Quality of Surface Waters of the United States 1960

Parts 3 and 4. Ohio River Basin and St. Lawrence River Basin

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

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1742

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PREFACE

This report was prepared by the Geological Survey in cooperation with the States of Georgia, Illinois, Indiana, Kentucky, Minnesota, New York, North Carolina, Ohio, Pennsylvania, and West Virginia, and with other agencies by personnel of the Water Resources Division under the direction of L. B. Leopold, chief hydrologist, and S. K. Love, chief, Quality of Water Branch. The data were collected and prepared for publication under the supervision of the following district engineers or district chemist:

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

ILLUSTRATION

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1960

PARTS 3 and 4

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 records of chemical analysis, suspended sediment, and temperature for surface waters given in this volume serve as a basis for determining the suitability of the waters examined for all uses. The discharge of a stream and (to a lesser extent) the chemical quality are related to variations in rainfall and other forms of precipitation. In general, lower concentrations of dissolved solids may be expected during the periods of high flow than during periods of low flow. The concentration in some streams may change materially with relatively small variations in flow, whereas for other streams the quality may remain relatively uniform throughout large ranges in discharge. The quantities of suspended sediment carried by streams are also related to discharge, and during flood periods the sediment content in streams may vary over wide ranges.

In 1941, the Geological Survey began publishing annual records of chemical quality, suspended sediment, and water temperature. The records prior to 1948 were published each year in a single volume for the entire country, and in two volumes in 1948 and 1949. Beginning in 1950, the records were published in four volumes and beginning in 1959 in five volumes. The drainage basins covered in the five volumes are shown in Figure 1. The data given in this volume were collected during the water year October 1, 1959, to September 30, 1960. The records are 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.

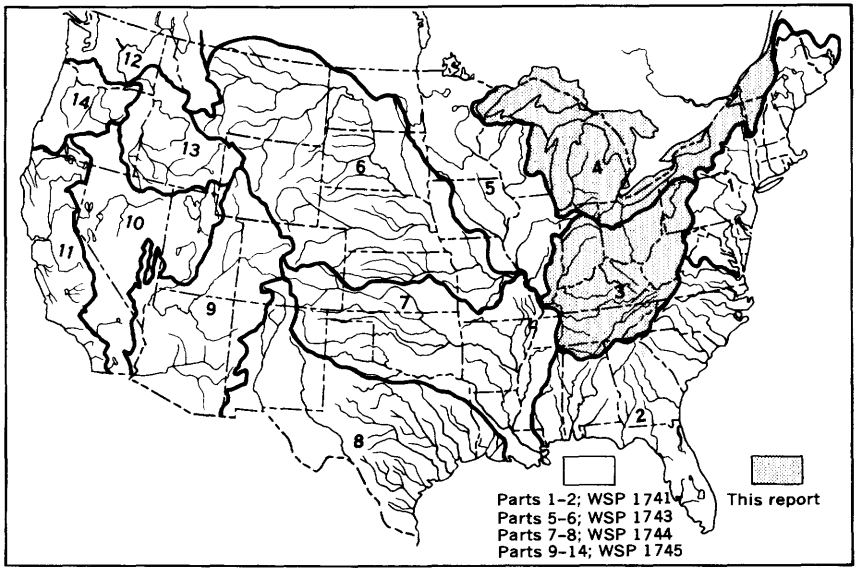

Figure 1.--Map of the conterminous United States showing basins covered by the five water-supply papers on quality of surface waters in 1960. The shaded portion represents the section of the country covered by this volume; the unshaded portion represents the section of the country covered by other water-supply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

A station number has been assigned as an added means of 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 two digits followed by a hyphen and a six digit number. The notation to the left of the hyphen identifies the Part or hydrologic region used by the Geological Survey for reporting hydrologic data. The number to the right of the hyphen represents the position of the location in the standard downstream order listing measuring stations within each of the 14 parts. The assigned numbers are in numerical order but are not consecutive. They are so selected from the complete 6 digit number scale that intervening numbers will be available for future assignments to new locations. The identification number for each station in this report is printed to the left of the station name and contains only the essential digits. For example, the number is printed as 4-100 for a station whose complete identification number is 04-0100.00.

Descriptive statements are given for each sampling station where chemical analyses, temperature measurements, or sediment determinations have been made. These statements include the 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, 1960, the Geological Survey maintained 136 stations on 78 streams for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 70 of these locations for chemical-quality studies. Samples were also collected less frequently at many other points. Water temperatures were measured daily at 105 stations. Not all analyses of samples of surface water collected during the year have been included. Single analyses of an incomplete nature generally have been omitted. Also, analyses made of the daily samples before compositing have not been reported. The specific conductance of almost all daily samples was determined, and as noted in the table headings this information is available for reference at the district offices listed under Division of Work, on page 29.

Quantities of suspended sediment are reported for 19 stations during the year ending September 30, 1960. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 17 of the stations.

COLLECTION AND EXAMINATION OF SAMPLES

Samples for analyses are usually collected at or near points on streams where gaging stations are maintained by Surface Water Branch of U. S. Geological Survey for measurement of water discharge. 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 con-

centration for the section in contrast to the average concentration that existed without regard to the variable velocities of the individual fluid elements.

The near uniformly dispersed ions of the solute load move with the velocity of the transporting water. Accordingly, the mean section concentration of solutes determined from samples is a precise measure of the total solute load. The mean section 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 in a manual 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 generally holding to the principle of 10 day periods or equivalent to three composite samples per month modifications are usually made on the basis of dissolved-solids content as indicated by measurements of conductivity of daily samples, supplemented by other information such as chloride content, river stage, weather conditions and other background information of the stream.

TEMPERATURE

Daily water temperatures were measured at most of the 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 for an individual station in order that the data would be relatively unaffected by diurnal variations in temperature. Most large, swiftly flowing streams probably have a small diurnal variation in water temperature, whereas sluggish or shallow streams may have a daily range of several degrees and may follow closely the changes in air 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 U. S. depth-integrating cable-suspended samplers (U.S. Interagency, 1963, p. 56-77 and U. S. Interagency, 1952, p. 86-90) from a fixed sampling point at one vertical in the cross section. The US DH-48 hand sampler was used at many stations during periods of low flow. Depth-integrated samples were collected periodically at three or more verticals in the cross section to 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 throughout the 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 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 preceding and following 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 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. Interagency, 1957). The fine fractions were classified by the pipet method (Kilmer and Alexander, 1949) or the bottom withdrawal tube method (U.S. Interagency, 1943, p. 82-90).

EXPRESSION OF RESULTS

Quantities of water for analysis are most conveniently measured in the laboratory by use of volumetric glassware. The analytical results thus obtained in this report are expressed in weights of solute in a given volume of water. To express the results in parts of solute per million (ppm) of water the data must be converted. For most waters this conversion is made by assuming that the liter of water sample weighs 1 kilogram; and thus milligrams per liter are equal to parts per million.

Equivalents per million are not reported, although the expression of analyses in equivalents per million is sometimes preferred. 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 reciprocal 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	Hydroxide (OH^{-1})	0.05880
Arsenic (As^{+2})	.02669	Iodide (I^{-1})	.00788
Barium (Ba^{+2})	.01456	Iron (Fe^{+3})	.05372
Beryllium (Be^{+2})	.22192	Lead (Pb^{+2})	.00965
Bicarbonate (HCO_3^{-1})	.01639	Lithium (Li^{+1})	.14411
Bromide (Br^{-1})	.01251	Magnesium (Mg^{+2})	.08226
Cadmium (Cd^{+2})	.01779	Manganese (Mn^{+2})	.03640
Calcium (Ca^{+2})	.04990	Nickel (Ni^{+2})	.03406
Carbonate (CO_3^{-2})	.03333	Nitrate (NO_3^{-1})	.01613
Chloride (Cl^{-1})	.02821	Phosphate (PO_4^{-3})	.03159
Chromium (Cr^{+6})	.11539	Potassium (K^{+1})	.02557
Cobalt (Co^{+2})	.03394	Sodium (Na^{+1})	.04350
Copper (Cu^{+2})	.03148	Strontium (Sr^{+2})	.02283
Fluoride (F^{-1})	.05264	Sulfate (SO_4^{-2})	.02082
Hydrogen (H^{+1})	.99209	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. 24) and the temperature in degrees Fahrenheit. Color is expressed in units of the platinum-cobalt scale proposed by Hazen (1892, p. 427-428). A unit of color is produced by one milligram per liter of platinum in the form of the chloroplatinate ion. Hydrogen-ion concentration is expressed in terms of pH units. By definition the pH value of a solution is the negative logarithm of the concentration of gram ions of hydrogen. However, the pH meter that is generally used in Survey laboratories determines the activity of the hydrogen ions as distinguished from concentration.

An average of analyses for the water year is given for most daily sampling stations. Most of these averages are arithmetical, time-weighted, or discharge-weighted; when analyses during a year are all on 10-day composites of daily samples with no 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 after thorough mixing in the reservoir. 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. Discharge-weighted averages are usually lower than arithmetical averages for most streams because at times of high discharge the rivers generally have lower concentrations of 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 concentration in parts per million by the daily mean discharge, and the appropriate conversion factor, normally 0.0027.

Particle-size analyses are expressed in percentages of material finer than indicated sizes in millimeters. The size classification used in this report is that recommended by the American Geophysical Union subcommittee on Terminology (Lane and others, 1947, p. 937). Other data included as pertinent to the size analyses for many streams are the date of collection, the stream discharge, sediment concentration when sample was collected, and the method of analysis.

COMPOSITION OF SURFACE WATERS

All natural waters contain dissolved mineral matter. Water in contact with soils or rock, even for only a few hours, will dissolve some mineral matter. The quantity of dissolved mineral matter in a natural water depends primarily on the type of rocks or soils with which the water has been in contact and the length of time of contact. Some streams are fed by both surface runoff and ground water from spring or seeps. Such streams reflect the chemical character of their concentrated underground sources during dry periods and are more dilute during periods of heavy rainfall. Ground water is generally more highly mineralized than surface runoff because it remains in contact with the rocks and soils for much longer periods. The dissolved-solids content in a river is frequently increased by drainage from mines or oil fields, by the addition of industrial or municipal wastes, or--in irrigated regions--by drainage from irrigated lands.

The mineral constituents and physical properties of natural waters reported in the tables of analyses include those that have a practical bearing on the value of the waters for most purposes. The analyses generally include results for silica, iron, calcium, magnesium, sodium, potassium (or sodium and potassium together calculated as sodium), alkalinity as carbonate and bicarbonate, sulfate, chloride, fluoride, nitrate, boron, pH, dissolved solids and specific conductance. Aluminum, manganese, color, acidity, oxygen consumed, and other dissolved constituents and physical properties are reported for certain streams. Phenolic material and minor elements including strontium, chromium, nickel, copper, lead, zinc, cobalt, arsenic, cadmium, and others are occasionally determined for a few streams in connection with specific

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

MINERAL CONSTITUENTS IN SOLUTION

Silica (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 white porcelain or enameled ware and fixtures and on fabrics washed in the water.

Manganese (Mn)

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

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. Waters impounded in large reservoirs may contain manganese that has been dissolved from the mud on the bottom of the reservoir by action of carbon dioxide produced by anaerobic fermentation of organic matter. It is 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.

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, moderate amounts of alkalinity does not adversely affect most users.

Hydroxide may occur in water that has been softened by the lime process. Its presence in streams usually can be taken as an indication of contamination and does not represent the natural chemical character of the water.

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 quantities of chloride may affect the industrial use of water by increasing the corrosiveness of waters that contain large quantities of calcium and magnesium.

Fluoride (F)

Fluoride has been reported as being present in some rocks to about the same extent as chloride. However, the quantity of 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 the 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 fluorisis, 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, p. 593), 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). In a report published by the National Research Council, Maxcy (1950, p. 271) 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, and some sources that contribute nitrate, such as organic wastes and leaching of soils, may be important as sources for phosphate in water and its occurrence may add to the apparent alkalinity. The addition of phosphates in water treatment 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 may therefore contain considerable amounts of phosphate.

Boron (B)

Boron in small quantities has been found essential for plant growth, but irrigation water containing more than 1 part per 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, p. 1409) at 25°C. In natural water this concentration would not be approached, however, since a pH of less than 4.5 would probably be required to prevent formation of lead hydroxide and carbonate. It is reported (Pleissner, 1907) that at 18°C water free of carbon dioxide will dissolve the 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, p. 767) 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) equal the amount of calcium and magnesium hardness (also expressed as calcium carbonate) there is no noncarbonate hardness. Noncarbonate hardness is about equal to the amount of hardness remaining after water is boiled. The scale formed at high temperatures by the evaporation of water containing noncarbonate hardness commonly is tough, heat 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.

Tolerances for oxygen consumed in feed water for low-and high-pressure boilers and 15 and 3 ppm, respectively (Northeastern Water Works Association, 1940). Wash water containing more than 8 ppm has been reported to import a bad odor to textiles; concentrations for water used in beverages and brewing range from 0.5 to 5.0 ppm (California State Water Pollution Control Board, 1952, 1954).

Organics

Phenols. --Phenolic material in water resources is invariably the result of pollution. Phenols are widely used as disinfectants and in the synthesis of many organic compounds. Waste products from oil refineries, coke areas, and chemical plants may contain high concentrations. Fortunately, phenols decompose in the 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.

Detergents (ABS). --The chief surfactant in commercial detergents is anionic alkylbenzenesulfonate (ABS). ABS and other anionic surfactants 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, Robertson, and Page, 1962). Although the physiological implications of ABS to human beings is unknown, prolonged ingestion of this material by rats is believed to be nontoxic (Paynter, 1960). The U.S. Public Health Service (1962) recommends that ABS should not exceed 0.5 ppm in drinking and culinary waters.

Temperature

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

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 or from the bottom. Condensation of water vapor at the water surface is reported to furnish measurable quantities of heat. Heat loss takes place largely through radiation, with further losses through evaporation and conduction to the air and bottom. Thus the temperature of a small stream generally reaches a maximum in mid-to late afternoon due to solar heating and reaches a minimum from early to mid-morning after nocturnal radiation.

Temperature variations which commonly occur during summer in lakes and reservoirs of temperate regions result in a separation of the water volume into a circulating upper portion and a non-circulating lower portion. Separating the two is a stratum of water of variable vertical thickness in which the temperature 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 resources.

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 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 of it 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

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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 Geological Survey State reports on the surface-water supply of the United States. 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 for the time at which samples were collected, computed from a stage-discharge relation or from a discharge measurement.

PUBLICATIONS

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

Numbers of water-supply papers containing records for Parts 3 and 4, 1941-60

Year	WSP	Year	WSP	Year	WSP	Year	WSP
1941	942	1947	1102	1953	1290	1959	1642
1942	950	1948	1132	1954	1350	1960	1742
1943	970	1949	1162	1955	1400		
1944	1022	1950	1186	1956	1450		
1945	1030	1951	1197	1957	1520		
1946	1050	1952	1250	1958	1571		

Geological Survey reports containing chemical quality, temperature, and sediment data obtained before 1941 are listed below. Publications dealing largely with the quality of ground-water supplies and only incidentally covering the chemical composition of

surface waters are not included. Publications that are out of print are preceded by an asterisk.

PROFESSIONAL PAPER

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

BULLETINS

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

WATER-SUPPLY PAPERS

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

State	Cooperating agency	Drainage basin	District office
Georgia	Department of Mines, Mining and Geology, Garland Peyton, director.	Ohio River	Room 244, Federal Bldg., Ocala, Fla. 32670
Illinois	Ohio River Valley Water Sanitation Commission, Edward J. Cleary, executive director and chief engineer.		2822 E. Main Street Columbus, Ohio 43209
Indiana	Ohio River Valley Water Sanitation Commission, Edward J. Cleary, executive director and chief engineer.		
Kentucky[a]	University of Kentucky, F. C. Dickey, president, through State Geological Survey, W. W. Hagan, director and State Geologist. Ohio River Valley Water Sanitation Commission, Edward J. Cleary, executive director and chief engineer.		
Minnesota	Minnesota Iron Range Resources and Rehabilitation Commission, Kaarlo J. Otava, commissioner.	St. Lawrence River	Cotner Terrace Bldg. 225 North Cotner Blvd. Lincoln, Nebr. 68505

a Financial assistance was provided by the Agricultural Research Service, Soil Conservation Service and Forestry Service of the United States Department of Agriculture for some of the sediment investigations.

State	Cooperating agency	Drainage basin	District office
New York	New York State Department of Commerce, Bureau of Industrial Development, Henry Gallien, director.	St. Lawrence River	Room 348 Federal Bldg. P.O. Box 948 Albany, N.Y. 12201
North Carolina	North Carolina Department of Water Resources, H. E. Brown, director.	Ohio River basin	Federal Bldg. P.O. Box 2857 Raleigh, N. C. 27602
Ohio	Department of Natural Resources, Herbert B. Eagon, director. Ohio River Valley Water Sanitation Commission, Edward J. Cleary, executive director and chief engineer.		2822 E. Main Street Columbus, Ohio 43209
Pennsylvania	Pennsylvania Department of Agriculture, Dr. William L. Henning secretary. Pennsylvania Department of Forests and Waters, Maurice K. Goddard, secretary. Soil Conservation Commission, David Unger, director.	Ohio River	Room 1302 U.S. Custom House, 2nd and Chestnut Sts. Philadelphia, Pa. 19106

State	Cooperating agency	Drainage basin	District office
West Virginia	Ohio River Valley Sanitation Commission, Edward J. Cleary, executive director and chief engineer.	Ohio River	2822 E. Main Street Columbus, Ohio 43209

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 libraries. Copies of Geological Survey publications still in print may be purchased at a nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402, who will, upon request, furnish lists giving prices.

COOPERATION

Many Municipal, State, and Federal agencies assisted in collecting records for these quality-of-water investigations. In addition to the cooperative programs, many stations were operated from funds appropriated directly to the Geological Survey.

The table on p. 26 lists State and local agencies that cooperated in quality-of-water investigations in the drainage basins included in this volume, and the locations of quality-of-water district offices responsible for the data collected.

DIVISION OF WORK

The quality-of-water program was conducted by the Water Resources Division of the Geological Survey, L. B. Leopold, chief hydrologist, and S. K. Love, chief, Quality of Water Branch. The records were collected and prepared for publication under the supervision of district engineers or district chemists as follows: In Pennsylvania, N. H. Beamer; Minnesota, D. M. Culbertson; North Carolina, G. A. Billingsley; Georgia, J. W. Geurin; New York, F. H. Pauszek; and in Illinois, Indiana, Kentucky, Ohio, and West Virginia, G. W. Whetstone.

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CHEMICAL ANALYSES, WATER TEMPERATURES, AND SEDIMENT

PART 3. OHIO RIVER BASIN

OHIO RIVER MAIN STEM

3-365. ALLEGHENY RIVER AT KITTANNING, PA.

LOCATION.--At center of bridge on U.S. Highway 422 at Kittanning, Armstrong County, 2,500 feet downstream from gaging station.
DRAINAGE AREA.--8,973 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1944 to June 1953, October 1956 to September 1959.
Water temperatures: October 1944 to June 1953, October 1956 to September 1959.
EXTREMES, 1958-59.--Dissolved solids: Maximum, 227 ppm Sept. 13-14, 17-30; minimum, 79 ppm Apr. 28-30, May 1-7.
Hardness: Maximum, 111 ppm Sept. 13-14, 17-30; minimum, 35 ppm Apr. 3, 5-8.
Specific conductance: Maximum daily, 375 micromhos Sept. 22; minimum daily, 93 micromhos Jan. 26.
Water temperatures: Maximum, 85°F Aug. 25; minimum, 33°F Feb. 2.
EXTREMES, 1944-53, 1956-59.--Dissolved solids (1944-47, 1958-59): Maximum, 304 ppm Oct. 11-20, 1946; minimum, 63 ppm Mar. 1-10, 1945.
Hardness (1944-47, 1949-59, 1956-59): Maximum, 148 ppm Sept. 11-20, 1952; minimum, 34 ppm Feb. 21-28, Mar. 1-10, 1951.
Specific conductance: Maximum daily, 580 micromhos, Oct. 18, 1946; minimum daily, 92 micromhos Mar. 15, 1952.
Water temperatures: Maximum, 86°F July 31, Aug. 4, 1957; minimum, freezing point Dec. 17, 1951.
REMARKS.--Records of specific conductance of daily samples available in district office at Philadelphia, Pa. Records of discharge for water year October 1958 to September 1959 given in WSP 1625.

