380	29	30	330	55	49
7	330	31	28	380	22	22	325	53	46
8	300	38	31	380	21	22	315	37	31
9	280	26	20	372	19	19	310	32	27
10	261	27	19	365	15	15	310	28	23
11	230	28	17	360	37	36	305	26	21
12	159	38	16	350	40	38	300	32	26
13	188	47	24	350	27	26	290	36	28
14	275	39	29	350	25	24	290	23	18
15	280	20	15	350	25	24	295	47	37
16	315	32	27	350	36	34	295	46	37
17	305	12	10	350	47	44	295	41	33
18	295	33	26	350	42	40	285	38	29
19	310	34	28	350	35	33	290	43	34
20	315	30	26	345	29	27	325	35	31
21	325	34	30	350	18	17	355	40	38
22	372	36	36	345	18	17	388	40	42
23	380	30	31	340	23	21	372	34	34
24	365	38	37	335	27	24	350	38	36
25	345	48	45	330	18	16	330	32	28
26	325	40	35	320	23	20	325	16	14
27	335	30	27	315	20	17	320	17	15
28	350	35	33	305	17	14	320	8	7
29	325	31	27	305	33	27	320	12	10
30	325	30	26	--	--	--	310	28	23
31	340	39	36	--	--	--	310	33	28
Total	9505	--	885	10117	--	789	9820	--	905

S Computed by subdividing day.

KANSAS RIVER BASIN--Continued

6-8776. SMOKY HILL RIVER AT ENTERPRISE, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	305	20	16	440	110	130	280	180	140
2	305	38	31	440	140	160	261	140	98
3	310	35	29	433	150	180	275	87	64
4	330	37	33	425	120	140	290	80	62
5	345	34	32	410	130	140	285	92	70
6	388	33	34	410	120	130	305	190	160
7	418	26	29	403	150	160	320	170	150
8	410	33	36	515	200	280	300	170	140
9	402	33	36	608	160	260	290	170	130
10	388	26	27	470	230	290	493	310	410
11	388	40	42	410	300	330	553	560	830
12	402	36	39	355	290	280	700	500	940
13	388	40	42	325	160	140	780	410	860
14	372	36	36	310	210	170	902	850	2100
15	372	31	31	300	170	140	1660	2000 S	10000
16	395	34	36	310	150	120	2500	3400	23000
17	455	47	58	300	140	110	2390	3300	21000
18	440	53	63	285	160	120	1600	2800	12000
19	395	50	53	270	150	110	990	2000	5300
20	395	65	69	261	150	100	791	740	1600
21	395	56	59	249	160	110	746	900	1800
22	403	47	51	245	190	120	1670	2500 S	12000
23	463	74	92	233	180	110	1210	2000	6500
24	608	73	120	233	220	140	2230	3300 S	21000
25	455	50	61	229	190	120	1610	1900 S	9000
26	700	740 S	1500	217	180	100	728	970	1900
27	653	770	1400	233	230	140	510	780	1100
28	448	360	430	265	190	130	409	250	280
29	433	180	210	305	220	180	371	270	270
30	433	88	100	310	230	190	940	1200 S	4800
31	--	--	--	305	190	160	--	--	--
Total	12594	--	4795	10504	--	4990	26389	--	137704

Day	JULY			AUGUST			SEPTEMBER		
1	1470	2300 S	9900	194	130	68	480	150	190
2	1070	890	2600	231	130	81	416	220	250
3	1170	960	3000	176	94	44	353	210	200
4	920	940	2300	137	70	25	444	200	240
5	629	530	900	127	73	25	377	210	210
6	1020	760	2100	124	79	26	870	470	1100
7	1040	930	2600	111	82	24	1470	430	1700
8	769	600	1200	80	74	16	1370	400	1500
9	556	340	510	64	83	14	2210	3600 S	24000
10	495	270	360	80	87	18	2440	5200	34000
11	359	220	210	62	91	14	1530	3300	14000
12	286	250	190	216	150	87	900	1200	2900
13	308	190	160	189	120	61	656	1300	2300
14	444	160	190	117	100	31	548	770	1100
15	347	200	190	104	82	23	480	470	610
16	275	140	100	159	81	34	465	380	480
17	231	110	68	185	85	42	465	330	410
18	198	93	49	154	79	32	465	310	390
19	171	62	28	137	78	28	465	280	350
20	154	50	20	247	200	130	488	290	380
21	141	58	22	1110	1700	5100	518	300	420
22	130	60	21	1000	1900	5100	518	380	530
23	111	63	18	764	1600	3300	510	340	460
24	107	88	25	638	1200	2100	451	320	390
25	98	99	26	416	600	670	416	340	380
26	104	92	26	308	280	230	383	280	290
27	258	500	340	341	310	280	371	210	210
28	258	750	520	430	310	360	395	200	210
29	950	1800	4600	383	240	250	365	200	200
30	674	400	720	402	280	300	313	180	150
31	264	270	190	548	220	320	--	--	--
Total	15002	--	33183	9234	--	18833	21132	--	89550

Total discharge for year (cfs-days)..... 168131
Total load for year (tons)..... 400393

S Computed by subdividing day.

6-8776. SMOKY HILL RIVER AT ENTERPRISE, KANS.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 1, 1963	0700	61		870	1650	3880	78	89		--		100	--					PWC
Oct. 3	0700	65		700	1200	2270	77	91		94		100	--					PWC
Oct. 19	0700	65		1190	2520	8100	72	84		97		100	--					PWC
Oct. 22	0700	65		3130	6130	51800	47	61		80		98	100					VPWC
Oct. 22	1745	--		2340	2980	18800	57	71		89		100	--					PWC
Oct. 24	0700	64		1490	2120	8530	69	81		94		100	--					PWC
June 22, 1964	1540	79		2080	3150	17700	70	76		91		100	--					VPWC
June 22	1540	79		2080	3150	17700	24	50		91		100	--					VPN
June 24	1700	80		2740	4240	31400	55	62		80		99	100					VPWC
June 24	1700	80		2740	4240	31400	16	36		78		99	100					VPN
Sept. 10	1130	78		2540	5090	34900	75	82		92		98	99	100				VPWC

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
June 11, 1964	1610		15	515			3	8	28	54	72	82	94	99	100			SV
July 15	1215		8	402			2	4	22	51	76	86	95	100	--			SV
Aug. 14	1305		20	92			1	3	18	38	57	67	82	93	100			SV
Sept. 10	1130		9	2540			2	4	17	55	76	83	92	98	100			SV

KANSAS RIVER BASIN--Continued

6-8785. LYON CREEK NEAR WOODBINE, KANS.

LOCATION.--At gaging station at highway bridge, 2 miles downstream from Cary Creek, 7 miles north of Woodbine, Geary County, and 10 miles upstream from mouth.
DRAINAGE AREA.--230 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 29, 1963	24	12				70	26	21	5.0	207	17	65	42	0.3	2.9	0.16	384	282	84	0.5	590	8.4	
Nov. 27.....	19	9.5				83	50	39	4.2	217	24	185	60	.5	.9	.21	800	412	194	.8	930	8.3	
Dec. 10.....	A13	5.5				127	52	40	3.8	376	0	193	72	.5	.4	.21	705	530	222	.8	1090	7.9	
Jan. 27, 1964	16	3.0				128	47	39	2.5	356	0	206	66	.4	3.2	.15	680	512	220	.7	1020	8.0	
Feb. 14.....	16	1.0				116	48	37	1.8	344	0	187	61	.4	.4	.18	824	487	205	.7	950	8.0	
Feb. 20.....	16	1.0				104	50	38	2.2	320	0	193	64	.4	.4	.15	638	465	202	.8	990	8.2	
Mar. 13.....	13	1.0				115	50	41	1.8	322	0	207	69	.4	.5	.16	662	492	228	.8	1000	8.1	
Apr. 10.....	23	9.5		0.03	0.00	90	36	27	4.1	271	0	151	44	.5	1.4	.13	520	372	150	.6	780	7.7	
May 11.....	30	8.5				104	42	34	4.7	376	0	134	42	.2	4.2	.18	570	432	124	.7	920	8.0	
June 24.....	67	9.5				55	17	22	4.4	195	0	62	25	.5	6.2	.12	300	207	47	.7	500	7.3	
July 29.....	16	8.0				75	28	26	5.0	234	0	112	42	.5	1.2	.10	420	302	110	.7	680	7.4	
Aug. 18.....	9.3	6.8				80	32	30	4.7	266	0	117	44	.4	.6	.27	464	331	113	.7	770	7.4	
Sept. 10.....	8.2	9.8				59	18	18	4.5	207	0	70	18	.4	2.8	.19	318	221	51	.5	470	7.5	

A Daily mean discharge.

Periodic determinations of suspended-sediment discharge, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Jan. 27, 1964.....	1515	32		16	23	1.0												
Apr. 10.....	1625	62		23	91	5.6												

6-8800. LINCOLN CREEK NEAR SEWARD, NEBR.

LOCATION.--At gaging station at county road bridge, 2 miles west of Seward, Seward County, and 2.5 miles upstream from mouth.
DRAINAGE AREA.--420 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: June 1963 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 24, 1963	7.7	34		0.04	0.22	69	13	24	8.6	307	2	24	5.0	0.4	0.1	0.04	331	224	0	0.7	514	8.3	3
Nov. 13.....	6.7	31		.07	.13	71	13	25	7.4	317	0	26	4.7	.4	.0	.04	332	232	0	.7	530	7.8	2
Dec. 18.....	7.9	38		.07	.23	79	14	27	7.0	350	0	28	5.6	.2	.7	.04	374	256	0	.7	583	7.9	--
Jan. 21, 1964	9.9	29		.03	.16	67	11	25	5.9	290	0	24	6.0	.3	.5	.04	317	214	0	.7	508	7.9	--
Feb. 27.....	6.7	28		.01	.12	65	18	26	6.2	305	0	28	5.8	.4	.1	.04	327	234	0	.7	519	8.2	--
Mar. 18.....	10	29		.04	--	68	14	26	6.7	312	0	24	5.3	.3	.1	.04	329	228	0	.8	505	8.1	--
Apr. 27.....	177	17		.22	--	14	3.7	5.1	12	66	0	10	3.9	.3	3.4	.04	165	50	0	.3	156	6.9	--
May 27.....	11	36		.06	.43	65	12	24	9.6	291	0	26	6.2	.4	2.7	.02	337	213	0	.7	512	7.1	--
June 15.....	3340	10		.11	.17	3.9	.8	1.0	8.6	18	0	4.8	1.4	.2	4.3	.04	86	13	0	.1	52	6.7	--
June 16:																							
At 0745....	2000	11		.22	.07	4.6	1.1	1.2	9.4	22	0	5.2	1.5	.3	4.7	.05	96	16	0	.1	62	6.7	--
At 1355....	1700	11		--	--	4.8	1.2	1.2	9.8	22	0	6.0	1.7	.2	4.6	.04	136	17	0	.1	60	6.8	--
June 17.....	1140	11		.25	--	6.6	1.1	1.7	10	23	0	6.5	3.0	.4	5.6	.06	A57	21	2	.2	68	6.4	160
July 28.....	5.9	34		.02	.28	62	13	25	11	292	0	25	7.1	.5	3.3	.06	327	210	0	.8	510	7.7	6
Aug. 20.....	25	25		.06	.14	53	12	21	16	238	0	31	7.6	.4	6.0	.05	299	181	0	.7	462	7.6	7
Sept. 23.....	8.8	29		.06	.12	52	9.1	19	8.8	227	0	21	3.4	.3	2.6	.05	278	167	0	.6	407	7.8	8

A Calculated from determined constituents.

KANSAS RIVER BASIN--Continued

6-8800. LINCOLN CREEK NEAR SEWARD, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 24, 1963	1540	64		7.7	108	2.2	--	--	--	--	--	100						S
Nov. 13	1210	38		6.7	14	.2	--	--	--	--	--	96						S
Dec. 2	1055	34		7.9	24	.5	--	--	--	--	--	--						
Dec. 18	1450	32		7.9	32	.7	--	--	--	--	--	--						
Jan. 21, 1964	1100	32		9.9	32	.8	--	--	--	--	--	--						
Feb. 27	1045	32		6.7	3	.1	--	--	--	--	--	--						
Mar. 18	1200	42		10	88	2.4	--	--	--	--	--	--						
Apr. 27	1450	55		177	3250	1550	72	82	--	84	96	100						VPWC
May 27	1410	65		11	246	7.3	--	--	--	--	--	90	95	98	100			V
June 15	1930	69		3380	2000	18200	82	92	94	96	100	--						PWC
June 16	0800	68		1980	1590	8500	84	92	95	--	98	100						SPWC
June 16	1355	71		1700	1880	8630	82	93	96	98	99	100						SPWC
June 17	1120	71		1140	1440	4430	85	90	94	97	100	--						PWC
July 28	1125	79		5.9	240	3.8	--	--	--	--	--	100						S
Aug. 20	1100	73		25	296	20	--	--	--	--	--	--						
Sept. 23	1320	61		8.8	332	7.9	--	--	--	--	--	--						

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters										Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 24, 1963	1540		6	7.7			75	81	89	97	100							V
Nov. 13	1210		5	6.7			80	83	89	94	96	97	99	100				SV
Dec. 18	1450		4	7.9			85	88	94	99	100							V

6-8808. WEST FORK BIG BLUE RIVER NEAR DORCHESTER, NEBR.

LOCATION.--At gaging station at county road bridge, 6.2 miles northwest of Dorchester, Seward County, and 19 miles upstream from mouth.
DRAINAGE AREA.--1,210 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: June 1963 to September 1964.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 24, 1963	71	33		0.04	0.01	64	11	25	7.4	260	0	37	13	0.4	0.8	0.05	321	206	0	0.8	505	7.6	4
Nov. 13.....	66	32		.08	.17	67	12	27	7.2	260	0	44	15	.4	.0	.05	344	218	5	.8	528	7.2	5
Dec. 18.....	65	34		.04	--	70	12	32	7.4	263	0	47	18	.3	8.3	.07	376	223	7	.9	567	7.5	--
Jan. 21, 1964	77	30		.02	.17	65	11	28	6.1	244	0	42	16	.4	5.7	.06	334	207	7	.8	525	7.5	--
Feb. 27.....	64	28		.01	.13	65	12	29	6.4	248	0	45	17	.4	3.8	.03	336	211	8	.9	525	8.2	--
Mar. 18.....	78	27		.03	--	61	13	29	6.5	251	0	39	16	.4	2.2	.04	318	205	0	.9	514	8.0	--
Apr. 27.....	613	21		.37	--	23	5.5	14	12	105	0	20	12	.3	1.1	.06	200	80	0	.7	257	6.8	--
May 27.....	77	33		.03	.13	62	11	27	9.0	241	0	40	14	.4	4.0	.06	330	200	2	.8	512	7.3	--
June 15.....	1190	15		.06	.08	9.1	2.5	5.0	12	45	0	11	5.2	.3	2.7	.05	160	33	0	.4	116	6.9	--
June 17.....	540	16		.18	--	13	2.6	6.6	10	52	0	12	6.8	.4	3.6	.04	A97	43	0	.4	139	6.9	75
July 23.....	39	31		.18	.10	62	11	28	8.8	257	0	38	16	.4	2.7	.06	324	198	0	.9	514	7.7	15
Aug. 20.....	71	28		.03	.03	51	13	26	9.4	227	0	39	15	.5	4.4	.04	313	181	0	.8	469	7.9	4
Sept. 23.....	79	29		.05	.04	58	8.6	27	8.8	216	0	41	17	.4	2.5	.05	310	180	3	.9	480	7.4	10

A Calculated from determined constituents.

KANSAS RIVER BASIN--Continued

6-8808. WEST FORK BIG BLUE RIVER NEAR DORCHESTER, NEBR.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Suspended sediment: Sediment concentration (ppm)	Suspended sediment: 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	0.125	0.250	0.500	1.000	2.000	Method of analysis
Oct. 24, 1963.....	1155	64		71	128	24	68	70	--	89	--	98	--					VP
Nov. 13.....	1010	38		66	23	4.1	--	--	--	--	--	99	--					S
Dec. 2.....	0940	33		68	23	4.2	--	--	--	--	--	--	--					
Dec. 18.....	1140	32		65	14	2.4	--	--	--	--	--	69	--					S
Jan. 21, 1964.....	0920	32		77	36	7.5	--	--	--	--	--	--	--					
Feb. 27.....	1350	36		64	13	2.2	--	--	--	--	--	--	--					
Mar. 18.....	1010	42		78	39	8.2	--	--	--	--	--	--	--					
Apr. 27.....	1150	55		613	5500	9100	49	56	66	76	88	99	100					VPWC
May 27.....	1130	63		77	307	64	69	74	81	90	95	99	100					SPWC
June 15.....	1715	69		1190	3940	12600	61	69	76	84	91	99	99	100				VPWC
June 17.....	1420	74		540	2590	3780	70	78	82	87	95	99	100					SPWC
July 23.....	1025	83		39	234	25	--	--	--	--	--	--	--					
Aug. 20.....	0935	71		71	497	95	--	--	--	--	--	--	--					
Sept. 23.....	1055	60		79	430	92	--	--	--	--	--	--	--					

6-8808. WEST FORK BIG BLUE RIVER NEAR DORCHESTER, NEBR.--Continued

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters										Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 24, 1963.....	1155		17	71			0	1	15	62	89	96	99	100				SV
Nov. 13.....	1010		10	66			--	0	12	62	93	99	100	--				SV
Dec. 18.....	1140		10	65			4	5	20	63	86	94	99	100				SV
Jan. 21, 1964.....	0920		6	77			--	0	12	64	87	95	99	100				SV
Feb. 27.....	1350		17	64			0	1	14	63	86	93	100	--				SV
Mar. 18.....	1010		6	78			1	1	11	55	84	93	98	100				SV
Apr. 27.....	1150		5	613			--	0	18	70	83	94	100	--				SV
May 27.....	1130		10	77			3	4	30	71	92	97	100	--				SV
June 15.....	1715		4	1190			--	0	8	48	78	92	98	100				SV
June 17.....	1420		4	540			2	4	28	60	83	91	98	100				SV
July 23.....	1025		12	39			1	1	14	60	88	96	100	--				SV
Aug. 20.....	0935		12	71			4	7	25	65	91	97	100	--				SV
Sept. 23.....	1055		10	79			2	3	17	60	89	96	100	--				SV

KANSAS RIVER BASIN--Continued

6-8824. BIG BLUE RIVER NEAR OKETO, KANS.

LOCATION.--At county higbway bridge near Oketo, Marshall County, about 3 miles downstream from Kansas-Nebraska State line and 8 miles downstream from gaging station.
DRAINAGE AREA.--4,420 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. Records of discharge are given for Big Blue River at Barneston, Nebr. No appreciable inflow between gaging station and sampling point except during periods of intense local precipitation.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 9, 1963.	29	21		--	--	47	13	30	13	195	0	32	34	0.3	3.2	0.08	314	170	10	1.0	490	7.4	
Nov. 5.....	22	22		--	--	66	14	52	9.4	271	0	43	55	.2	1.6	.16	390	222	0	1.5	630	8.2	
Dec. 5.....	18	22		--	--	72	19	46	8.8	246	24	53	50	.2	1.9	.18	428	258	16	1.2	660	8.4	
Jan. 7, 1964.	22	21		--	--	78	13	48	8.0	305	0	52	43	.2	2.7	.16	421	248	0	1.3	670	7.8	
Feb. 4.....	602	17		--	--	66	13	47	7.2	271	0	47	44	.2	2.5	.16	377	218	0	1.4	600	7.9	
Mar. 3.....	282	5.5		--	--	44	16	46	6.1	202	0	50	44	.3	.4	.18	318	176	10	1.5	530	7.5	
Mar. 30.....	15	5.5		--	--	72	14	42	6.5	290	0	48	37	.4	.1	.10	362	237	0	1.2	560	7.9	
May 15.....	464	13		--	--	30	8.0	15	12	134	0	24	12	.5	4.9	.08	185	108	0	.6	290	7.1	
May 26.....	770	19		0.02	0.00	53	12	34	12	205	0	39	36	.4	7.1	.12	320	182	14	1.1	520	7.7	
June 9.....	495	19		--	--	56	10	41	10	217	0	42	41	.4	3.9	.10	324	180	2	1.3	540	7.5	
July 14.....	379	18		--	--	48	9.7	28	12	205	0	26	24	.5	5.3	.13	276	160	0	1.0	440	7.2	
Aug. 4.....	29	19		--	--	54	13	41	13	232	0	33	44	.5	1.3	.10	340	188	0	1.3	540	7.4	
Sept. 23.....	334	10		.05	.00	21	3.8	15	10	85	0	17	16	.4	7.5	.15	164	68	0	.8	230	7.3	

6-8830. LITTLE BLUE RIVER NEAR DEWEESE, NEBR.

LOCATION.--At bridge on State Highway 14, 0.2 mile downstream from gaging station, 0.8 mile upstream from Walnut Creek, 4 miles southeast of Deweese, Clay County, and 5.8 miles northwest of Angus.
DRAINAGE AREA.--1,140 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: August 1956 to September 1958, October 1959 to June 1960, November 1960 to September 1964.
Water temperatures: August 1956 to September 1961.
Sediment records: August 1956 to September 1961.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
																		Calcium, magnesium	Noncarbonate				
Oct. 29, 1963	70	33		0.02	--	62	8.1	16	6.6	224	0	32	8.4	0.4	0.4	0.04	284	188	4	.5	432	7.7	
Nov. 19.....	73	31		.03	--	61	9.2	16	6.4	225	0	31	8.6	.2	.1	.05	277	190	5	.5	433	7.7	
Dec. 6.....	71	30		.01	--	61	9.5	16	6.4	224	0	31	9.2	.2	.1	.04	278	191	7	.5	434	7.5	
Jan. 22, 1964	68	32		.03	0.04	61	9.0	15	5.9	224	0	29	8.6	.4	.4	.03	279	189	5	.5	432	7.4	
Feb. 10.....	68	33		.01	--	61	9.0	15	6.1	223	0	31	7.6	.4	2.1	.05	277	189	6	.5	434	7.6	
Mar. 11.....	68	33		.01	.01	60	12	15	5.8	223	0	31	8.4	.3	.1	.01	284	197	14	.5	436	7.7	
Apr. 12.....	76	32		.01	--	61	8.5	15	6.3	223	0	32	7.4	.4	1.1	.00	282	187	4	.5	434	7.6	
May 12.....	99	31		.05	.01	51	9.7	14	7.6	198	0	28	7.9	.3	2.0	.02	256	167	5	.5	398	7.4	
June 15.....	832	23		.12	.20	14	2.2	3.0	9.4	59	0	7.0	4.0	.3	.7	.05	116	44	0	.2	127	6.8	
June 16.....	756	20		.27	.13	9.1	2.3	1.6	11	44	0	7.0	2.1	.4	.8	.06	120	32	0	.1	91	7.0	
July 10.....	47	29		.03	.06	51	7.1	13	7.9	190	0	26	7.6	.4	.8	.04	242	156	0	.5	372	7.6	
Aug. 14.....	26	29		.11	--	59	9.0	16	7.3	223	0	28	8.9	.4	.2	.03	272	184	1	.5	424	7.8	
Sept. 29.....	54	32		.01	.07	62	8.1	16	6.7	222	0	32	8.8	.4	.7	.03	278	188	6	.5	433	7.6	

KANSAS RIVER BASIN--Continued

6-8844. LITTLE BLUE RIVER NEAR BARNES, KANS.