Chemical analyses, in parts per million, water year October 1958 to September 1959

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 1-4, 6-20,1958.	6,750	--	--	--	--	13	--	41	44	17	--	0.4	--	75	42	218	7.3	10
Oct. 21-29, 31, Nov. 1-18.....	7,190	3.0	0.10	24	6.3	14	1.8	54	42	23	0.0	.5	140	86	42	249	7.1	3
Nov. 19-24.....	25,000	--	--	--	--	9.2	--	29	33	12	.0	2.0	146	57	33	166	7.5	5
Jan. 23, 25-29, 1959.	75,150	--	--	--	--	4.6	--	17	24	5.8	--	2.5	89	39	25	111	7.0	7
Jan. 30-31, Feb. 1-5.	35,400	--	--	--	--	7.1	--	22	29	8.3	--	2.2	100	46	28	129	7.0	6
Feb. 6-10.....	27,100	--	--	--	--	9.4	--	28	36	9.8	--	2.5	122	56	33	166	7.0	7
Feb. 11-20.....	58,000	6.8	.00	10	3.4	4.0	1.3	16	26	6.5	.2	2.3	88	39	26	118	6.7	3
Feb. 22-27.....	18,600	--	--	--	--	7.8	--	23	38	10	--	2.1	129	57	38	166	6.8	3
Feb. 28, Mar. 1-7....	22,800	--	--	--	--	5.3	--	27	39	5.8	--	2.2	127	61	39	180	7.0	5
Mar. 8-13, 15-20.....	30,200	--	--	--	--	8.0	--	24	32	9.6	--	2.2	112	51	32	150	7.0	5
Mar. 21.....	27,300	--	--	--	--	30	--	19	51	39	--	19	--	74	59	354	5.7	15
Mar. 22-30, Apr. 1-2.	37,900	--	--	--	--	7.6	--	24	30	8.6	--	1.5	115	47	28	145	6.8	5
Apr. 3, 5-8.....	55,700	--	--	--	--	4.4	--	17	19	6.6	--	1.3	93	35	21	109	7.0	8
Apr. 10-27.....	17,400	4.5	.00	16	4.7	9.8	1.5	32	35	14	.2	3.4	105	60	34	181	6.7	3
Apr. 28-30, May 1-7..	35,200	--	--	--	--	6.9	--	20	32	7.7	--	1.2	79	47	31	135	6.7	3
May 8-30.....	13,000	--	--	--	--	9.4	--	36	31	11	--	1.0	100	58	29	171	6.8	3
May 31, June 1-13....	6,310	--	--	--	--	13	--	42	39	16	--	.7	121	70	36	208	7.4	4
June 14-27.....	6,170	--	--	--	--	16	--	48	46	22	--	.6	150	84	45	259	7.5	4
June 28-30, July 1-9.	8,890	--	--	--	--	11	--	34	33	15	--	1.0	111	60	32	185	7.3	5

July 10-25, 1959...	3,730	--	--	--	--	14	--	39	44	22	--	.6	169	78	46	245	6.9	4
July 26-27, 30-31, Aug. 1-15.....	2,590	--	--	--	--	21	--	48	52	29	--	.6	186	90	51	292	7.0	3
Aug. 16-31, Sept. 1-12.....	2,130	3.4	.02	30	6.4	25	2.0	48	62	36	.1	.7	200	102	62	336	7.2	10
Sept. 13-14, 17-30.	1,160	9.4	.02	32	7.4	28	2.0	62	55	43	.2	.7	227	111	60	358	7.5	5
Time-weighted average.....	16,000	--	--	--	--	11	--	38	41	19	--	1.3	138	71	40	219	--	5
Analysis of additional sample																		
Apr. 23, 1959.....	12,000					5.1	--	38	31	6.1		1.1	140	62	31	176	7.5	6

Temperature (°F) of water, water year October 1958 to September 1959

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

3-365. ALLEGHENY RIVER AT KITTANNING, PA.--Continued

LOCATION.--At center of bridge on U.S. Highway 422 at Kittanning, Armstrong County, 2,500 feet downstream from gaging station.
DRAINAGE AREA.--8,973 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1944 to June 1953, October 1956 to September 1960.
Water temperatures: October 1944 to June 1953, October 1956 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 214 ppm Sept. 1-5, 7-10; minimum, 75 ppm Apr. 1-5, 7-10.
Hardness: Maximum, 111 ppm Sept. 1-5, 7-10; minimum, 37 ppm Apr. 1-5, 7-10.
Specific conductance: Maximum daily, 396 micromhos Sept 27; minimum daily, 85 micromhos Apr. 3.
Water temperatures: Maximum, 79°F July 27, 30; minimum, 33°F Jan. 25, 26, Feb. 26, Mar. 1, 2, 8-11.
EXTREMES, 1944-53, 1956-60.--Dissolved solids (1944-47, 1958-60): Maximum, 304 ppm Oct. 11-20, 1946; minimum, 63 ppm Mar. 1-10, 1945.
Hardness (1944-47, 1949-53, 1956-60).--Maximum, 148 ppm Sept. 11-20, 1952; minimum, 34 ppm Feb. 21 to Mar. 10, 1951.
Specific conductance: Maximum daily, 580 micromhos Oct. 18, 1946; minimum daily, 76 micromhos, Apr. 8, 9, 1947.
Water temperatures: Maximum, 86°F July 31, Aug. 4, 1957; minimum, freezing point Dec. 17, 1951, Jan. 5, 6, 1958.
REMARKS.--Records of specific conductance of daily samples available in district office at Philadelphia, Pa. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 1-10, 1959		9.8		0.00	0.00	38	2.9	23	2.2	58	58	42	0.2	1.4	204	107	60		343	7.0	2
Oct. 11-20.....		--		--	--	--	--	a18	--	38	53	19	--	1.5	146	74	43		224	6.9	6
Oct. 21-Nov. 1.		--		--	--	--	--	a14	--	35	47	20	--	1.4	148	76	48		237	6.8	5
Nov. 11-26.....		--		--	--	--	--	a9.4	--	26	35	14	--	1.1	103	58	37		173	6.7	3
Nov. 27-Dec. 13		--		--	--	--	--	a8.0	--	19	39	11	--	1.4	94	55	40		159	6.5	4
Dec. 14-22.....		--		--	--	--	--	a5.8	--	15	32	7.2	--	1.8	80	45	33		127	6.4	5
Jan. 1-10, 1960		6.4		.10	.08	12	4.3	5.0	1.2	16	33	8.6	.1	1.6	90	48	35		136	6.8	3
Feb. 1-10.....		4.9		.16	.34	18	5.6	8.5	1.2	26	44	15	.1	1.5	122	68	47		192	7.1	3
Mar. 1-6, 8-10.		5.2		.16	.16	20	6.1	11	1.5	36	44	17	.1	1.4	135	75	46		213	7.3	4
Apr. 1-5, 7-10.		6.6		.04	.00	11	2.3	4.0	.8	11	26	6.0	.2	2.7	75	37	28		101	7.0	3
May 1-10.....		4.1		.00	.00	20	4.9	11	1.0	38	38	18	.1	.8	128	70	39		203	7.6	3
June 1-10.....		4.6		.00	.02	16	5.2	9.3	1.2	28	39	14	.1	.8	105	62	39		177	7.3	4
July 1-10.....		4.5		.01	.02	19	7.1	14	1.4	36	55	18	.1	.3	125	77	47		212	7.6	6
Aug. 1-10.....		6.2		.00	.01	28	9.0	19	2.2	45	64	28	.2	.5	195	107	70		311	7.2	2
Sept. 1-5, 7-10		6.4		.00	.01	30	8.6	25	3.0	50	65	36	.2	.3	214	111	70		342	7.3	2

a Sodium, potassium calculated as sodium (Na).

OHIO RIVER MAIN STEM--Continued

3-365. ALLEGHENY RIVER AT KITTANNING, PA.--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement between 6 a.m. and 10 a.m.)

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

3-485. KISKIMINETAS RIVER AT LEECHBURG (VANDERGRIFT), PA.

LOCATION.--At raw-water intake of West Leechburg plant at Allegheny-Ludlum Steel Corp., 0.2 mile below Brady Run, Armstrong County, and 6.7 miles downstream from gaging station at Vandergrift.
DRAINAGE AREA.--1,860 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1946 to September 1951, October 1958 to July 1959, October 1959 to September 1960.
Water temperatures: October 1946 to September 1951, October 1958 to July 1959, November 1959 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 945 ppm Aug. 27 to Sept. 12; minimum, 141 ppm Mar. 30 to Apr. 8.
Hardness: Maximum, 417 ppm Aug. 27 to Sept. 12; minimum, 74 ppm Mar. 30 to Apr. 8.
Specific conductance: Maximum daily, 1,520 micromhos, Sept. 10; minimum daily, 191 micromhos Apr. 4.
Water temperatures: Maximum, 81°F July 26, Sept. 2; minimum, 33°F Mar. 9, 11.
EXTREMES, 1946-51, 1958-60.--Dissolved solids (1946-47, 1959-60): Maximum, 945 ppm Aug. 27 to Sept. 12; minimum, 141 ppm Mar. 30 to Apr. 8, 1960.
Hardness (1946-47, 1949-51, 1959-60): Maximum, 514 ppm Oct. 1-10, 1946; minimum, 74 ppm Mar. 30 to Apr. 8, 1960.
Specific conductance: Maximum daily, 5,420 micromhos Aug. 12, 1951; minimum daily, 175 micromhos July 22, 1950.
Water temperatures: Maximum, 90°F July 25, 1950; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance and pH of daily samples available in district office at Philadelphia, Pa. Records of discharge for water year October 1959 to September 1960 based on records for Kiskiminetas at Vandergrift given in WSP 1705.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Oct. 23, 1959.		19	15	1.5	3.9	92	36	48	5.0	0	585	15	0.4	0.4	799	378	378	3.4	1310	2.9	4
Nov. 12-27....		14	5.0	.15	2.3	44	22	21	4.5	0	284	10	.2	.7	420	201	201	1.1	644	3.6	4
Nov. 28-Dec.13		--	--	--	--	--	--	--	--	0	164	7.6	--	1.3	261	134	134	.6	442	4.0	3
Dec. 14-18....		--	--	--	--	--	--	--	--	0	111	6.5	--	1.3	178	94	94	.4	313	4.0	2
Dec. 19-29....		--	--	--	--	--	--	--	--	0	193	8.4	--	3.8	313	155	155	.8	513	3.7	3
Dec. 30-Jan.8, 1960.....		11	1.7	.03	2.0	25	1.0	6.7	3.0	0	129	5.4	.1	2.1	208	104	104	.4	326	3.8	3
Jan. 9-14.....		--	--	--	--	--	--	--	--	0	183	6.0	--	3.6	297	145	145	.6	470	3.9	3
Jan. 15-20....										0	113	5.6	--	4.1	198	98	98	.3	300	4.1	3
Jan. 21-Feb. 8		13	3.7	.04	4.2	41	15	14	5.0	0	206	7.4	.3	3.8	313	164	164	.7	520	3.8	2
Feb. 9-16.....		--	--	--	--	--	--	--	--	0	134	5.5	--	6.0	214	106	106	.4	332	4.0	1
Feb. 17-29....		12	3.7	.09	4.5	38	14	12	4.6	0	197	6.0	.2	3.0	302	153	153	.7	503	3.8	3
Mar. 1-20.....		15	4.0	.06	5.5	51	25	18	8.5	0	293	11	.3	1.8	450	230	230	.5	710	3.9	4
Mar. 21-27....		--	--	--	--	--	--	--	--	0	272	11	--	4.6	410	195	195	.6	626	3.8	1
Mar. 30-Apr. 8		8.2	1.1	.04	1.4	18	7.1	3.8	2.5	0	94	3.0	.1	2.0	141	74	74	.2	230	4.0	3

Apr. 11-16, 1960.....	--	--	--	--	--	--	--	--	0	192	5.5	--	3.8	298	140	140	.7	486	3.7	1
Apr. 17-23....	--	--	--	--	--	--	--	--	0	272	8.0	--	3.0	406	190	190	1.0	620	3.6	1
Apr. 24-May 3.	--	--	--	--	--	--	--	--	0	306	9.0	--	1.9	464	225	225	1.2	722	3.5	3
May 4-9.....	--	--	--	--	--	--	--	--	0	350	10	--	2.1	528	255	255	1.5	839	3.4	3
May 11-14, 16-21.....	--	--	--	--	--	--	--	--	0	110	4.5	--	3.2	176	90	90	.5	314	4.0	3
May 22-June 7.	12	2.1	.09	3.0	36	14	11	3.4	0	204	3.0	.2	2.0	310	148	148	.9	519	3.4	4
June 8-15.....	--	--	--	--	--	--	--	--	0	281	8.0	--	2.0	433	195	195	1.4	717	3.4	3
June 16-20....	--	--	--	--	--	--	--		0	176	6.0	--	1.3	282	132	132	.9	479	3.7	3
June 21-July 8	--	--	--	--	--	--	--		0	359	9.0	--	.6	512	235	235	2.3	882	3.2	1
July 9-31, Aug. 1-7....	19	8.6	1.6	7.4	73	32	33	7.5	0	477	9.0	.3	.9	638	314	314	2.6	1090	3.1	1
Aug. 8-9, 11-26.....	--	--	--	--	--	--	--	--	0	535	14	--	1.0	766	345	345	2.8	1260	3.2	1
Aug. 27-31, Sept. 1-12..	24	11	6.5	1.4	106	37	48	9.0	0	644	18	.4	1.2	945	417	417	3.0	1470	3.0	3
Sept. 15-30...	--	--	--	--	--	--	--	--	0	359	11	--	.4	526	255	255	1.8	856	3.3	3
Time-weighted average....	--	--	--	--	--	--	--	--	0	294	8.6	--	2.0	433	208	208	1.3	707	3.4	2

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

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	--	--	--	--	--	--	--	--	48	40	47	48	49	50	46	45	44	38	39	40	42	41	42	45	45	41	44	43	41	42	--	--
December	39	40	40	42	43	43	40	39	39	40	39	42	43	43	43	42	44	44	42	41	38	34	34	34	35	39	42	45	46	44	43	41
January.....	42	39	40	39	40	39	38	39	38	40	40	39	44	42	48	41	42	43	39	38	37	35	34	34	35	38	37	39	40	40	39	39
February.....	39	38	37	38	41	42	40	39	39	42	44	40	41	36	36	34	36	40	38	36	36	36	36	37	38	38	37	37	37	--	--	38
March.....	37	36	35	34	34	36	34	43	33	34	33	35	35	35	39	38	37	40	41	42	41	39	37	38	37	39	41	44	40	48	47	38
April.....	47	47	46	45	44	45	46	46	45	45	43	40	51	56	60	63	65	60	51	57	63	65	69	69	70	72	67	65	65	66	--	56
May.....	64	59	61	63	--	68	65	60	57	54	52	51	50	52	--	55	59	62	61	63	68	68	65	60	64	66	68	67	66	65	63	61
June	64	64	70	72	74	75	74	73	73	72	73	74	72	70	68	68	69	66	70	71	72	71	72	72	72	74	76	76	78	78	--	72
July.....	75	74	78	74	72	71	71	72	75	73	73	75	77	74	70	74	76	77	78	77	75	76	77	79	79	81	80	80	80	80	78	76
August.....	78	78	78	78	78	79	78	79	78	--	76	76	77	78	77	76	77	76	77	78	78	76	76	77	75	76	76	79	80	80	80	77
September.....	80	81	78	76	77	77	79	79	80	78	74	68	69	66	68	70	69	68	69	70	69	69	71	71	70	69	70	69	69	68	--	72

OHIO RIVER MAIN STEM

ALLEGHENY RIVER AT WILKINSBURG, PA.

LOCATION.--At the Wilkinsburg Nadine Road waterplant, filter plant raw-water intake, at Wilkinsburg, Allegheny County, and at mile 8.9.
RECORDS AVAILABLE.--Chemical analyses: July to December 1959.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesday and Thursdays.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.08	1.8	18	120	0.2	243	122	107	0.0	367	6.9	--	--	0.000	0.001	3
July 27-30.....	.03	.88	14	138	.3	266	132	122	.0	399	6.9	1	2	.004	.003	3
Aug. 3-6.....	.27	.67	20	141	.3	270	141	130	.0	416	6.9	2	2	.007	.003	8
Aug. 10-13.....	.06	1.1	10	161	.3	297	148	141	.0	442	6.6	2	2	.000	--	7
Aug. 17-20.....	.05	1.3	2	196	.3	329	168	166	.5	508	4.8	2	2	.003	.002	2
Aug. 24-27.....	.04	.61	23	184	.2	270	138	119	--	425	7.0	2	3	.005	.004	4
Aug. 31-Sept. 3....	.03	1.1	2	191	.2	334	166	162	.2	502	5.4	1	2	.002	.002	4
Sept. 7-10.....	.01	.94	7	158	.2	292	150	145	.1	456	6.2	--	--	--	.002	1
Sept. 14-17.....	.07	1.0	10	164	.3	287	154	146	.0	462	6.6	--	--	--	.001	8
Sept. 21-24.....	.09	1.2	12	170	.3	334	165	155	.0	496	7.2	--	--	--	--	5
Sept. 28-Oct. 1....	.03	1.1	10	198	.3	367	184	176	.0	552	6.2	--	--	--	.002	2
Oct. 5-8.....	.06	.99	20	170	.2	320	172	156	.1	521	6.5	--	--	--	.000	5
Oct. 12-15.....	.23	.43	28	74	.2	177	95	72	.0	291	6.9	--	--	--	.002	15
Oct. 19-22.....	.17	.60	24	97	.2	198	105	86	.1	314	6.8	--	--	--	.001	10
Oct. 26-29.....	.62	1.1	18	94	.2	198	106	91	.1	318	6.6	--	--	--	.000	15
Nov. 2-5.....	.33	.60	20	65	.1	135	81	64	.1	224	6.6	--	--	--	.001	20
Nov. 9-10, 12.....	.19	.54	14	61	.2	137	71	60	.0	204	6.8	--	--	--	.002	8
Nov. 16-19.....	.44	.47	20	53	.1	131	72	54	.1	212	6.9	--	--	.003	.003	21
Nov. 23-26.....	.44	.62	20	62	.2	142	78	62	.0	223	6.9	--	--	.011	.002	18
Nov. 30-Dec. 3.....	.46	.99	7	62	.1	130	69	62	.1	193	6.2	--	--	.002	.010	24
Dec. 7-10.....	.53	.74	17	58	.1	142	72	58	.0	206	6.6	--	--	--	.006	25

3-504. TYGART RIVER AT ELKINS, W. VA.

LOCATION.--At city waterplant at Elkins, Randolph County, 2.5 miles upstream from gaging station.
DRAINAGE AREA.--268 square miles upstream from waterplant; 272 square miles upstream from gaging station.
RECORDS AVAILABLE.--Water temperatures: January 1947 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 76°F several days in July and August; minimum, 34°F on several days during February and March.
EXTREMES, 1947-60.--Water temperatures: Maximum, 92°F July 22, 1952; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705. No appreciable inflow between waterplant and gaging station except during periods of heavy local rains. During flood periods part of the flow is diverted around the waterplant in a flood by-pass channel.

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

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	66	64	64	66	66	66	66	66	65	67	66	62	60	58	56	58	56	55	52	54	54	54	56	56	53	50	48	48	48	50	52	58
November	52	48	48	50	56	52	46	44	42	42	44	42	46	44	48	48	42	40	38	39	38	40	42	44	42	40	42	40	38	36	--	44
December	38	40	40	40	42	40	36	35	36	38	37	42	42	40	40	42	44	42	40	40	40	40	40	40	40	42	42	44	40	40	39	40
January	40	42	40	40	38	38	38	38	39	39	40	42	44	46	46	44	42	42	39	37	36	36	36	36	38	39	40	40	40	42	40	40
February	42	40	40	42	40	40	38	40	40	44	40	38	38	34	34	36	38	37	37	38	38	38	38	38	38	38	38	38	38	--	--	39
March	36	34	34	34	34	34	34	34	34	34	34	34	34	34	34	36	36	36	38	38	38	34	34	38	38	38	40	40	46	46	46	37
April	47	48	48	48	48	44	46	46	44	43	46	50	54	56	58	58	58	54	56	58	60	62	64	65	66	66	66	60	58	60	--	55
May	58	56	56	58	62	62	63	54	52	48	48	48	48	48	54	58	62	60	62	64	66	64	64	66	64	66	62	60	60	58	60	58
June	62	64	65	66	72	70	70	71	71	71	72	70	72	72	70	72	72	70	70	72	70	71	72	72	70	70	72	74	74	74	--	70
July	72	70	70	70	70	70	70	70	72	70	72	72	72	72	72	72	72	72	72	73	73	74	74	74	74	76	76	76	76	76	75	73
August	76	76	76	76	74	74	74	74	74	72	72	71	73	72	72	72	72	72	72	74	74	74	74	74	72	72	72	74	76	76	74	74
September	74	74	74	72	72	72	72	74	72	72	68	64	60	60	62	62	62	62	62	64	64	64	64	66	66	66	66	64	64	64	--	67

MONONGAHELA RIVER BASIN--Continued

3-605. SALEM FORK AT SALEM, W. VA.

LOCATION.--At wire-weight gage at bridge, 0.4 mile downstream from recorder gage, 0.6 mile downstream from Dog Run, 0.4 mile upstream from Cherrycamp Run, and 1.4 miles northeast of Salem, Harrison County.
DRAINAGE AREA.--8.32 square miles.
RECORDS AVAILABLE.--Sediment records: October 1954 to September 1960 (periodic).
REMARKS.--This station is operated as part of the Soil Conservation Service Salem Fork watershed demonstration project. Since September 1958 the flow above the station has been partly controlled by seven floodwater detention reservoirs with a total combined detention capacity of 376 acre-feet below the emergency spillways. There is also a municipal water-supply reservoir with a capacity of 155 acre-feet. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

Date of collection	Time (24 hour)	Water temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Percent finer than size indicated, in millimeters										Method of analysis
Oct. 5, 1959	1400			0.1	42	t											
Oct. 12	1630			.2	12	t											
Oct. 20	1645			.2	56	t											
Oct. 27	1700			1.8	10	t											
Nov. 3	1640			.7	18	t											
Nov. 10	1630			.9	14	t											
Nov. 17	1445			8.0	24	0.5											
Nov. 24	1640			14	23	.9											
Dec. 1	1130			8.0	18	.4											
Dec. 8	1605			11	18	.5											
Dec. 15	1335			9.6	11	.3											
Dec. 18	1320			21	30	1.7											
Dec. 21	1400			7.5	10	.2											
Dec. 30	1130			16	14	.6											
Jan. 5, 1960	1530			13	19	.7											
Jan. 12	1625			3.8	15	.2											
Jan. 15	0840			388	401	420											
Jan. 15	1000			302	342	279											
Jan. 19	0800			16	24	1.0											
Jan. 22	0915			8.3	16	.4											

Jan. 26, 1960.....	0915			5.2	12	0.2													
Jan. 28.....	0915			19	88	4.5													
Jan. 29.....	0900			22	16	1.0													
Feb. 2.....	0915			6.3	8	.1													
Feb. 5.....	0845			3.8	13	.1													
Feb. 9.....	0845			17	19	.9													
Feb. 11.....	0900			84	64	14													
Feb. 16.....	0845			6.3	14	.2													
Feb. 19.....	0915			39	19	2.0													
Feb. 23.....	0845			10	9	.2													
Feb. 26.....	0900			93	46	12													
Mar. 1.....	0845			11	7	.2													
Mar. 8.....	0900			6.3	8	.1													
Mar. 15.....	0845			7.8	12	.2													
Mar. 22.....	0900			16	12	.5													
Mar. 29.....	0830			43	32	3.7													
Mar. 31.....	0845			138	171	64													
Apr. 1.....	0830			41	56	6.2													
Apr. 4.....	0930			58	80	12													
Apr. 5.....	1020			44	50	5.9													
Apr. 12.....	1230			6.9	8	.1													
Apr. 19.....	0945			2.6	10	.1													
Apr. 26.....	1000			1.4	17	.1													
May 3.....	0910			2.1	24	.1													
May 10.....	1345			28	56	4.2													
May 17.....	1100			5.9	21	.3													
May 23.....	0900			62	80	13													
May 24.....	0915			20	43	2.3													
May 31.....	0845			9.2	25	.6													
June 7.....	0845			.9	18	t													

3-605. SALEM FORK AT SALEM, W. VA.--Continued

Periodic determinations of suspended-sediment discharge, water year October 1959 to September 1960--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)	Percent finer than size indicated, in millimeters										Method of analysis
June 14, 1960.....	0900			1.2	18	.1											
June 21.....	1130			.4	22	t											
June 24.....	0905			9.2	166	4.1											
June 28.....	0845			.2	12	t											
July 5.....	0850			1.5	8	t											
July 12.....	0830			.2	14	t											
July 19.....	0900			3.3	30	.3											
July 26.....	1515			1.0	16	t											
Aug. 2.....	1630			.3	17	t											
Aug. 4.....	1400			84	173	39											
Aug. 5.....	1045			41	102	11											
Aug. 8.....	0845			5.6	13	.2											
Aug. 9.....	1100			4.1	10	.1											
Aug. 16.....	1250			41	40	4.4											
Aug. 23.....	0900			14	30	1.1											
Aug. 29.....	1400			.9	20	t											
Sept. 6.....	1545			16	42	1.8											
Sept. 13.....	1400			5.2	14	.2											
Sept. 20.....	1030			4.8	8	.1											

t Less than 0.05 ton.

3-630. MONONGAHELA RIVER AT LOCK AND DAM 8, AT POINT MARION, PA.

LOCATION.--About 750 feet upstream from dam, lock and dam 8 (mile 90.8), at Point Marion, Fayette County, and 1.5 miles upstream from Cheat River.
DRAINAGE AREA.--2,720 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1955 to September 1960.
Water temperatures: October 1955 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 583 ppm Nov. 7-8; minimum, 114 ppm Dec. 1-11, 15-31.
Hardness: Maximum, 287 ppm Nov. 7-8; minimum, 64 ppm Apr. 1-19.
Specific conductance: Maximum daily, 1,060 micromhos July 17; minimum daily, 137 micromhos Dec. 17-18.
Water temperatures: Maximum, not determined; minimum, 34°F Mar. 10, 11.
EXTREMES, 1955-60.--Dissolved solids: Maximum, 620 ppm July 21-27, 29-31, 1959; minimum, 100 ppm Aug. 2-7, 9-10, 1958.
Hardness: Maximum, 287 ppm Nov. 7-8, 1959; minimum, 54 ppm June 1-10, 1956.
Specific conductance: Maximum daily, 1,200 micromhos June 19, 1958; minimum daily, 124 micromhos Aug. 7, 1958.
Water temperatures: Maximum, not determined; minimum, freezing point on many days during winter months.
REMARKS.--Values for aluminum and acidity were determined from single samples collected on Oct. 26, Nov. 9, Dec. 28, 1959, and Mar. 12, 1960, and not representative of the respective composite samples. Specific conductance and pH of daily samples available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Organics: Phenols as C_6H_5OH	Organics: Detergent (MBAS)
Oct. 1-31, 1959.....	6.6	3.7	1.5	0.50	33	12	24	1.7		0		202	8.0	0.5	0.2	0.20	281	132	132	1.8	537	3.6	1	0.20	0.0
Nov. 1-6, 9-14, 16-17.	6.6	3.3	1.4	1.6	43	14	25	2.3		0		230	10	.4	.5	.08	322	165	165	1.6	565	3.7	2	.08	.0
Nov. 7-8.....	8.5	--	2.4	2.9	77	23	49	2.8		0		406	16	.3	.8	.08	583	287	287	--	899	3.6	1	.08	.0
Nov. 18-27, 29.....	5.6	--	1.4	.9	23	8.3	11	1.4		0		112	6.0	.2	.9	.05	164	92	92	--	300	4.3	2	.05	.0
Dec. 1-11, 15-31.....	5.5	1.1	.90	1.3	17	6.1	5.5	.9		0		78	3.5	.1	1.3	.12	114	68	68	.9	216	4.4	1	.12	.0
Jan. 1-13, 15-31, 1960	6.0	--	1.9	.18	20	6.3	5.6	1.6		0		91	2.0	.1	.9	.15	140	76	76	1.1	245	4.2	2	.15	.0
Feb. 1-7, 19-21, 23, 25-27, 29.....	6.8	1.3	2.8	.37	28	7.6	9.1	.9		0		126	5.0	.2	1.0	.04	174	101	101	.6	314	4.2	2	.04	.0
Mar. 1, 3-7, 9-16, 21-23, 25-26, 28-29, 31.....	5.9	3.5	1.8	.70	31	9.4	12	1.1		0		152	5.0	.3	1.7	.07	223	116	116	1.6	390	--	2	.07	.0
Apr. 1-19.....	4.8	--	2.4	.28	17	5.3	5.3	.9		0		76	2.5	.3	1.0	.04	118	64	64	--	210	--	1	.04	.0
Apr. 20-25, 27-29.....	6.8	5.6	5.1	.18	36	12	17	1.3		0		206	4.0	.5	.3	.02	285	140	140	2.8	537	3.5	4	.02	.0
May 1-2, 6, 8-9.....	11	6.3	2.1	.91	63	20	33	1.8		0		350	7.0	.6	.3	.05	499	239	239	2.9	798	--	1	.05	.0
May 10-11, 13-25, 27-28.....	7.2	--	.08	.21	28	8.7	11	1.1		0		138	5.0	.2	.4	.05	206	106	106	--	359	--	1	.05	.0
June 1-3, 5-14.....	6.0	--	.66	.54	22	6.3	7.6	1.1		0		101	3.0	.2	.1	.03	173	81	81	.9	293	4.0	0	.03	.0
July 3-4, 6-7, 9-23, 25-28.....	9.2	4.7	1.1	1.8	67	21	38	2.4		0		362	8.0	.6	.3	.23	522	254	254	2.5	856	--	1	.23	.0
Aug. 1, 4-8, 11-13, 15	7.7	2.6	.27	.65	56	16	30	2.6		0		278	8.0	.5	.5	.20	394	206	206	1.3	668	--	2	.20	.0
Sept. 4-12, 14-17, 21.	6.7	1.6	.37	1.3	41	10	17	1.9		0		185	4.5	.2	.4	.05	293	143	143	1.4	458	--	5	.05	.0

MONONGAHELA RIVER BASIN--Continued

3-630. MONONGAHELA RIVER AT LOCK AND DAM 8, AT POINT MARION, PA.--Continued

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

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

3-690. SHAVERS FORK AT PARSONS, W. VA.

LOCATION.--At intake to industrial water-supply system, Armour Leather Company plant at Parsons, Tucker County, 0.3 mile upstream from confluence with Black Fork, and 0.4 mile downstream from gaging station.
DRAINAGE AREA.--214 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1946 to December 1948, April to September 1949, January to September 1950, October 1952 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 78°F Aug. 3-5, 16-18; minimum, 34°F Dec. 11, 14, Mar. 22-25.
EXTREMES, 1946-50, 1952-60.--Water temperatures: Maximum, 87°F Aug. 26, 1959; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

MONONGAHELA RIVER BASIN--Continued

3-716. CHEAT RIVER AT LAKE LYNN, PA.

LOCATION.--At the Lake Lynn hydroelectric plant of the West Penn Power Company at Lake Lynn, Fayette County, 3 miles upstream from the mouth, and 13.8 miles downstream from the discontinued gaging station on Cheat River near Pisgah, W. Va.
DRAINAGE AREA.--1,411 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1948 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 81°F Aug. 3-5, 30, 31; minimum, 34°F Feb. 29, Mar. 1, 2, 25.
EXTREMES, 1948-60.--Water temperatures: Maximum, 85°F July 30, 1949, July 28, 1952, and Aug. 6, 1955; minimum, 33°F several days during winter months.
REMARKS.--Records furnished by the West Penn Power Company.

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

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	72	70	--	--	72	72	72	72	71	--	--	68	64	64	62	69	68	--	67	66	68	66	66	--	--	64	64	62	62	60	--	--
November	--	60	60	59	58	56	--	--	56	54	--	52	52	--	--	52	50	49	49	49	--	--	48	48	48	--	47	--	--	44	--	--
December	43	42	42	42	--	--	40	40	38	38	38	--	--	40	43	41	41	41	--	--	41	40	39	38	--	--	--	39	40	40	40	--
January	--	--	--	38	38	39	38	39	--	--	39	40	43	41	42	--	--	45	45	41	41	38	--	--	36	36	36	36	36	--	--	--
February	37	36	35	37	38	--	--	37	37	42	40	39	--	--	--	40	39	37	38	--	--	--	36	36	35	35	--	--	34	--	--	--
March	34	34	36	36	--	--	36	36	35	37	37	--	--	36	36	36	37	37	--	--	37	38	37	36	34	--	--	38	38	40	40	--
April	42	--	--	44	44	44	45	43	--	--	45	45	46	47	--	--	--	52	54	54	56	57	--	--	62	64	60	62	63	--	--	--
May	--	62	62	63	64	64	--	--	62	58	58	56	55	--	--	54	57	57	56	62	--	--	64	63	64	66	--	--	--	--	64	--
June	65	68	70	--	--	68	70	70	72	73	--	--	73	74	73	73	73	--	--	73	72	74	73	73	--	--	74	74	75	75	--	--
July	75	--	--	--	--	74	74	74	--	--	74	76	76	74	75	--	--	76	76	76	76	76	--	--	76	78	78	78	78	--	--	--
August	77	79	81	81	81	--	--	80	80	79	80	80	--	--	80	79	78	78	79	--	--	78	78	78	76	76	--	--	80	81	81	--
September	80	80	--	--	--	79	78	78	78	--	--	76	75	74	73	72	--	--	73	71	71	70	72	--	--	72	71	70	69	--	--	--

3-750. MONONGAHELA RIVER AT CHARLEROI, PA.

LOCATION.--At Charleroi waterplant pumping station at Charleroi, Washington County, 1.1 mile upstream from gaging station, and at mile 42.6.
DRAINAGE AREA.--5,213 square miles at gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1944 to June 1953, October 1956 to September 1958, July to December 1959.
Water temperatures: October 1944 to June 1953, October 1956 to September 1958.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesdays and Thursdays. Previous chemical and temperature records collected at a point approximately 2.2 miles downstream.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.58	1.4	0	334	0.2	467	212	212	2.1	804	3.50	--	--	0.000	0.000	0
July 28-30.....	.91	1.4	0	319	.3	454	176	176	2.6	792	3.35	1	1	.000	.001	1
Aug. 3-6.....	2.2	1.7	0	368	.3	527	227	227	3.3	913	3.30	1	2	.005	.004	5
Aug. 10-13.....	.48	1.5	0	340	.3	496	210	210	2.1	808	3.45	2	2	.000	.006	2
Aug. 17-18.....	.35	1.6	0	324	.4	480	207	207	1.9	782	3.50	1	--	.009	--	5
Aug. 25-27.....	.57	1.6	0	308	.2	453	191	191	2.2	778	3.40	2	3	.005	.006	5
Sept. 1-3.....	.82	1.9	0	411	.2	596	243	243	2.7	942	3.35	2	2	.003	.001	4
Sept. 7-10.....	1.2	2.1	0	388	.2	537	241	241	2.7	900	3.30	--	--	--	.001	2
Sept. 16-17.....	.98	1.7	0	353	.2	476	225	225	2.3	811	3.45	--	--	--	.001	5
Sept. 21-24.....	1.1	1.9	0	302	.3	512	208	208	2.3	809	3.40	--	--	--	.001	2
Sept. 28-Oct. 1....	.62	1.4	0	308	.2	466	195	195	1.8	771	3.40	--	--	--	.001	5
Oct. 5-8.....	.88	1.6	0	314	.2	448	186	186	2.3	778	3.40	--	--	--	.000	3
Oct. 12-15.....	1.4	1.6	0	345	.2	503	210	210	2.4	849	3.40	--	--	--	.001	2
Oct. 19-22.....	1.3	1.6	0	358	.2	525	218	218	3.6	869	3.40	--	--	--	.000	4
Nov. 2-5.....	.26	.72	0	126	.1	180	87	87	1.8	324	4.05	--	--	--	.001	4
Nov. 9-12.....	.14	.77	0	127	.2	202	87	87	.7	331	4.00	--	--	--	.000	3
Nov. 16-19.....	.16	1.8	0	249	.2	365	188	188	1.4	590	3.70	--	--	.000	.000	14
Nov. 23-26.....	.09	1.0	0	138	.1	214	105	105	.8	348	4.05	--	--	.000	.000	10
Nov. 30-Dec. 3.....	.06	.76	0	89	.1	147	84	84	.2	235	4.5	--	--	.002	.000	24
Dec. 7-10.....	.11	.40	1	69	.1	110	58	57	.3	188	4.7	--	--	--	.000	25

MONONGAHELA RIVER BASIN--Continued

MONONGAHELA RIVER AT CLAIRTON, PA.

LOCATION.--At Clairton bridge at Clairton, Allegheny County, 3.8 miles upstream from Youghiogheny River and 4.5 miles downstream from lock and dam No. 3, and at mile 19.3.
RECORDS AVAILABLE.--Chemical analyses: July to December 1959.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesdays and Thursdays.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.11	1.6	0	336	0.5	527	225	225	1.2	753	4.15	--	--	1.31	0.880	2
July 27-30.....	.22	1.5	0	360	.3	542	229	229	1.7	810	3.75	2	2	.021	.030	5
Aug. 3-6.....	.29	1.6	0	344	.3	530	218	218	1.7	793	3.80	4	2	.238	.099	20
Aug. 10-13.....	.46	2.1	0	404	.4	611	255	255	2.4	914	3.50	2	2	.111	.145	9
Aug. 17-19.....	.16	1.4	0	300	.4	448	196	196	1.3	704	3.80	3	--	.079	--	6
Aug. 24-27.....	.16	1.9	0	352	.3	523	240	240	1.2	788	3.95	3	2	.082	.013	9
Aug. 31-Sept. 3....	.14	1.6	0	331	.3	504	214	214	1.2	744	3.80	3	3	.003	.001	8
Sept. 8-10.....	.30	2.0	0	435	.4	668	266	266	1.7	957	3.80	--	--	--	.164	2
Sept. 16-17.....	.76	2.3	0	463	.3	730	310	310	1.5	983	4.00	--	--	--	.123	9
Sept. 21-24.....	.62	2.5	0	429	.4	618	279	279	2.0	963	3.70	--	--	--	.000	8
Sept. 28-Oct. 1....	.40	1.6	0	389	.2	601	256	256	2.2	910	3.60	--	--	--	.001	6
Oct. 5-8.....	.25	2.0	0	369	.3	554	245	245	1.4	832	3.85	--	--	--	1.11	15
Oct. 12-14.....	.55	1.8	0	376	.2	556	240	240	1.4	847	3.80	--	--	--	--	15
Oct. 19-22.....	.31	1.9	0	389	.3	593	248	248	1.5	884	3.90	--	--	--	.113	15
Oct. 26-29.....	.49	1.4	0	277	.2	414	177	177	1.7	679	3.70	--	--	--	.000	10
Nov. 2-5.....	.07	.86	4	154	.2	238	114	111	.7	376	4.7	--	--	--	.002	4
Nov. 9-12.....	.12	.97	0	154	.2	240	103	103	.6	378	4.35	--	--	--	.001	6
Nov. 16-19.....	.12	1.1	0	174	.2	264	123	123	1.0	437	4.20	--	--	.013	.009	9
Nov. 23-26.....	.10	.81	0	170	.1	264	128	128	.8	394	4.25	--	--	.019	.028	9
Nov. 30-Dec. 3.....	.26	.78	2	96	.1	160	90	86	.2	249	4.9	--	--	.011	.013	44
Dec. 7-10.....	.20	.51	4	68	.1	114	60	57	.1	186	5.5	--	--	--	.010	7

MONONGAHELA RIVER BASIN--Continued

MONONGAHELA RIVER AT HAYS, PA.