LOCATION.--At gaging station at bridge on State Highway 15 E., 0.4 mile downstream from Malone Creek, 4.5 miles north of Barnes, Washington County, and 18 miles upstream from mouth.
DRAINAGE AREA.--3,330 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 9, 1963.	310	22				60	12	27	10	210	0	42	33	0.3	1.0	0.08	330	199	27	0.8	530	7.8	
Oct. 31.....	240	21				67	9.0	28	8.7	227	0	37	34	.3	1.0	.13	339	204	18	.9	510	8.0	
Dec. 9.....	175	21				76	13	38	7.7	224	19	58	39	.2	1.7	.16	400	243	28	1.0	610	8.3	
Dec. 31.....	310	21				69	14	33	6.5	242	0	52	41	.2	1.8	.10	380	230	31	.9	550	7.6	
Jan. 30, 1964	240	25				74	15	40	6.5	181	36	58	43	.3	1.9	.13	385	248	37	1.1	610	8.3	
Feb. 26.....	147	20				75	16	32	6.3	249	0	68	34	.3	1.6	.13	402	253	49	.9	620	8.0	
Mar. 30.....	175	17				74	9.6	36	6.5	244	0	50	38	.3	.9	.10	361	224	24	1.0	540	8.2	
Apr. 27.....	2050	12				22	7.0	4.8	4.2	83	0	13	10	.4	1.8	.08	100	84	18	.2	140	7.2	
May 26.....	180	24		0.00	0.00	66	11	34	8.6	229	0	45	37	.4	1.3	.12	347	210	22	1.0	560	7.7	
July 1.....	196	22				54	11	33	11	207	0	43	36	.4	1.1	.12	313	180	10	1.1	520	7.3	
July 14.....	104	19				64	12	40	8.7	234	0	51	47	.5	.3	.18	358	209	17	1.2	590	7.2	
Aug. 4.....	27	18				94	16	58	8.7	283	0	109	64	.5	.2	.18	500	300	68	1.4	790	7.4	
Sept. 23.....	400	23				43	6.0	23	9.0	144	0	31	28	.4	4.9	.16	245	132	14	.9	370	7.5	

6-8870. BIG BLUE RIVER NEAR MANHATTAN, KANS.

LOCATION.--At outlet to Tuttle Creek Reservoir, 2.4 miles upstream from gaging station, about 6.5 miles northwest of Manhattan, Riley County, and 9.7 miles upstream from mouth.
DRAINAGE AREA.--9,560 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1955 to September 1958, October 1961 to September 1984.
Water temperatures: October 1955 to September 1958.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 1, 1963.	1910	7.0		--	--	39	10	15	9.3	163	0	25	15	0.4	0.4	0.10	225	138	4	0.6	360	7.4	
Oct. 30.....	440	8.0		--	--	42	9.5	15	9.0	159	0	28	16	.3	.9	.13	205	144	14	.5	350	7.5	
Dec. 9.....	190	9.0		--	--	46	6.1	16	9.8	166	0	26	16	.3	1.8	.16	230	140	4	.6	360	7.7	
Dec. 30.....	160	13		--	--	59	10	32	8.7	229	0	42	28	.3	1.6	.12	311	188	0	1.0	480	8.2	
Jan. 29, 1964	190	11		--	--	47	9.5	21	9.3	151	19	31	21	.3	1.8	.13	245	156	0	.7	400	8.4	
Apr. 1.....	1280	8.5		--	--	51	11	20	8.3	195	0	33	20	.4	1.0	.12	261	172	12	.7	420	7.7	
May 11.....	940	5.5		0.03	0.00	56	11	23	8.1	205	0	36	24	.4	1.0	.07	277	184	16	.7	440	8.2	
May 13.....	742	2.5		--	--	53	11	22	8.3	200	0	39	23	.3	.9	.07	258	177	13	.7	430	8.1	
May 26.....	880	2.0		.00	.04	54	10	24	8.3	205	0	40	23	.5	1.8	.10	275	176	8	.8	460	7.8	
June 30.....	10800	5.0		--	--	46	7.1	18	7.5	163	0	34	17	.4	2.0	.08	218	144	10	.7	360	7.4	
July 29.....	1350	4.8		--	--	42	6.6	23	7.8	168	0	29	17	.4	.2	.12	211	132	0	.9	350	7.5	
Sept. 23.....	1040	6.8		.00	.15	48	7.8	19	8.8	178	0	34	17	.4	3.9	.15	237	152	6	.7	380	7.7	

6-8875. KANSAS RIVER AT WAMEGO, KANS.

LOCATION.--At gaging station at bridge on State Highway 99 at Wamego, Pottawatomie County, 3 miles downstream from Antelope Creek and at mile 129.1.
DRAINAGE AREA.--55,240 square miles, approximately, of which a large area is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: August 1956 to September 1958, October 1961 to September 1964.
Water temperatures: August 1956 to September 1964.
Sediment records: October 1957 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 859 ppm Mar. 1-21; minimum, 232 ppm June 30 to July 12.
Hardness: Maximum, 366 ppm Jan. 10-11; minimum, 136 ppm June 30 to July 12.
Specific conductance: Maximum daily, 1,450 micromhos Mar. 13; minimum daily, 319 micromhos June 29.
Water temperatures: Maximum, 90°F July 28, Aug. 10; minimum, freezing point on many days during December to February.
Sediment concentrations: Maximum daily, 4,600 ppm June 23; minimum daily, not determined.
Sediment loads: Maximum daily, 160,000 tons June 23; minimum daily, 40 tons on several days during December.
EXTREMES, 1956-64.--Dissolved solids (1956-58, 1961-64): Maximum, 1,180 ppm Feb. 2, 1957; minimum, 160 ppm July 27-28, 1958.
Hardness (1956-58, 1961-64): Maximum, 448 ppm Feb. 2, 1957; minimum, 102 ppm July 27-28, 1958.
Specific conductance (1956-58, 1961-64): Maximum daily, 1,980 micromhos Nov. 12, 1956; minimum daily, 217 micromhos Sept. 8, 1958.
Water temperatures: Maximum (1956-60, 1961-64), 90°F Aug. 4, 1959, July 28, Aug. 10, 1964; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily (1957-64), 10,000 ppm July 5, 1959; minimum daily (1960-63), 30 ppm Dec. 1-3, 1962.
Sediment loads: Maximum daily (1957-64), 752,000 tons May 7, 1959; minimum daily (1960-64), 40 tons on several days in 1963.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Maximum observed during water year: Dissolved solids, 886 ppm Mar. 18; hardness, 374 ppm Dec. 27, Mar. 18. Minimum observed during water year: Dissolved solids, 151 ppm June 23; hardness, 106 ppm June 23. Chemical analyses by Kansas State Department of Health, Topeka, Kans. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in Project Office at Topeka, Kans. Additional samples were collected for more comprehensive definition of water quality at this station. Flow affected by ice Dec. 13 to Jan. 22, Jan. 28, Feb. 26.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 1-7, 1963....	3911			50	11	42		188		48	39				312	0.42	3290	170	16	1.4	510	
Oct. 8-18.....	3393			55	11	51		195		54	53				322	.44	2950	182	22	1.6	550	
Oct. 19-29.....	3148			55	10	48		166		61	57				321	.44	2730	178	42	1.6	550	
Oct. 30-Nov. 25...	2093			74	12	67		217		75	86				430	.58	2430	234	56	1.9	730	
Nov. 26.....	1420	12		78	22	85	12	210	22	97	120	0.4	2.6	0.16	541	.74	2070	285	76	2.2	890	8.3
Dec. 1-10.....	956			98	23	144		298		139	185				758	1.03	1960	339	95	3.4	1260	
Dec. 13-17.....	550			90	20	152		234		156	198				760	1.03	1130	306	114	3.8	1270	
Dec. 21-31.....	750			90	20	141		249		146	180				718	.98	1450	306	102	3.5	1210	
Jan. 1-9, 1964....	989			106	24	151		305		160	194				810	1.10	2160	363	113	3.4	1350	
Jan. 10-11.....	800			112	21	140		312		155	178				788	1.07	1700	366	110	3.2	1310	
Jan. 16-31.....	1040			106	21	141		295		156	179				764	1.04	2150	351	109	3.3	1280	
Feb. 1-29.....	940			103	25	149		298		164	190				795	1.08	2020	360	116	3.4	1330	
Mar. 1-21.....	729			106	22	172		288		180	215				859	1.17	1690	355	119	4.0	1440	
Mar. 22-31.....	1219			88	15	119		246		132	141				624	.85	2050	281	79	3.1	1060	

Apr. 1-23, 1964...	1427			78	22	112		239		123	144				616	.84	2370	285	89	2.9	1050	
Apr. 24-30.....	3560			57	9.7	45		183		57	49				330	.45	3170	182	32	1.5	560	
May 1-25.....	2442			62	16	63		215		77	72				424	.58	2800	220	44	1.8	690	
May 26-31.....	1250			72	16	121		246		112	135				804	.82	2040	246	44	3.4	970	
June 1-29.....	3603			55	10	35		185		46	53				318	.43	3090	178	26	1.1	530	
June 30-July 12...	10570			43	6.9	31		171		30	23				232	.32	6620	136	0	1.2	370	
July 13-27.....	2370			53	9.7	49		185		51	53				337	.46	2160	172	20	1.6	550	
July 28-Aug. 7....	1852			64	8.9	60		195		63	71				371	.50	1860	196	38	1.9	640	
Aug. 8-13.....	759			59	10	109		181		80	138				510	.69	1050	188	40	3.5	850	
Aug. 14-24.....	1124			54	10	43		183		50	48				312	.42	947	176	26	1.4	520	
Aug. 25-Sept. 8...	2129			59	15	102		195		84	129				510	.69	2930	208	48	3.1	860	
Sept. 9-30.....	2624			61	6.3	48		185		57	51				327	.44	2320	178	26	1.6	550	
Weighted average	--			63	12	65		203		71	77				405	0.55	2450	206	40	1.8	676	
Time-weighted average.....	A2187			74	15	90		226		97	111				517	--	--	246	61	2.4	865	
Tons per day....	--			378	74	391		1230		427	464				--	--	--	--	--	--	--	

A Mean discharge based on 366 days; mean discharge for 353 days of chemical analyses, 2,239 cfs.

Additional analyses, in parts per million, water year October 1963 to September 1984

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 29, 1963	2740	11		--	--	66	12	66	12	193	0	79	88	0.4	2.1	0.18	430	214	56	2.0	710	8.1	
Dec. 27.....	765	12		--	--	104	28	144	13	315	0	157	193	.5	1.8	.16	810	374	116	3.2	1330	8.2	
Jan. 28, 1964	964	12		--	--	104	22	127	11	293	0	145	168	.2	2.0	.16	738	350	110	3.0	1210	8.2	
Feb. 26.....	888	11		--	--	94	30	132	12	293	0	151	179	.4	1.6	.18	765	358	118	3.0	1230	7.9	
Mar. 18.....	643	8.0		--	--	107	26	168	12	298	0	186	228	.4	.7	.18	886	374	130	3.8	1420	8.0	
Apr. 10.....	1240	6.0		0.00	0.00	96	27	122	11	251	0	181	170	.4	.9	.16	752	350	144	2.8	1270	7.8	
May 6.....	2930	8.0		--	--	62	17	61	11	215	0	76	77	.5	1.8	.15	418	224	48	1.8	700	7.6	
May 26.....	2020	5.4		.00	.00	61	14	68	10	215	0	74	85	.4	.6	.16	439	210	34	2.0	740	7.6	
June 23.....	17200	8.7		--	--	34	5.1	12	6.5	127	0	20	13	.4	1.8	.07	151	108	2	.5	270	7.4	
June 24.....	11600	9.8		--	--	36	5.8	15	6.3	127	0	24	18	.5	4.9	.08	185	114	10	.6	290	7.4	
Aug. 17.....	880	7.0		--	--	69	16	136	15	215	0	93	197	.4	.5	.15	634	238	62	3.8	1070	7.4	
Sept. 11.....	4000	12		.09	.00	61	9.7	105	12	168	0	93	141	.4	5.8	.18	530	192	54	3.3	890	7.4	

KANSAS RIVER BASIN--Continued

6-S875. KANSAS RIVER AT WAMEGO, KANS.--Continued

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Aver-age
	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	
October	70	72	71	71	--	72	72	71	73	73	71	71	70	70	70	70	70	70	--	67	70	71	70	69	70	71	68	60	61	59	56	69
November	56	--	55	56	59	59	59	60	--	--	56	53	--	50	52	58	--	53	50	52	54	44	--	42	44	--	--	--	43	--	--	--
December	42	--	42	43	--	--	--	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	35	34	32	33	32	32	--	34
January	35	34	--	--	34	--	--	--	--	33	32	32	32	32	32	32	32	32	32	32	34	32	39	32	32	35	32	35	37	32	41	33
February	--	46	46	45	32	38	36	32	42	32	40	32	44	32	32	39	44	--	41	--	39	--	38	41	--	37	39	42	--	--	--	39
March	46	53	--	--	40	42	40	--	40	41	45	51	55	--	55	52	--	54	--	40	45	50	55	--	--	42	46	--	43	46	54	--
April	58	65	54	--	--	56	--	53	59	62	56	--	57	60	--	68	60	--	59	65	65	--	64	66	68	--	55	56	61	--	--	--
May	62	--	69	70	69	70	71	66	69	68	70	65	70	71	74	80	79	77	80	78	78	76	77	78	--	79	--	70	69	66	--	72
June	72	72	75	67	65	78	--	83	83	80	77	80	79	81	81	81	78	84	86	88	84	78	75	78	82	83	82	80	81	75	--	79
July	79	81	80	--	80	80	80	81	80	80	80	78	82	82	82	84	85	87	--	85	86	87	84	87	84	--	81	90	85	85	87	83
August	--	81	89	87	88	86	86	85	81	90	81	79	--	66	69	71	78	82	84	77	81	77	78	79	74	75	76	80	--	78	77	80
September	81	84	84	79	76	--	80	82	84	75	72	72	70	74	71	70	70	74	77	72	72	74	71	69	71	--	64	66	65	70	--	74

KANSAS RIVER BASIN--Continued

6-8875. KANSAS RIVER AT WAMEGO, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964
(Where no daily concentrations are reported, loads are estimated)

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	5190	1100	15000	2200	670	4000	1000	58	160
2..	4550	820	10000	2130	390	2200	989	--	110
3..	4330	650	7600	2100	350	2000	963	23	60
4..	3540	590	5600	2050	250	1400	976	38	100
5..	3330	570	5100	2080	180	1000	976	--	80
6..	3240	470	4100	2050	170	940	976	--	80
7..	3200	310	2700	2000	160	860	976	--	80
8..	4480	380	4600	2000	150	810	963	--	80
9..	4330	240	2800	1980	140	750	890	--	70
10..	3380	180	1600	2180	140	820	854	--	70
11..	3760	140	1400	2130	130	750	655	--	50
12..	3360	190	1700	2050	160	880	560	--	40
13..	3110	210	1800	1990	140	750	550	--	40
14..	3020	250	2000	2070	120	670	550	--	40
15..	2950	160	1300	2080	120	670	550	34	50
16..	2900	160	1200	2100	140	790	550	--	40
17..	2990	260	S 2200	2100	120	680	550	--	40
18..	3040	1300	11000	2100	92	520	600	--	50
19..	2840	1500	11000	2120	89	510	600	--	50
20..	3760	2700	27000	2250	74	450	650	--	50
21..	2910	2000	16000	2200	90	530	700	--	60
22..	3040	1700	S 15000	2110	120	680	750	--	60
23..	5190	3700	52000	2160	100	580	800	--	90
24..	3660	3000	30000	2150	82	480	800	48	100
25..	2910	1900	15000	2080	83	470	800	39	84
26..	2600	1200	8400	1420	72	280	800	22	48
27..	2600	1000	7000	1090	75	220	750	--	40
28..	2550	760	5200	1080	70	200	750	23	46
29..	2570	740	5100	1050	60	170	700	--	40
30..	2080	760	4300	1040	60	170	700	--	40
31..	1980	670	3600	--	--	--	700	--	40
Total	103390	--	281300	58140	--	25230	23628	--	1988

Day	JANUARY			FEBRUARY			MARCH		
1..	750	28	57	938	--	80	782	86	180
2..	850	28	64	938	29	73	794	58	120
3..	900	--	70	950	--	100	818	--	100
4..	1000	--	100	1000	70	190	794	--	100
5..	1100	57	170	989	--	100	782	61	130
6..	1100	--	200	1020	54	150	758	59	120
7..	1100	--	200	1020	38	100	734	33	65
8..	1100	--	200	1000	--	100	734	--	60
9..	1000	--	200	976	35	92	758	38	78
10..	900	59	140	938	--	80	722	27	53
11..	700	--	100	914	34	84	710	42	80
12..	650	--	100	938	--	100	699	78	150
13..	600	--	100	938	40	100	688	80	150
14..	650	--	100	938	--	100	688	--	100
15..	800	--	100	963	--	100	677	64	120
16..	900	--	100	976	47	100	666	34	61
17..	950	--	200	963	33	86	655	--	50
18..	1000	--	200	950	--	100	644	31	54
19..	1000	--	200	950	50	130	688	--	70
20..	1100	--	180	926	--	80	758	48	98
21..	1300	56	200	926	34	85	770	27	56
22..	1450	--	200	926	--	80	902	51	120
23..	1110	56	170	938	39	99	1080	66	190
24..	1040	--	100	938	67	170	1120	--	200
25..	1000	--	100	902	--	200	1170	--	200
26..	976	40	100	900	75	180	1180	40	130
27..	950	--	100	890	89	210	1150	43	130
28..	950	41	100	830	120	270	1120	--	100
29..	976	44	120	794	--	200	1070	37	110
30..	938	--	100	--	--	--	1560	120	500
31..	1000	--	100	--	--	--	1840	110	550
Total	29840	--	4171	27269	--	3539	27511	--	4225

S Computed by subdividing day.

KANSAS RIVER BASIN--Continued

6-8875. KANSAS RIVER AT WAMEGO, KANS.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued
(Where no daily concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE			
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)		Tons per day
1..	1860	91	460	3170	--	13000	1300	170		600
2..	1400	84	320	3090	--	10000	1700	180		830
3..	1130	58	180	3020	580	4700	1500	170		690
4..	1180	--	200	2990	180	1400	1000	140		380
5..	1250	--	200	2950	280	2200	1160	150		470
6..	1430	57	220	2910	300	2400	1100	150		440
7..	1310	--	200	2930	270	2100	1050	99		280
8..	1220	64	210	3060	330	2700	1100	120		360
9..	1170	42	130	3310	390	3500	1140	180		550
10..	1160	37	120	3040	280	2300	1030	210		580
11..	1160	31	97	2500	250	1700	2130	1200		6900
12..	1410	--	300	2050	230	1300	2120	1600		9200
13..	1520	84	340	2180	260	1500	3150	2600	S	26000
14..	1250	61	200	2230	270	1600	3520	4100		39000
15..	1110	--	200	1990	240	1300	3000	2000		16000
16..	1290	78	270	1630	220	970	5410	3900		57000
17..	1900	160	820	1290	190	660	8650	4300		100000
18..	2100	--	700	1200	190	620	4730	2800		36000
19..	1720	52	240	1610	240	1000	3480	2200		21000
20..	1590	66	280	2280	240	1500	2670	1700		12000
21..	1570	60	250	2370	200	1300	2260	1400		8500
22..	1420	230	880	2350	230	1400	2200	1700		10000
23..	1670	1400	6300	2300	220	1400	12200	4600	S	160000
24..	2970	2200	18000	2300	180	1100	12000	3300		110000
25..	2330	2300	14000	2300	180	1100	6030	2200		36000
26..	2180	1800	10000	1630	160	700	3880	1800		19000
27..	6330	3900	67000	1160	130	410	3600	980		9500
28..	5070	2600	36000	1330	160	570	4970	1000		13000
29..	3130	1500	13000	1260	180	610	6410	1100		19000
30..	2910	--	11000	1050	160	450	10900	1500		44000
31..	--	--	--	1070	150	430	--	--		--
Total	57740	--	182117	68550	--	65920	115390	--		757280

Day	JULY			AUGUST			SEPTEMBER		
1..	11600	830	26000	1840	--	1300	2520	570	3900
2..	12600	740	25000	1560	--	1000	2570	510	3500
3..	12200	630	21000	1770	250	1200	2330	350	2200
4..	12100	600	20000	1790	200	970	2620	360	2500
5..	11900	620	20000	1520	130	530	1980	200	1100
6..	11600	530	16000	1260	100	340	1720	170	790
7..	11400	430	13000	1070	100	290	1650	150	670
8..	11700	400	13000	890	80	190	1940	280	1500
9..	11000	310	9200	655	67	120	2760	680	5100
10..	8080	270	5900	710	78	150	3090	2100	18000
11..	6800	250	4600	758	72	150	3880	2200	23000
12..	5540	220	3300	758	79	160	3780	2900	30000
13..	3780	200	2000	782	77	160	3180	2600	22000
14..	2830	190	1400	878	76	180	2830	2000	15000
15..	2020	200	1100	976	92	240	2930	1100	8700
16..	2070	240	1300	938	110	280	2910	570	4500
17..	1900	220	1100	878	100	240	2810	440	3300
18..	1790	200	970	842	100	230	2880	310	2400
19..	1700	160	730	794	100	210	2740	230	1700
20..	2040	180	990	854	130	300	2710	220	1600
21..	2160	160	930	950	160	410	2660	220	1600
22..	2130	130	750	1350	430	1600	2520	220	1500
23..	2500	160	1100	2070	1000	5600	2420	220	1400
24..	2590	130	910	1840	700	3500	2230	200	1200
25..	2590	110	770	2100	620	3500	2070	180	1000
26..	2610	110	780	2210	660	3900	1960	180	950
27..	2840	210	1600	2120	500	2900	1890	180	920
28..	1990	240	1300	2040	340	1900	1860	180	900
29..	2440	--	2300	1980	250	1300	1810	170	830
30..	2880	--	2700	2010	220	1200	1800	150	730
31..	2250	--	1800	2150	380	2200	--	--	--
Total	171630	--	201530	42343	--	36250	75050	--	162490

Total discharge for year (cfs-days)..... 800481
Total load for year (tons)..... 1726040

S Computed by subdividing day.

6-8875. KANSAS RIVER AT WAMEGO, KANS.--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Oct. 29, 1963.....	1210	63		2740	764	5650	68	70		96		100	--	--				PWC
Oct. 29.....	1210	63		2740	764	5650	32	70		97		100	--	--				PN
June 23, 1964.....	1350	77		16700	5260	237000	52	58		73		97	99	99	100			VPWC
June 24.....	1150	76		11600	3060	95800	63	69		82		97	99	100				VPWC
Sept. 11.....	1445	75		4020	2080	22600	16	41		87		99	99	100				VPN
Sept. 11.....	1445	75		4020	2080	22600	64	70		86		99	99	100				VPWC

Particle-size analyses of bed material, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
Oct. 29, 1963.....	1210		10	2740			0	1	4	46	84	93	98	99	99	100		SV
Dec. 27.....	1140		25	765			--	0	2	21	47	66	83	94	98	100		SV
Jan. 28, 1964.....	1450		10	964			--	1	15	53	87	94	99	100	--	--		SV
Feb. 26.....	1430		10	888			2	8	22	54	75	86	94	99	100	--		SV
Mar. 18.....	1200		10	643			0	2	15	46	71	83	90	93	94	100		SV
Apr. 10.....	1120		34	1240			--	0	5	41	76	90	99	100	--	--		SV
May 6.....	1530		15	2930			3	4	17	51	75	85	94	97	98	100		SV
June 23.....	1350		14	16700			--	0	8	44	75	87	95	97	98	100		SV
July 28.....	1530		30	2200			--	0	7	50	78	91	98	100	--	--		SV
Aug. 17.....	1555		6	880			0	1	9	48	76	90	97	100	--	--		SV
Sept. 11.....	1445		12	4020			--	0	10	42	67	79	90	96	98	100		SV

KANSAS RIVER BASIN--Continued

6-8880. VERMILLION CREEK NEAR WAMEGO, KANS.

LOCATION.--At gaging station at highway bridge, 1 mile upstream from Indian Creek, 14 miles northeast of Wamego, Pottawatomie County, and at mile 19.3.
DRAINAGE AREA.--243 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
Water temperatures: April 1958 to September 1959.
Sediment records: April 1958 to September 1963.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluorids (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 28, 1963	9.5	8.0		--	--	133	38	23	4.7	322	0	231	22	0.3	0.8	0.19	630	488	224	0.5	930	8.2	
Nov. 18.....	11	7.5		--	--	107	34	22	6.3	405	0	84	18	.3	1.0	.27	490	406	74	.5	760	7.7	
Jan. 14, 1964	18	4.0		--	--	106	42	34	4.2	390	0	140	29	.1	1.9	.18	578	437	117	.7	900	7.8	
Feb. 17.....	12	1.5		--	--	88	24	22	3.0	298	0	90	20	.1	.4	.18	410	318	74	.5	640	7.9	
Mar. 20.....	21	.5		--	--	93	24	28	3.5	332	0	93	25	.2	.7	.18	440	330	58	.7	680	7.9	
May 26.....	2.4	6.0		0.03	0.00	89	20	21	4.4	307	0	72	15	.5	1.0	.16	386	304	52	.5	640	7.7	
June 23.....	6100	8.5		--	--	38	4.2	5.3	3.0	134	0	14	3.0	.4	1.9	.07	134	112	2	.2	220	7.5	
July 1.....	63	12		--	--	108	22	15	3.0	376	0	66	13	.3	3.5	.10	430	360	52	.3	700	7.7	
Aug. 24.....	4.0	3.6		--	--	93	29	26	3.2	307	0	119	27	.3	.1	.23	466	351	99	.6	760	7.5	
Sept. 23.....	1.9	6.0		.00	.05	84	32	21	3.4	271	0	133	20	.5	1.6	.16	470	341	119	.5	740	7.6	

6-8905. DELAWARE RIVER AT VALLEY FALLS, KANS.

LOCATION.--At gaging station at highway bridge, 200 feet downstream from Walnut Creek, 300 feet upstream from Atchison, Topeka and Santa Fe Railway Co. bridge, 0.2 mile north of Valley Falls, Jefferson County, and at mile 30.6.
DRAINAGE AREA.--922 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 18, 1963	16	11		--	--	92	21	48	4.8	332	0	84	48	0.2	0.4	0.13	484	316	44	1.2	800	7.7	
Nov. 18.....	30	11		--	--	102	23	37	7.0	342	0	97	34	.3	.4	.21	490	349	68	.9	750	8.0	
Dec. 11.....	30	9.5		--	--	93	23	37	5.5	356	0	70	32	.2	.4	.15	460	326	34	.9	720	8.3	
Jan. 23, 1964	97	6.0		--	--	86	16	36	3.4	288	0	86	30	.2	.4	.12	410	280	44	.9	640	7.6	
Feb. 14.....	48	5.0		--	--	80	21	27	3.2	293	0	69	25	.2	.5	.13	384	286	46	.7	590	8.0	
Mar. 19.....	48	4.0		--	--	80	19	35	3.2	283	0	86	30	.2	.9	.10	388	278	46	.9	620	8.0	
Apr. 28.....	390	8.0		--	--	43	8.9	11	4.4	156	0	26	5.0	.5	5.8	.08	196	144	16	.4	310	7.7	
May 15.....	59	11		0.00	0.08	90	15	30	5.4	325	0	67	19	.4	.4	.10	398	286	19	.8	630	8.1	
June 23.....	12500	10		--	--	31	2.6	6.7	3.8	112	0	8.0	3.0	.4	3.6	.08	116	88	0	.3	190	7.2	
June 30.....	156	17		--	--	107	18	20	4.2	366	0	57	16	.3	3.4	.10	418	341	41	.5	690	7.8	
July 30.....	16	11		--	--	85	24	36	4.2	322	0	80	35	.3	.2	.15	422	310	46	.9	700	7.6	
Aug. 24.....	16	8.0		--	--	61	18	21	4.5	207	0	69	19	.4	1.3	.18	305	226	56	.6	510	7.5	
Sept. 28.....	15	10		.00	.00	84	21	34	5.3	293	0	76	33	.4	.9	.19	436	296	56	.9	680	7.8	

KANSAS RIVER BASIN--Continued

6-8910. KANSAS RIVER AT LECOMPTON, KANS.

LOCATION.--At gaging station at highway bridge at Lecompton, Douglas County, 0.6 mile downstream from Delaware River and at mile 64.7.
DRAINAGE AREA.--58,420 square miles, approximately, of which a large area is noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1957 to September 1958, October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 11, 1963	3700	17		--	--	52	13	32	11	181	0	49	41	0.3	9.3	0.12	323	183	35	1.0	510	8.1	
Nov. 4.....	2240	11		--	--	67	17	56	12	202	0	87	84	.3	1.8	.18	460	237	71	1.6	740	7.7	
Dec. 6.....	1425	12		--	--	94	27	118	12	307	0	128	158	.3	.4	.13	714	346	94	2.8	1150	7.2	
Jan. 13, 1964	750	13		--	--	117	24	105	9.5	346	0	157	124	.2	5.3	.15	736	390	106	2.3	1160	7.5	
Jan. 31.....	1015	12		--	--	102	21	125	12	278	0	160	165	.3	4.9	.19	732	341	113	2.9	1210	7.7	
Mar. 5.....	1130	8.0		--	--	97	22	136	13	285	0	165	179	.4	1.3	.21	772	332	98	3.2	1240	7.9	
Apr. 10.....	1600	10		--	--	86	24	106	10	229	17	136	142	.4	.1	.18	644	313	97	2.6	1070	8.4	
May 15.....	2450	5.0		0.03	0.00	68	19	78	11	224	0	103	100	.5	1.8	.15	488	248	64	2.2	820	7.6	
June 8.....	2650	10		--	--	53	15	23	5.4	183	0	47	28	.5	4.2	.08	280	194	44	.7	460	7.5	
July 14.....	4500	6.0		--	--	53	9.7	29	8.0	181	0	43	34	.4	1.3	.18	283	172	24	.9	470	7.4	
Sept. 1.....	3500	6.6		--	--	45	7.7	26	6.7	144	0	39	35	.4	1.4	.10	240	144	26	.9	390	7.2	
Sept. 28.....	2000	13		.00	.00	61	13	59	12	200	0	82	73	.5	1.4	.18	420	206	42	1.6	680	7.9	

KANSAS RIVER BASIN--Continued

6-8915. WAKARUSA RIVER NEAR LAWRENCE, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 59, 4 miles south of Lawrence, Douglas County, and at mile 13.3.
DRAINAGE AREA.--425 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. No flow Oct. 10-15.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Nov. 15, 1963.....	0.5	6.5	--	74	14	17	5.3	266	0	30	23	0.3	0.4	0.18	313	0.43	0.42	242	24	0.5	510	7.6
Jan. 23, 1964.....	2.9	4.5	--	82	18	22	3.6	307	0	37	23	.2	.4	.15	347	.47	2.72	278	26	.6	610	7.8
Feb. 12.....	2.0	4.0	--	65	18	18	3.2	273	0	27	22	.2	1.0	.13	322	.44	1.74	236	12	.5	540	8.0
Mar. 19.....	1.1	2.5	--	77	14	20	3.3	288	0	24	23	.3	1.2	.10	312	.42	.93	250	14	.6	510	8.0
May 8.....	39	7.5	0.02	85	11	12	3.3	244	0	63	9.0	.4	3.4	.08	325	.44	34.2	257	57	.3	510	7.8
May 22.....	5.6	4.5	--	88	18	7.3	3.3	276	0	64	12	.4	1.3	.10	350	.48	5.29	294	68	.2	580	7.7
June 19.....	4500	8.2	--	37	1.8	6.1	8.1	120	0	16	5.0	.5	4.9	.05	144	.20	1750	100	2	.3	220	7.2
July 30.....	4.9	9.0	--	43	6.9	12	5.0	156	0	25	9.0	.5	3.2	.15	213	.29	2.82	136	8	.4	320	7.3
Aug. 21.....	36	17	--	42	7.5	9.3	4.3	146	0	21	7.0	.5	7.5	.19	192	.26	18.7	136	16	.3	300	7.3
Sept. 24.....	6.5	5.4	.04	74	7.7	15	3.8	239	0	40	12	.5	.5	.10	299	.41	5.25	216	20	.4	490	7.6

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KANSAS RIVER BASIN--Continued

6-8925. KANSAS RIVER AT BONNER SPRINGS, KANS.

LOCATION.--At gaging station at bridge on State Highway 7, 0.6 mile east of Bonner Springs, Wyandotte County, 0.9 mile downstream from Wolf Creek, and at mile 20.3.
DRAINAGE AREA.--59,890 square miles, approximately, of which a large area is noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
Water temperatures: October 1961 to September 1963.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Chemical analyses by Kansas State Department of Health, Topeka, Kans.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 1, 1963.....	7110	--	--	44	8.3	21	--	132	--	30	34	--	--	--	A270	0.37	5180	144	36	0.8	400	--
Oct. 6-31.....	3554	--	--	55	16	48	--	185	--	66	60	--	--	--	340	.46	3260	203	51	1.5	590	--
Nov. 1-30.....	2378	--	--	74	12	74	--	220	--	86	87	--	--	--	449	.61	2880	234	54	2.1	770	--
Dec. 1-11.....	1276	--	--	96	25	114	--	283	--	137	148	--	--	--	684	.93	2360	342	110	2.7	1140	--
Dec. 17.....	B750	16	--	122	24	147	15	329	0	204	176	0.3	10	0.16	906	1.23	1830	403	133	3.2	1360	8.3
Dec. 23-31.....	1178	--	--	120	30	161	--	327	--	201	205	--	--	--	920	1.25	2930	423	155	3.4	1480	--
Jan. 1-19, 1964...	1280	--	--	112	22	141	--	288	--	178	174	--	--	--	824	1.12	2850	370	134	3.2	1310	--
Jan. 24-31.....	1484	--	--	104	26	121	--	276	--	160	161	--	--	--	765	1.04	3070	366	140	2.7	1240	--
Feb. 1-8.....	1390	--	--	106	22	129	--	273	--	153	162	--	--	--	750	1.02	2810	355	131	3.0	1220	--
Feb. 10-15.....	1270	--	--	102	24	140	--	276	--	165	166	--	--	--	768	1.04	2630	353	127	3.2	1290	--
Feb. 18.....	1200	--	--	103	21	121	--	271	--	135	161	--	--	--	A696	.95	2260	344	122	2.8	--	--
Feb. 22.....	1130	--	--	96	27	117	--	283	--	130	164	--	--	--	A681	.93	2080	350	118	2.7	--	--
Feb. 28-29.....	1085	--	--	97	21	150	--	290	--	151	167	--	--	--	752	1.02	2200	328	90	3.6	1220	--
Mar. 1-15.....	1028	--	--	102	23	142	--	271	--	170	176	--	--	--	786	1.07	2180	348	126	3.3	1320	--
Mar. 18.....	B890	6.0	--	106	21	149	12	271	0	184	195	.4	13	.16	822	1.12	1980	351	129	3.5	1380	7.5
May 6.....	B3550	7.5	--	68	13	55	9.3	200	0	80	71	.5	4.2	.12	414	.56	3970	223	59	1.6	690	7.6
May 7-21.....	2877	--	--	62	15	64	--	212	--	80	68	--	--	--	412	.56	3200	216	42	1.9	700	--
June 17.....	B12500	15	--	50	6.6	16	4.7	173	0	30	14	.4	2.4	.07	226	.31	7630	152	10	.6	360	7.2
Aug. 3.....	B2470	8.0	0.00	53	11	56	9.3	166	0	67	72	.5	3.1	.15	364	.50	2430	177	41	1.8	600	7.5
Aug. 21.....	B3090	8.0	--	50	9.5	58	8.7	137	0	54	83	.4	12	.18	361	.49	3010	164	52	2.0	600	7.1
Aug. 29.....	B2650	9.0	.00	59	12	85	11	181	0	91	101	.5	4.9	.18	470	.64	3360	196	48	2.6	780	7.4
Sept. 23.....	B2810	12	.13	59	12	52	12	195	0	81	53	.5	1.5	.18	382	.52	2900	196	36	1.6	620	7.6

A Calculated from determined constituents.
B Discharge at time of sampling.

6-8925. KANSAS RIVER AT BONNER SPRINGS, KANS.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Analyses of additional samples																						
Oct. 17, 1963.....	B3180	9.5		59	15	50	11	195	0	70	62	0.3	2.2	0.10	399	0.54	3430	208	48	1.5	640	7.5
Nov. 14.....	B2550	12		76	13	66	13	222	0	81	86	.3	8.0	.18	468	.64	3220	243	61	1.8	770	7.6
Jan. 17, 1964.....	B950	13		114	29	147	13	312	0	216	175	.2	17	.15	888	1.21	2280	404	148	3.2	1380	7.3
Feb. 12.....	B1410	10		99	25	120	12	256	0	149	163	.3	30	.19	752	1.02	2860	350	140	2.8	1210	7.8
May 15.....	B2470	5.5	0.00	78	14	79	10	229	0	107	102	.3	2.0	.10	520	.71	3470	252	64	2.2	870	8.0

B Discharge at time of sampling.

CHARITON RIVER BASIN

6-9039. CHARITON RIVER NEAR RATHBUN, IOWA

LOCATION.--At gaging station on left bank at county highway bridge, 0.8 mile northeast of Rathbun, Appanoose County, 1 mile upstream from Walnut Creek, and 1.3 miles downstream from Buck Branch.
DRAINAGE AREA.--551 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1962 to September 1964.
Sediment records: October 1962 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum, 80°F July 24; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 2,500 ppm Apr. 21; minimum daily, 4 ppm Feb. 6, 9, Mar. 26.
Sediment loads: Maximum daily, 10,000 tons Apr. 21; minimum daily, less than 0.05 ton on many days during October to January.
EXTREMES, 1962-64.--Water temperatures: Maximum, 87°F June 9, 1963; minimum, freezing point on many days each year.
Sediment concentrations: Maximum daily, 2,800 ppm Mar. 26, 1963; minimum daily, 4 ppm Feb. 6, 9, Mar. 26, 1964.
Sediment loads: Maximum daily, 10,000 tons Mar. 26, 1963, Apr. 21, 1964; minimum daily, less than 0.5 ton on many days during October to December 1963, January 1964.
REMARKS.--Flow affected by ice Dec. 2 to Mar. 2.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October	56	56	56	54	56	62	58	56	58	54	58	56	56	54	56	58	54	56	56	58	60	58	58	58	60	58	56	48	46	48	46	55
November	40	36	40	44	46	46	40	42	46	42	40	38	34	34	36	38	42	36	34	40	38	44	38	36	34	34	34	34	33	33	--	38
December	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
February	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March	32	33	33	34	32	33	33	33	32	33	33	33	34	34	33	34	33	33	33	32	32	34	34	33	33	33	32	33	33	32	33	33
April	33	34	34	38	40	42	45	38	40	44	50	50	48	50	48	50	58	52	50	49	51	52	54	54	53	55	58	56	52	50	--	48
May	52	54	56	62	56	64	66	68	66	64	64	62	58	56	58	66	66	70	68	64	66	68	66	64	66	66	64	62	62	60	69	63
June	60	62	56	60	60	62	64	68	72	68	69	66	70	70	68	66	71	72	72	71	70	72	72	71	72	76	72	72	70	74	--	68
July	74	76	74	76	70	72	76	74	74	72	70	70	66	68	68	70	74	74	78	76	76	76	78	80	76	70	78	74	74	70	76	74
August	76	78	78	76	70	66	76	68	68	66	70	60	58	60	62	60	60	62	62	68	66	66	64	66	60	62	66	68	64	66	68	67
September	68	68	70	70	64	62	64	72	68	68	62	60	60	60	60	62	62	60	62	62	62	62	60	59	56	60	58	40	40	42	--	61

CHARITON RIVER BASIN--Continued

6-9039. CHARITON RIVER NEAR RATHBUN, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	7.9	340	7	1.0	27	0.1	7.2	88	2
2	6.6	310	6	1.1	18	.1	4.5	--	E 1
3	4.4	270	3	1.1	13	T	2.8	61	.5
4	2.9	210	2	1.0	13	T	2.4	48	.3
5	2.3	260	2	.9	21	.1	2.2	39	.2
6	1.4	150	.6	.8	24	.1	2.1	35	.2
7	.8	130	.3	.7	22	T	2.3	34	.2
8	1.1	140	.4	.9	26	.1	2.5	74	.5
9	.8	130	.3	.9	29	.1	2.6	27	.2
10	.5	120	.2	.9	28	.1	2.6	35	.2
11	.3	130	.1	.8	23	T	2.5	28	.2
12	.3	140	.1	.7	18	T	2.3	29	.2
13	.3	120	.1	.6	15	T	2.1	30	.2
14	.2	120	.1	.7	30	.1	2.0	26	.1
15	.2	120	.1	.8	30	.1	1.8	25	.1
16	.2	82	T	.8	14	T	1.7	19	.1
17	.2	88	T	.9	17	T	1.8	21	.1
18	.5	54	.1	.9	21	.1	2.0	25	.1
19	.6	42	.1	.9	23	.1	2.1	13	.1
20	.7	38	.1	1.5	49	.2	2.1	16	.1
21	.7	28	.1	2.1	27	.2	2.0	9	T
22	.7	68	.1	6.0	190	3	1.8	11	.1
23	.5	110	.1	20	250 S	20	1.7	14	.1
24	.5	28	T	61	140	23	1.8	14	.1
25	.6	22	T	35	100	9	2.0	8	T
26	.7	20	T	24	120	8	2.3	--	E .2
27	.8	37	.1	18	110	5	2.3	9	.1
28	.8	36	.1	13	97	3	1.8	10	T
29	.7	24	T	10	93	3	1.6	20	.1
30	.7	35	.1	8.9	84	2	1.5	19	.1
31	.9	26	.1	--	--	--	1.4	8	T
Total	39.8	--	23.6	215.9	--	77.8	71.8	--	7.6

Day	JANUARY			FEBRUARY			MARCH		
1	1.4	8	T	8.4	14	0.3	6.8	14	0.3
2	1.4	10	T	8.0	5	.1	9.0	5	.1
3	1.3	14	T	7.8	6	.1	11	8	.2
4	1.3	9	T	7.4	11	.2	12	9	.3
5	1.3	8	T	7.2	-- E	.2	14	26	1
6	1.3	11	T	6.8	4	.1	17	19	.9
7	1.4	9	T	6.2	16	.3	15	58	2
8	1.5	7	T	6.0	21	.3	14	12	.5
9	1.6	16	0.1	5.8	4	.1	16	18	.8
10	1.7	6	T	5.5	23	.3	19	15	.8
11	1.8	10	T	5.2	7	.1	30	36	3
12	2.0	10	.1	5.0	15	.2	28	9	.7
13	2.2	6	T	4.8	6	.1	26	7	.5
14	2.4	43	.3	4.6	8	.1	24	12	.8
15	2.5	38	.3	4.5	11	.1	42	13	1
16	2.7	37	.3	4.4	39	.5	51	29	4
17	2.8	40	.3	4.4	50	.6	40	11	1
18	2.9	46	.4	5.0	10	.1	28	25	2
19	3.0	35	.3	5.4	8	.1	19	12	.6
20	3.3	41	.4	5.6	6	.1	13	18	.6
21	3.8	39	.4	6.2	6	.1	11	34	1
22	6.0	37	.6	7.0	8	.2	11	47	1
23	10	16	.4	7.6	9	.2	11	6	.2
24	12	16	.5	6.6	17	.3	11	12	.4
25	15	13	.5	6.2	7	.1	13	7	.2
26	21	11	.6	5.8	8	.1	16	4	.2
27	17	17	.8	5.6	-- E	.1	14	30	1
28	11	12	.4	5.4	10	.1	13	7	.2
29	10	23	.6	5.3	15	.2	15	90	4
30	9.4	9	.2	--	--	--	19	150	8
31	9.0	9	.2	--	--	--	21	24	1
Total	164.0	--	8.1	173.7	--	5.4	589.8	--	38.3

E Estimated.
S Computed by subdividing day.
T Less than 0.05 ton.