LOCATION.--At Glenwood Bridge at Hays, Allegheny County, 5.2 miles downstream from gaging station at Braddock, and at mile 6.0.
DRAINAGE AREA.--7,337 square miles at gaging station.
RECORDS AVAILABLE.--Chemical analyses: July to December 1959.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesdays and Thursdays.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.05	1.3	0	284	0.4	458	197	197	0.4	657	4.5	--	--	0.000	0.001	1
July 27-30.....	.10	1.6	0	324	.4	484	206	206	1.2	703	4.10	1	2	.002	.002	4
Aug. 3-6.....	.18	1.4	0	282	.3	434	193	193	1.1	660	4.00	2	2	.001	.004	3
Aug. 10-13.....	.22	1.6	0	327	.4	480	202	202	1.6	741	3.75	2	1	.001	.003	6
Aug. 17-18.....	.27	1.7	0	344	.4	516	224	224	1.8	780	3.85	2	--	.003	a.006	4
Aug. 24-27.....	.05	1.6	0	290	.4	444	203	203	.5	658	4.40	2	2	.008	.010	4
Aug. 31-Sept. 3....	.13	1.5	0	309	.2	474	204	204	.9	704	3.85	3	3	.002	.003	6
Sept. 7-10.....	.13	1.5	0	317	.5	485	206	206	.9	718	3.95	--	--	--	.003	2
Sept. 16-17.....	.21	1.6	0	328	.2	534	216	216	.9	730	4.00	--	--	--	.003	7
Sept. 21-24.....	.25	1.9	0	349	.4	519	227	227	.9	793	4.15	--	--	--	.003	5
Sept. 28-Oct. 1....	.06	.93	0	306	.2	489	205	205	.8	706	4.40	--	--	--	.003	2
Oct. 5-8.....	.19	1.7	0	299	.2	456	205	205	1.0	695	4.00	--	--	--	.000	8
Oct. 12-14.....	.05	1.6	0	273	.2	401	194	194	.5	624	4.45	--	--	--	--	2
Oct. 19-22.....	.02	1.4	0	288	.1	446	191	191	.9	668	4.25	--	--	--	.003	6
Oct. 26-29.....	.31	1.2	0	244	.2	394	158	158	1.6	603	3.75	--	--	--	.000	10
Nov. 2-5.....	.08	.70	2	124	.1	194	94	92	.4	312	4.6	--	--	--	.053	5
Nov. 9-12.....	.35	.88	6	140	.2	228	102	97	.2	341	5.3	--	--	--	.030	4
Nov. 16-19.....	1.8	.95	2	158	.2	245	118	114	.4	392	5.1	--	--	.006	.012	9
Nov. 23-26.....	.27	1.2	0	170	.2	281	134	134	.4	423	4.6	--	--	.017	.021	12
Nov. 30-Dec. 3.....	.11	.74	4	91	.1	164	87	82	.2	241	5.9	--	--	.010	.014	24
Dec. 7-10.....	.77	.61	8	89	.1	157	78	72	.2	244	6.2	--	--	--	.035	20

a Sample collected Aug. 20, 1959.

OHIO RIVER MAIN STEM

OHIO RIVER AT BRUNOT'S ISLAND, PA.

LOCATION.--At the Duquesne Power and Light Company, Read Station, condenser water inlet, at Brunot's Island, Allegheny Island, at mile 2.3.
RECORDS AVAILABLE.--Chemical analyses: July to December 1959.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Manday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesdays and Thursdays.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^+)	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.04	1.1	17	155	0.4	291	138	124	0.0	427	6.8	--	--	--	0.002	7
July 27-30.....	.03	1.4	4	205	.4	350	164	159	.1	508	6.1	2	2	0.004	.004	4
Aug. 4, 6.....	.09	.84	2	204	--	362	167	166	.3	521	4.8	2	4	.004	.004	7
Aug. 10-13.....	.04	1.3	2	233	.4	398	175	174	.4	553	4.8	2	2	.000	.001	8
Aug. 17-20.....	.07	1.6	0	246	.4	408	190	190	.5	595	4.6	2	--	.002	.003	3
Aug. 24-27.....	.03	1.3	5	212	.3	349	170	164	.1	530	6.1	2	2	.003	.003	6
Aug. 31-Sept. 3....	.04	1.4	4	222	.2	370	179	176	.2	546	5.6	2	3	.001	.002	4
Sept. 9-10.....	.08	1.5	1	248	.2	403	191	190	.6	594	4.6	--	--	--	.001	2
Sept. 16-17.....	.09	1.2	4	226	.3	364	180	177	.1	570	5.5	--	--	--	.001	6
Sept. 21-24.....	.21	1.5	4	258	.3	407	193	190	.2	624	5.5	--	--	--	.002	5
Oct. 5-8.....	.06	1.4	5	234	.3	401	204	200	.2	607	5.7	--	--	--	.000	7
Oct. 12-15.....	.13	.70	22	110	.2	222	122	104	.1	364	6.9	--	--	--	.000	10
Oct. 19-22.....	.04	.85	12	154	.2	268	132	122	.1	418	6.5	--	--	--	.001	7
Oct. 26-29.....	.20	1.0	14	120	.2	223	118	107	.1	362	6.4	--	--	--	.005	15
Nov. 2-5.....	.23	.61	18	73	.1	145	80	65	.1	240	6.6	--	--	--	.018	20
Nov. 16-19.....	.56	.54	20	69	.2	144	79	62	.0	240	7.0	--	--	.009	.019	20
Nov. 23-24.....	.16	.90	10	102	.2	174	98	89	.0	294	6.7	--	--	.018	--	18
Nov. 30-Dec. 3.....	.23	.87	6	67	.1	134	71	64	.1	199	6.2	--	--	.012	.022	42
Dec. 7-10.....	.30	.65	8	65	.1	128	72	66	.0	206	6.7	--	--	--	.014	15

OHIO RIVER MAIN STEM--Continued

OHIO RIVER AT McKEES ROCKS, PA.

LOCATION.--At McKees Rocks Bridge, at McKees Rocks, Allegheny County, and at mile 3.3.
RECORDS AVAILABLE.--Chemical analyses: July to December 1959.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesday and Thursdays.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.07	1.3	18	182	0.4	322	150	136	a0.2	482	6.8	--	--	0.000	0.002	9
July 27-30.....	.03	1.2	6	210	.3	361	167	162	.1	528	6.4	2	2	.003	.003	4
Aug. 3-6.....	.10	1.0	4	206	.3	351	167	164	.2	527	6.2	4	2	.007	.005	6
Aug. 10-13.....	.12	1.4	1	262	.4	434	186	185	.4	615	4.8	2	2	.000	.004	5
Aug. 17-20.....	.04	1.6	2	252	.5	417	192	189	.2	622	5.4	4	2	.004	.002	5
Aug. 24-27.....	.05	1.3	5	232	.3	381	181	176	.1	570	6.0	2	3	.005	.002	5
Aug. 31-Sept. 1, 3.	.05	1.4	4	236	.3	388	182	178	.1	569	6.0	2	3	.001	.001	5
Sept. 8-10.....	.04	1.5	3	246	.4	414	196	194	.4	610	5.3	--	--	--	.002	1
Sept. 16-17.....	.21	1.4	7	255	.2	452	198	193	.2	627	5.8	--	--	--	.010	20
Sept. 21-24.....	.32	1.5	6	276	.4	470	202	197	.1	686	5.8	--	--	--	.004	10
Sept. 28-Oct. 1....	.13	1.3	10	268	.4	467	204	196	.2	677	5.9	--	--	--	.003	15
Oct. 5-8.....	.07	1.6	3	256	.3	435	211	209	.3	650	5.4	--	--	--	.000	16
Oct. 12-15.....	.18	.59	30	103	.2	223	113	88	.0	361	7.0	--	--	--	.001	15
Oct. 19-22.....	.02	.86	18	153	.2	277	136	121	.1	436	6.6	--	--	--	.004	10
Oct. 27-29.....	.28	1.2	8	130	.2	237	126	120	.2	379	6.3	--	--	--	.008	15
Nov. 2, 4-5.....	.45	.62	18	72	.1	147	77	62	.1	240	6.7	--	--	--	.018	20
Nov. 9-10, 12.....	.33	.54	16	72	.2	148	76	63	.0	222	6.8	--	--	--	.026	10
Nov. 16-19.....	.51	.51	18	70	.2	149	79	63	.1	242	6.6	--	--	.014	.017	19
Nov. 23-25.....	.37	.92	12	99	.2	185	98	88	.1	280	6.7	--	--	.028	--	17
Nov. 30-Dec. 3.....	.29	.84	8	68	.1	138	72	64	.1	204	6.3	--	--	.013	.020	44
Dec. 7-9.....	.59	.65	14	61	.1	121	70	58	.0	204	6.5	--	--	--	.020	15

a Sample collected July 21, 1959.

OHIO RIVER MAIN STEM--Continued

OHIO RIVER AT SOUTH HEIGHTS, PA.

LOCATION.--At Duquesne Power and Light Company No. 2 screen house, at South Heights, Beaver County, 1.8 miles downstream from Dashields Dam, 2.2 miles downstream from gaging station at Sewickly, and at mile 15.5.
DRAINAGE AREA.--19,500 square miles, approximately, at gaging station.
RECORDS AVAILABLE.--Chemical analyses: July to December 1959.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesdays and Thursdays.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.09	1.2	18	179	0.4	335	157	136		486	6.8	--	--	0.000	0.000	7
July 27-30.....	.13	1.5	7	210	.4	371	168	157		525	6.6	2	2	.006	.014	8
Aug. 3-6.....	.06	1.2	6	204	.4	367	172	166		541	6.5	2	2	.006	.003	8
Aug. 10-13.....	.06	1.2	7	231	.4	391	177	171		562	6.2	3	2	.000	.005	5
Aug. 17-20.....	.04	1.4	5	234	.5	389	186	182		596	6.2	2	2	.002	.003	6
Aug. 24-27.....	.03	1.6	4	261	.4	422	204	190		635	5.4	2	3	.004	.003	6
Aug. 31-Sept. 3....	.09	1.1	13	224	.4	370	178	165		560	6.6	2	3	.002	.002	9
Sept. 8-10.....	.06	1.4	8	240	.4	405	196	190		607	6.3	--	--	--	.002	2
Sept. 14-17.....	.04	1.6	6	262	.3	385	200	195		638	6.0	--	--	--	.001	10
Sept. 21-24.....	.22	1.5	14	254	.4	471	198	187		681	6.4	--	--	--	.002	9
Sept. 28-Oct. 1....	.11	1.3	14	262	.4	463	205	194		693	6.9	--	--	--	.002	10
Oct. 5-8.....	.06	1.5	7	253	.3	423	205	200		642	6.0	--	--	--	.001	10
Oct. 12-15.....	.14	.63	38	94	.3	221	114	83		371	7.0	--	--	--	.001	15
Oct. 19-22.....	.09	.96	20	150	.2	279	135	119		444	6.6	--	--	--	.004	10
Oct. 26-29.....	.09	1.2	5	195	.3	298	150	146		454	5.6	--	--	--	.018	15
Nov. 2, 4-5.....	.23	.76	14	94	.2	171	94	82		282	6.4	--	--	--	.012	15
Nov. 9-10, 12.....	.18	.68	14	81	.2	165	80	68		242	6.8	--	--	--	.009	15
Nov. 16-19.....	.39	.57	18	77	.2	164	83	68		257	6.9	--	--	.016	.016	25
Nov. 23-26.....	.11	1.0	8	126	.3	220	114	107		332	6.2	--	--	.013	.021	20
Nov. 30-Dec. 3.....	.06	.83	8	82	.1	149	81	75		230	6.2	--	--	.034	.021	56
Dec. 7-10.....	.16	.51	11	78	.1	139	85	76		236	6.4	--	--	--	.020	15

3-940. MAHONING RIVER AT LEAVITTSBURG, OHIO

LOCATION.--Temperature recorder at gaging station at highway bridge in Leavittsburg, Trumbull County, 300 feet downstream from Duck Creek, and 1.2 miles downstream from Eagle Creek.
DRAINAGE AREA.--580 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1951 to September 1953.
Water temperatures: April 1943 to December 1945, October 1946 to September 1948, unpublished; October 1948 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 78°F Aug. 31; minimum, 33°F on several days during February and March.
EXTREMES, 1948-60.--Water temperatures: Maximum, 86°F July 2, 1949; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

BEAVER RIVER BASIN--Continued

3-995. MAHONING RIVER AT LOWELLVILLE, OHIO

LOCATION.--At Washington Street bridge at Lowellville, Mahoning County, 300 feet downstream from gaging station, 1 mile upstream from Ohio-Pennsylvania State line, and 3 miles downstream from Yellow Creek.
DRAINAGE AREA.--1,076 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1951 to September 1953, October 1956 to September 1960.
Water temperatures: October 1949 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 451 ppm Apr. 23-25, 27, Apr. 29 to May 1, May 3-6, 8; minimum, 244 ppm Apr. 1-2, 5, 7-11, 13-14, 19.
Hardness: Maximum, 238 ppm Apr. 23-25, 27, Apr. 29 to May 1, May 3-6, 8; minimum, 145 ppm Apr. 1-2, 5, 7-11, 13-14, 19.
Specific conductance: Maximum daily, 816 micromhos Mar. 17; minimum daily, 207 micromhos Mar. 31.
Water temperatures: Maximum, 94°F on several days during August and September; minimum, 40°F Feb. 12.
EXTREMES, 1949-60.--Dissolved solids (1951-53, 1956-60): Maximum, 629 ppm Jan. 1-10, 1953; minimum, 145 ppm Feb. 11, 13, 15, 17, 1959.
Hardness (1951-53, 1956-60): Maximum, 328 ppm Jan. 1-10, 1953; minimum, 96 ppm Feb. 11, 13, 15, 17, 1959.
Specific conductance (1951-53, 1956-60): Maximum daily, 1,160 micromhos May 30, 1952; minimum daily, 160 micromhos Feb. 11, 1959.
Water temperatures: Maximum, 112°F Aug. 19, 1955; minimum, freezing point Dec. 5, 1950.
REMARKS.--Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. Water temperature affected by cooling water return from steel mills. Temperature record once-daily measurement Oct. 1 to June 29; continuous ethyl alcohol-actuated thermograph July 13 to Sept. 30. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Nitrite (NO_2)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)	Ammonia nitrogen as NH_4
																			Calcium, magnesium	Noncarbonate						
Oct.1-3,5-6, 8-9,11-18, 20-31,23-24,26-29, 31, 1959..	1030	9.9		0.21		50	11	17	5.0	0.90	94		102	18	0.6	5.9	1.50	280	170	93		452	7.2	12	0.20	0.2
Nov.1-4,6-7, 9-11,13, 15-16,18, 22-25, 28-30.....	1287	11		.29		50	12	18	6.0	7.0	80		128	20	.5	.0	.45	292	175	109		476	7.0	12	.30	1.9
Dec.1,3-4, 6-8,25,27, 29-30.....	2238	9.4		--		50	12	19	6.3	.05	78		130	21	.5	3.8	.30	310	175	111		485	6.8	25	.30	2.6
Jan.1,3,5,7, 11-12,14, 16,21,23, 26,28, 31, 1960..	2099	8.1		--		48	11	17	6.5	.15	66		129	19	.6	1.4	.15	279	165	111		450	6.6	25	.20	2.4

Feb.1-2,4,6-7,9,12,14,16,18,21-28, 1960..	1655	8.5		--	0.40	50	11	20	5.8	1.60	48		144	24	.5	6.0	.60	305	170	131		474	6.7	7	.20	1.9
Mar.1,3-4,6,8-10,12,14,16-21,23,25,27,29-31.....	1972	9.4		--		62	14	34	9.8	.05	56		190	43	.8	26	.15	426	212	166		644	6.7	4	.30	4.6
Apr. 1-2,5,7-11,13-14, 19....	2388	7.8		--		40	11	14	4.7	.00	56		105	17	.4	3.0	.30	244	145	99		394	--	6	.20	1.8
Apr.23-25,29-May 1,3-6,8.....	465	8.0		--		69	16	32	11	.80	62		222	39	.8	.0	.30	451	238	187		703	6.6	6	.50	7.4
May 10-11,13-17,19-22,24-25..	1360	7.5		--		42	9.9	17	5.2	.40	66		108	19	.6	.0	.20	260	146	92		423	--	25	.40	3.1
June 6-9,11-14,16-19,21-23,26-30.....	724	8.6		--		54	13	24	7.1	2.0	70		150	26	.6	2.4	.30	329	188	131		527	--	20	.40	3.8
July 22-26,28,30-31..	582	7.8		--		52	12	25	6.6	1.2	52		159	29	.6	.8	.30	321	179	137		533	--	10	.30	4.6
Aug.1-13,15-27,30-31..	669	7.9		--		55	9.8	26	6.5	.04	64		142	27	.5	5.8	.25	333	178	125		517	--	10	.20	3.0
Sept.1-10,12-25,27-30	435	9.2		--		62	13	30	7.7	.04	72		176	31	.6	2.8	.25	383	208	149		618	--	25	.40	6.8
Weighted average..	--	8.9		--		52	12	22	6.6	1.1	67		140	25	0.6	6.4	0.40	318	177	122		502	--	14	0.30	2.9
Time-weighted average a	1220	8.9		--	--	53	12	23	6.8	1.1	68		145	26	0.6	5.2	0.42	329	183	127		520	--	14	0.30	3.3
Tons per day.....	--	29		--	--	170	39	72	22	3.52	221		461	82	2.0	21	1.30	1050	--	--		--	--	--	0.90	--

a Represents 63 percent of the days and 63 percent of the discharge.