CHARITON RIVER BASIN--Continued

6-9039. CHARITON RIVER NEAR RATHBUN, IOWA--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	17	33	2	136	180	66	26	380	27
2..	17	19	.9	155	200	84	19	430	22
3..	15	34	1	155	230	96	15	290	12
4..	18	37	2	141	190	72	12	210	7
5..	34	48	4	106	190	54	10	200	5
6..	54	52	8	83	190	43	8.9	190	5
7..	155	120	50	67	170	31	7.5	170	3
8..	119	100	32	57	150	23	6.9	150	3
9..	79	98	21	111	180	54	5.7	150	2
10..	59	94	15	323	1100	960	5.4	120	2
11..	43	100	12	160	1100	480	4.8	140	2
12..	33	73	7	105	670	190	5.7	140	2
13..	28	81	6	91	520	130	6.9	200	4
14..	118	460	S 230	63	390	66	9.2	200	5
15..	160	700	300	50	320	43	503	1000	S 2000
16..	101	400	110	42	210	24	1100	1500	4500
17..	74	280	56	36	190	18	835	1400	3200
18..	50	180	24	28	220	17	702	840	1600
19..	42	160	18	22	160	10	622	730	1200
20..	715	1800	S 4700	19	150	8	974	1300	S 4600
21..	1520	2500	10000	15	130	5	1670	1900	8600
22..	1560	1300	5500	13	140	5	1760	830	3900
23..	1180	800	2500	11	130	4	3510	420	4000
24..	718	640	1200	13	250	9	4060	330	3600
25..	388	620	650	142	480	180	3780	210	2100
26..	216	500	290	294	1200	950	2500	170	1100
27..	175	400	190	185	1200	600	1960	180	950
28..	238	360	230	97	1100	290	1270	220	754
29..	200	350	190	66	780	140	427	220	250
30..	136	210	77	50	500	68	216	110	64
31..	--	--	--	37	400	40	--	--	--
Total	8262	--	26425.9	2873	--	4760	26032	--	42519

Day	JULY			AUGUST			SEPTEMBER		
1..	136	81	30	13	320	11	42	180	20
2..	115	76	24	9.9	230	6	30	150	12
3..	85	67	15	7.9	200	4	18	130	6
4..	64	99	17	7.2	140	3	14	230	9
5..	63	110	19	6.6	190	3	32	350	30
6..	53	110	16	6.3	130	2	100	300	81
7..	54	290	42	5.7	130	2	903	1700	S 4500
8..	58	420	66	5.1	110	2	1400	570	2200
9..	141	440	170	4.4	110	1	622	350	590
10..	63	450	77	3.6	74	.7	414	360	400
11..	54	380	55	3.6	86	.8	388	260	270
12..	250	590	S 450	3.4	93	.9	190	180	92
13..	323	600	520	2.7	67	.5	83	130	29
14..	185	310	150	2.7	62	.5	50	100	14
15..	97	200	52	2.7	61	.4	36	90	9
16..	58	170	27	2.5	69	.5	28	99	7
17..	43	170	20	2.5	100	.7	24	100	6
18..	74	160	32	2.7	75	.5	238	340	S 450
19..	52	160	22	2.3	65	.4	686	540	1000
20..	34	160	15	3.2	80	.7	282	280	210
21..	26	150	11	14	280	11	299	280	230
22..	21	160	9	9.9	270	7	228	210	130
23..	18	--	E 6	7.2	250	5	508	530	S 980
24..	15	97	4	5.4	91	1	1370	960	3600
25..	13	100	4	5.4	84	1	801	410	890
26..	11	100	3	4.4	79	.9	455	330	410
27..	11	88	3	3.8	81	.8	323	280	240
28..	10	89	2	4.1	87	1	160	140	60
29..	104	530	S 170	11	99	3	81	100	22
30..	46	540	67	11	110	3	53	81	12
31..	21	330	19	13	130	5	--	--	--
Total	2298	--	2117	186.2	--	79.3	9858	--	16509

Total discharge for year (cfs-days)..... 50764.2
Total load for year (tons)..... 92571.0

E Estimated.
S Computed by subdividing day.

CHARITON RIVER BASIN--Continued

6-9039. CHARITON RIVER NEAR RATHBUN, IOWA--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Apr. 21, 1964.....	1600	56		1540	2600	11000	43	57	--	83		97	99	100				VPN
Apr. 21.....	1600	56		1540	2600	11000	59	69	77	88		97	99	100				VPWC
Apr. 24.....	1245	57		702	880	1700	63	--	82	90	96	99	--	--				SPWC

LITTLE CHARITON RIVER BASIN

6-9063. *EAST FORK CHARITON RIVER NEAR HUNTSVILLE, MO.*

LOCATION.--At gaging station at downstream side of left pile bent of bridge on County Highway C, 1 mile downstream from Sugar Creek, and 1.5 miles northwest of Huntsville, Randolph County.
DRAINAGE AREA.--220 square miles.
RECORDS AVAILABLE.--Chemical analyses: September 1963 to September 1964.
EXTREMES, December 1963 to September 1964.--Specific conductance: Maximum, 2,390 micromhos Feb. 19; minimum, 150 micromhos Sept. 10-12.
REMARKS.--Stream frozen on many days during winter months.

Chemical analyses, in parts per million, September 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphorus as PO_4	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Immediate acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Oxygen consumed: Filtered	Oxygen consumed: Unfiltered
Sept. 1, 1963	0.6	--	--	0.11	19	168	82	--	--		0	0	810	--	--	--	--	--	757	757	0.8	1280	4.3	--		
Sept. 17.....	.6	5.7	21	3.1	18	172	79	16	6.6		0	0	874	4.0	0.7	1.5	0.00	1300	755	755	3.3	1200	3.5	2		
Oct. 9.....	.2	12	16	1.4	23	173	114	25	7.4		0	0	1070	18	1.8	.4	.08	1620	901	901	1.8	1400	4.2	--		
Nov. 13.....	.2	18	15	8.6	14	218	112	44	9.7		0	0	1270	11	1.8	.3	.18	1790	1000	1000	2.8	1490	2.6	18		
Dec. 3.....	.8	10	9.6	5.8	6.2	245	117	34	9.0		0	0	1240	11	.8	.7	.13	1800	1090	1090	2.3	1800	2.9	4		
Feb. 10, 1964	.5	10	6.8	5.4	15	298	137	46	6.5		0	0	1410	16	.9	.1	.00	2150	1310	1310	1.7	2180	3.8	2		
Mar. 10.....	50	7.7	.0	2.2	3.3	143	55	20	4.5		36	0	588	5.5	.4	3.4	.03	890	584	554	--	1150	6.3	9		
Mar. 31.....	110	8.1	.4	.62	1.3	78	28	15	4.2		66	0	264	7.0	.2	3.3	.01	494	310	256	--	630	7.4	8		6
Apr. 21.....	1060	9.4	2.3	.21	.4	46	14	7.0	4.1		52	0	144	2.0	.3	2.8	.24	217	173	130	--	380	7.3	70		
May 13.....	16	6.2	.1	.96	4.8	187	85	29	5.6		108	0	756	12	.5	.2	.03	1220	817	728	--	1340	7.2	5		
June 9.....	12	6.8	.1	.06	2.7	167	74	24	4.6		52	0	702	8.0	.5	.8	.04	1120	722	679	--	1250	6.3	12		
July 7.....	1.4	7.7	.2	.21	.4	97	45	23	6.1		66	0	388	19	.6	.1	.04	668	427	373	--	850	7.1	10		
Sept. 9.....	A198	6.8	1.4	.72	.00	9.2	2.2	2.3	5.0		27	0	16	1.5	.4	2.7	.06	63	32	10	--	90	7.0	130		

A Daily mean discharge.

Date of collection	Dissolved oxygen: Parts per million	Dissolved oxygen: Percent saturation	Organics: Phenols as C_6H_5OH	Organics: Alkyl benzene sulfonate (ABS)	Ammonia nitrogen as NH_4	Nitrite (NO_2)	Cyanide (CN)	Turbidity	Temperature
Oct. 9, 1963.....	8.4	93						6	69
Nov. 13.....	9.5	73						7	39
Dec. 3.....	--	--						6	38
Mar. 31, 1964.....	--	--						60	38
Apr. 21.....	--	--						330	61
June 9.....	--	--						8	78
July 7.....	--	--						25	84
Sept. 9.....	--	--						550	72

LITTLE CHARITON RIVER BASIN--Continued

6-9063. EAST FORK CHARITON RIVER NEAR HUNTSVILLE, MO.--Continued

Specific conductance, in micromhos at 25°C, December 1963 to September 1964

	OCTOBER			NOVEMBER			DECEMBER		
	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average
1..							--	--	--
2..							--	--	--
3..							--	--	E 1900
4..							1970	1900	1950
5..							1970	1970	1970
6..							1970	1940	1950
7..							1940	1900	1920
8..							1900	1900	1900
9..							1900	1880	1900
10..							1880	1840	1880
11..							1840	1800	1800
12..							1810	1800	1800
13..							1820	1810	1810
14..							1820	1820	1820
15..							1810	1800	1800
16..							1800	1800	1800
17..							1800	1800	1800
18..							1820	1800	1810
19..							--	--	E 2000
20..							--	--	E 2000
21..							--	--	E 2000
22..							--	--	--
23..							--	--	--
24..							--	--	--
25..							--	--	--
26..							--	--	--
27..							--	--	--
28..							--	--	--
29..							--	--	--
30..							--	--	--
31..							--	--	--

	JANUARY			FEBRUARY			MARCH		
1..	--	--	--	2130	2130	2130	--	--	--
2..	--	--	--	2170	2130	2150	--	--	--
3..	--	--	--	2200	2170	2180	--	--	--
4..	--	--	--	2210	2200	2200	--	--	--
5..	--	--	--	2220	2210	2220	--	--	--
6..	--	--	--	2220	2220	2220	--	--	--
7..	--	--	--	2220	2220	2220	--	--	--
8..	--	--	--	2220	2220	2220	--	--	--
9..	--	--	--	2200	2200	2200	--	--	--
10..	--	--	--	2200	2180	2180	--	--	--
11..	--	--	--	2180	2180	2180	1340	1200	1300
12..	--	--	--	2180	2170	2180	1340	1340	1340
13..	--	--	--	2300	2170	2200	1340	1340	1340
14..	--	--	--	2210	2200	2210	1480	1340	1410
15..	--	--	--	2200	2200	2200	1480	1450	1470
16..	--	--	--	2300	2210	2260	1450	1370	1420
17..	--	--	--	2350	230	2320	1370	1370	1370
18..	--	--	--	2370	2350	2370	1380	1370	1380
19..	--	--	--	2390	2370	2380	1380	1380	1380
20..	--	--	--	2370	2350	2350	1390	1380	1390
21..	--	--	--	2350	2350	2350	1390	1140	1240
22..	--	--	--	2350	2350	2350	1140	1040	1080
23..	--	--	--	2350	2280	2310	1040	1040	1040
24..	--	--	--	2280	2190	2260	1120	1040	1090
25..	--	--	--	2180	2180	2180	1160	1080	1150
26..	--	--	--	--	--	--	1080	695	790
27..	2110	2070	2090	--	--	--	880	770	820
28..	2140	2110	2130	--	--	--	880	590	700
29..	2180	2140	2160	--	--	--	600	590	595
30..	2190	2180	2180	--	--	--	600	600	600
31..	--	--	E 2130	--	--	--	650	600	640

E Estimated.

LITTLE CHARITON RIVER BASIN--Continued

6-9063. EAST FORK CHARITON RIVER NEAR HUNTSVILLE, MO.--Continued

Specific conductance, in micromhos at 25°C, December 1963 to September 1964--Continued

	APRIL			MAY			JUNE		
	Maximum	Mininum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average
1..	750	650	690	630	530	580	930	850	875
2..	910	750	840	695	630	665	850	850	850
3..	1010	910	930	780	695	730	855	850	850
4..	1010	720	790	830	780	805	870	855	860
5..	755	345	490	845	830	840	1390	870	1090
6..	405	360	390	855	845	850	1390	920	1080
7..	360	250	300	950	855	910	1100	1065	990
8..	385	245	280	950	950	950	--	--	E 1200
9..	520	385	470	990	940	960	--	--	E 1300
10..	610	520	570	1030	990	1020	--	--	--
11..	700	610	655	1190	1030	1080	--	--	--
12..	780	700	740	1200	1180	1180	--	--	--
13..	815	780	795	1450	1180	1370	--	--	--
14..	880	815	840	1480	1320	1440	--	--	--
15..	930	880	900	1480	1480	1480	--	--	--
16..	970	930	950	1470	1440	1470	--	--	--
17..	1000	970	990	1440	1420	1430	--	--	--
18..	1080	1000	1040	1440	1420	1420	--	--	--
19..	1160	1080	1120	1490	1440	1480	--	--	--
20..	1130	480	820	1500	1490	1500	--	--	--
21..	445	380	415	1500	1320	1400	--	--	--
22..	385	270	325	1330	1320	1320	--	--	--
23..	415	265	280	1340	1330	1330	--	--	--
24..	520	280	460	1660	1340	1500	--	--	--
25..	615	520	570	1560	1430	1480	--	--	--
26..	755	615	680	1650	1300	1440	--	--	--
27..	730	475	525	1990	1330	1700	--	--	--
28..	595	485	550	1990	1780	1900	--	--	--
29..	485	445	460	1780	1510	1730	--	--	--
30..	530	440	490	1510	1230	1410	--	--	--
31..	--	--	--	1230	930	1080	--	--	--

	JULY			AUGUST			SEPTEMBER		
1..	--	--	--	--	--	--	--	--	--
2..	--	--	--	--	--	--	--	--	--
3..	--	--	--	--	--	--	--	--	--
4..	--	--	--	--	--	--	--	--	--
5..	--	--	--	--	--	--	--	--	--
6..	--	--	--	--	--	--	--	--	--
7..	--	--	E 860	--	--	--	--	--	--
8..	970	860	875	--	--	--	--	--	--
9..	970	945	955	--	--	--	--	--	E 150
10..	945	905	915	--	--	--	150	150	150
11..	2290	910	1280	--	--	--	150	150	150
12..	1250	575	800	--	--	--	155	150	155
13..	705	575	615	--	--	--	170	155	160
14..	765	705	750	--	--	--	195	170	185
15..	765	765	765	--	--	--	210	195	200
16..	765	755	760	--	--	--	440	210	265
17..	755	755	755	--	--	--	1490	390	900
18..	755	755	755	--	--	--	690	280	435
19..	780	755	760	--	--	--	280	280	280
20..	820	780	800	--	--	--	290	280	280
21..	880	820	860	--	--	--	860	295	530
22..	940	890	920	--	--	--	1190	250	415
23..	--	--	E 940	--	--	--	1280	430	790
24..	--	--	--	--	--	--	630	350	435
25..	--	--	--	--	--	--	1360	350	1040
26..	--	--	--	--	--	--	1040	830	955
27..	--	--	--	--	--	--	900	710	760
28..	--	--	--	--	--	--	800	695	750
29..	--	--	--	--	--	--	695	695	695
30..	--	--	--	--	--	--	690	690	690
31..	--	--	--	--	--	--	--	--	--

E Estimated.

SLOUGH CREEK BASIN

6-9066. BURGE BRANCH NEAR ARROW ROCK, MO.

LOCATION.--At gaging station on right bank, 30 feet upstream from culvert on county road, 1.5 miles south of Arrow Rock, Saline County.
DRAINAGE AREA.--0.33 square miles.
RECORDS AVAILABLE.--Sediment records: July 1961 to September 1964.
EXTREMES, 1963-64.--Sediment concentrations: Maximum daily, 4,260 ppm July 2; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 88 tons Apr. 5; minimum daily, 0 tons on many days.
EXTREMES, 1961-64.--Sediment concentrations: Maximum daily, 5,360 ppm Mar. 20, 1962; minimum daily, no flow on many days.
Sediment loads: Maximum daily, 251 tons Mar. 20, 1962; minimum daily, 0 tons on many days each year.
REMARKS.--Records good except for those from estimated-concentration graph, which are fair. No sediment discharge reported for four months of little or no flow, December 1963 to February 1964, and August 1964.

Suspended sediment, water year October 1963 to September 1964

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0	--	0	0	--	0			
2	0	--	0	0	--	0			
3	0	--	0	0	--	0			
4	0	--	0	0	--	0			
5	0	--	0	0	--	0			
6	0	--	0	0	--	0			
7	0	--	0	0	--	0			
8	0	--	0	0	--	0			
9	0	--	0	0	--	0			
10	0	--	0	0	--	0			
11	0	--	0	0	--	0			
12	0	--	0	0	--	0			
13	0	--	0	0	--	0			
14	0	--	0	0	--	0			
15	0	--	0	0	--	0			
16	0	--	0	0	--	0			
17	0	--	0	0	--	0			
18	.63	1330 B	3.0	0	--	0			
19	.01	100	T	0	--	0			
20	0	--	0	0	--	0			
21	0	--	0	0	--	0			
22	0	--	0	.01	100	T			
23	0	--	0	0	--	0			
24	0	--	0	0	--	0			
25	0	--	0	0	--	0			
26	0	--	0	0	--	0			
27	0	--	0	0	--	0			
28	0	--	0	0	--	0			
29	0	--	0	0	--	0			
30	0	--	0	0	--	0			
31	0	--	0	--	--	--			
Total	0.64	--	3.0	0.01	--	0.0	0		0

T Less than 0.05 ton.
B Computed from estimated-concentration graph and subdividing day.

SLOUGH CREEK BASIN--Continued

6-9066. BURGE BRANCH NEAR ARROW ROCK, MO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	JANUARY				FEBRUARY				MARCH			
	Mean discharge (cfs)	Suspended sediment			Mean discharge (cfs)	Suspended sediment			Mean discharge (cfs)	Suspended sediment		
		Mean concentration (ppm)		Tons per day		Mean concentration (ppm)		Tons per day		Mean concentration (ppm)		Tons per day
1									0	--		0
2									0	--		0
3									0	--		0
4									0	--		0
5									.02	100		T
6									.05	100		T
7									.03	100		T
8									.04	100		T
9									.04	100		T
10									.01	100		T
11									0	--		0
12									0	--		0
13									0	--		0
14									0	--		0
15									0	--		0
16									0	--		0
17									0	--		0
18									0	--		0
19									.08	552	B	.2
20									.18	100		T
21									.03	100		T
22									0	--		0
23									0	--		0
24									0	--		0
25									.06	100		T
26									.02	100		T
27									.01	100		T
28									.02	100		T
29									0	--		0
30									0	--		0
31									0	--		0
Total	0			0	0			0	0.59	--		0.3

Day	APRIL				MAY				JUNE			
1	0	--		0	0.02	100		0	0	--		0
2	0	--		0	.01	100		0	0	--		0
3	0	--		0	0	--		0	0	--		0
4	.08	328	A	.7	.02	100		0	.04	100		T
5	3.72	2460	B	88	0	--		0	.32	112	B	.6
6	.06	100		T	0	--		0	.02	100		T
7	.02	100		T	0	--		0	.01	100		T
8	.01	100		T	0	--		0	.01	100		T
9	0	--		0	0	--		0	0	--		0
10	0	--		0	0	--		0	0	--		0
11	0	--		0	0	--		0	0	--		0
12	0	--		0	.01	100		0	0	--		0
13	0	--		0	0	--		0	0	--		0
14	0	--		0	0	--		0	.28	191	B	.3
15	0	--		0	0	--		0	.05	100		T
16	0	--		0	0	--		0	.01	100		T
17	0	--		0	0	--		0	0	--		0
18	.28	536	B	3.7	0	--		0	0	--		0
19	.37	1890	B	4.3	0	--		0	.07	100		0
20	.92	1180	B	14	0	--		0	.01	100		0
21	1.12	1160	B	11	0	--		0	.28	160	B	.2
22	.03	100		T	0	--		0	.02	100		T
23	1.63	1160	B	14	0	--		0	0	--		0
24	.03	100		T	0	--		0	0	--		0
25	.02	100		T	0	--		0	0	--		0
26	.91	558	S	6.6	0	--		0	0	--		0
27	.22	100		.1	.16	411	B	1.6	0	--		0
28	.04	100		T	.79	406	B	4.0	0	--		0
29	.03	100		T	.01	100		0	0	--		0
30	.01	100		T	0	--		0	0	--		0
31	--	--		--	0	--		0	--	--		--
Total	9.50	--		142	1.02	--		5.6	1.12	--		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 and subdividing day.

SLOUGH CREEK BASIN--Continued

6-9066. BURGE BRANCH NEAR ARROW ROCK, MO.--Continued

Suspended sediment, water year October 1963 to September 1964--Continued

Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1	0	0	0				0	--	0
2	.78	4260 S	9.1				0	--	0
3	1.02	473 B	2.4				0	--	0
4	.02	100	T				0	--	0
5	0	--	0				0	--	0
6	0	--	0				0	--	0
7	0	--	0				0	--	0
8	0	--	0				0	--	0
9	0	--	0				0	--	0
10	0	--	0				0	--	0
11	0	--	0				0	--	0
12	.01	100	T				0	--	0
13	0	--	0				0	--	0
14	0	--	0				0	--	0
15	0	--	0				0	--	0
16	0	--	0				0	--	0
17	0	--	0				0	--	0
18	0	--	0				0	--	0
19	0	--	0				0	--	0
20	0	--	0				0	--	0
21	0	--	0				0	--	0
22	0	--	0				0	--	0
23	0	--	0				0	--	0
24	0	--	0				0	--	0
25	0	--	0				0	--	0
26	0	--	0				.01	100	T
27	0	--	0				0	--	0
28	0	--	0				0	--	0
29	0	--	0				0	--	0
30	0	--	0				0	--	0
31	0	--	0				--	--	--
Total	1.83	--	11.5	0		0	0.01	--	0.0

Total discharge for year (cfs-days)..... 14.72
Total load for year (tons)..... 163.5

S Computed by subdividing day.
T Less than 0.05 ton.
B Computed from estimated-concentration graph and subdividing day.