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BEAVER RIVER BASIN--Continued

3-995. MAHONING RIVER AT LOWELLVILLE, OHIO--Continued

Analyses of additional samples

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Nitrite (NO_2)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^+	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)	Ammonia nitrogen as NH_4
																			Calcium, magnesium	Noncarbonate						
Dec. 22 ,1959	179		0.5	34	0.20																0.9					
Jan. 8, 1960.	73		.5	31	.19																1.4					

3-995. MAHONING RIVER AT LOWELLVILLE, OHIO--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement at 4 p.m. Oct. 1 to June 29; continuous ethyl-alcohol actuated thermograph July 13 to Sept. 30)

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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Minimum	70	69	70	---	69	70	---	65	69	---	---	64	63	63	62	62	62	62	---	61	60	---	61	58	---	55	53	55	55	---	58	---
November	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Minimum	56	55	54	55	---	53	51	---	56	51	54	---	67	---	50	58	---	58	---	---	---	59	---	63	60	---	---	58	48	51	---	---
December	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Minimum	53	---	58	52	---	53	48	49	---	55	54	45	---	---	---	45	51	---	---	---	55	57	---	---	56	---	61	---	50	60	---	---
January	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Minimum	55	---	48	---	48	---	45	47	---	---	57	53	---	45	---	48	---	---	---	---	50	---	52	---	---	52	---	53	---	---	43	---
February	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Minimum	52	54	53	53	---	50	51	---	47	---	---	40	---	43	---	46	---	45	---	---	47	48	55	55	53	53	---	55	---	---	---	---
March	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Minimum	53	---	43	49	---	60	---	62	63	59	---	55	---	60	---	---	70	65	65	63	62	---	61	---	64	---	70	---	---	---	---	---
April	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Minimum	52	62	---	---	50	---	52	42	45	48	---	---	60	56	---	---	---	---	58	---	---	---	92	89	---	---	91	---	---	89	---	---
May	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Minimum	86	---	87	82	90	---	---	76	---	58	58	---	58	65	72	74	75	---	76	83	83	83	---	74	---	---	---	---	---	---	---	---	---
June	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Minimum	---	---	---	---	---	83	84	83	86	---	82	77	78	---	---	83	79	83	84	---	85	89	90	---	---	91	91	91	93	---	---	---
July	---	---	---	---	---	---	---	---	---	---	---	---	---	89	87	86	86	86	86	86	86	87	87	87	87	88	88	86	87	88	88	---
Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	87	85	86	86	86	86	86	86	86	87	87	87	87	84	86	86	87	87	---
Minimum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
August	87	87	86	86	86	86	86	89	91	91	93	93	92	92	90	94	94	94	94	93	92	90	90	90	90	91	91	91	92	92	92	90
Maximum	87	86	85	86	86	86	82	81	89	90	89	90	91	90	90	90	91	91	91	91	89	89	89	88	88	88	90	90	90	85	90	88
Minimum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
September	92	93	92	90	89	89	92	94	94	91	89	87	87	88	88	90	88	86	86	86	89	90	90	89	87	88	89	89	89	88	---	89
Maximum	89	90	89	88	88	87	88	90	91	89	87	87	85	84	85	87	86	85	85	86	86	87	87	87	85	86	87	87	87	84	---	87
Minimum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

BEAVER RIVER BASIN--Continued

3-1075. BEAVER RIVER AT BEAVER FALLS, PA.

LOCATION.--At gaging station at pumping station of Eastvale Waterplant at Beaver Falls, Beaver County, 5.5 miles upstream from mouth, and 7 miles downstream from Connoquenessing Creek.
DRAINAGE AREA.--3,106 square miles.
RECORDS AVAILABLE.--Chemical analyses: July to December 1959.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesdays and Thursdays. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.07	0.00	72	87	0.4	247	144	83		356	7.5	--	--	0.003	0.001	8
July 27-30.....	.05	.01	75	78	.4	234	134	69		322	7.5	6	6	.003	.001	12
Aug. 3-6.....	.24	.03	78	69	.4	211	134	68		334	7.6	7	7	.008	.004	9
Aug. 10-13.....	.18	.09	84	83	.4	249	150	80		367	7.5	6	7	.001	.005	14
Aug. 17-20.....	.09	.02	80	87	.6	246	150	81		382	7.5	6	6	.005	.003	9
Aug. 24-27.....	.03	.00	81	90	.4	252	156	86		384	7.3	6	7	.006	.005	8
Aug. 31-Sept. 3....	.06	.03	81	96	.4	255	151	81		388	7.5	6	7	.002	.001	8
Sept. 7-10.....	.03	.05	89	83	.5	237	148	75		374	7.3	--	--	--	.004	2
Sept. 16-17.....	.11	.20	86	90	.4	240	149	78		374	7.2	--	--	--	.002	10
Sept. 21-24.....	.20	.05	90	89	.4	249	154	80		404	7.4	--	--	--	.003	7
Sept. 28-Oct. 1....	.05	.09	93	91	.7	268	156	80		411	7.5	--	--	--	.002	10
Oct. 5-8.....	.09	.15	76	92	.3	233	148	86		383	7.0	--	--	--	.000	25
Oct. 12-15.....	.22	.05	71	85	.6	226	140	82		344	7.2	--	--	--	.001	9
Oct. 19-22.....	.22	.08	96	131	.5	279	198	120		444	7.4	--	--	--	.003	8
Oct. 26-29.....	.28	.16	70	87	.4	221	148	90		348	7.2	--	--	--	.000	15
Nov. 2-5.....	.20	.09	68	91	.4	220	140	84		349	7.0	--	--	--	.001	15
Nov. 9-12.....	.31	.10	71	85	.2	227	139	81		338	7.5	--	--	--	.003	8
Nov. 16-19.....	.62	.14	60	90	.3	220	139	90		343	7.0	--	--	.018	.001	20
Nov. 23-26.....	.71	.26	64	112	.6	279	162	110		412	7.2	--	--	.000	.001	19
Nov. 30-Dec. 3.....	.57	.24	46	81	.3	208	121	83		309	7.0	--	--	.041	.029	19
Dec. 7-10.....	.63	.08	49	84	.2	194	133	93		320	7.0	--	--	--	.009	15

OHIO RIVER MAIN STEM

OHIO RIVER AT MIDLAND, PA.

LOCATION.--At raw-water intake of the Midland Water Company, at Midland, Beaver County and at mile 36.3.
RECORDS AVAILABLE.--Chemical analyses: July to December 1959.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesdays and Thursdays.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.03	0.35	22	166	0.4	308	157	137		462	7.0	--	--	0.001	0.002	3
July 27-30.....	.17	.24	26	178	.4	339	160	137		494	7.1	3	3	.001	.004	4
Aug. 3-6.....	.05	.94	16	188	.5	322	168	151		507	6.9	3	3	.004	.004	4
Aug. 10-11.....	.03	.44	20	197	.4	384	170	152		525	6.9	4	--	.000	--	4
Aug. 19.....	.06	.54	19	204	.3	364	180	165		552	6.6	--	--	--	--	3
Aug. 24-26.....	.05	.63	14	214	.4	382	189	175		560	6.6	3	--	.005	--	4
Aug. 31-Sept. 3....	.08	.65	19	214	.4	382	179	163		562	7.1	3	3	.002	.002	4
Sept. 7-10.....	.02	.61	22	204	.5	358	182	164		547	6.7	--	--	--	.003	1
Sept. 17.....	.07	.64	22	212	--	382	196	178		562	6.5	--	--	--	.004	6
Sept. 21-24.....	.13	.55	20	208	.4	368	190	174		575	6.7	--	--	--	.002	6
Sept. 30-Oct. 1....	.08	.03	25	216	.4	410	189	169		610	6.7	--	--	--	.001	3
Oct. 5, 7-8.....	.05	1.0	18	233	.4	405	201	186		617	6.4	--	--	--	.000	7
Oct. 12-13, 15.....	.03	.19	44	116	.3	262	142	106		428	7.1	--	--	--	.000	10
Oct. 19-22.....	.08	.36	36	115	.3	253	130	101		408	6.9	--	--	--	.004	8
Oct. 26-29.....	.14	.81	23	146	.3	275	144	125		422	6.5	--	--	--	.004	15
Nov. 2-5.....	.23	.45	26	90	.2	182	102	80		299	6.6	--	--	--	.003	10
Nov. 9-12.....	.02	.15	23	72	.2	158	76	57		244	7.0	--	--	--	.010	10
Nov. 16-19.....	.46	.37	28	83	.5	180	103	80		290	6.6	--	--	.005	.007	21
Nov. 24, 26.....	.47	.62	22	110	.6	225	122	102		342	6.7	--	--	.006	.018	22
Nov. 30-Dec. 3.....	.24	.68	16	70	.6	154	85	72		236	6.6	--	--	.017	.012	84
Dec. 10.....	.60	.46	18	71	1.0	159	91	76		268	6.5	--	--	--	.024	20

OHIO RIVER MAIN STEM--Continued

OHIO RIVER AT WEIRTON, W. VA.

LOCATION.--At Weirton waterplant raw-water intake, at Weirton, Hancock County, 1.5 miles downstream from Kings Creek, and at mile 61.8.
RECORDS AVAILABLE.--Chemical analyses: July to December 1959.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesdays and Thursdays.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.05	0.07	27	161	0.5	308	156	133		449	7.1	--	--	0.000	0.007	10
July 27-30.....	.04	.24	30	165	.4	333	161	132		474	7.2	3	4	.005	.004	14
Aug. 3-6.....	.05	.42	28	176	.5	340	164	139		482	7.2	4	2	.004	.004	10
Aug. 10-13.....	.09	.43	25	190	.5	371	173	150		514	7.0	3	3	.001	.002	7
Aug. 17-20.....	.03	.11	28	188	.5	355	177	151		522	7.0	3	4	.003	.002	5
Aug. 24-27.....	.02	.48	23	206	.4	374	188	167		551	6.8	4	3	.002	.004	8
Aug. 31-Sept. 3....	.04	1.2	13	242	.4	435	204	191		612	6.9	3	3	.003	.001	10
Sept. 7-10.....	.03	.47	31	186	.4	348	179	154		544	7.0	--	--	--	.004	2
Sept. 16-17.....	.06	.89	25	197	.3	381	192	172		553	6.7	--	--	--	.010	10
Sept. 21-24.....	.14	.18	25	214	.5	367	195	175		581	6.8	--	--	--	.005	9
Sept. 28-Oct. 1....	.10	.03	26	203	.4	380	189	168		579	6.9	--	--	--	.003	8
Oct. 5-8.....	.07	.50	30	213	.4	389	200	176		606	6.6	--	--	--	.002	20
Oct. 12-15.....	.04	.61	38	142	.3	298	160	129		474	6.8	--	--	--	.000	10
Oct. 19-22.....	.12	.16	46	101	.2	242	130	92		395	7.1	--	--	--	.002	15
Oct. 26-29.....	.14	1.0	21	164	.3	290	152	135		460	6.5	--	--	--	.008	15
Nov. 2-5.....	.23	.74	22	100	.2	194	103	85		318	6.5	--	--	--	.001	15
Nov. 9-12.....	.18	.37	22	74	.2	163	86	68		242	7.0	--	--	--	.004	20
Nov. 16-19.....	.40	.41	23	89	.2	182	100	80		290	6.6	--	--	.004	.009	20
Nov. 23-26.....	.34	.70	20	105	.3	204	110	93		318	6.7	--	--	.013	.012	22
Nov. 30-Dec. 3.....	.16	.74	16	80	.2	166	88	75		248	6.5	--	--	.011	.018	79
Dec. 7-10.....	.42	.53	20	76	.2	157	89	72		251	6.7	--	--	--	.021	30

OHIO RIVER MAIN STEM--Continued

3-1096. OHIO RIVER AT EAST LIVERPOOL, OHIO

LOCATION.--At East Liverpool waterplant raw-water intake, at East Liverpool, Columbiana County, and at mile 40.2.
RECORDS AVAILABLE.--Chemical analyses: July to December 1959.
REMARKS.--The 1959 national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesdays and Thursdays.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.02	0.30	26	164	0.5	319	165	141		461	7.1	--	--	0.004	0.000	6
July 27-30.....	.05	.51	31	174	.4	312	165	136		493	7.3	3	3	.004	.007	6
Aug. 3-6.....	.05	.55	24	176	.4	323	167	144		488	7.1	3	3	.004	.003	6
Aug. 10-13.....	.11	.38	25	190	.4	364	175	152		519	7.1	4	3	.000	.004	6
Aug. 17-20.....	.19	.40	19	197	.5	368	182	161		534	6.8	3	3	.003	.004	4
Aug. 24-27.....	.04	.93	12	211	.4	377	191	171		563	6.8	3	3	.002	.003	4
Aug. 31-Sept. 3....	.02	.65	19	217	.4	377	184	164		563	7.0	4	4	.001	.001	4
Sept. 7-10.....	.02	.47	25	198	.7	366	184	164		549	6.7	--	--	--	.004	1
Sept. 16-17.....	.04	.71	23	218	.3	382	198	179		568	6.6	--	--	--	.002	7
Sept. 21-24.....	.12	.54	24	208	.5	390	188	169		575	6.8	--	--	--	.023	6
Sept. 28-Oct. 1....	.02	.05	26	217	.4	400	193	172		604	6.7	--	--	--	.005	6
Oct. 5-8.....	.06	1.0	32	229	.4	406	204	178		625	6.6	--	--	--	.000	10
Oct. 12-14.....	.02	.34	45	115	.3	263	144	107		430	7.0	--	--	--	--	10
Oct. 15.....	--	--	--	--	--	--	--	--		--	--	--	--	--	.001	--
Oct. 20-22.....	.09	.44	40	119	.2	256	136	103		415	7.1	--	--	--	.001	8
Oct. 26-29.....	.20	.92	24	148	.3	273	148	129		429	6.5	--	--	--	.001	15
Nov. 2-5.....	.19	.39	26	90	.2	183	100	78		297	6.6	--	--	--	.014	15
Nov. 9-12.....	.16	.18	26	74	.2	169	89	68		252	7.1	--	--	--	.005	20
Nov. 16-19.....	.53	.34	30	81	.2	172	102	77		281	6.7	--	--	.022	.024	19
Nov. 23-26.....	.46	.51	24	108	.3	220	117	96		326	6.8	--	--	.021	.030	18
Nov. 30-Dec. 3.....	.33	.51	14	69	.2	150	82	69		224	6.7	--	--	.025	.019	59
Dec. 7, 8, 10.....	.60	.20	25	71	.2	150	87	66		251	6.7	--	--	--	.029	20

OHIO RIVER MAIN STEM--Continued

OHIO RIVER AT WHEELING, W. VA.

LOCATION.--At Wheeling waterplant raw-water intake at Wheeling, Ohio County, 9.6 miles upstream from gaging station at Bellaire, Ohio, and at mile 86.8.
RECORDS AVAILABLE.--Chemical analyses: July to December 1960.
REMARKS.--The national steel strike (July 15 to Nov. 7, 1959) was in effect during most of the sampling period. Daily samples were collected Monday through Thursday each week. Analyses for phenol and oxygen consumed were made on samples collected on Tuesdays and Thursdays.

Chemical analyses, in parts per million, July to December 1959

Date of collection	Iron (Fe)	Manganese (Mn)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity (H^{+1})	Specific conductance (micromhos at 25°C)	pH	Oxygen consumed		Phenols as C_6H_5OH		Turbidity
							Calcium, magnesium	Noncarbonate				Tuesday	Thursday	Tuesday	Thursday	
July 21-23, 1959...	0.07	0.18	27	157	0.5	297	163	138		446	7.1	--	--	0.000	0.001	9
July 27-30.....	.08	.74	26	172	.5	334	168	144		478	7.2	3	4	.002	.008	11
Aug. 3-6.....	.09	.61	28	182	.5	345	174	149		514	7.2	4	4	.005	.002	15
Aug. 10-13.....	1.2	.68	23	201	.6	387	182	162		523	7.0	5	7	.001	.002	9
Aug. 17-20.....	.18	.49	22	208	.6	377	190	169		557	7.0	3	4	.003	.001	7
Aug. 24-27.....	.04	.41	24	209	.5	366	192	170		554	6.9	3	4	.002	.001	7
Aug. 31-Sept. 3....	.07	1.0	14	244	.4	416	203	190		610	6.9	4	3	.002	.001	8
Sept. 8-10.....	.05	.46	22	205	.8	388	202	184		597	7.0	--	--	--	.002	3
Sept. 16-17.....	.11	.49	24	214	.5	391	200	181		585	6.6	--	--	--	.003	7
Sept. 21, 23-24....	.23	1.0	20	226	.6	385	208	192		601	6.8	--	--	--	.009	8
Sept. 28-Oct. 1....	.17	.24	19	230	.6	411	208	193		613	6.8	--	--	--	.002	6
Oct. 5-8.....	.20	.36	22	226	.4	403	201	183		624	6.5	--	--	--	.000	8
Oct. 12-15.....	.25	1.1	24	184	.3	348	181	161		541	6.7	--	--	--	.003	9
Oct. 19-22.....	.32	.34	40	118	.3	259	142	109		419	6.9	--	--	--	.001	9
Oct. 26-29.....	.25	1.1	20	166	.3	298	154	138		467	6.5	--	--	--	.001	30
Nov. 2-5.....	.25	.55	20	112	.2	210	113	96		342	6.5	--	--	--	.003	15
Nov. 9-12.....	.37	.47	22	78	.2	168	84	66		251	7.2	--	--	--	.018	20
Nov. 16-19.....	.38	.51	20	94	.2	189	102	84		300	6.5	--	--	.002	.006	16
Nov. 23-26.....	.42	.73	22	102	.2	211	108	90		318	6.7	--	--	.011	.017	18
Nov. 30-Dec. 3.....	.22	.78	14	79	.2	162	89	76		244	6.5	--	--	.016	.034	80
Dec. 7-10.....	.39	.44	20	80	.2	163	94	78		261	6.7	--	--	--	.037	30

3-1097. OHIO RIVER AT LOCK AND DAM 8, AT NEWELL, W. VA.

LOCATION.--About 1,000 feet upstream from dam, lock and dam 8 (mile 46.4) at Newell, Hancock County, 2,500 feet upstream from Rowes Run, and 3,300 feet downstream from Muckmores Run.
DRAINAGE AREA.--23,500 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1954 to September 1960.
Water temperatures: October 1954 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 368 ppm Sept. 1-10; minimum, 82 ppm Mar. 25-31.
Hardness: Maximum, 185 ppm Aug. 1, 5-31; minimum, 46 ppm Mar. 25-31.
Specific conductance: Maximum daily, 581 micromhos Sept. 10; minimum daily, 133 micromhos Apr. 2.
Water temperatures: Maximum, 86°F Aug. 7, 8; minimum, freezing point on several days during February.
EXTREMES, 1954-60.--Dissolved solids: Maximum, 504 ppm Oct. 21-23, 30-31, 1957; minimum, 82 ppm Mar. 25-31, 1960.
Hardness: Maximum, 246 ppm Oct. 20-23, 30-31, 1957; minimum, 46 ppm Mar. 25-31, 1960.
Specific conductance: Maximum daily, 797 micromhos Oct. 15, 1957; minimum daily, 133 micromhos Apr. 2, 1960.
Water temperatures: Maximum, 88°F July 31, 1955; minimum, freezing point on many days during winter months.
REMARKS. Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphorus as (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
															Calcium, magnesium	Noncarbonate				
Oct. 1-31, 1959.....	8.2	0.16	0.47	42	12	31	2.9	32	155	24	0.4	2.4	0.14	295	155	129	482	6.7	3	0.1
Nov. 1-30.....	6.6	.40	.40	28	8.0	17	2.1	17	97	14	.2	2.8	.20	191	103	89	312	6.6	3	.1
Dec. 1-31.....	7.1	1.9	.29	23	6.7	10	.9	12	80	11	.1	3.4	.02	154	85	75	255	6.4	2	.0
Jan. 1-18, 20-31, 1960	6.3	.79	.59	24	6.4	12	1.4	11	87	12	.1	3.9	.10	162	86	78	265	6.3	3	.1
Feb. 1-17, 20-29.....	6.2	1.4	.19	26	7.8	12	1.9	11	93	11	.2	3.8	.10	155	97	88	272	--	2	.0
Mar. 1-13, 15-24.....	6.4	2.4	.85	35	11	19	2.4	10	136	16	.1	5.3	.12	236	133	125	380	--	2	.1
Mar. 25-31.....	6.7	1.8	.31	12	3.8	5.3	1.1	12	38	6.3	.1	3.6	.17	82	46	36	138	--	5	.0
Apr. 12-30.....	5.6	.39	.15	23	7.0	12	1.7	14	80	11	.2	3.7	.09	155	86	75	258	--	4	.1
May 1-6, 12-31.....	6.6	.74	.12	26	6.5	12	1.7	13	95	11	.2	2.5	.05	172	92	81	289	--	1	.0
June 1-30.....	8.9	.53	.54	27	8.5	17	1.9	15	106	12	.3	3.6	.16	204	103	90	322	--	4	.1
July 1-31.....	8.7	.31	.75	40	11	23	2.9	14	150	20	.4	5.3	.30	287	145	134	424	--	4	.1
Aug. 1, 5-31.....	9.1	.23	1.2	51	14	34	3.3	8	202	22	.5	4.7	--	350	185	178	547	--	3	.1
Sept. 1-10.....	8.0	.14	.91	51	13	34	3.5	11	202	24	.5	6.3	.09	368	181	172	561	--	5	.1
Sept. 11-20.....	7.9	.26	1.1	48	13	35	3.4	4	206	20	.4	6.6	.12	362	174	171	542	--	4	.1
Sept. 21-30.....	7.5	.18	.80	42	11	25	3.0	0	172	16	.4	4.4	.08	315	150	150	466	--	5	.2
Time-weighted average.....	7.4	0.78	0.54	33	9.2	19	2.2	14	122	15	0.3	3.9	0.12	226	119	108	360	--	3	0.1

OHIO RIVER MAIN STEM--Continued

3-1097. OHIO RIVER AT LOCK AND DAM 8, AT NEWELL, W. VA.--Continued

Analyses of additional samples

Date of collection	Aluminum (Al)	Total acidity (H^{+1})	Nickel (Ni)	Copper (Cu)	Lead (Pb)	Zinc (Zn)	Cobalt (Co)	Arsenic (As)	Cadmium (Cd)	Total chromium (Cr^{6})
Feb. 1-7, 1960..	0.0	--	0.00	0.00	0.00	0.00	0.00	0.00	0.1	0.00
Mar. 17-24.....	--	0.2	.00	.00	.00	.25	.00	.00	.0	.00
June 1-6.....	.1	.1	.00	.00	.00	.11	.00	.00	.0	.00
Aug. 6-9.....	.2	.0	.10	.00	.00	.00	.00	.00	.0	.00
Sept. 24-26.....	.5	.4	.00	.01	.00	.60	.00	.00	.1	.00

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

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

MUSKINGUM RIVER BASIN

3-1290. TUSCARAWAS RIVER AT NEWCOMERSTOWN, OHIO

LOCATION.--At gaging station on right bank at downstream side of highway bridge, 0.8 mile south of Newcomerstown, Tuscarawas County, 2 miles upstream from Buckhorn Creek, and 4 miles downstream from Dunlap Creek.
DRAINAGE AREA.--2,436 square miles.
RECORDS AVAILABLE.--Chemical analyses: July 1946 to September 1948, October 1955 to September 1957.
Chloride and specific conductance: July 1946 to May 1949, October 1957 to September 1960.
Hardness: October 1957 to September 1960.
Water temperatures: July 1946 to May 1949, October 1955 to September 1960.
EXTREMES, 1959-60.--Hardness: Maximum, 1,010 ppm Oct. 25; minimum, 134 ppm Mar. 31.
Specific conductance: Maximum daily, 3,260 micromhos Oct. 25; minimum daily, 347 micromhos Mar. 31.
Water temperatures: Maximum, 82°F July 25, 27, 29; minimum, freezing point on several days during December, January and March.
EXTREMES, 1946-49, 1955-60.--Hardness (1946-48, 1955-60): Maximum, 1,780 ppm Oct. 20, 1955; minimum, 91 ppm Jan. 23, 1959.
Specific conductance: Maximum daily, 6,530 micromhos Sept. 21, 1948; minimum daily, 232 micromhos May 9, 1947.
Water temperatures: Maximum, 86°F Aug. 22, 1959; minimum, freezing point on many days during winter months.
REMARKS.--Ohio Canal diverts small amount of water from river at Portage Lake, 3 miles south of Akron. Part of diverted water goes into the Cuyahoga River basin. Flow regulated by 8 flood control reservoirs. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

Chloride, in parts per million, water year Ocotber 1959 to September 1960

Day	October	November	December	January	February	March	April	May	June	July	August	September
1.....	540	370	90	134	182	166	23	240	260	430	430	480
2.....	740	435	98	154	220	178	30	240	390	360	360	430
3.....	94	320	102	143	300	190	46	230	310	480	205	430
4.....	120	275	219	135	302	355	70	290	320	360	230	710
5.....	260	230	107	59	231	375	85	260	320	250	390	470
6.....	360	295	152	65	280	146	63	400	330	300	380	240
7.....	290	250	186	94	242	192	56	380	340	190	320	270
8.....	330	155	106	125	--	190	66	220	420	160	320	500
9.....	106	165	132	174	--	312	69	220	350	210	400	510
10.....	86	155	151	163	--	146	86	210	300	260	420	500
11.....	76	175	--	180	--	215	87	96	320	330	390	520
12.....	79	185	133	166	--	200	91	290	320	370	350	540
13.....	120	192	57	150	72	201	148	210	380	450	420	590
14.....	200	210	28	43	107	236	180	190	220	440	460	620
15.....	230	258	33	49	134	262	172	200	81	420	480	610

MUSKINGUM RIVER BASIN--Continued

3-1290. TUSCARAWAS RIVER AT NEWCOMERSTOWN, OHIO--Continued

Chloride, in parts per million, water year October 1959 to September 1960--Continued

Day	October	November	December	January	February	March	April	May	June	July	August	September
16.....	310	190	61	69	168	245	146	200	114	410	470	580
17.....	370	125	94	58	182	288	162	220	156	410	490	610
18.....	270	145	131	67	191	261	145	210	135	540	520	580
19.....	300	145	161	95	242	215	133	210	146	500	560	590
20.....	360	140	194	115	202	195	185	200	222	250	640	620
21.....	570	205	210	98	210	194	168	240	280	400	640	640
22.....	550	205	204	108	155	225	180	230	190	375	360	620
23.....	570	230	220	116	210	172	190	240	220	200	220	650
24.....	680	210	259	143	222	186	200	260	280	190	440	630
25.....	900	200	270	149	265	258	200	460	360	240	380	620
26.....	270	220	234	150	262	205	180	240	300	250	360	630
27.....	280	95	195	185	242	200	220	220	280	310	400	690
28.....	310	98	170	212	172	149	240	260	300	400	350	720
29.....	340	70	150	212	158	54	240	260	340	420	330	700
30.....	290	75	109	240	--	35	260	260	360	480	380	640
31.....	300	--	152	132	--	20	--	230	--	580	420	--
Average	332	200	146	128	206	202	137	245	278	353	403	564

3-1290. TUSCARAWAS RIVER AT NEWCOMERSTOWN, OHIO--Continued

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

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	700	550	245	296	360	343	160	423	416	588	512	552
2	830	590	255	322	390	350	189	427	508	504	506	528
3	276	476	255	292	465	359	166	394	444	614	430	514
4	319	430	372	255	462	521	196	453	460	483	398	706
5	425	388	277	189	426	518	200	431	464	387	535	522
6	539	414	316	207	444	331	197	560	499	433	556	384
7	438	374	338	246	424	377	191	546	505	334	431	408
8	463	282	257	280	--	362	203	406	568	330	428	584
9	275	346	282	307	--	501	199	402	508	386	506	620
10	228	324	314	329	--	355	216	358	436	433	534	588
11	221	344	--	347	--	412	214	265	460	492	503	630
12	243	352	278	329	--	406	245	408	462	536	484	640
13	299	364	202	313	184	393	314	339	512	610	543	680
14	374	380	157	178	219	433	342	327	380	600	568	664
15	414	426	162	175	262	452	340	353	218	576	590	662
16	480	356	192	195	307	435	328	339	224	588	578	654
17	517	296	229	188	320	471	338	368	272	581	607	696
18	450	316	275	213	341	450	321	364	273	668	639	654
19	472	302	309	243	399	405	318	368	292	604	662	658
20	519	306	357	257	366	390	372	366	369	434	668	692
21	693	364	375	242	381	372	358	394	412	570	666	716
22	698	360	370	273	337	405	372	396	344	492	516	724
23	713	386	390	294	399	346	382	407	388	336	357	748
24	819	354	435	316	403	364	386	439	448	346	562	706
25	1010	356	451	321	437	427	390	545	484	395	470	702
26	437	372	433	329	441	369	362	401	440	432	460	708
27	437	252	390	358	398	364	409	387	424	468	516	740
28	468	254	356	391	328	284	413	432	443	560	491	724
29	477	211	325	383	339	161	413	434	474	580	479	740
30	454	220	270	397	--	135	433	430	511	604	520	712
31	468	--	297	300	--	134	--	395	--	656	576	--
Average	488	358	305	282	368	375	298	405	421	503	525	641

MUSKINGUM RIVER BASIN--Continued

3-1290. TUSCARAWAS RIVER AT NEWCOMERSTOWN, OHIO--Continued

Specific conductance, in micromhos at 25°C, water year October 1959 to September 1960

Day	October	November	December	January	February	March	April	May	June	July	August	September
1.....	2280	1710	669	832	1030	989	403	1280	1280	1870	1810	2020
2.....	2760	1890	718	921	1160	1020	473	1310	1660	1610	1650	1810
3.....	767	1510	736	860	1410	1070	452	1210	1440	2000	1280	1800
4.....	890	1360	1130	774	1410	1580	553	1400	1470	1570	1220	2610
5.....	1290	1190	790	514	1250	1600	590	1290	1450	1250	1740	1920
6.....	1630	1370	915	548	1350	955	543	1760	1560	1380	1760	1240
7.....	1360	1240	1020	677	1270	1100	514	1720	1570	1020	1440	1350
8.....	1480	925	718	831	--	1060	560	1240	1830	957	1440	2020
9.....	788	969	810	986	--	1500	562	1210	1590	1150	1730	2140
10.....	651	981	899	965	--	1010	615	1100	1400	1310	1830	2090
11.....	625	1040	--	1020	--	1230	625	732	1520	1530	1730	2180
12.....	662	1090	841	997	--	1190	682	1280	1520	1680	1610	2260
13.....	839	1120	523	908	528	1180	904	1030	1700	1920	1810	2350
14.....	1120	1180	400	462	655	1270	1030	978	1220	1890	1920	2480
15.....	1240	1340	420	469	781	1390	1020	1040	637	1850	1980	2480
16.....	1490	1120	522	540	923	1310	942	1020	689	1840	1980	2390
17.....	1660	857	652	499	981	1450	997	1130	852	1820	2040	2470
18.....	1380	939	803	561	1030	1390	932	1090	822	2170	2170	2400
19.....	1440	903	934	676	1220	1230	904	1100	890	2020	2280	2440
20.....	1640	892	1080	732	1110	1140	1070	1090	1170	1340	2480	2490
21.....	2320	1110	1130	690	1130	1120	1030	1200	1320	1810	2480	2540
22.....	2280	1110	1120	747	965	1200	1070	1200	1060	1660	1740	2540
23.....	2340	1190	1200	787	1140	1010	1120	1250	1180	1060	1160	2620
24.....	2700	1130	1340	901	1180	1070	1140	1340	1430	1030	1890	2540
25.....	3260	1090	1480	928	1320	1310	1150	1840	1600	1210	1710	2510
26.....	1340	1160	1260	933	1330	1130	1060	1250	1410	1290	1600	2540
27.....	1340	726	1140	1040	1230	1080	1220	1170	1330	1480	1770	2700
28.....	1430	733	1020	1140	978	853	1270	1320	1420	1740	1650	2770
29.....	1520	594	943	1140	942	449	1260	1300	1590	1870	1590	2790
30.....	1400	614	764	1190	--	361	1340	1300	1650	1970	1710	2570
31.....	1410	--	904	866	--	347	--	1180	--	2310	1890	--
Average	1530	1100	892	810	1100	1120	867	1240	1340	1600	1780	2300

MUSKINGUM RIVER BASIN--Continued

3-1290. TUSCARAWAS RIVER AT NEWCOMERSTOWN, OHIO--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement at 6 p.m.)

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

MUSKINGUM RIVER BASIN--Continued

3-1423. SALT FORK AT MOUTH, NEAR CAMBRIDGE, OHIO

LOCATION.--At bridge on U.S. Highway 21, 0.3 mile upstream from mouth, 4 miles north of Cambridge, Guernsey County.
DRAINAGE AREA.--160 square miles.
RECORDS AVAILABLE.--Chemical analyses: July 1959 to September 1960.
REMARKS.--No discharge records available for this station.

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

Date of collection	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
July 19, 1959	6.2		0.69	0.46	40	10	35	2.6	101	44	64	0.2	1.0	272	141	58		455	7.2	10
Aug. 26	5.7		.39	.41	52	14	31	3.4	147	67	55	.2	1.2	312	187	66		519	7.5	4
Sept. 28	6.8		.46	.13	53	14	9.8	3.2	89	120	12	.2	.8	278	190	117		427	7.5	5
Dec. 9	7.0		.33	.26	30	8.2	6.4	1.5	57	64	8.5	.2	.1	168	109	62		262	7.4	4
Jan. 8, 1960	7.3		.29	.24	22	13	7.1	1.1	59	62	10	.3	2.8	158	109	60		264	7.2	5
Feb. 5	7.3		.41	.26	34	8.8	9.7	.9	75	64	13	.2	2.0	--	121	60		304	7.5	2
Mar. 15	6.7		.27	.12	38	12	11	.3	82	73	16	.1	1.9	202	145	78		339	6.8	8
Apr. 13	5.3		.56	.28	30	9.8	7.9	.8	68	58	10	.2	1.3	166	116	60		273	6.8	8
June 2	7.0		.48	.25	37	10	11	1.7	94	60	12	.3	.9	190	134	56		327	7.5	10
July 12	5.8		.28	.27	40	10	34	1.9	108	36	60	.2	.9	280	141	52		458	7.2	6
Aug. 8	5.7		.52	.40	52	11	31	2.4	112	70	60	.2	.9	307	175	82		503	7.4	7
Sept. 13	5.3		.28	.26	48	15	44	4.0	114	58	87	.3	1.5	350	182	88		595	7.1	5

Date of collection	Strontium (Sr)	Phosphorus as PO_4	Cyanide (CN)	Phenols as C_6H_5OH	Dissolved oxygen: ppm	Dissolved oxygen: Percent saturation
Apr. 13, 1960	0.0	0.02	0.000	0.000	10.4	94
Sept. 13			.000	.000	7.0	73

3-1445. MUSKINGUM RIVER AT DRESDEN, OHIO

LOCATION.--At gaging station at bridge on State Highway 208, 0.5 mile east of Dresden, Muskingum County, and 0.5 mile downstream from Wakatomika Creek.
DRAINAGE AREA.--5,982 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1952 to September 1960.
Sediment records: October 1952 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 84°F July 25, 28; minimum, 33°F Jan. 22-24, Mar. 4,5.
Sediment concentrations: Maximum daily, 802 ppm June 14; minimum daily, 7 ppm Sept. 10.
Sediment loads: Maximum daily, 21,800 tons June 14; minimum daily, 18 tons Sept. 10.
EXTREMES, 1952-60.--Water temperatures: Maximum, 88°F Aug. 4, 1955; minimum, freezing point on many days during winter months.
Sediment concentrations (1952-58): Maximum daily, 1,870 ppm Nov. 17, 1955; minimum daily, 1 ppm on several days during 1952 1954, and 1956.
Sediment loads (1952-58): Maximum daily, 45,500 tons Feb. 26, 1956; minimum daily, 3 tons on several days during 1952 to 1954, and 1956.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1625. Flow regulated by 14 flood-control reservoirs.

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

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

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MUSKINGUM RIVER BASIN--Continued

3-1445. MUSKINGUM RIVER AT DRESDEN, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960

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..	1750	32	151	3350	32	289	10500	76	2150
2..	3830	114	1180	3650	28	276	9110	62	1520
3..	3990	124	1340	3840	34	352	8450	48	1100
4..	3290	72	640	3970	30	322	8450	45	1030
5..	3160	51	435	5400	82	1200	8070	42	915
6..	3730	86	866	6940	115	2150	8340	40	901
7..	4380	131	1550	7180	119	2310	10400	58	1630
8..	5130	159	2200	6060	78	1280	11900	85	2730
9..	7740	292	6100	5110	58	800	11000	75	2230
10..	8230	337	7490	4490	42	509	9020	49	1190
11..	7440	200	4020	4080	25	275	7720	38	792
12..	5620	141	2140	3860	26	271	9390	71 S	1980
13..	4300	90	1040	3780	21	214	19500	359 S	18900
14..	3440	61	566	3920	21	222	23200	271	17000
15..	3140	50	424	4910	35	464	23000	175	10900
16..	2880	45	350	5960	56	901	21300	133	7650
17..	2600	43	302	5660	66	1010	19100	102	5260
18..	2360	35	223	5060	50	683	15600	85	3580
19..	2180	30	176	5450	28	412	11800	96	3060
20..	2020	25	136	5450	25	368	9080	60	1470
21..	1900	25	128	5290	21	300	7370	44	876
22..	1830	24	118	5130	20	277	6290	33	560
23..	1780	24	115	5060	19	260	5760	29	451
24..	2140	37	214	5180	30	420	5290	28	400
25..	3650	65	640	5660	38	581	4900	23	304
26..	4540	72	882	5830	34	535	4830	22	287
27..	4440	63	755	7180	86 S	1840	5080	23	315
28..	4370	43	507	11400	204	6280	5820	33	518
29..	4150	36	403	12900	200	6970	7350	50	992
30..	3650	36	355	12300	121	4020	9430	74	1880
31..	3280	29	257	---	---	---	10000	87	2350
Total	116940	--	35703	174050	--	35791	327050	--	94921
	JANUARY			FEBRUARY			MARCH		
1..	8750	65	1540	7050	34	647	6310	23	392
2..	7250	46	900	6360	26	446	5780	21	328
3..	8670	107	2500	5470	23	340	5440	20	294
4..	13000	161	5650	4830	19	248	5100	17	234
5..	14700	123	4880	4540	19	233	4950	18	240
6..	13300	76	2730	4620	29	362	5010	15	203
7..	11000	52	1540	8380	79	1790	4760	16	206
8..	8450	46	1050	10100	85	2320	4390	18	213
9..	7070	35	668	10100	78	2130	4180	17	192
10..	6160	27	449	12900	106	3690	4130	14	156
11..	5730	22	340	19900	359	19300	3960	14	150
12..	5580	30	452	23100	247	15400	3820	19	196
13..	9960	170 S	5640	23800	165	10600	3780	19	194
14..	17400	313	14700	22800	120	7390	3660	15	148
15..	20300	235	12900	17000	88	4040	3500	16	151
16..	23200	187	11700	11800	54	1720	3530	19	181
17..	23300	121	7610	10000	43	1160	3680	20	199
18..	21300	92	5290	8890	44	1060	3830	20	207
19..	18900	84	4290	8040	38	825	4040	21	229
20..	17300	80	3740	7250	37	724	4610	24	299
21..	15300	55	2270	6730	32	581	4960	27	362
22..	12300	40	1330	6440	26	452	5290	30	428
23..	9820	35	928	6160	26	432	5240	26	368
24..	8380	28	634	5820	23	361	5190	26	364
25..	7600	27	554	5650	22	336	5440	33	485
26..	6950	27	507	6100	28	461	5560	44	660
27..	6590	22	391	6810	34	625	6080	47	772
28..	6710	25	453	7130	30	578	10800	218	6360
29..	7790	37	778	6810	24	441	21200	320	18300
30..	8580	42	973	---	---	---	25000	242	16300
31..	7980	40	862	---	---	---	17500	212	10000
Total	359320	--	98249	284580	--	78692	200720	--	58811

S Computed by subdividing day.