SLOUGH CREEK BASIN--Continued

6-9066. BURGE BRANCH NEAR ARROW ROCK, MO.--Continued

Particle-size analyses of suspended sediment, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Apr. 7, 1964.....	0930	63		7.36	2520		50	58	70	82	93	98	100					SBWC
July 2.....	2330	75		17.1	3100		30	42	53	71	87	99	100					SBWC
July 2.....	2400	75		15.0	2730		53	64	74	89	95	99	100					SBWC

MISSOURI RIVER MAIN STEM

6-9090. MISSOURI RIVER AT BOONVILLE, MO.

LOCATION.--Temperature recorder at gaging station on downstream side of second pier from right abutment of Missouri-Kansas-Texas Railroad Company bridge at Boonville, Cooper County, River mile 196.6.
DRAINAGE AREA.--505,700 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: May 1953 to February 1959, October 1960 to September 1964.
EXTREMES, 1963-64.--Water temperatures: Maximum daily mean, 85°F July 25, 27; minimum daily mean, freezing point on several days during December and January.
EXTREMES, 1953-59, 1960-64.--Water temperatures: Maximum daily mean (1953-58, 1960-64), 90°F July 31 to Aug. 3, 1955; minimum daily mean, freezing point on many days during winter months.

Daily mean temperature (°F) of water, water year October 1963 to September 1964
(Recorder with temperature attachment, continuous ethyl alcohol-actuated thermograph)

Month	Day																													Average
	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	
October	67	67	68	68	68	68	68	69	69	68	68	68	68	67	67	67	67	67	67	67	68	68	68	68	68	68	68	66	64	62	61	67
November	59	54	55	54	53	53	53	52	52	52	52	52	50	49	48	48	49	49	48	47	46	48	47	46	45	44	43	43	43	41	--	49
December	40	40	40	40	40	40	40	40	38	36	35	34	34	34	34	34	33	34	34	34	34	34	34	33	32	32	32	33	33	34	33	35
January	33	32	32	32	32	32	32	32	33	33	33	33	33	33	33	33	33	32	32	33	34	36	39	40	38	37	36	34	33	34	35	34
February	36	36	38	39	40	40	39	37	38	37	37	37	37	37	37	37	37	38	38	38	38	37	38	36	37	37	37	37	38	--	--	38
March	38	39	41	43	41	41	42	42	41	40	40	41	42	45	46	47	48	46	46	45	43	43	44	45	44	40	40	40	40	40	40	42
April	41	44	45	45	44	44	45	45	45	46	48	50	52	52	52	54	56	57	57	57	58	59	60	59	60	60	61	60	58	58	--	52
May	58	59	61	62	65	66	67	67	67	67	67	66	64	64	65	67	68	70	71	73	74	75	75	75	75	75	74	71	68	66	66	68
June	66	66	66	67	65	63	63	65	68	71	72	72	71	71	70	71	72	73	73	73	73	73	73	73	73	73	74	75	77	77	--	71
July	77	78	78	79	79	79	80	79	79	80	79	78	77	77	78	78	78	79	81	82	82	83	84	84	85	84	85	84	83	82	81	80
August	82	83	84	83	82	81	81	81	79	79	79	77	75	74	72	72	72	72	73	73	72	73	73	72	73	73	73	73	73	74	74	76
September	73	73	74	75	75	75	75	73	73	73	73	72	71	71	71	71	70	69	69	70	70	70	69	67	66	65	64	63	62	62	--	70

OSAGE RIVER BASIN

6-9110. MARAIS DES CYGNES RIVER AT MELVERN, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 75, 3 miles west of Melvern, Osage County, 6.5 miles upstream from Long Creek, and at mile 445.7.
DRAINAGE AREA.--351 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. No flow Oct. 1-17, Nov. 2-22, Nov. 30 to Dec. 24, Jan. 25-30, Aug. 6-13.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 23, 1963	0.8	5.0		--	--	67	10	9.6	4.8	237	0	27	6.0	0.2	0.4	0.10	249	208	14	0.3	420	7.7	
Dec. 27.....	A.2	12		--	--	69	17	13	5.6	285	0	33	10	.3	.5	.16	314	242	8	.4	510	8.1	
Jan. 13, 1964	.1	8.5		--	--	90	22	11	4.7	351	0	32	10	.2	1.6	.16	353	315	27	.3	570	7.5	
Feb. 10.....	.6	7.5		--	--	70	12	15	3.8	281	0	22	9.0	.2	1.1	.15	301	224	0	.4	500	8.2	
Feb. 27.....	.2	6.0		--	--	78	13	10	3.3	300	0	20	10	.2	.4	.15	300	248	2	.3	490	7.8	
Mar. 16.....	.1	5.0		--	--	85	16	9.2	3.8	310	0	24	10	.3	.9	.13	304	278	24	.2	510	7.9	
Apr. 20.....	4.3	21		--	--	49	93	10	4.2	176	0	32	6.0	.3	2.3	.10	228	160	16	.2	350	7.8	
Apr. 28.....	60	16		--	--	57	11	10	3.5	163	0	65	8.0	.4	3.9	.12	254	187	53	.3	390	7.9	
May 12.....	16	7.0		0.03	0.00	86	11	9.7	4.4	193	0	66	7.0	.4	1.2	.08	276	210	52	.3	440	7.5	
June 16:																							
At 1210....	574	7.0		--	--	44	6.8	9.6	4.1	142	0	32	5.0	.6	8.0	.08	186	138	22	.4	300	7.2	
At 2000....	210	10		--	--	53	8.8	12	4.1	176	0	39	7.0	.4	3.1	.08	228	168	24	.4	360	7.2	
July 27.....	A.1	7.5		--	--	54	12	9.3	4.7	205	0	30	7.0	.5	.4	.12	241	184	16	.3	380	7.4	
Aug. 18.....	3.9	5.4		--	--	48	8.8	11	7.0	190	0	23	6.0	.4	1.9	.18	213	156	0	.4	350	7.3	
Sept. 24.....	.8	5.4		.00	.08	46	8.0	6.7	4.8	171	0	22	5.0	.4	1.3	.16	189	148	8	.2	310	7.4	

A Daily mean discharge.

6-9135. MARAIS DES CYGNES RIVER NEAR OTTAWA, KANS.

LOCATION.--At East Seventh Street Bridge, 0.9 mile downstream from gaging station, 0.5 mile east of Ottawa City limits, Franklin County, and 0.8 mile downstream from Skunk Creek.
DRAINAGE AREA.--1,250 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
Water temperatures: October 1961 to September 1964.
EXTREMES, 1963-64.--Dissolved solids: Maximum, 494 ppm Dec. 1-31; minimum, 132 ppm Apr. 20-22.
Hardness: Maximum, 250 ppm Jan. 1 to Feb. 29; minimum, 88 ppm Apr. 20-22.
Specific conductance: Maximum daily, 853 micromhos Jan. 14; minimum daily, 150 micromhos June 19.
Water temperatures: Minimum, freezing point on many days during December to February.
EXTREMES, 1961-64.--Dissolved solids: Maximum, 494 ppm Dec. 1-31, 1963; minimum, 120 ppm July 13-19, 1963.
Hardness: Maximum, 348 ppm Nov. 1-27, 1962; minimum, 76 ppm July 13-19, 1963.
Specific conductance: Maximum daily, 853 micromhos Jan. 14, 1964; minimum daily, 146 micromhos July 16, 1963.
Water temperatures: Maximum (1961-63), 95°F July 23, 1963; minimum, freezing point on many days during winter months.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Maximum observed during water year: Dissolved solids, 542 ppm Oct. 16; hardness, 304 ppm Jan. 15. Chemical analyses by Kansas State Department of Health, Topeka, Kans. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in Project Office at Topeka, Kans. Additional samples were collected for more comprehensive definition of water quality at this station.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
Oct. 1-31, 1963...	2.6			53	14	45		168		53	42		40		370	0.50	2.60	190	52	1.4	590	
Nov. 1-30.....	2.0			56	14	50		168		60	47		53		396	.54	2.14	202	64	1.5	640	
Dec. 1-31.....	2.6			59	23	71		198		70	65		84		494	.67	3.73	242	60	2.0	750	
Jan. 1-31, 1964...	5.3			69	19	67		249		62	59		53		471	.64	6.74	250	46	1.8	740	
Feb. 1-29.....	5.7			72	17	54		224		53	64		44		456	.62	7.02	250	66	1.5	710	
Mar. 1-19.....	4.8			56	16	71		183		56	75		62		461	.63	5.97	210	60	2.1	750	
Mar. 20-21.....	10.9			69	13	37		207		50	50		16		370	.50	10.9	226	56	1.1	600	
Mar. 22-31.....	5.8			67	20	51		222		51	67		38		450	.61	7.05	249	67	1.4	730	
Apr. 1-4.....	9.1			62	17	51		210		53	73		--		444	.60	10.9	224	52	1.5	740	
Apr. 5.....	260			72	15	--		--		36	51		--		--	--	--	241	--	--	600	
Apr. 6.....	1120			64	17	--		--		30	125		--		--	--	--	230	--	--	790	
Apr. 7-19.....	80.3			46	8.5	12		137		37	13		--		217	.30	47.1	150	38	.4	350	
Apr. 20-22.....	216			27	5.0	6.9		63		22	4.0		--		132	.16	77.0	88	20	.3	200	
Apr. 23-24.....	3780			32	6.3	13		98		32	10		--		172	.23	1760	106	26	.5	250	
Apr. 25-30.....	1005			43	9.8	13		134		37	5.0		--		186	.25	505	132	22	.5	300	
May 3-7.....	217			46	8.0	15		140		54	7.0		--		200	.27	117	146	33	.5	320	
May 8-31.....	46.0			53	9.2	20		173		51	13		--		242	.33	30.1	170	28	.7	390	
June 1-30.....	642			34	7.0	9.0		124		21	7.0		2.3		166	.23	288	114	12	.4	260	

OSAGE RIVER BASIN--Continued

6-9135. MARAIS DES CYGNES RIVER NEAR OTTAWA, KANS.--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
July 1-31, 1964...	12.4			61	5.8	19		183		42	17		9.7		272	0.37	9.11	176	26	0.6	430	
Aug. 1-31.....	7.3			48	8.8	30		146		46	38		--		318	.43	6.27	156	36	1.0	500	
Sept. 1-10.....	4.3			53	6.8	20		185		22	21		--		232	.32	2.69	160	8	.7	390	
Sept. 11-16.....	143			53	5.8	23		181		22	29		--		224	.30	86.5	156	8	.8	380	
Sept. 17-30.....	11.7			40	5.8	11		129		21	14		--		191	.26	6.03	124	18	.4	300	
Weighted average	--			38	7.9	12		126		29	13		--		183	0.25	55.0	126	19	0.4	301	
Time-weighted average.....	A117			55	13	39		177		48	39		--		341	--	--	189	43	1.1	540	
Tons per day....	--			12	2.4	3.7		38		8.7	3.9		--		--	--	--	--	--	--	--	

A Mean discharge based on 366 days; mean discharge for 364 days of chemical analyses, 111 cfs.

6-9135. MARAIS DES CYGNES RIVER NEAR OTTAWA, KANS.--Continued

Additional analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 16, 1963	14.0	14				35	14	115	19	237	0	62	67	1.0	88	0.52	542	145	0	4.2	820	6.9	
Nov. 14.....	7.1	6.5				54	18	54	14	168	0	56	56	.8	62	.38	433	208	70	1.6	680	6.9	
Dec. 18.....	A2.0	7.5				67	24	64	14	210	0	76	65	.8	80	.30	525	266	94	1.7	800	8.3	
Jan. 15, 1964	A2.4	7.5				87	21	60	12	278	0	69	70	.8	53	.30	538	304	76	1.5	850	6.9	
Feb. 11.....	23.8	8.5				66	21	56	11	229	0	60	64	.7	40	.28	449	251	63	1.5	760	7.4	
Mar. 5.....	23.8	7.5				50	22	72	13	181	0	57	79	.9	84	.31	480	216	68	2.1	770	7.0	
Mar. 17.....	18.7	7.5				56	20	70	10	278	0	54	76	.8	6.2	.27	433	222	0	2.0	760	7.1	
Apr. 21.....	355	6.0				38	6.6	12	4.4	117	0	38	7.0	.4	6.6	.13	186	122	26	.5	280	7.5	
Apr. 27.....	3130	8.0				49	7.3	9.0	3.5	154	0	39	6.0	.5	4.9	.10	209	152	26	.3	320	7.6	
May 13.....	51	10		0.03	0.06	57	10	12	4.1	171	0	42	16	.4	6.2	.07	234	183	43	.4	380	7.5	
Aug. 19.....	4.5	8.2				42	12	50	13	142	0	52	43	1.1	58	.38	350	154	38	1.8	560	7.1	

A Daily mean discharge.

Temperature (°F) of water, water year October 1963 to September 1964

Month	Day																													Average
	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	
October.....	75	77	76	78	80	75	78	79	77	76	73	72	75	74	75	70	70	71	76	70	72	72	71	72	75	74	64	64	58	63	56	72
November.....	55	58	59	57	59	61	59	58	60	59	54	50	48	46	50	53	54	54	53	54	62	50	45	45	46	44	46	51	45	46	--	53
December.....	44	42	35	42	41	44	40	34	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	34	37	34	34	33	32	32	32	35
January.....	38	37	33	35	35	37	33	33	32	32	32	32	32	32	32	32	32	36	33	32	39	39	36	32	32	32	32	32	32	32	35	34
February.....	38	39	36	35	--	--	--	--	--	--	39	--	--	--	--	--	--	--	--	--	--	--	--	--	32	--	--	--	--	--	--	--	--
March.....	--	--	--	--	48	--	--	--	--	--	--	--	--	--	--	--	58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	64	--	--	--	--	--	61	--	--	--	--	--
May.....	--	--	--	--	--	--	--	--	--	--	--	--	70	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
August.....	--	--	--	--	--	--	--	--	--	--	82	82	73	67	68	75	78	85	87	81	85	78	79	81	80	79	80	81	80	84	78	--
September.....	85	85	84	84	80	81	84	85	84	85	73	74	75	79	75	71	75	78	80	75	77	76	72	69	71	68	65	66	70	72	--	77

OSAGE RIVER BASIN--Continued

6-9140. POTTAWATOMIE CREEK NEAR GARNETT, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 59, 0.2 mile downstream from confluence of North Pottawatomie and Cedar Creeks, 0.4 mile upstream from Atchison, Topeka and Santa Fe Railway Co. bridge, 4 miles north of Garnett, Anderson County, and at mile 40.7.
DRAINAGE AREA.--334 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1963 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. No flow Oct. 1-15, 27, Oct. 30 to Nov. 21, Dec. 4-7, 9-24, Jan. 10-21, 24-30, Feb. 2 to Mar. 4, Apr. 3, May 23-26, July 24-27, Aug. 12, 13.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Nov. 29, 1963	0.1	9.0		--	--	72	7.9	14	5.5	229	24	8.2	9.0	0.3	1.4	0.18	255	212	0	0.4	420	8.5	
Jan. 31, 1964	A.1	12		--	--	75	10	13	3.8	285	0	5.8	12	.2	2.3	.12	275	228	0	.4	470	7.4	
Mar. 5.....	.1	8.0		--	--	80	13	16	2.5	303	0	9.0	20	.2	1.1	.12	302	253	4	.4	500	7.9	
Apr. 10.....	11	3.5		--	--	64	6.0	27	5.2	198	0	43	32	.3	.4	.08	263	184	22	.9	420	7.9	
Apr. 27.....	645	10		--	--	39	3.5	10	4.4	129	0	23	5.0	.5	4.9	.13	172	112	6	.4	260	7.6	
May 13.....	3.2	12		0.05	0.19	60	4.0	10	3.8	193	0	20	8.0	.4	1.2	.05	224	166	8	.3	370	7.4	
June 5.....	4990	8.0		--	--	18	.0	5.0	2.4	56	0	7.0	2.0	.4	3.1	.07	79	45	0	.3	100	6.9	
July 13.....	.9	12		--	--	69	5.8	12	3.3	227	0	18	10	.3	1.1	.15	249	196	10	.4	410	7.4	
Aug. 10.....	.2	8.6		--	--	35	6.0	13	4.3	151	0	13	5.0	.5	.7	.12	167	112	0	.5	260	7.5	
Sept. 24.....	1.3	9.4		.02	.00	54	4.3	7.3	3.8	176	0	16	7.0	.4	1.3	.16	192	152	8	.3	310	7.4	

A Daily mean discharge.

6-9175. MARMATON RIVER NEAR FORT SCOTT, KANS.

LOCATION.--At bridge on U.S. Highway 69 at Fort Scott, Bourbon County, 0.3 mile upstream from Mill Creek and 1.4 miles upstream from gaging station.
DRAINAGE AREA.--393 square miles upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1961 to September 1964.
REMARKS.--Chemical analyses by Kansas State Department of Health, Topeka, Kans. No appreciable inflow between sampling point and gaging station except during periods of intense local precipitation.

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 10, 1963	0.6	15		--	--	46	8.0	84	15	163	0	102	80	0.7	5.3	0.44	471	148	14	3.0	750	7.8	
Oct. 31.....	2.1	7.0		--	--	85	13	10	2.7	290	0	17	18	.1	1.1	.15	318	266	28	.3	510	8.2	
Dec. 5.....	.7	.5		--	--	70	5.2	10	4.5	215	0	24	15	.2	.4	.10	249	196	20	.3	410	7.4	
Jan. 8, 1964.	.8	8.0		--	--	85	8.8	15	5.0	268	0	31	22	.1	1.4	.13	322	248	28	.4	520	7.1	
Jan. 30.....	.6	8.0		--	--	89	13	17	4.4	285	0	35	27	.2	1.1	.15	345	276	42	.4	560	7.4	
Mar. 4.....	1.5	4.5		--	--	97	14	20	3.8	264	0	71	34	.3	1.1	.16	384	300	83	.5	620	7.9	
Apr. 8.....	96	5.5		--	--	35	4.0	4.1	2.2	95	0	22	4.0	.5	7.1	.07	132	104	26	.2	210	7.7	
Apr. 27.....	1350	8.0		--	--	49	4.9	5.3	2.2	144	0	25	6.0	.5	4.9	.08	182	142	24	.2	290	7.7	
May 13.....	84	6.5		0.00	0.00	70	5.2	6.7	2.0	198	0	32	9.0	.3	2.6	.05	235	196	34	.2	390	7.6	
June 3.....	79	5.4		--	--	56	2.1	15	2.2	154	0	32	9.0	.3	6.2	.10	209	148	22	.5	340	7.6	
July 10.....	1.1	9.0		--	--	78	6.2	12	2.5	239	0	32	11	.2	.5	.18	272	220	24	.4	450	7.3	
Aug. 7.....	3.5	7.0		--	--	67	7.0	11	2.2	222	0	23	10	.5	.6	.13	242	196	14	.3	390	7.3	
Sept. 24.....	1.1	6.0		.02	.42	70	6.2	10	3.0	212	0	23	16	.4	1.1	.18	254	200	26	.3	420	7.4	

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
															Parts per million	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate				
MILK RIVER BASIN																							
6-1745. MILK RIVER AT NASHUA, MONT.																							
Oct. 3, 1963....	128	6.7	0.00	71	28	136	5.7	289	0	310	24	0.4	0.9	0.23	740	1.01	256	292	55	3.4	1120	7.6	12
May 5, 1964.....	2090	25	.09	42	16	116	5.9	84	0	339	3.6	.3	2.0	.18	616	.84	3480	172	103	3.8	872	6.7	35
June 2.....	37.0	5.7	.12	67	30	164	7.6	250	0	390	20	0.5	2.0	0.22	962	1.31	96.1	289	84	4.2	1270	7.6	5
July 1.....	1040	8.1	.37	46	18	84	4.2	155	0	231	9.3	.4	1.3	.11	506	.69	1420	190	63	2.6	756	7.3	10
Aug. 5.....	71.0	8.6	.11	45	28	138	7.4	230	0	312	24	.3	2.8	.23	703	.96	135	227	38	4.0	1050	7.9	19
Sept. 2.....	180	7.0	.20	52	25	102	6.1	236	0	226	16	.3	.5	.16	557	.76	271	231	37	2.9	859	7.3	10

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
PAINTED WOODS CREEK BASIN																							
6-3418. PAINTED WOODS CREEK NEAR WILTON, N. DAK.																							
Oct. 8, 1963.	0.2	7.2				50	50	294	12	648	0	442	15	0.2	1.4	0.46	A1190	332	0	7.0	1810	8.1	
Apr. 4, 1964.	22	9.8				26	15	40	12	134	0	113	4.8	.2	.7	.11	321	127	17	1.5	467	8.7	
May 15.....	3.6	22		0.15	0.00	70	63	324	15	622	30	572	19	.4	1.8	.39	A1420	434	0	6.8	2050	8.4	
June 24.....	17	29				38	50	290	11	592	0	437	11	.5	3.1	.50	A1160	300	0	7.3	1710	8.1	
CANNONBALL RIVER BASIN																							
6-3500. CANNONBALL RIVER AT REGENT, N. DAK.																							
Aug. 17, 1964	2.5	7.3		0.04	0.03	58	35	184	8.2	391	13	339	5.6	0.5	0.1	0.54	865	290	0	4.7	1270	8.4	10
Sept. 28.....	3.2			.02																	1420		
GRAND RIVER BASIN																							
8-3570. SHADEHILL RESERVOIR AT SHADEHILL, S. DAK.																							
June 4, 1963.	B2267.23	5.3				24	13	267	1.3	412	0	352	5.3	0.4	0.7	0.34	922	114	0	11	1380	8.1	
May 14, 1964.	B2260.26	4.9				26	14	290	7.4	416	0	372	6.8	.5	.1	.37	980	124	0	11	1460	7.2	
6-4368. HORSE CREEK NEAR VALE, S. DAK.																							
Aug. 17, 1964	136	8.3		0.09	0.03	217	85	117	11	199	0	890	16	0.5	1.3	0.26	A1440	891	728	1.7	1840	7.9	9
Sept. 25.....	80	4.8		.03	.05	233	97	158	9.2	189	0	1060	22	.5	3.9	.30	A1680	981	826	2.2	2090	7.8	
6-4395. CHEYENNE RIVER NEAR EAGLE BUTTE, S. DAK.C/																							
Apr. 8, 1964.	260	21	0.0	0.10	0.05	140	39	191	12	196	0	685	31	0.5	6.8	0.24	A1220	508	347	3.7	1890	7.4	
Sept. 26.....	288	5.2	.0	.01	.01	237	85	200	16	155	0	1130	45	.5	2.6	.36	A1800	942	815	2.8	2240	7.6	

A Calculated from determined constituents.
B Lake elevation, in feet.
C Some spectrographic and radiochemical data available in district office at Lincoln, Nebr.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
OKOBOJO CREEK BASIN																							
6-4397.8. COTTONWOOD LAKE NEAR AGAR, S. DAK.																							
Dec. 6, 1963.	(D)	30				84	65	340	57	569	0	662	99	0.4	0.6	0.80	A1620	476	9	6.8	2350	8.1	
Mar. 9, 1964.	(D)	37				75	71	336	52	510	6	680	95	.4	7.4	.68	A1610	479	51	6.7	2340	8.3	
May 22.....	(D)	19		0.08	1.8	99	90	426	57	545	0	990	103	.4	3.3	.58	A2060	619	172	7.5	2840	7.7	
6-4398.2. SULLY LAKE NEAR ONIDA, S. DAK.																							
Dec. 6, 1963.	(D)	18				74	30	88	18	274	0	268	11	0.3	0.4	0.15	681	308	83	2.2	964	7.7	
Mar. 9, 1964.	(D)	11				50	26	69	13	187	0	206	8.6	.2	5.8	.13	515	232	79	2.0	750	7.9	
May 22.....	(D)	12		0.04	0.79	60	22	71	15	190	0	235	6.6	.3	2.8	.06	551	242	86	2.0	800	7.2	
MISSOURI RIVER MAIN STEM																							
6-4400. MISSOURI RIVER AT PIERRE, S. DAK.C/																							
Apr. 8, 1964.	14600	6.9	0.0	0.04	0.00	64	22	72	2.8	201	0	214	11	0.5	0.8	0.12	531	248	83	2.0	784	7.9	
Sept. 26.....	8300	7.1	.0	.02	.01	65	18	75	6.0	191	0	226	13	.5	.7	.12	521	236	79	2.1	783	8.0	
WHITE RIVER BASIN																							
6-4457. WHITE RIVER AT SLIM BUTTE, S. DAK.																							
May 13, 1964.	12	35		0.02	0.12	49	16	98	9.8	268	0	160	10	0.6	1.6	0.10	528	187	0	3.0	822	7.9	--
Aug. 14.....	4.7	20		.05	.08	205	40	264	23	182	0	1020	27	.9	.6	.44	A1690	878	529	4.4	2170	8.1	7
Aug. 16.....	1.6	16		.13	.06	134	22	213	20	160	0	720	21	.9	14	.34	A1240	426	295	4.5	1730	7.6	9
NIOBRARA RIVER BASIN																							
6-4575. NIOBRARA RIVER NEAR GORDON, NEBR.																							
Oct. 8, 1952.	77	48		--		--	--	14	7.4	146	8	--	--	--	--	--	220	116	0	0.6	272	8.4	
June 25, 1963	88	54		0.03	0.00	39	5.7	15	8.6	176	0	14	1.5	0.6	1.5	0.04	244	121	0	.6	313	7.2	
June 23, 1964	70	47		.03		35	5.0	11	6.8	154	0	9.8	2.4	.4	1.1	.03	198	108	0	.5	269	7.4	

EAGLE CREEK NEAR O'NEILL, NEBR.