MUSKINGUM RIVER BASIN--Continued

3-1445. MUSKINGUM RIVER AT DRESDEN, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960--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	8910	160	B 3800	3740	30	303	4230	24	274
2	6870	139	2580	4210	27	307	4090	25	276
3	10400	121	3400	4050	25	273	3600	26	253
4	17100	117	5400	3650	20	197	3310	26	232
5	20300	115	6300	3320	20	179	3000	30	243
6	23500	112	7110	3090	20	167	2950	52	414
7	24700	94	6270	2990	15	121	2620	42	297
8	24700	87	5800	3240	20	175	2490	41	276
9	21400	90	5200	4200	46	522	2380	40	257
10	17400	75	3520	5260	65	923	2160	36	210
11	16000	62	2680	6550	66	1170	1990	33	177
12	15100	70	2850	8360	84	1900	2100	37	210
13	11400	78	2400	8230	76	1690	2190	44	260
14	8620	79	1840	7290	56	1100	8440	802	S 21800
15	7450	67	1350	6690	65	B 1200	11800	440	14000
16	6770	54	987	6190	72	1200	11400	260	B 8000
17	6890	54	1000	5560	38	570	9130	193	4760
18	6710	53	960	4900	26	344	6710	161	2920
19	6060	40	654	4370	26	307	5170	135	1880
20	5470	34	502	3960	22	235	4280	112	1290
21	5030	24	326	3660	25	247	3590	80	775
22	4760	20	257	3520	23	218	3240	66	577
23	4490	23	279	3960	31	331	3340	99	893
24	4230	21	240	4570	35	432	3710	100	B 1000
25	3970	14	150	4450	32	384	3500	95	B 900
26	3780	16	163	3960	36	385	3030	75	B 600
27	3740	17	172	3560	46	442	2610	63	444
28	3600	15	146	3880	31	325	2330	55	B 350
29	3420	15	138	4010	36	390	2270	55	A 340
30	3320	20	179	4040	30	327	3960	230	B 2800
31	--	--	--	4100	31	343	--	--	--
Total	306090	--	66653	143560	--	16707	125620	--	66708

	JULY			AUGUST			SEPTEMBER		
1	3310	230	B 2000	1560	19	80	2510	71	481
2	3180	130	B 1100	1530	16	66	2170	47	275
3	3030	64	524	1440	25	97	1810	63	308
4	3020	--	180	1480	26	104	1500	42	170
5	3060	--	190	2050	46	255	1310	25	88
6	2910	20	157	2010	58	315	1210	12	39
7	2400	--	149	2160	49	286	1120	8	24
8	2090	--	130	1920	46	238	1060	13	37
9	1900	--	118	1670	36	162	1020	10	28
10	1750	19	90	1510	25	102	980	7	18
11	1670	--	104	1460	26	102	971	10	26
12	1590	--	99	1370	23	85	1020	9	25
13	1540	20	83	1260	20	68	962	11	28
14	1690	--	105	1200	24	78	935	15	38
15	1850	--	115	1160	21	66	926	15	38
16	2010	35	190	1140	20	62	917	18	44
17	1980	--	123	1180	22	70	908	17	42
18	1740	--	108	1140	19	58	899	16	39
19	1630	21	92	1130	20	61	899	19	46
20	1930	26	135	1070	23	66	899	20	48
21	2390	39	252	1110	22	66	882	16	38
22	2600	35	246	2760	--	2300	882	19	45
23	2110	29	165	3930	240	A 2500	882	19	45
24	1780	27	130	2610	80	564	873	19	45
25	1590	25	107	2030	37	203	848	15	34
26	1500	23	93	1650	31	138	830	15	34
27	1840	27	134	1420	34	130	805	14	30
28	1870	31	156	1280	26	90	848	18	41
29	2150	30	174	1210	27	88	830	20	45
30	2010	24	130	1190	26	84	830	23	52
31	1690	21	96	1920	37	192	--	--	--
Total	65810	--	7474	50550	--	8776	32536	--	2251

Total discharge for year (cfs-days)..... 2186826
Total load for year (tons)..... 570736

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

MUSKINGUM RIVER BASIN--Continued

3-1445. MUSKINGUM RIVER AT DRESDEN, OHIO--Continued

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

Date of collection	Time (24 hour)	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	
Feb. 11, 1960.....	1730			21600	387		46	57	68	82	91	97	98	100				SBWC
Mar. 29.....	1235			21700	378		40	47	58	70	83	93	96	100				SBWC
Mar. 29.....	1235			21700	378		14	23	44	70	85	92	95	100				SBN
June 14.....	1000			8340	1120		40	53	61	80	93	97	98	98	100			SBWC

3-1500. MUSKINGUM RIVER AT McCONNELSVILLE, OHIO

LOCATION.--At bridge on State Highway 37 at McConnelsville, Morgan County, 0.5 mile upstream from gaging station and dam 7, and 3 miles downstream from Oilspring Run.
DRAINAGE AREA.--7,411 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1951, October 1954 to September 1960.
Water temperatures: October 1950 to September 1951, July 1954 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 1,320 ppm Oct. 14; minimum, 196 ppm Mar. 31 to Apr. 6.
Hardness: Maximum, 447 ppm Oct. 1-5; minimum, 136 ppm Mar. 31 to Apr. 6.
Specific conductance: Maximum daily, 1,760 micromhos Oct. 5; minimum daily, 322 micromhos Apr. 1.
Water temperatures: Maximum, 85°F Sept. 2; minimum, 34°F Jan. 22-24, Mar. 5.
EXTREMES, 1950-51, 1954-60.--Dissolved solids: Maximum, 2,070 ppm Oct. 13-15, 1964; minimum, 152 ppm Jan. 22-29, 1959.
Hardness: Maximum, 916 ppm Oct. 13-15, 1954; minimum, 109 ppm Jan. 22-29, 1959.
Specific conductance: Maximum daily, 3,410 micromhos Oct. 14, 1954; minimum daily, 242 micromhos Jan. 24, 1959.
Water temperatures: Maximum, 94°F Aug. 4, 1955; minimum, freezing point Feb. 2, 1951, Feb. 10, 11, 1955; Jan. 8, 9, 21-22, 1959.
REMARKS.--Records of specific conductance of daily samples are available in district office at Columbus, Ohio. Records of discharge for water year October 1959 to September 1960 given in WSP 1705. Flow regulated by 14 flood-control reservoirs.

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

Date of collection	Mean discharge	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Strontium (Sr)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_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
															Parts per million	Tons per acre-foot	Tons per day	Calcium, magnesium	Noncarbonate				
Oct. 1-5, 1959	3620	4.4	0.02	141	23	0.11	103	7.4	114	176	280	0.3	3.2		795	1.08	7770	447	354	2.1	1420	7.1	3
Oct. 6-9.....	5950	10	.03	90	17	.02	46	5.2	86	156	115	.2	4.3		466	.66	7810	295	224	1.2	836	6.8	3
Oct. 10-13....	7075	12	.03	64	13	.01	28	4.5	80	114	62	.2	4.8		342	.47	6530	213	147	.8	591	7.1	3
Oct. 14.....	3800	--	--	--	--	--	--	--	--	--	380	--	--		1320	1.80	13540	--	--	--	1700	--	--
Oct. 15-20....	2817	14	.03	76	17	.01	30	4.2	100	131	84	.2	4.5		410	.56	3120	260	178	.8	702	7.6	3
Oct. 21-25....	2600	14	.02	110	20	.02	64	4.3	124	147	180	.2	6.0		607	.83	4260	357	255	1.5	1020	7.3	2
Oct. 26-29....	4875	13	.00	142	22	--	92	4.9	112	162	270	.2	7.0		768	1.04	10110	445	353	1.9	1350	7.3	8
Oct. 30-Nov.10	5400	12	.01	96	17	--	51	3.8	102	125	142	.2	3.9		501	.68	7300	310	226	1.3	889	7.4	5
Nov. 11-28....	6268	11	.00	74	19	--	37	2.8	112	114	96	.3	4.2		414	.56	7010	263	171	1.0	725	7.6	4
Nov. 29-Dec.12	11040	8.3	.01	58	16	--	22	2.4	92	101	55	.3	4.2		312	.42	9300	211	136	.7	545	7.3	5
Dec. 13-18....	22200	9.1	.05	44	14	--	13	2.3	84	80	32	.3	5.2		241	.33	14450	168	99	.4	420	7.3	7
Dec. 19-31....	8084	9.7	.02	71	17	--	30	2.5	106	104	80	.3	6.2		373	.51	8140	247	160	.8	649	7.5	4
Jan. 1-15,1960	11530	11	.01	56	16	--	24	2.5	88	96	52	.3	5.8		307	.42	9560	206	134	.7	527	6.9	5
Jan. 16-20....	24040	9.3	.02	41	12	--	13	2.5	72	68	28	.3	6.2		216	.29	14020	152	92	.5	384	6.5	4
Jan. 21-25....	12410	9.1	.01	54	15	--	20	2.2	82	95	44	.3	5.7		286	.39	9580	196	129	.6	490	6.6	4
Jan. 26-Feb. 9	8224	9.0	.02	71	16	--	29	2.5	102	109	76	.4	5.5		369	.50	8190	243	160	.8	647	6.8	4
Feb. 10-17....	21160	8.5	.03	43	12	--	13	2.5	72	72	32	.3	6.2		225	.31	12850	157	98	.5	397	6.7	5
Feb. 18-Mar. 7	7394	8.0	.04	73	17	--	32	2.3	99	113	78	.3	4.3		377	.51	7530	252	171	.9	658	6.6	4

MUSKINGUM RIVER BASIN--Continued

3-1500. MUSKINGUM RIVER AT McCONNELSVILLE, OHIO--Continued

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

Date of collection	Mean discharge	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Strontium (Sr)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_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
															Parts per million	Tons per acre-foot	Tons per day	Calcium, magnesium	Noncarbonate				
Mar. 8-27,1960	5300	6.8	0.00	78	18	--	37	2.3	109	127	90	0.3	4.6		418	0.57	5980	269	179	1.0	726	7.2	3
Mar. 28-30....	21070	5.8	.00	54	13	--	20	1.7	78	82	52	.2	4.5		272	.37	15470	188	124	.6	493	6.9	2
Mar. 31-Apr. 6	17100	6.4	.00	38	10	--	9.8	1.8	70	66	23	.2	6.0		196	.27	9050	136	78	.4	339	7.0	4
Apr. 7-15.....	16930	6.9	.00	51	13	--	18	2.1	86	81	42	.2	5.1		262	.36	11980	181	110	.6	458	7.0	5
Apr. 16-30....	5284	5.6	.00	73	16	--	30	2.5	118	110	74	.3	2.8		372	.51	5310	248	152	.8	652	7.4	5
May 1-15.....	5414	5.8	.00	82	17	--	40	3.1	117	121	102	.4	2.8		432	.59	6310	275	179	1.1	738	7.4	2
May 16-June 3.	5307	7.7	.00	76	16	--	33	2.4	119	105	82	.3	3.0		384	.52	5500	256	158	.9	678	7.2	4
June 4-13.....	2904	5.0	.01	87	18	--	49	3.6	122	117	124	.4	1.7		466	.63	3650	291	191	1.2	833	7.0	3
June 14-26....	6157	8.0	.02	70	16	--	34	3.4	108	100	83	.4	5.2		373	.51	6200	241	152	1.0	667	6.9	7
June 27-July 5	3193	8.2	.00	88	15	--	46	3.9	116	116	116	.5	4.4		455	.62	3920	281	186	1.2	783	7.5	6
July 6-10.....	2462	7.6	.06	115	16	--	69	3.8	122	123	192	.6	4.1		591	.80	3930	353	253	1.6	1050	7.4	5
July 11-20....	1990	6.4	.00	93	18	--	50	3.6	124	128	126	.6	2.7		489	.67	2630	306	205	1.2	848	7.3	5
July 21-29....	2080	4.4	.01	110	18	--	70	4.3	112	141	184	.8	2.7		590	.80	3310	349	257	1.6	1040	7.3	5
July 30-Aug. 3	1836	5.3	.00	88	18	--	47	4.4	134	120	109	.8	.4		459	.62	2280	294	184	1.2	826	7.7	4
Aug. 4-9.....	2118	4.6	.00	117	19	--	78	4.7	120	144	198	.8	3.5		629	.86	3600	370	272	1.8	1120	7.2	6
Aug. 10-12....	1653	4.0	.00	92	18	--	50	4.4	120	134	123	.8	1.7		487	.66	2170	304	205	1.2	872	6.9	6
Aug. 13-25....	1780	3.7	.00	111	20	--	73	5.1	118	138	186	.8	3.1		599	.81	2880	359	263	1.7	1080	7.0	7
Aug.26-Sept.13	1494	2.8	.00	102	15	--	70	5.2	113	122	168	.8	2.6		544	.74	2190	316	224	1.7	994	7.3	5
Sept. 14-30...	986	3.6	.01	131	15	--	89	6.0	136	146	216	.7	5.8		680	.92	1810	389	277	2.0	1220	7.1	5
Weighted average...	--	8.3	0.01	66	15	--	30	2.8	96	101	75	0.3	4.8		353	0.48	6420	229	150	0.8	617	7.0	4
Time-weighted average...	6745	7.5	0.01	82	16	--	43	3.4	107	115	109	0.4	4.2		435	--	435	272	184	1.1	764	7.1	4
Tons per day	--	151	0.25	1210	281	--	543	50	1760	1850	1370	5.9	87		--	--	--	--	--	--	--	--	--

MUSKINGUM RIVER BASIN--Continued

3-1500. MUSKINGUM RIVER AT McCONNELSVILLE, OHIO--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement at 4 p.m.)

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

LITTLE KANAWHA RIVER BASIN

3-1520. LITTLE KANAWHA RIVER AT GLENVILLE, W. VA.

LOCATION.--At waterplant at Glenville, Gilmer County, 0.5 mile upstream from gaging station and 0.7 mile upstream from Sycamore Run.
DRAINAGE AREA.--386 square miles upstream from gaging station.
RECORDS AVAILABLE.--Water temperatures: October 1946 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 81°F Aug. 29 to Sept. 2; minimum, 34°F several days during November, and January to March.
EXTREMES, 1946-60.--Water temperatures: Maximum, 86°F Aug. 22, 1947, July 31, Aug. 1-6, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Temperature records furnished by West Virginia Water Service Company. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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	70	69	68	68	68	68	68	67	66	65	62	58	55	56	55	54	53	53	52	51	52	52	55	52	50	49	48	46	45	48	56
November	50	48	46	48	50	52	50	44	44	40	40	40	40	40	40	40	42	40	35	34	37	37	36	36	36	37	38	42	40	38	--	41
December	36	36	38	40	39	39	37	35	35	35	35	38	43	41	39	40	41	42	40	37	39	37	35	37	39	40	41	42	43	44	43	39
January	42	42	42	40	39	38	38	38	38	38	42	44	46	44	43	42	41	41	41	38	37	36	35	34	35	36	37	39	40	41	40	40
February	39	40	39	39	38	39	40	40	40	41	42	42	39	37	35	34	37	36	35	36	36	37	38	38	39	40	40	40	40	--	--	38
March	38	36	35	34	34	35	34	34	34	34	34	35	36	36	37	37	37	38	40	40	40	39	39	40	40	40	43	46	48	48	49	38
April	50	52	53	51	49	46	48	48	48	48	50	54	58	60	61	62	63	63	62	62	64	67	69	70	70	70	69	68	67	65	--	59
May	64	65	65	66	67	68	65	60	53	51	50	51	52	53	55	59	62	64	66	68	71	71	71	71	71	71	71	69	70	70	71	64
June	71	73	74	75	76	77	76	77	76	74	75	75	74	74	73	72	71	70	71	69	67	68	73	78	78	77	76	77	78	79	--	74
July	71	71	72	74	74	74	74	75	74	72	74	75	76	77	78	78	78	78	78	78	79	79	80	80	80	80	79	79	79	80	79	77
August	80	79	79	77	78	76	77	77	76	74	74	75	79	79	79	78	78	78	78	77	77	76	75	75	76	78	80	80	81	81	81	78
September	81	81	80	80	79	78	76	77	77	76	75	66	66	67	67	70	68	65	65	66	66	67	65	66	65	65	66	65	65	64	--	70

3-1556. LITTLE KANAWHA RIVER AT PARKERSBURG, W. VA.

LOCATION.--At East Street Bridge at Parkersburg, Wood County, 0.9 mile upstream from Neal Run and 1.3 miles upstream from mouth.
DRAINAGE AREA.--2,297 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1959 to September 1960.
Water temperatures: October 1959 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 124 ppm Sept. 1-30; minimum, 56 ppm Feb. 1-15, 18-29.
Hardness: Maximum, 57 ppm Sept. 1-30; minimum, 29 ppm Apr. 1-15.
Specific conductance: Maximum daily, 312 micromhos Sept. 4; minimim daily, 66 micromhos Apr. 2.
Water temperatures: Maximum, not determined; minimum, 33°F Mar. 5, 11-13.
REMARKS.--Records of specific conductance and pH of daily samples are available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
Oct. 27-31, 1959..		3.1		0.01		9.5	6.3	12	2.1		38		30	11	0.1	0.8	0.15	96	50	19		178	7.0	8	0.0
Nov. 1-30...		5.0		.02		14	4.2	16	2.1		28		40	18	.2	1.8	.15	118	52	29		213	6.8	5	.0
Dec. 1-31...		7.4		--		9.8	3.8	6.6	1.2		22		24	7.2	.2	2.9	.14	77	40	22		126	--	8	.0
Jan. 1-31, 1960..		6.6		--		8.8	3.0	6.1	.9		20		22	5.7	.2	2.3	.14	66	34	18		108	--	12	.0
Feb. 1-15, 18-29.....		5.8	0.2	--		8.3	2.5	4.4	1.0		19		19	6.0	.1	1.6	.17	56	31	15		99	--	18	.0
Mar. 1-5, 7, 9-31.....		6.8		--		8.7	3.6	5.4	.9		22		18	7.0	.1	1.6	.17	56	31	13		99	--	18	.0

LITTLE KANAWHA RIVER BASIN--Continued

3-1556. LITTLE KANAWHA RIVER AT PARKERSBURG, W. VA.--Continued

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
																			Calcium, magnesium	Noncarbonate					
Apr. 1-15, 1960..		6.5		--		8.1	2.2	3.7	1.2		20		17	4.0	0.1	1.4	0.10	66	29	13		90	-	20	0.0
Apr. 16-30..		4.5		--		12	2.8	9.2	1.1		28		28	8.5	.2	.8	.10	85	42	19		142	--	5	.0
May 1-31....		6.0		--		10	2.9	6.7	1.3		31		22	6.3	.2	.6	.15	74	37	12		124	--	7	.0
June 1-5, 7-30.....		7.4		--		14	2.9	10	1.8		32		29	10	.2	1.1	.30	102	47	21		155	--	20	.0
July 1-31...		8.1		--		14	3.0	13	2.3		34		35	9.0	.1	1.2	.10	114	48	20		170	--	25	.0
Aug. 1-12, 16-25, 27-31.....		6.6		--		13	3.2	8.9	2.7		37		26	9.0	.1	1.1	.20	97	46	16		154	--	40	.0
Sept. 1-30..		6.7		--		17	3.5	14	2.5		41		38	12	.2	1.2	.25	124	57	23		204	--	9	.0
Time-weighted average.		6.5	--	--		12	3.2	9	1.6		28		27	8.8	0.2	1.5	0.16	88	42	19		143	--	15	--