Jan. 2, 1957.	E20	39		0.03	--	26	3.4	7.1	4.1	99	0	7.5	1.0	0.1	11	0.04	153	79	0	0.3	199	7.5	3
June 26, 1963	25.3	42		.10	0.00	28	3.9	7.8	4.4	113	0	8.5	1.0	.3	7.3	.02	166	86	0	.4	213	7.1	
Apr. 7, 1964.	30.4	38		.03	.00	28	3.4	7.9	4.1	108	0	8.8	1.8	.2	9.2	.00	153	84	0	.4	215	7.4	
Apr. 27.....	93.8	30		.17	.00	28	3.2	10	6.6	108	0	13	3.2	.3	4.7	.04	175	83	0	.5	220	6.8	
Sept. 15.....	22.7	43		.03	.02	33	.4	8.0	4.4	110	0	7.0	1.4	.3	6.8	.02	167	84	0	.4	209	7.4	

EAST BRANCH EAGLE CREEK NEAR O'NEILL, NEBR.

Jan. 2, 1957.	E7	52		0.01	--	44	3.9	6.4	4.9	166	0	3.8	1.0	0.2	3.5	0.04	210	126	0	0.2	277	7.9	3
June 26, 1963	11.7	54		.02	0.00	44	4.4	6.7	5.1	167	0	4.8	.9	.3	5.2	.02	220	128	0	.3	261	7.2	
Apr. 7, 1964.	9.5	44		.30	.01	44	4.4	8.0	4.5	167	0	5.2	2.0	.4	2.8	.00	199	128	0	.3	288	7.3	
Apr. 27.....	38.5	36		.13	.00	42	4.6	10	6.4	169	0	7.2	2.7	.4	3.2	.04	222	124	0	.4	293	7.2	
Sept. 15.....	7.5	57		.01	.03	46	2.9	7.9	4.9	166	1	4.0	1.2	.3	3.3	.01	214	127	0	.3	280	8.3	

6-4652. HONEY CREEK NEAR O'NEILL, NEBR.

Jan. 29, 1957	E2	33		0.07	--	38	5.4	6.6	3.4	131	0	15	0.4	0.2	12	0.06	184	117	10	0.3	266	7.7	3
Apr. 7, 1964.	.8	16		.29	0.01	20	2.7	4.8	4.5	83	0	7.2	2.4	.1	.2	.00	108	61	0	.3	156	7.1	
Apr. 27.....	2.8	16		.45	.00	21	3.6	5.9	5.4	93	0	7.0	2.7	.1	.4	.02	134	67	0	.3	170	6.9	

BLACKBIRD CREEK NEAR O'NEILL, NEBR.

Jan. 2, 1957.	E5	47		0.02	--	39	3.5	7.1	4.4	140	0	7.5	1.0	0.2	7.4	0.03	197	112	0	0.3	260	8.1	5
June 26, 1963	6.2	53		.10	0.00	41	4.3	7.5	8.0	154	0	11	1.3	.4	8.1	.02	226	120	0	.3	265	7.4	
Apr. 28, 1964	28.8	37		.13	.00	45	5.0	12	5.8	176	0	13	3.2	.5	3.7	.03	231	133	0	.5	318	7.1	
Sept. 16.....	4.7	54		.04	.05	41	2.8	7.2	4.6	146	0	12	1.4	.3	4.9	.01	204	114	0	.3	260	7.7	

REDBIRD CREEK NEAR O'NEILL, NEBR.

Jan. 2, 1957.	E8	43		0.11	--	28	2.7	7.0	3.6	100	0	10	0.5	0.2	8.4	0.03	155	81	0	0.3	207	7.9	5
June 26, 1963	14.5	47		.05	0.00	29	2.8	6.8	4.7	107	0	8.8	1.0	.3	7.3	.01	172	84	0	.3	205	7.0	
Apr. 28, 1964	58.5	30		.23	.00	26	4.2	8.7	4.8	104	0	12	2.4	.3	4.1	.03	162	82	0	.4	210	7.0	
Sept. 16.....	14.5	49		.03	.04	28	3.7	6.8	4.4	104	0	14	1.6	.3	6.5	.01	166	85	0	.3	193	7.6	

A Calculated from determined constituents.
C Some spectrograph and radiochemical data available in district office at Lincoln, Nebr.
D Lake content not known. Information on lake stage available in district office at Lincoln, Nebr.
E Estimated.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
CHOTEAU CREEK BASIN																							
CHOTEAU CREEK NEAR WAGNER, S. DAK.																							
Mar. 18, 1964	10.3	16		0.03	0.05	134	33	241	17	196	0	565	192	0.3	2.1	1.5	A1300	471	310	4.8	1990	7.3	
Apr. 9.....	.3	14				265	85	310	25	333	0	1050	238	.3	2.6	1.2	A2160	1010	737	4.2	2970	7.3	
May 14.....	.2	6.1				281	119	311	24	268	0	1300	198	.6	.6	.97	A2370	1190	970	3.9	3070	7.9	
JAMES RIVER BASIN																							
6-4676. JAMES RIVER NEAR MANFRED, N. DAK.																							
May 16, 1964.	0.1	22		0.01	0.20	54	31	206	12	550	0	238	20	0.5	1.2	0.59	909	264	0	5.5	1310	7.5	
June 26.....	7.4	36				28	17	50	8.3	250	0	42	5.5	.3	1.3	.22	333	139	0	1.8	468	8.0	
Sept. 10.....	E.1	--				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	978	--	
6-4679. BIG SLOUGH AT HAMBERG, N. DAK.																							
Apr. 2, 1964.	0.1	7.1				20	5.9	11	12	68	0	45	3.6	0.2	4.9	0.00	161	74	18	0.6	237	6.8	
May 16.....	.1	16		0.10	0.20	82	66	214	26	374	0	578	52	.4	.9	.18	A1220	474	167	4.3	1750	7.4	
July 2.....	.3	21				42	59	241	17	408	0	482	53	.4	4.1	.20	A1120	348	13	5.6	1650	8.0	
6-4695. PIPESTEM CREEK NEAR BUCHANAN, N. DAK.																							
Apr. 2, 1964.	35	6.8				15	4.5	15	14	68	0	33	8.1	0.2	6.9	0.03	155	56	0	0.9	232	6.7	
May 20.....	5.8	14		0.09	0.28	83	44	107	12	390	0	271	24	.3	1.7	.15	781	390	70	2.4	1140	7.6	
June 25.....	133	26				41	27	40	8.5	223	0	103	6.7	.2	.8	.17	378	212	29	1.2	554	8.0	
6-4700. JAMES RIVER AT JAMESTOWN, N. DAK.																							
Jan. 20, 1964	2.8	31		--	--	72	40	173	8.0	422	0	262	83	0.3	0.5	0.63	907	344	0	4.1	1370	8.1	
Mar. 4.....	3.0	28		--	--	63	33	143	6.9	394	0	188	60	.2	1.3	.55	724	291	0	3.6	1140	8.0	
Mar. 19.....	3.7	24		0.02	0.29	86	29	116	6.0	485	0	128	46	.2	.2	.44	695	334	0	2.8	1080	7.9	
Mar. 30.....	3.0	23		--	--	89	33	124	6.7	484	0	164	52	.2	1.0	.44	750	359	0	2.9	1160	8.1	
May 20.....	10.0	17		.09	.63	88	40	102	11	399	0	238	31	.3	1.8	.24	745	386	59	2.3	1120	7.6	
June 25.....	274	25		--	--	41	21	34	8.5	204	0	85	8.3	.2	1.5	.11	337	189	22	1.1	502	8.0	
Sept. 8.....	91	18		--	--	76	33	104	9.8	443	0	141	33	.3	2.1	.31	648	327	0	2.5	1000	7.8	

8-4719. MOCCASIN CREEK NEAR NAHON, S. DAK.

Apr. 18, 1963	7.9	15		0.04	0.69	61	28	241	25	300	0	329	150	1.3	3.3	0.59	A1000	266	20	6.4	1620	7.3
Mar. 19, 1964	2.2	20				103	40	318	24	378	0	448	221	1.2	30	.68	A1390	422	112	6.7	2180	7.3
May 11.....	37	15				90	30	214	22	246	0	398	144	1.0	13	.59	A1050	347	145	5.0	1650	7.7

6-4737.55. LAKE LOUISE NEAR MILLER, S. DAK.

Dec. 6, 1963.	(D)	0.6				28	18	23	14	191	0	29	20	0.2	0.5	0.13	244	144	0	0.8	415	7.3
Mar. 9, 1964.	(D)	.9				23	15	19	11	157	0	24	12	.1	1.2	.08	204	119	0	.8	342	7.2
May 22.....	(D)	1.8		0.03	0.10	21	27	25	14	209	0	35	14	.2	1.3	.12	270	162	0	.9	448	7.5

6-4743.1. COTTONWOOD LAKE NEAR REDFIELD, S. DAK.

Dec. 6, 1963.	(D)	30				49	47	288	27	504	0	380	122	0.4	0.3	0.57	A1190	316	0	7.1	1820	7.7
Mar. 9, 1964.	(D)	25				42	52	292	26	492	0	380	129	.4	.3	.57	A1190	319	0	7.1	1860	8.2
May 21.....	(D)	24		0.06	0.08	46	41	265	24	429	0	365	98	.4	2.4	.43	A1080	285	0	6.8	1650	7.4

6-4745. TURTLE CREEK AT REDFIELD, S. DAK.

Oct. 22, 1963	0.8	6.7		--	--	41	44	304	23	360	12	367	173	0.7	7.6	0.95	A1160	282	0	7.9	1850	8.4
Mar. 18, 1964	E.2	15		0.13	0.19	58	31	540	28	355	0	855	167	4.3	51	2.4	A1930	273	0	14	2910	7.1
May 21.....	E.3	6.6		.05	.10	46	42	346	21	387	0	435	228	.8	1.1	.94	A1320	286	0	8.9	2150	8.2

6-4759. LAKE BYRON NEAR HURON, S. DAK.

Dec. 3, 1963.	B1247.8	16				95	90	338	33	400	0	854	129	0.5	0.9	0.91	A1750	608	280	6.0	2520	7.4
Mar. 11, 1984	B1247.6	28				82	38	129	15	211	0	316	53	.5	12	.41	779	303	130	3.2	1140	7.4
May 22.....	B1247.8	9.9		0.08	0.23	88	80	320	34	324	0	818	112	.5	2.9	.79	A1630	547	281	5.9	2330	7.2

A Calculated from determined constituents.
B Lake elevation, in feet.
D Lake content not known. Information on lake stage available in district office at Lincoln, Nebr.
E Estimated.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
																		Calcium, magnesium	Noncarbonate				
PLATTE RIVER BASIN																							
KIOWA CREEK ABOVE FORT LARAMIE CANAL, NEAR LYMAN, NEBR.																							
June 12, 1963	0.6					58	7.9	28	7.7	284	0	12	4.8				313	177	0	0.9	460	8.0	
Nov. 7.....	E.1					56	10	19	6.8	255	0	11	2.8				281	181	0	.6	413	7.8	
Mar. 23, 1964	.3					49	9.1	20	5.2	240	0	7.5	3.6				263	160	0	.7	382	7.7	
KIOWA CREEK ABOVE HORSE CREEK LATERAL, NEAR LYMAN, NEBR.																							
Nov. 7, 1963.	5.4					33	6.0	203	9.8	394	0	203	20				742	107	0	8.5	1090	7.9	
Mar. 23, 1964	1.2					30	11	121	7.8	306	0	110	16				502	121	0	4.8	747	8.0	
Aug. 19.....	1.0	60				40	10	228	12	462	0	228	28	0.7	8.1	0.26	876	141	0	8.4	1250	7.9	
UNNAMED TRIBUTARY TO KIOWA CREEK NEAR LYMAN, NEBR.																							
Nov. 7, 1963.	1.5					22	9.5	352	11	579	0	313	32				1110	94	0	16	1610	7.8	
Mar. 23, 1964	.3					25	11	488	12	665	39	444	80				1500	108	0	21	2170	8.5	
Aug. 19.....	6.7	45				33	11	219	9.6	388	0	254	22	0.8	6.6	0.18	833	128	0	8.4	1180	7.8	
OWL CREEK ABOVE FORT LARAMIE CANAL, NEAR LYMAN, NEBR.																							
Aug. 29, 1963	E0.1					24	9.0	55	9.2	241	0	18	4.8				272	97	0	2.4	418	7.8	
Nov. 7.....	E.2					31	12	54	9.0	271	0	17	6.0				295	128	0	2.1	459	7.9	
Mar. 23, 1964	.5					37	13	66	8.2	330	0	31	6.8				366	145	0	2.4	538	7.9	
Aug. 19.....	E.1	12				31	9.4	84	11	287	0	16	7.7	0.7	0.3	0.14	313	116	0	2.6	480	8.1	
OWL CREEK BELOW FORT LARAMIE CANAL, NEAR LYMAN, NEBR.																							
Nov. 7, 1963.	E0.3					40	13	111	8.6	347	0	92	11				490	152	0	3.9	737	7.9	
Mar. 23, 1984	.8					29	8.7	58	6.2	252	0	21	6.2				295	100	0	2.5	435	8.0	
Aug. 19.....	E.4	35				80	18	114	11	290	0	217	20	0.5	0.4	0.14	648	224	0	3.3	923	8.0	

OWL CREEK NEAR LYMAN, NEBR.

Nov. 7, 1963.	2.0					29	12	305	12	578	0	266	31				1010	123	0	12	1490	7.8	
Mar. 23, 1964	1.2					28	10	244	9.6	468	12	193	31				806	112	0	10	1220	8.4	
Aug. 19.....	8.2	27				47	17	156	9.8	320	0	236	22	0.6	3.8	0.20	711	188	0	5.0	1030	7.9	

UNNAMED EASTERN TRIBUTARY TO KIOWA CREEK NEAR LYMAN, NEBR.

Nov. 7, 1963.	0.6					22	3.2	302	9.0	517	20	229	20				946	68	0	16	1370	8.4	
Mar. 26, 1964	.1					23	9.6	365	12	684	23	233	30				1130	97	0	16	1630	8.4	
Aug. 19.....	2.0	44				36	5.8	216	9.2	405	0	224	19	0.8	4.9	0.28	779	114	0	8.8	1140	8.0	

KIOWA CREEK ABOVE DRY CREEK DRAIN, NEAR LYMAN, NEBR.

Nov. 7, 1963.	15.1					29	9.8	272	11	490	11	236	25				920	113	0	11	1400	8.3	
Mar. 26, 1964	7.8					30	8.3	274	11	516	0	225	29				921	109	0	11	1340	8.1	
Aug. 19.....	16.6	43				32	17	210	11	412	0	234	24	0.7	7.7	0.26	809	151	0	7.5	1180	8.1	

DRY CREEK DRAIN BELOW FORT LARAMIE CANAL, NEAR LYMAN, NEBR.

June 12, 1963	0.5					29	5.2	130	9.6	235	0	166	17				537	94	0	5.8	770	7.9	
Nov. 7.....	E.1					20	5.4	156	6.2	258	0	173	16				551	72	0	8.0	829	7.3	
Mar. 23, 1964	.1					9.1	2.6	107	4.4	214	0	75	13				338	33	0	8.1	537	8.2	
Aug. 19.....	39.7	11				59	21	60	5.0	173	0	198	14	0.4	0.7	0.07	477	232	90	1.7	704	7.6	

WESTERN TRIBUTARY TO DRY CREEK DRAIN ABOVE HORSE CREEK LATERAL, NEAR LYMAN, NEBR.

Nov. 7, 1963.	0.6					21	2.8	393	11	627	0	345	41				1220	64	0	21	1790	7.8	
Mar. 23, 1964	1.7					8.9	6.8	340	9.2	575	0	257	28				1010	50	0	21	1500	8.1	
Aug. 19.....	5.2	29				49	18	154	10	305	0	249	23	0.7	3.4	0.14	717	196	0	4.8	1030	7.8	

E Estimated.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
PLATTE RIVER BASIN--Continued																							
DRY CREEK DRAIN BELOW HORSE CREEK LATERAL, NEAR LYMAN, NEBR.																							
Aug. 29, 1963	4.0					33	11	250	11	433	0	270	31				884	126	0	9.6	1290	7.8	
Nov. 7.....	4.5					21	1.1	355	9.6	606	0	286	30				1090	57	0	21	1580	7.8	
Mar. 23, 1964	2.8					13	7.2	402	9.2	602	22	323	40				1200	62	0	22	1760	8.5	
Aug. 19.....	2.3	32				43	19	216	11	390	0	288	31	0.8	1.4	0.30	869	185	0	6.9	1260	8.0	
WESTERN TRIBUTARY TO DRY CREEK DRAIN NEAR LYMAN, NEBR.																							
Nov. 7, 1963.	1.2					28	82	298	12	497	11	272	29				988	99	0	6.5	1480	8.3	
Mar. 23, 1964	.8					18	17	311	12	528	13	264	32				1000	114	0	13	1480	8.3	
Aug. 19.....	1.1	32				34	15	234	11	431	0	279	29	0.9	0.4	0.22	913	148	0	8.4	1280	8.2	
DRY CREEK DRAIN NEAR LYMAN, NEBR.																							
Nov. 7, 1963.	10.0					37	8.1	325	12	568	14	289	30				1060	126	0	13	1630	8.4	
Mar. 26, 1964	3.7					36	17	322	12	608	0	286	37				1090	160	0	11	1590	8.1	
Aug. 29.....	8.2	48				46	22	250	12	511	0	279	33	0.9	9.6	0.27	981	206	0	7.6	1430	7.9	
AKERS DRAW NEAR MORRILL, NEBR.																							
Nov. 1, 1949.		47		0.02		76	20	47	11	283		135	12	0.8	11	0.40	534	272	40	1.2	733	7.5	
Aug. 18, 1964	12.5	46				89	20	52	18	270	0	173	14	.5	18	.09	600	306	85	1.3	824	7.7	
GERING DRAIN TRIBUTARY NEAR GERING, NEBR.																							
Nov. 7, 1963.	3.8					80	14	146	12	382	0	221	25				776	258	0	4.0	1090	7.8	
Mar. 25, 1964	1.8					70	14	144	11	352	0	205	26				713	232	0	4.1	1040	7.9	
6-6820. NORTH PLATTE RIVER NEAR MINATARE, NEBR.																							
Aug. 20, 1964:																							
Ninemile chan.....	115	38		0.00	0.04	81	19	109	10	336	0	201	26	0.5	7.9	0.17	669	282	6	2.8	979	8.2	
Main chan..	49	37		.00	.05	77	18	112	9.2	327	0	201	26	.5	7.0	.19	658	265	0	3.0	967	8.2	

NINEMILE DRAIN ABOVE TRI-STATE CANAL, NEAR MINATARE, NEBR.

Nov. 7, 1963.	14.8					89	15	49	8.2	239	0	152	13				537	283	87	1.3	733	7.9	
Mar. 24, 1964	7.5					77	15	49	7.8	235	0	122	16				542	255	62	1.3	723	8.0	

EAST NINEMILE DRAIN NEAR MINATARE, NEBR.

Nov. 7, 1963.	10.4					79	14	49	8.0	214	0	158	15				514	253	77	1.3	693	7.5	
Mar. 24, 1964	4.7					76	15	47	7.6	217	0	150	14				502	252	74	1.3	690	7.7	

6-7670.4. JOHNSON RESERVOIR BELOW POWER PLANT NO. 2, NEAR LEXINGTON, NEBR.

Apr. 12, 1964	F40760	28		0.02	0.02	69	20	69	10	205	0	216	22	0.5	1.8	0.08	541	254	86	1.9	802	7.6	
Sept. 16.....	F41700	17		.01	.00	50	17	78	11	216	0	162	21	.5	.2	.14	482	194	17	2.4	732	7.5	

6-7725. WOOD RIVER NEAR CHAPMAN, NEBR.

Jan. 26, 1964	10	31		0.05	0.10	71	14	41	13	199	0	102	31	0.5	29	0.23	446	235	72	1.2	667	7.8	
Apr. 7.....	9.4	31		.04	.00	72	16	36	10	216	0	100	21	.6	34	.18	451	247	70	1.0	652	7.7	
Apr. 27.....	49	18		.07	.00	40	8.3	14	13	130	0	47	10	.3	12	.06	251	134	27	.5	370	6.9	
July 8.....	70	10		.07	.07	22	3.4	9.3	6.0	67	0	24	7.2	.2	13	.10	138	69	14	.5	208	7.1	
Sept. 17.....	15	30		.01	.05	75	14	41	12	224	0	103	27	.5	26	.13	450	246	62	1.1	667	7.4	

6-7992.9. UNION CREEK NEAR STANTON, NEBR.

Apr. 15, 1964	26.9	28		0.05		86	17	17	8.6	355	0	26	2.4	0.3	2.4	0.05	371	283	0	0.4	590	7.8	
June 17.....	3140	12		.10	0.08	23	3.8	1.5	7.2	89	0	7.0	2.0	.2	.5	.04	129	73	0	.1	162	6.9	

F Lake content, in acre-feet.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1963 to September 1964

Date of collection	Discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH	Color
PLATTE RIVER BASIN--Continued																							
OAK CREEK NEAR RAYMOND, NEBR.																							
May 5, 1964..	7.9	21		0.08	0.25	115	27	24	8.6	434	9	71	8.4	0.4	0.8	0.08	520	399	28	0.5	790	8.3	5
May 24.....	1370	9.4		.07	.00	35	6.7	3.8	5.9	138	0	8.0	1.5	.5	1.6	.03	154	115	2	.2	238	7.4	45
June 8.....	2.2	15		.17	.06	107	25	22	8.8	425	0	62	8.0	.4	.2	.07	467	368	19	.5	743	8.1	--
June 12.....	191	24		--	--	--	--	74	5.2	--	--	24	9.5	--	--	--	340	105	--	3.1	469	--	--
June 13.....	2270	9.7		.73	.12	36	6.1	3.1	6.0	138	0	5.8	1.0	.4	1.6	.05	152	115	2	.1	241	7.0	--
June 15.....	944	7.9		.31	.00	30	3.9	2.9	5.2	112	0	6.0	1.0	.5	1.1	.07	123	91	0	.1	196	7.2	--
6-8055. PLATTE RIVER NEAR SOUTH BEND, NEBR.																							
Mar. 29, 1962	55700	15				33	6.2	4.0	10	136	0	15	0.2	0.2	0.0	0.03	162	108	0	0.2	252	6.9	23
Sept. 18, 1964.....	G3100	36		0.01	0.38	59	13	330	9.6	223	0	93	469	.3	2.8	.18	A1120	200	17	10	1990	7.4	
NEMAHA RIVER BASIN																							
WALNUT CREEK NEAR FAIRVIEW, KANS.																							
June 22, 1964 H.....	406	9.7				34	7.0	6.3	10	129	0	19	6.0	0.4	9.3	0.07	172	114	8	0.3	270	7.2	
June 29.....	2.9					144	26	B13		339		190	14				602	466	188	.3	890		
6-8153. WALNUT CREEK AT RESERVE, KANS.																							
Nov. 18, 1963 H.....	4.5	11				123	24	25	6.4	307	0	172	20	0.3	4.9	0.18	536	406	154	0.5	780	7.7	
June 11, 1964 H.....	1130	8.5				41	7.2	6.3	6.5	149	0	19	5.0	.4	3.5	.05	163	132	10	.2	270	7.2	
June 15.....	2077	--				40	2.9	I 12	--	132	--	23	4.0	--	--	--	156	112	4	.5	240	--	
June 29.....	34.2	--				98	16	I 16	--	298	--	75	17	--	--	--	420	310	66	.4	660	--	

6-8480. PRAIRIE DOG CREEK AT NORTON, KANS.H/

Oct. 24, 1963	3.4	31				75	20	11	14	322	0	21	10	0.4	0.4	0.10	346	269	5	0.3	530	7.9	
May 13, 1964.	4.0	27				88	17	16	13	361	0	18	13	.4	.0	.15	366	290	0	.4	610	7.9	

6-8595. LADDER CREEK BELOW CHALK CREEK, NEAR SCOTT CITY, KANS.H/

Apr. 22, 1964	2.2	12				74	30	40	10	310	0	118	21	1.8	0.2	0.30	477	308	54	1.0	760	8.0	
June 25.....	5.8	20				96	24	49	16	254	0	207	22	1.3	.4	.28	565	338	130	1.2	870	7.6	

6-8682. SALINE RIVER AT WILSON DAM, KANS.H/

Aug. 24, 1964	7.8	6.8				141	74	1160	26	249	0	654	1650	0.7	0.4	0.50	A3830	656	452	20	6640	7.4	
Sept. 22.....	39	11		0.00	0.00	123	37	606	20	249	0	348	885	.6	.7	.27	A2150	459	255	12	3740	7.6	

6-8700. SMOKY HILL RIVER NEAR SALINA, KANS.

Aug. 24, 1964	89.9	9.2		0.09	0.05	63	14	62	9.6	148	0	81	94	0.3	11	0.09	431	214	93	1.8	744	7.2	
Sept. 17.....	213	3.6		.04	.07	88	13	110	10	152	0	140	174	.5	2.8	.11	636	273	148	2.9	1110	7.1	

6-8724. BEAVER CREEK NEAR SMITH CENTER, KANS.H/

Nov. 18, 1963	1.4	19				181	25	56	20	351	0	325	44	0.3	2.3	0.21	854	554	266	1.0	1190	7.8	
Apr. 22, 1964	.5	18				166	26	64	20	349	0	315	49	.5	3.9	.16	840	521	235	1.2	1210	7.7	

6-8892. SOLDIER CREEK NEAR DELIA, KANS.H/

Nov. 7, 1963.	1.5	11				116	33	30	5.0	393	0	108	34	0.3	0.9	0.18	542	425	103	0.6	830	7.9	
July 22, 1964	12.5	6.8				90	26	26	3.2	310	0	84	29	.3	.4	.12	440	332	78	.6	710	7.4	

A Calculated from determined constituents.
G Daily mean discharge.
H Chemical analyses by Kansas State Department of Health, Topeka, Kans.
I Calculated Na plus K, reported as Na.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964
(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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
LITTLE PRICKLY PEAR CREEK BASIN																	
SIEBEN DITCH BELOW CLARK CREEK, NEAR WOLF CREEK, MONT.																	
Oct. 1, 1963	1445	59		E 5	2	T											
Nov. 6	1040	47		E 2	3	T											
Jan. 7, 1964	1010	34		E 3	53	0.4											
Feb. 4	0955	38		E .7	14	T											
Mar. 3	1355	45		E 1	10	T											
Mar. 31	0935	43		E 1.5	19	.1											
May 6	0825	44		14	16	.6											
June 2	1310	54		E 15	19	.8											
June 29	1825	60		E 10	15	.4											
Aug. 4	1515	63		E 5	11	.1											
Sept. 4	1245	54		E 5	13	.2											
LITTLE PRICKLY PEAR CREEK ABOVE MEDICINE ROCK CREEK, NEAR WOLF CREEK, MONT.																	
Nov. 6, 1963	1150	41		24	5	0.3											
Dec. 5	0915	35		E 40	9	1.0											
Jan. 7, 1964	1500	32		36	18	1.7											
Mar. 3	1410	35		E 28	43	3.2											
Mar. 31	1020	36		47	922	117											
May 6	0900	44		199	192	103											
June 30	1030	59		E 100	82	22											
Aug. 4	1745	67		E 35	12	1.1											
MEDICINE ROCK CREEK NEAR WOLF CREEK, MONT.																	
Nov. 6, 1963	1110	48		1	3	T											
May 6, 1964	1100	46		E 20	1020	55											

6-712. LYONS CREEK NEAR WOLF CREEK, MONT.

Oct. 1, 1963.....	1500	60			2.8	14	0.1											
Nov. 6.....	1400	45			3.9	428	4.5											
Dec. 5.....	0940	38			4.2	10	.1											
Jan. 7, 1964.....	1045	34			2.6	23	.2											
Feb. 4.....	1015	33			2.8	3	T											
Mar. 3.....	1425	36			3.2	5	T											
Mar. 31.....	1035	36			5.2	13	.2											
May 6.....	1200	46			105	97	27											
June 2.....	1740	55			62	77	13											
June 30.....	0810	52			48	8	1.0											
Aug. 4.....	1540	66			46	17	2.1											

LITTLE PRICKLY PEAR CREEK ABOVE SHEEP CREEK, NEAR WOLF CREEK, MONT.

Jan. 7, 1964.....	1415	32		E	40	51	5.5											
Feb. 4.....	1350	36		E	30	187	15											
Mar. 3.....	1450	40		E	30	144	12											
Mar. 31.....	1120	42			55	85	13											
May 6.....	1335	47		E	350	104	98											

SHEEP CREEK NEAR WOLF CREEK, MONT.

May 6, 1964.....	1345	47			36	30	2.9											
June 2.....	1705	56		E	10	4	.1											

E Estimated.
T Less than 0.05 ton.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (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	0.125	0.250	0.500	1.000	2.000	Method of analysis
LITTLE PRICKLY PEAR CREEK BASIN--Continued																		
WOLF CREEK NEAR WOLF CREEK, MONT.																		
Oct. 1, 1963	1520	61		E 2	12	0.1												
Nov. 6	1630	45		2.9	19	.1												
Dec. 5	1015	41		2.0	10	.1												
Jan. 7, 1964	1125	35		E 5	11	.1												
Feb. 4	1330	41		2	3	T												
Mar. 3	1515	41		E 3	2	T												
Mar. 31	1145	49		E 2.5	6	T												
May 6	1515	47		147	206	82												
June 2	1650	54		76	48	9.8												
June 30	0825	57		E 20	25	1.4												
Aug. 4	1730	66		E 6	23	.4												
Sept. 4	1545	60		E 6	4	.1												
YELLOWSTONE RIVER BASIN																		
NORTH FORK BLUEWATER CREEK NEAR BRIDGER, MONT.																		
Oct. 1, 1963	0900	55		8.4	7	0.2												
Oct. 4	1125	56		8.6	17	.4												
Oct. 7	1010	56		8.9	39	.9												
Oct. 14	1310	57		9.3	19	.5												

Oct. 18, 1963......	1420	57		9.6	13	0.3
Oct. 21............	1305	56		10	6	.2
Oct. 25............	1015	55		10	7	.2
Oct. 28............	1400	52		11	605	18
Nov. 4.............	1545	54		11	16	.5
Nov. 12............	1155	54		11	10	.3
Nov. 18............	1015	52		11	3	.1
Nov. 27............	1045	54		12	4	.1
Dec. 2.............	1450	53		12	12	.4
Dec. 5.............	1110	53		12	14	.5
Dec. 11............	1510	50		12	11	.4
Dec. 14............	1230	51		12	23	.7
Dec. 16............	1520	50		12	51	1.7
Dec. 18............	1505	51		12	6	.2
Dec. 19............	1415	53		12	11	.4
Dec. 20............	1105	52		12	3	.1
Dec. 21............	1005	50		12	8	.3
Dec. 22............	0900	50		12	4	.1
Dec. 23............	1050	52		12	11	.4
Dec. 26............	1030	52		12	8	.3
Dec. 27............	0940	51		12	12	.4
Dec. 28............	1330	52		12	8	.3
Dec. 30............	1345	52		12	10	.3
Dec. 31............	1000	52		12	15	.5
Jan. 1, 1964.......	0945	54		12	4	.1
Jan. 2.............	1150	52		12	3	.1
Jan. 3.............	1310	52		12	11	.4
Jan. 4.............	1030	52		12	5	.2
Jan. 4.............	1150	52		12	17	.6

E Estimated
T Less than 0.05 ton.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
YELLOWSTONE RIVER BASIN--Continued																		
NORTH FORK BLUEWATER CREEK NEAR BRIDGER, MONT.--Continued																		
Jan. 5, 1964	1030	52		12	16	0.5												
Jan. 6	0945	52		12	17	.6												
Jan. 6	1310	50		12	11	.4												
Jan. 7	0940	52		12	23	.7												
Jan. 8	0950	52		12	13	.4												
Jan. 9	1115	50		12	12	.4												
Jan. 10	1015	52		12	11	.4												
Jan. 11	1505	51		12	6	.2												
Jan. 12	1230	52		12	185	6.0												
Jan. 13	1430	52		12	16	.5												
Jan. 15	1440	52		12	9	.3												
Jan. 16	1100	51		12	10	.3												
Jan. 17	1035	51		12	20	.6												
Jan. 18	1045	52		12	8	.3												
Jan. 19	0900	51		12	10	.3												
Jan. 20	1440	52		12	10	.3												
Jan. 21	1445	52		12	7	.2												
Jan. 22	1510	52		12	11	.4												
Jan. 23	0820	51		12	19	.6												
Jan. 24	1100	50		12	13	.4												
Jan. 25	0945	52		12	13	.4												
Jan. 27	1420	52		12	10	.3												
Jan. 28	1330	52		12	10	.3												
Jan. 29	1800	52		12	13	.4												
Jan. 30	1045	52		12	12	.4												
Jan. 31	1030	52		12	29	.9												
Feb. 1	1345	52		12	22	.7												
Feb. 2	1005	52		12	18	.6												
Feb. 3	1140	52		12	19	.6												

Feb. 3, 1964.......	1350	52		12	15	0.5
Feb. 7.............	1045	52		12	7	.2
Feb. 8.............	1030	54		12	6	.2
Feb. 9.............	1035	54		12	17	.6
Feb. 10............	1340	54		12	6	.2
Feb. 11............	1650	54		12	360	12
Feb. 12............	0910	50		12	111	3.6
Feb. 13............	1110	52		12	3	.1
Feb. 14............	1550	52		12	9	.3
Feb. 15............	1020	52		12	3	.1
Feb. 16............	1030	52		12	5	.2
Feb. 17............	1505	52		12	2	.1
Feb. 18............	1450	54		12	2	.1
Feb. 19............	1430	52		12	2	.1
Feb. 21............	1220	52		12	8	.3
Feb. 22............	0830	52		12	14	.5
Feb. 23............	0845	52		12	16	.5
Feb. 24............	1445	50		12	6	.2
Feb. 25............	1345	52		12	2	.1
Feb. 26............	1635	52		12	4	.1
Feb. 28............	1110	50		12	5	.2
Feb. 29............	1045	54		12	9	.3
Mar. 1.............	1015	54		12	10	.3
Mar. 2.............	1255	54		12	1	T
Mar. 3.............	1545	53		12	13	.4
Mar. 4.............	1440	54		12	9	.3
Mar. 5.............	1600	52		12	13	.4

T Less than 0.05 ton.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
YELLOWSTONE RIVER BASIN--Continued																		
NORTH FORK BLUEWATER CREEK NEAR BRIDGER, MONT.--Continued																		
Mar. 6, 1964	1125	52		12	7	0.2												
Mar. 7	1115	54		12	11	.4												
Mar. 8	1010	52		12	13	.4												
Mar. 9	1505	54		12	20	.6												
Mar. 10	0810	52		12	81	2.6												
Mar. 11	1405	54		12	14	.5												
Mar. 12	1320	56		12	9	.3												
Mar. 13	1150	52		12	20	.6												
Mar. 14	0805	50		12	20	.6												
Mar. 15	1120	52		12	83	2.7												
Mar. 16	1340	56		11	176	5.2												
Mar. 17	1455	56		11	31	.9												
Mar. 18	1330	56		11	25	.7												
Mar. 19	1320	54		11	21	.6												
Mar. 21	1110	54		11	15	.4												
Mar. 22	1300	50		12	11	.4												
Mar. 23	1050	50		11	11	.3												
Mar. 24	1025	50		11	6	.2												
Mar. 25	1355	54		11	7	.2												
Mar. 26	1315	54		11	22	.7												
Mar. 27	1310	54		11	25	.7												
Mar. 28	1020	54		11	14	.4												
Mar. 29	1010	54		11	20	.6												
Mar. 30	1520	58		11	29	.9												
Mar. 31	1450	58		11	12	.4												
Apr. 3	0830	52		11	22	.7												
Apr. 10	1510	57		11	8	.2												
Apr. 17	1035	55		11	6	.2												
Apr. 24	0830	55		11	7	.2												

Apr. 29, 1964	1150	59	11	23	0.7	
May 4	1345	58	10	29	.8	
May 7	1010	57	10	22	.6	
May 8	1420	55	10	32	.9	
May 11	1040	51	12	269	8.7	
May 11	1725	55	10	71	1.9	
May 12	1120	--	10	88	2.4	
May 15	1615	58	10	20	.5	
May 18	1130	59	10	47	1.3	
May 22	1010	57	10	19	.5	
May 26	1045	57	10	48	1.3	
June 1	0950	56	10	26	.7	
June 1	1300	59	10	23	.6	
June 5	1100	58	10	23	.6	
June 8	1905	53	12	942	30	
June 11	0940	56	10	20	.5	
June 11	1350	53	14	250	9.4	
June 18	1130	57	10	36	1.0	
June 22	1605	59	10	30	.8	
June 26	1130	60	10	11	.3	
June 29	1305	60	10	14	.4	
June 30	1645	58	15	197	5.5	
July 1	1120	60	14	82	2.3	
July 2	1120	61	13	66	2.3	
July 3	1505	60	14	50	1.9	
July 6	1030	60	13	21	.7	
July 10	0800	57	13	35	1.2	
July 10	1000	60	13	15	.5	
July 13	1310	61	12	98	3.2	

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
YELLOWSTONE RIVER BASIN--Continued																		
NORTH FORK BLUEWATER CREEK NEAR BRIDGER, MONT.--Continued																		
July 17, 1964	1220	61		12	7	0.2												
July 21	1610	59		12	10	.3												
July 23	1115	60		12	9	.3												
July 27	1510	61		11	31	.9												
July 31	1235	61		11	10	.3												
Aug. 3	1120	59		11	17	.5												
Aug. 7	1440	60		12	18	.6												
Aug. 10	1610	59		10	11	.3												
Aug. 14	1530	60		11	32	1.0												
Aug. 17	1130	60		11	14	.4												
Aug. 21	1100	57		11	6	.2												
Aug. 24	1120	57		11	11	.3												
Aug. 28	1430	57		11	24	.7												
Aug. 31	1140	58		12	36	1.2												
Sept. 8	0945	57		12	116	3.8												
Sept. 14	1020	57		12	8	.3												
Sept. 28	1155	57		12	8	.3												
6-2803. SOUTH FORK SHOSHONE RIVER NEAR VALLEY, WYO.																		
Nov. 4, 1963	1110	41		125	3	1.0												
Dec. 6	0830	38		100	7	1.9												
Jan. 9, 1964	1600	33		67	20	3.6												
Feb. 6	0850	32		65	5	.9												
Mar. 6	0950	34		63	4	.7												
Apr. 2	0820	36		98	10	2.6												
May 8	1400	49		154	13	5.4												
June 5	0935	47		1160	134	420												
July 1	1350	55		2150	684	3970												
Aug. 6	1530	62		388	16	17												
Sept. 5	1730	--		161	3	1.3												

E Estimated.

CANNONBALL RIVER BASIN

6-3500. CANNONBALL RIVER AT REGENT, N. DAK.

Aug. 17, 1964.....	1720	77		2.5	103	0.7												
Sept. 28.....	1645	56		3.2	46	.4												

WHITE RIVER BASIN

6-4457. WHITE RIVER AT SLIM BUTTE, S. DAK.

May 13, 1964.....	0925	65		12	342	11						100						S
Aug. 14.....	0700	68		4.7	1820	23												
Aug. 16.....	1030	62		1.6	346	1.5												

JAMES RIVER BASIN

6-4735. WEST BRANCH SNAKE CREEK NEAR ATHOL, S. DAK.

May 6, 1964.....	1330			95	127	32						71	77	86	95	100		V
May 19.....	1010			3.3	72	.6												

PLATTE RIVER BASIN

6-6815. GERING DRAIN NEAR GERING, NEBR.

Oct. 23, 1963.....	0935			19	269	14						67	92	99	100			V
Dec. 30.....	0930			12	89	2.9						65	78	92	100			V

6-7070. NORTH FORK SOUTH PLATTE RIVER AT SOUTH PLATTE, COLO.

July 14, 1964.....	1530	70		122	8	3												
July 28.....	1520	68		190	10	5												
Aug. 12.....	1330	59		265	17	12												
Aug. 24.....	1145	55		236	13	8												
Sept. 14.....	1250	52		244	10	7												

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
PLATTE RIVER BASIN--Continued																		
6-7075. SOUTH PLATTE RIVER AT SOUTH PLATTE, COLO.																		
Oct. 15, 1963	1155	50		135	7	3												
Nov. 5	1050	40		135	4	1												
Nov. 20	1040	33		103	8	2												
Dec. 3	1125	32		56	11	2												
Dec. 18	1210	33		143	14	5												
Apr. 13, 1964	1320	48		145	6	2												
Apr. 13	1340	48		145	4	2												
Apr. 30	1430	56		416	16	18												
May 9	1220	50		441	12	14												
June 15	1155	63		350	13	12												
July 14	1320	70		421	9	10												
July 28	1320	67		565	15	23												
Aug. 12	1050	70		510	15	21												
Aug. 24	1000	55		357	9	9												
Sept. 14	1100	53		276	7	5												
6-7520. CACHE LA POUDRE RIVER AT MOUTH OF CANYON, NEAR FORT COLLINS, COLO.																		
Nov. 6, 1963	1115	40		49	8	1												
Nov. 19	1410	37		19	10	.5												
Dec. 2	1120	32		22	5	.3												
Mar. 18, 1964	1215	40		24	5	.3												
Apr. 17	1345	46		59	5	.8												
May 1	1245	57		62	2	.3												
May 23	1450	50		1260	40	140												
June 2	1400	53		809	10	22												
June 16	1120	49		1230	6	20												
June 30	1305	54		1270	17	58												
July 15	1140	63		382	4	4												
July 30	1510	67		306	6	5												
Aug. 13	1120	67		104	3	.8												

6-7983. CLEARWATER CREEK NEAR CLEARWATER, NEBR.

Oct. 15, 1963.....	1005	58		22	32	1.9						43	57	100	--	--		V
Nov. 5.....	1220	47		24	58	3.8						42	62	100	--	--		V
Dec. 11.....	1150	32		20	107	5.8						46	63	91	100	--		V
Jan. 15, 1964.....	1210	32		15	43	1.7						45	65	100	--	--		V
Feb. 18.....	1715	35		30	100	8.1						25	43	95	100	--		V
Mar. 24.....	1125	32		122	1480	488	8	8		10		33	65	97	100	--		VPWC
Apr. 14.....	1200	51		49	274	36						29	47	98	100	--		V
May 19.....	1005	67		25	88	5.9						56	69	98	100	--		V
June 8.....	1730	81		22	158	9.4						60	72	97	99	100		V
June 18.....	1400	82		30	254	20						22	41	94	97	100		V
July 6.....	1745	89		22	145	8.6						50	65	90	100	--		V
July 20.....	1605	93		18	116	5.6						77	84	99	100	--		V
Aug. 3.....	1710	77		18	78	3.8						55	68	98	100	--		V
Sept. 1.....	1625	83		22	117	6.9						42	60	99	100	--		V
Sept. 14.....	1555	71		22	79	4.7						30	46	95	100	--		V

6-7988. ELKHORN RIVER AT MEADOW GROVE, NEBR.

Sept. 24, 1963.....	0945	65		279	211	159	--	--	--	--	--	64	77	96	99	100		V
Nov. 5.....	0845	44		206	61	34	--	--	--	--	--	47	57	91	100	--		V
Dec. 11.....	1445	32		160	46	20	--	--	--	--	--	--	--	--	--	--		
Jan. 15, 1964.....	1020	32		205	29	16	--	--	--	--	--	--	--	--	--	--		
Feb. 18.....	1450	32		292	181	143	--	--	--	--	--	40	56	93	100	--		V
Mar. 24.....	1430	36		444	438	525	--	--	--	--	--	36	48	88	100	--		V
Apr. 14.....	1425	61		533	376	541	--	--	--	--	--	25	35	75	99	100		V
May 19.....	1305	78		390	225	237	--	--	--	--	--	--	--	--	--	--		
June 8.....	1550	84		233	166	104	--	--	--	--	--	71	77	97	100	--		V
June 18.....	1200	76		800	1330	2870	44	50	54	58	66	77	84	95	100	--		VPWC
June 23.....	1315	73		1190	4040	13000	57	65	71	74	84	88	94	98	100	--		VPWC
July 6.....	1555	90		400	345	372	--	--	--	--	--	68	77	95	99	100		V
July 20.....	1445	89		190	144	74	--	--	--	--	--	80	90	99	100	--		V
Aug. 3.....	1525	79		153	160	66	--	--	--	--	--	68	76	98	100	--		V
Sept. 1.....	1455	78		182	150	74	--	--	--	--	--	70	78	97	100	--		V
Sept. 14.....	1435	71		175	113	53	--	--	--	--	--	89	75	98	100	--		V

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
PLATTE RIVER BASIN--Continued																		
6-7992.9. UNION CREEK NEAR STANTON, NEBR.																		
Oct. 14, 1963	1155	63		21	64	3.6	--	--		--		85	99	100				V
Nov. 4	1150	48		22	40	2.4	--	--		--		95	99	100				V
Dec. 10	1240	32		24	57	3.7	--	--		--		88	100	--				V
Jan. 14, 1964	1450	32		21	24	1.4	--	--		--		92	--	--				S
Feb. 17	1745	39		20	31	1.7	--	--		--		95	100	--				V
Mar. 25	1215	32		12	73	2.4	--	--		--		--	--	--				
Apr. 15	0900	50		27	114	8.3	--	--		--		71	98	100				V
May 18	1215	76		26	180	11	54	82		69		90	--	--				SPWC
June 8	1200	85		21	114	6.5	--	--		--		--	--	--				
June 17	2310	68		3140	13400	114000	30	34	38	43	57	87	94	99	100			VPWC
July 6	1200	89		41	123	14	--	--		--		--	--	--				
July 20	1135	83		25	98	6.6	--	--		--		--	--	--				
Aug. 3, 1964	1205	77		13	42	1.5	--	--		--		--	--	--				
Sept. 1	1130	76		26	72	5.0	--	--		--		89	98	100				V
Sept. 14	1140	68		20	32	1.7	--	--		--		78	100	--				V
KANSAS RIVER BASIN																		
6-8220. NORTH FORK REPUBLICAN RIVER NEAR WRAY, COLO.																		
Aug. 1, 1963	1050	70		20	154	8	21	27	32	37	49	76	94	100				VBWC
Oct. 1	1200	62		22	152	9												
Oct. 17	1200	58		22	49	3												
Nov. 18	1135	47		24	52	3												
Dec. 16	1300	39		23	42	3												
Jan. 2, 1964	--	--		24	42	3												

8-8325. FRENCHMAN CREEK NEAR ENDERS, NEBR.

Apr. 22, 1964.....	1610	59		9.3	29	0.7						--	--	--	--			
Apr. 23.....	0530	49		9.7	30	.8						--	--	--	--			
June 16.....	0745	64		79	34	7.2						--	--	--	--			
June 17.....	1235	69		66	32	5.7						--	--	--	--			
July 9.....	1005	71		355	64	61						70	80	97	100			V
July 10.....	0750	72		325	35	31						--	--	--	--			
Aug. 12.....	1945	72		324	54	47						61	80	95	100			V
Aug. 13.....	0720	70		322	23	20						--	--	--	--			
Sept. 28.....	1245	61		5.6	8	.1						--	--	--	--			

6-8329. FRENCHMAN CREEK, 5.6 MILES EAST OF ENDERS DAM, NEAR WAUNETA, NEBR.

Oct. 28, 1983.....	1505	55		22	12	0.7						55	--	--	--	--		S
Nov. 20.....	1205	45		22	31	1.8						59	81	97	100	--		V
Jan. 22, 1964.....	1700	44		25	20	1.4						71	84	87	100	--		V
Feb. 10.....	1425	45		24	31	2.0						74	89	92	100	--		V
Feb. 25.....	0915	34		23	38	2.4						--	--	--	--	--		
Mar. 12.....	0825	41		23	30	1.9						--	--	--	--	--		
Apr. 22.....	1440	67		26	44	3.1						80	95	100	--	--		V
Apr. 23.....	0635	53		25	46	3.1						74	88	99	100	--		V
May 11.....	1525	65		28	64	4.8						82	95	99	100	--		V
June 16.....	0905	68		95	208	53						68	84	99	100	--		V
June 17.....	1335	74		74	168	34						68	83	97	100	--		V
July 9.....	1410	77		381	1380	1420						55	70	76	85	100		V
July 10.....	1005	75		332	1040	932						--	--	--	--	--		
Aug. 12.....	1820	75		341	798	735						38	57	68	75	100		V
Aug. 13.....	0915	71		340	629	577						33	55	63	74	98	100	SV
Sept. 28.....	1440	65		23	13	.8						64	80	92	100	--		V

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters										Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
KANSAS RIVER BASIN--Continued																	
6-8350. STINKING WATER CREEK NEAR PALISADE, NEBR.																	
Oct. 28, 1963	1220	51		39	261	27	[illegible]	--	--	--	--	92	100	--				V
Nov. 20	1005	38		48	328	42	--	--	--	--	--	94	99	100				V
Jan. 23, 1964	1130	32		56	932	141	15	20	27	37	56	92	99	100				VPWC
Feb. 10	1205	38		47	304	38	--	--	--	--	--	87	99	100				V
Feb. 24	1445	41		44	266	32	26	28	--	38	--	86	100	--				VPWC
Mar. 12	1000	41		52	309	43	29	26	--	36	--	89	100	--				VPWC
Apr. 11	1410	65		59	815	130	13	12	--	28	--	82	97	100				VPWC
Apr. 22	1140	55		53	544	78	21	30	--	43	--	93	100	---				VPWC
Apr. 23	0950	54		52	518	73	23	30	--	41	--	93	100	--				VPWC
May 11	1215	63		45	360	44	25	28	--	38	--	90	99	100				VPWC
June 16	1230	75		38	794	81	29	38	46	56	69	96	100	--				VPWC
June 17	1605	70		36	722	70	26	33	40	49	63	95	100	--				VPWC
July 9	1810	80		29	374	29	38	41	--	51	--	89	100	--				VPWC
July 10	1355	81		31	425	36	--	--	--	--	--	88	100	--				V
Aug. 12	1140	88		16	155	6.7	--	--	--	--	--	93	97	100				V
Aug. 13	1305	69		17	156	7.2	--	--	--	--	--	92	100	--				V
Sept. 28	1530	56		25	184	12	--	--	--	--	--	92	98	99	100			V
6-8595. LADDER CREEK BELOW CHALK CREEK, NEAR SCOTT CITY, KANS.																	
Apr. 22, 1964	0845	53		2.2	23	0.1	--	--		--		--	--	--				
May 22	0600	--		117	22500	7110	45	60		88		99	99	100				VPWC
May 22	0630	--		358	15100	14600	39	50		86		99	99	100				VPWC
June 14	1800	--		358	8900	8600	--	--		--		--	--	--				
June 25	1250	70		5.8	168	2.6	--	--		--		--	--	--				
6-8603. SOUTH BRANCH HACKBERRY CREEK NEAR ORION, KANS.																	
June 12, 1964				25	4670	320	--	--		--		--	--					
June 12				180	3590	1740	46	59		79		96	97	100				VPWC
June 12				400	3990	4310	44	51		71		99	100					VPWC

6-8723. MIDDLE BEAVER CREEK NEAR SMITH CENTER, KANS.

Oct. 23, 1963.....	1020	62		0.3	130	0.1												
Nov. 13.....	0845	35		.3	272	.2												
Jan. 22, 1964.....	1130	32		.5	113	.2												
Mar. 27.....	1055	36		.7	94	.2												
Apr. 22.....	1520	--		.5	36	T												
May 19.....	0945	67		.2	65	T												
June 8.....	0930	70		.1	122	T												

6-8767. SALT CREEK NEAR ADA, KANS.

Nov. 6, 1963.....	0910	46		1.3	427	1.5	--	--		--		--						
Dec. 3.....	1500	39		1.6	345	1.5	--	--		--		--						
Jan. 14, 1964.....	1615	32		1.4	360	1.4	--	--		--		--						
Feb. 4, 1964.....	1300	32		5.2	125	1.8	--	--		--		--						
Feb. 26.....	1200	32		3.5	91	8.6	--	--		--		--						
Mar. 18.....	1145	46		2.8	183	1.4	--	--		--		--						
Apr. 2.....	0940	46		3.1	116	1.0	--	--		--		--						
Apr. 8.....	1400	54		3.1	219	1.8	--	--		--		--						
Apr. 28.....	1000	47		3.3	61	.5	--	--		--		--						
Apr. 30.....	1045	58		3.1	58	.5	--	--		--		--						
May 20.....	1410	81		1.3	194	.7	--	--		--		--						
June 10.....	0725	64		1.1	406	1.2	--	--		--		--						
June 23.....	0820	--		191	5180	2670	64	68		78		100						VPWC
July 2.....	1350	88		.5	246	.3	--	--		--		--						
Sept. 2.....	1620	80		14	1830	69	91	91		96		100						PWC
Sept. 3.....	0940	74		4.8	587	7.6	--	--		--		--						
Sept. 15.....	1415	68		.1	189	.1	--	--		--		--						

T Less than 0.05 ton.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN- Continued

Periodic determinations of suspended-sediment discharge and particle size, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment: Percent finer than size indicated, in millimeters											Method of analysis
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
KANSAS RIVER BASIN--Continued																		
6-8775. TURKEY CREEK NEAR ABILENE, KANS.																		
Nov. 27, 1963	1020	43		14.5	21	0.8	--	--		--		--						
Jan. 27, 1964	1340	32		12.0	108	3.5	--	--		--		--						
Apr. 10	1700	62		12.0	78	2.5	--	--		--		--						
Apr. 23	1200	59		54.0	1760	257	63	76		96		100						VPWC
Apr. 23	1220	59		54.0	1760	257	7	12		--		100						VPN
May 11	0940	64		8.0	226	4.9	--	--		--		--						
June 11	1830	74		45.0	778	94	66	71		90		99	100					VPWC
July 29	1130	83		8.8	135	3.2	--	--		--		--						
Aug. 18	1250	75		3.3	56	.5	--	--		--		--						
Sept. 10	1550	79		2.2	68	.4	--	--		--		--						

CANNONBALL RIVER BASIN

6-3500. CANNONBALL RIVER AT REGENT, N. DAK.

Aug. 17, 1964.....	1720		12	2.5			33	41	49	55	61	64	71	81	90	100		SV
Sept. 28.....	1645		5	3.2			3	6	31	51	61	70	85	97	100			SV

PLATTE RIVER BASIN

6-6815. GERING DRAIN NEAR GERING, NEBR.

Oct. 23, 1963.....	0935		7	19			8	19	45	88	95	98	99	100				SV
Dec. 30.....	0930			12			6	13	35	78	94	98	100					SV

6-7075. SOUTH PLATTE RIVER AT SOUTH PLATTE, COLO.

Oct. 15, 1963.....			6	135			0	1	2	6	11	21	39	64	94	100		S
Apr. 13, 1964.....			12	145			0	2	7	15	25	36	50	69	90	100		S
June 15.....			12	350			0	1	5	10	19	30	44	59	81	88	90	S

6-7983. CLEARWATER CREEK NEAR CLEARWATER, NEBR.

Oct. 15, 1963.....	1005		11	22			0	2	55	9	99	100	--					SV
Nov. 5.....	1220		11	24			0	3	64	92	98	99	100					SV
Dec. 11.....	1150		6	20			6	23	71	96	99	100	--					SV
Jan. 15, 1964.....	1210		5	15			2	12	67	93	99	100	--					SV
Feb. 18.....	1715		11	30			0	1	49	92	98	98	100					SV
Mar. 24.....	1125		9	122			2	13	82	100	--	--	--					V
Apr. 14.....	1200		8	49			0	3	72	99	100	--	--					V
May 19.....	1005		12	25			0	2	67	98	100	--	--					V
June 8.....	1730		10	22			2	9	68	98	100	--	--					V
June 18.....	1400		6	30			0	2	68	97	100	--	--					V
July 6.....	1745		13	22			0	9	63	97	99	100	--					SV
July 20.....	1605		13	18			1	11	73	95	99	100	--					SV
Aug. 3.....	1710		13	18			1	7	67	96	99	100	--					SV
Sept. 1.....	1625		13	22			0	9	65	95	99	100	--					SV
Sept. 14.....	1555		13	22			2	11	71	96	99	100	--					SV

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Particle-size analyses of bed material, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
PLATTE RIVER BASIN--Continued																		
6-7988. ELKHORN RIVER AT MEADOW GROVE, NEBR.																		
Sept. 24, 1963	0945		20	279			6	24	70	90	99	100	--	--				SV
Nov. 5	0845		24	206			0	6	49	85	98	99	100	--				SV
Dec. 11	1445		8	160			0	3	44	90	98	100	--	--				SV
Jan. 15, 1964	1020		12	205			0	2	32	79	92	96	98	100				SV
Feb. 18	1450		24	292			0	2	40	88	97	99	100	--				SV
Mar. 24	1430		19	444			0	4	44	91	98	99	100	--				SV
Apr. 14	1425		4	533			--	0	28	90	100	--	--	--				V
May 19	1305		13	390			--	0	26	71	94	98	100	--				SV
June 8, 1964	1550		9	233			4	11	47	93	98	99	100	--				SV
June 18	1200		5	800			0	2	36	88	97	98	100	--				SV
June 23	1315		14	1190			--	0	26	89	95	97	99	100				SV
July 6	1555		26	400			0	2	48	94	99	100	--	--				SV
July 20	1445		11	190			0	1	36	87	96	98	99	100				SV
Aug. 3	1525		12	153			0	4	46	90	98	100	--	--				SV
Sept. 1	1455		15	182			0	2	49	91	99	99	100	--				SV
Sept. 14	1435		12	175			2	8	54	91	98	99	100	--				SV
6-7992.9. UNION CREEK NEAR STANTON, NEBR.																		
Oct. 14, 1963	1155		8	21			0	3	49	94	100	--	--	--				V
Nov. 4	1150		13	22			0	3	51	94	99	100	--	--				SV
Dec. 10	1240		6	24			4	6	44	92	98	99	100	--				SV
Jan. 14, 1964	1450		5	21			3	6	50	93	98	100	--	--				SV
Feb. 17	1745		8	20			1	1	48	94	99	100	--	--				SV
Mar. 25	1215		6	12			5	11	54	97	100	--	--	--				V
Apr. 15	0900		8	27			0	2	44	94	99	100	--	--				SV
May 18	1215		10	26			2	3	48	94	99	100	--	--				SV
June 8	1200		8	21			1	3	43	92	99	100	--	--				SV
June 17	2310		4	3140			4	11	80	100	--	--	--	--				V
July 6	1200		17	41			0	1	40	92	99	99	100	--				SV
July 20	1135		13	25			0	3	49	93	99	99	100	--				SV
Aug. 3	1205		11	13			0	1	47	93	99	100	--	--				SV
Sept. 1	1130		14	26			3	8	46	90	96	98	99	100				SV
Sept. 14	1140		14	20			1	4	39	89	97	98	99	100				SV

6-8220. NORTH FORK REPUBLICAN RIVER NEAR WRAY, COLO.

May 31, 1963.....			4	22			10	19	34	74	95	98	99	100				S
June 26.....			6	20			4	8	23	75	97	99	100	--				S
Aug. 1.....			6	19			3	7	22	71	96	99	100	--				S
Aug. 28.....			6	20			1	4	21	70	94	98	99	100				S
Oct. 1.....			7	22			7	18	41	80	97	99	100	--				S
Oct. 17.....			7	22			3	11	31	74	96	98	100	--				S
Nov. 18.....			6	24			6	14	36	79	97	99	100	--				S

6-8325. FRENCHMAN CREEK NEAR ENDERS, NEBR.

Apr. 22, 1964.....	1610		5	9.3			1	2	6	18	34	41	52	72	90	100		SV
Apr. 23.....	0530		4	9.7			1	2	7	17	38	47	61	78	89	100		SV
June 16.....	0745		9	79			1	6	25	49	66	72	83	96	100	--		SV
June 17.....	1235		18	66			1	5	25	56	72	78	88	97	100	--		SV
Sept. 28.....	1245		7	5.6			0	1	4	13	23	29	40	62	79	100		SV

6-8329. FRENCHMAN CREEK, 5.6 MILES EAST OF ENDERS DAM, NEAR WAUNETA, NEBR.

Oct. 28, 1963.....	1505		6	22			1	3	16	52	78	85	91	98	100			SV
Nov. 20.....	1205		6	22			1	1	11	44	74	83	90	97	100			SV
Jan. 22, 1964.....	1700		9	25			0	1	21	64	82	90	96	99	100			SV
Feb. 10.....	1425		7	24			0	1	12	52	75	83	93	99	100			SV
Feb. 25.....	0915		9	23			7	13	29	63	84	89	93	97	100			SV
Mar. 12.....	0825		6	23			0	2	13	51	78	87	96	100	--			SV
Apr. 22.....	1440		11	26			--	0	14	58	86	93	96	98	100			SV
Apr. 23.....	0635		11	25			0	1	15	60	87	93	98	99	100			SV
May 11.....	1525		9	28			0	1	18	59	84	90	96	99	99	100		SV
June 16.....	0905		15	95			0	2	20	54	85	92	98	100	--			SV
June 17.....	1335		14	74			2	4	22	67	92	96	98	100	--			SV
July 9.....	1410		5	381			1	7	43	78	89	94	98	100				V
July 10.....	1005		5	332			0	5	36	76	92	96	99	100	--			SV
Aug. 12.....	1820		5	341			1	11	31	70	86	90	95	98	100			SV
Aug. 13.....	0915		4	340			2	10	46	88	93	96	98	100	--			SV
Sept. 28.....	1440		10	23			--	0	10	61	89	94	98	100	--			SV

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN MISSOURI RIVER BASIN--Continued

Particle-size analyses of bed material, water year October 1963 to September 1964--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 temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Bed material: Percent finer than size indicated, in millimeters											Method of analysis
							0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.00	32.00	64.00	
PLATTE RIVER BASIN--Continued																		
6-8350. STINKING WATER CREEK NEAR PALISADE, NEBR.																		
Oct. 28, 1963	1220		7	39			10	23	33	53	68	76	89	96	100	--		SV
Nov. 20	1005		7	48			10	22	33	53	68	76	88	95	99	100		SV
Jan. 23, 1964	1130		7	56			2	3	12	44	71	83	94	99	100	--		SV
Feb. 10	1205		7	47			8	19	31	54	71	78	87	98	100	--		SV
Feb. 24	1445		18	44			22	36	47	65	82	89	97	100	--	--		SV
Mar. 12, 1964	1000		6	52			14	27	38	63	82	90	96	100	--	--		SV
Apr. 11	1410		9	59			27	50	58	69	78	86	94	99	100	--		SV
Apr. 22	1140		14	53			25	49	68	80	88	93	97	100	--	--		SV
Apr. 23	0950		12	52			16	39	61	77	85	91	97	100	--	--		SV
May 11	1215		9	45			8	19	34	58	77	85	94	98	100	--		SV
June 16	1230		11	38			3	9	21	45	67	80	94	99	100	--		SV
June 17	1605		13	36			5	13	28	64	84	91	97	100	--	--		SV
July 9	1810		13	29			3	9	17	31	50	62	80	96	100	--		SV
July 10	1355		7	31			4	12	21	36	54	66	83	94	100	--		SV
Aug. 12	1140		9	16			4	10	21	37	49	59	77	95	100	--		SV
Aug. 13	1305		19	17			4	11	20	36	49	58	74	92	99	100		SV
Sept. 28	1530		14	25			0	3	18	60	86	92	96	99	100	--		SV

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