LITTLE KANAWHA RIVER BASIN--Continued

3-1556. LITTLE KANAWHA RIVER AT PARKERSBURG, W. VA.--Continued

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

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

HOCKING RIVER BASIN

3-1595. HOCKING RIVER AT ATHENS, OHIO

LOCATION.--At gaging station on left bank at upstream side of Mill Street Bridge, 0.8 mile east of business section at Athens County, and 3.5 miles downstream from Margaret Creek.
DRAINAGE AREA.--944 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1954 to September 1960.
Water temperatures: October 1954 to September 1960.
Sediment records: October 1956 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 857 ppm Sept. 15-27; minimum, 200 ppm Feb. 11-13, Mar. 29-31.
Hardness: Maximum, 465 ppm Sept. 15-27; minimum, 125 ppm Mar. 29-31.
Specific conductance: Maximum daily, 1,380 micromhos Oct. 3; minimum daily, 321 micromhos Jan. 16.
Water temperatures: Maximum, 78°F Sept. 2; minimum, 33°F on many days during January to March.
Sediment concentrations: Maximum daily, 725 ppm Dec. 13; minimum daily, 1 ppm on several days during October, June, and September.
Sediment loads: Maximum daily, 10,800 tons Jan. 15; minimum daily, less than 0.5 ton on several days during October, June, and September.
EXTREMES, 1954-60.--Dissolved solids: Maximum, 1,320 ppm Oct. 4, 1957; minimum, 150 ppm Feb. 7-8, 1955.
Hardness: Maximum, 702 ppm Oct. 4, 1957; minimum, 86 ppm Jan. 22-24, 1959.
Specific conductance: Maximum daily, 1,680 micromhos Oct. 4, 1957; minimum daily, 192 micromhos Jan. 22, 1959.
Water temperatures: Maximum, 84°F Aug. 7, 1955; minimum, freezing point on several days during winter months.
Sediment concentrations (1956-60): Maximum daily, 1,320 ppm July 8, 1958; minimum daily, 1 ppm on many days.
Sediment loads (1956-60): Maximum daily, 21,200 tons Jan. 22, 1959; minimum daily, less than 0.5 ton on many days.
REMARKS.--Some regulation by Tom Jenkins Reservoir. Records of specific conductance of daily samples available in district office at Columbus, Ohio.
Records of discharge for water year October 1959 to September 1960 given in WSP 1705. Flow affected by ice Mar. 11.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Oxygen consumed: Unfiltered	Oxygen consumed: Filtered
Oct. 1-7, 1959..	124	9.1	0.02	102	40	92	5.0	64	438	75	0.2	3.6	790	419	367	1180	7.2	3		
Oct. 8-10.....	824	10	.04	80	30	50	5.0	22	322	57	.2	3.3	585	323	305	875	6.4	2		
Oct. 11-16.....	271	10	.03	57	22	25	3.8	28	219	26	.1	2.7	390	233	210	596	6.9	2		
Oct. 17-24.....	98.4	14	.02	90	35	44	3.8	76	316	51	.2	4.5	614	369	307	899	7.5	2		
Oct. 25-Nov. 8...	191	13	.03	99	41	65	4.8	48	384	80	.1	4.1	730	416	376	1070	6.9	3		
Nov. 9-24.....	158	11	.02	86	38	49	4.0	60	316	68	.1	3.8	630	371	322	936	7.0	3		
Nov. 25-28.....	819	9.3	.02	72	27	43	3.2	45	266	50	.2	3.1	511	291	254	771	6.9	3		
Nov. 29-Dec. 12..	970	8.3	.03	54	21	23	2.3	48	172	35	.1	5.3	360	221	182	566	7.2	2		
Dec. 13-17.....	2393	8.4	.04	45	16	14	2.4	44	130	22	.3	7.3	270	178	142	440	6.7	3		
Dec. 18-31.....	702	9.0	.03	61	25	23	1.8	68	193	33	.2	4.1	401	255	200	615	7.2	2		
Jan. 1-14, 1960..	1023	8.6	.03	54	19	20	1.9	63	164	27	.2	5.3	343	213	161	528	7.3	5		
Jan. 15-21.....	3376	8.4	.05	37	13	10	1.9	43	108	14	.1	5.6	229	146	111	362	7.0	4		
Jan. 22-31.....	1147	8.3	.00	52	19	18	1.6	58	157	22	.2	5.3	315	208	160	506	6.6	3		
Feb. 1-10.....	1143	8.8	.01	52	20	19	1.6	60	164	24	2	4.6	338	212	163	518	6.7	3		

Feb. 11-13, 1960.	3967	7.8	.04	33	12	8.5	2.1	42	92	11	.2	5.4	200	132	98	326	6.8	10	
Feb. 14-Mar. 1...	1259	8.6	.01	50	20	17	1.6	58	162	22	.1	10	327	207	160	502	6.8	3	
Mar. 2-14.....	791	8.8	.02	58	24	23	1.6	66	195	30	.1	3.1	385	243	189	589	6.9	4	
Mar. 15-19.....	828	4.4	.00	54	26	26	1.6	54	191	29	.1	3.2	384	242	198	590	6.7	3	
Mar. 20-28.....	1424	5.8	.00	45	19	18	1.4	44	148	26	.2	3.9	302	190	154	482	7.0	2	
Mar. 29-31.....	3507	6.4	.00	30	12	9.4	1.6	38	90	12	.1	4.5	200	125	94	316	6.8	1	
Apr. 1-8.....	1600	6.8	.00	43	16	16	1.7	46	138	19	.2	3.7	291	173	136	439	6.9	1	
Apr. 9-13.....	881	6.6	.00	54	23	21	1.4	58	180	26	.1	3.4	376	229	182	558	6.8	1	
Apr. 14-May 9....	570	6.6	.00	66	29	31	2.0	57	243	34	.2	1.5	479	284	237	701	6.8	3	
May 10-27.....	761	9 8	.00	57	23	27	2.4	40	207	34	.3	2.1	393	237	204	595	7.0	2	
May 28-June 1....	1770	10	.00	41	17	15	1.9	50	124	20	.2	4.2	283	172	131	431	6.9	4	
June 2-8.....	584	11	.00	58	24	26	2.2	64	196	29	.2	2.2	416	243	191	600	6.8	2	
June 9-19.....	341	13	.00	72	32	38	2.9	60	274	38	.2	2.6	549	311	262	769	6.9	2	
June 20-30.....	174	13	.00	86	35	48	3.2	70	320	46	.2	2.4	635	359	301	882	7.2	1	
July 1-15.....	211	11	.00	95	35	54	3.7	52	376	50	.3	2.7	687	381	339	936	7.3	3	
July 16-20.....	261	11	.01	74	27	33	4.5	32	267	43	.2	4.5	505	296	270	719	6.8	3	
July 21-31.....	134	13	.01	92	31	50	3.5	70	334	50	.3	1.0	630	357	300	923	6.4	2	
Aug. 1-13.....	136	13	.01	96	40	67	4.2	48	421	54	.4	1.0	750	404	365	1060	6.4	2	
Aug. 14-31.....	105	12	.01	94	36	56	4.4	46	370	56	.3	1.8	669	383	345	981	6.4	4	
Sept. 1-14.....	78.1	7.7	.01	106	44	86	4.6	48	464	76	.3	.6	837	446	406	1180	6.5	2	
Sept. 15-27.....	73.4	7.8	.02	107	48	77	4.6	28	468	76	.2	2.2	857	465	442	1180	6.5	4	
Weighted average	--	8.5	0.01	53	21	23	2.1	51	179	28	0.2	4.6	360	220	178	548	6.9	3	
Time-weighted average.....	709.9	9.6	0.01	71	29	38	2.9	53	264	42	0.2	3.5	508	296	252	746	6.8	3	
Tons per day....	--	16	0.03	102	40	43	4.1	98	343	53	0.3	8.9	690	--	--	--	--	--	

HOCKING RIVER BASIN--Continued

3-1595. HOCKING RIVER AT ATHENS, OHIO--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement at 7 a.m.)

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

HOCKING RIVER BASIN--Continued

3-1595. HOCKING RIVER AT ATHENS, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960
(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	165	6	3	125	C 4	1.4	709	26	50
2	165	2	1	127	C 4	1.4	697	24	45
3	132	2	1	125	C 4	1.4	727	26	51
4	98	1	T	137	C 4	1.5	715	22	42
5	89	1	T	184	9	4	685	21	39
6	91	2	T	316	11	9	794	32	69
7	137	1	T	382	9	9	1280	68	235
8	527	40	A 120	279	8	6	1340	65	235
9	1200	91	295	216	7	4	940	25	63
10	745	44	88	184	5	2	685	11	20
11	501	13	18	159	5	2	633	15	26
12	427	11	12	145	6	2	2260	406	S 3340
13	279	12	9	135	5	2	4740	725	9280
14	169	14	6	135	C 2	.7	3160	319	2720
15	137	8	3	145	C 2	.8	1790	148	715
16	123	9	3	154	C 2	.8	1280	60	207
17	113	10	3	154	C 2	.8	996	46	124
18	104	12	3	148	C 2	.8	975	47	124
19	95	9	2	137	C 2	.7	947	52	133
20	89	2	T	125	C 2	.7	788	34	72
21	89	3	1	123	C 2	.7	697	27	51
22	87	4	1	123	C 2	.7	628	27	46
23	87	4	1	127	C 2	.7	545	20	29
24	123	5	2	326	30	S 34	506	22	30
25	187	5	2	400	27	29	490	20	26
26	216	5	3	333	5	4	490	19	25
27	190	3	2	912	250	A 900	506	17	23
28	174	7	3	1630	419	1840	622	27	45
29	154	10	4	1270	68	S 246	892	40	96
30	137	5	2	853	37	85	905	28	68
31	132	4	B 1	--	--	--	834	36	81
Total	6943	--	591	9609	--	3191.1	33256	--	1811

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	703	23	44	933	49	123	1160	40	B 120
2	628	21	36	831	42	94	1000	37	100
3	1830	180	S 988	759	37	76	1040	38	107
4	2320	262	1640	682	34	63	978	--	61
5	1530	118	487	698	50	94	939	--	58
6	1130	40	122	1280	131	453	915	--	57
7	940	20	51	1720	114	529	855	--	55
8	757	15	31	1440	85	330	792	--	49
9	650	16	28	1350	54	197	754	--	47
10	578	16	25	1740	93	S 460	660	23	41
11	540	17	25	4590	578	7160	650	--	40
12	518	18	25	4880	423	5570	585	23	36
13	968	68	S 196	2430	225	1480	553	--	34
14	1230	66	219	1610	135	587	558	20	30
15	5360	714	S 10800	1340	120	B 430	601	25	40
16	5630	372	5650	1240	55	B 180	710	34	65
17	3010	193	1570	1190	50	161	843	60	A 140
18	2070	140	782	1210	49	160	1010	86	234
19	3020	182	1480	1160	50	B 160	978	44	116
20	2720	135	991	990	45	B 120	1160	69	216
21	1820	85	418	958	43	111	1180	59	188
22	1320	C --	130	933	33	83	1100	62	184
23	1190	C --	130	879	35	B 85	1000	36	97
24	1010	C --	130	825	39	87	1190	48	154
25	897	C --	130	915	46	S 125	1400	90	340
26	945	40	102	1910	204	1050	1300	62	218
27	1040	26	73	2050	165	913	1530	74	306
28	1330	68	244	1630	77	339	2960	394	S 3570
29	1510	120	489	1410	49	186	4610	420	5230
30	1200	74	240	--	--	--	3270	245	2160
31	1030	60	167	--	--	--	2640	188	1340
Total	49424	--	27443	43583	--	21406	38921	--	15433

S Computed by subdividing day.
T Less than 0.5 ton.
A Computed from partly estimated-concentration graph.
B Computed from estimated-concentration graph.
C Composite period.

HOCKING RIVER BASIN--Continued

3-1595. HOCKING RIVER AT ATHENS, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960--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..	2080	139	781	580	11	17	1010	38	104
2..	1540	94	391	638	18	31	820	26	58
3..	1330	68	244	511	11	15	704	23	44
4..	1730	95	444	453	7	8	601	22	36
5..	1880	105	533	408	5	6	505	19	26
6..	1640	90	398	379	4	4	558	19	29
7..	1410	63	240	374	5	5	500	17	23
8..	1190	50	161	721	23	S 51	398	8	8
9..	1060	48	137	909	47	115	336	5	4
10..	939	44	112	781	31	65	291	5	4
11..	843	35	80	984	48	128	257	4	3
12..	808	35	76	958	49	127	257	4	3
13..	754	34	69	855	32	74	341	8	7
14..	698	26	49	837	34	77	484	14	18
15..	666	23	41	770	30	62	500	19	26
16..	660	24	43	676	24	44	428	15	17
17..	803	39	84	655	23	41	332	11	10
18..	770	42	87	666	33	59	278	9	7
19..	676	40	73	558	18	27	245	8	5
20..	611	26	43	484	12	16	216	8	5
21..	580	19	30	458	14	17	186	10	5
22..	553	15	22	484	19	25	175	6	3
23..	521	13	18	711	35	A 85	190	8	4
24..	490	11	14	997	39	105	240	6	4
25..	464	6	8	671	15	27	205	5	3
26..	443	6	7	569	14	22	156	4	2
27..	537	10	14	1590	266	S 1890	139	2	1
28..	500	7	9	3080	534	4440	127	1	T
29..	453	10	12	2040	183	1010	130	2	1
30..	428	10	12	1460	94	370	147	5	2
31..	--	--	--	1260	59	201	--	--	--
Total	27057	--	4232	26517	--	9164	10756	--	462

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..	354	40	S 42	107	6	2	80	4	1
2..	186	6	3	102	9	2	77	4	1
3..	182	3	1	96	C 13	3.4	73	5	1
4..	162	10	4	96	C 13	3.4	69	5	1
5..	152	16	6	102	C 13	3.6	69	5	1
6..	130	14	5	111	C 13	3.9	67	5	1
7..	121	12	4	102	C 13	3.6	67	5	1
8..	114	14	4	92	C 13	3.2	67	5	1
9..	107	13	4	172	8	4	67	3	1
10..	109	12	4	172	10	5	67	4	1
11..	120	11	4	190	10	5	86	7	2
12..	130	11	4	245	7	5	109	6	2
13..	120	12	4	175	2	1	104	4	1
14..	357	110	A 120	114	3	1	92	3	1
15..	825	50	A 130	104	4	1	80	1	T
16..	374	10	10	94	C 3	.8	64	1	T
17..	224	12	7	92	C 3	.7	67	1	T
18..	205	16	9	89	C 3	.7	78	2	T
19..	274	22	16	83	C 3	.7	79	3	1
20..	228	23	14	80	C 3	.6	79	3	1
21..	190	20	10	84	C 3	.7	79	2	T
22..	147	15	6	157	7	3	77	2	T
23..	125	13	4	253	6	4	75	3	1
24..	118	12	4	125	5	2	73	5	1
25..	120	11	4	104	4	1	69	3	1
26..	114	10	3	95	C 3	.8	67	2	T
27..	121	9	3	89	C 3	.7	67	2	T
28..	149	9	4	86	C 3	.7	66	2	T
29..	149	9	4	82	C 3	.7	67	2	T
30..	123	8	3	83	C 3	.7	65	2	T
31..	121	7	2	83	5	1	--	--	--
Total	5951	--	442	3659	--	65.9	2246	--	25

Total discharge for year (cfs-days)..... 257,922
Total load for year (tons)..... 84,266

S Computed by subdividing day.
T Less than 0.5 ton.
A Computed from partly estimated-concentration graph.
C Composite period.

HOCKING RIVER BASIN--Continued

3-1595. HOCKING RIVER AT ATHENS, OHIO--Continued

Particle-size analyses of suspended sediment, water year October 1959 to September 1960

(Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N, in native water; P, pipet; S, sieve; V, visual accumulation tube; W, in distilled water)

Date of collection	Time (24 hour)	Water temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	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. 28, 1959.....	1100			1700	584		55	65	74	86	97	98	100	--	--			SBWC
Jan. 15, 1960.....	0700			4990	1430		50	57	71	84	94	96	99	100	--			SBWC
Jan. 15.....	1300			6540	812		47	61	73	85	94	97	99	100	--			SBWC
Feb. 11.....	1330			5030	696		40	53	60	75	90	96	98	99	100			SBWC
Feb. 11.....	1330			5030	696		19	28	45	67	89	95	98	99	100			SBN
Mar. 30.....	1145			3220	247		23	30	48	66	80	94	100	--	--			SBWC
Mar. 30.....	1145			3220	247		6	14	37	64	86	93	100	--	--			SBN

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3-1596. OHIO RIVER AT LOCK AND DAM 22, AT RAVENSWOOD, W. VA.

LOCATION.--About 650 feet upstream from dam (mile 220.9) at Ravenswood, Jackson County, 450 feet downstream from Sandy Creek, and 7,600 feet downstream from Turkey Run.
DRAINAGE AREA.--39,840 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1954 to September 1960.
Water temperatures: October 1954 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 444 ppm Oct. 1-23, 25-26, 30-31; minimum, 76 ppm Mar. 28-31.
Hardness: Maximum, 224 ppm Oct. 1-23, 25-26, 30-31; minimum, 41 ppm Mar. 28-31.
Specific conductance: Maximum daily, 909 micromhos Oct. 1; minimum daily, 117 micromhos Mar. 29.
Water temperatures: Maximum, 84°F Aug. 10,11; minimum, freezing point Mar. 14.
EXTREMES, 1954-60.--Dissolved solids: Maximum, 675 ppm Nov. 11-15, 17, 1957; minimum, 76 ppm Mar. 28-31, 1960.
Hardness: Maximum, 309 ppm Nov. 11-15, 17, 1957; minimum, 41 ppm Mar. 28-31, 1960.
Specific conductance: Maximum daily, 1,230 micromhos Oct. 1, 1957; minimum daily, 102 micromhos Apr. 29-30, 1958.
Water temperatures: Maximum, 87°F Aug. 5-8, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance and pH of daily samples are available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
																			Calcium, magnesium	Noncarbonate					
Oct. 1-23, 25-26, 30-31, 1959..		7.4				60	18	55	4.1		40		206	68	0.4	4.7	0.16	444	224	191		725	6.9	4	0.1
Nov. 1-7, 9-12, 14-30.		8.6				37	9.1	23	2.1		35		102	32	.2	3.4	.15	244	130	101		405	6.8	3	.1
Dec. 1-24, 26-31.....		6.9				28	7.6	11	1.7		31		72	18	.1	3.6	.10	165	101	76		281	6.9	3	.1
Jan. 3-7,11-31, 1960..		7.1				26	7.1	11	1.4		25		71	15	.2	4.0	.15	158	94	74		264	6.5	6	.1
Feb. 1-29...		8.0				32	8.6	14	1.2		46		79	21	.2	4.5	.14	210	116	78		311	6.7	3	.1
Mar. 1-7, 10-27.....		8.6				45	10	20	2.3		69		100	25	.2	6.6	.19	255	153	96		422	--	7	.1
Mar. 28-31..		6.0				11	3.3	5.5	.5		37		21	2.0	.1	1.4	.17	76	41	11		122	--	30	.0

Apr.1-12,14, 17-20, 24-27,1960		5.6				24	7.2	9.7	1.5		27	66	13	.2	3.3	.12	154	90	68		251	--	7	.0
May 1-11....		6.6				42	9.2	21	2.5		43	109	29	.3	3.6	.20	247	143	108		408	--	3	.1
May 12-31...		7.2				30	6.8	13	1.6		29	79	19	.2	3.0	.04	184	103	79		299	--	2	.0
June 1-2, 5-16, 18-30.		6.1				33	9.0	19	2.1		35	87	26	.3	3.3	.32	221	120	91		351	--	3	.1
July 1-28,31		6.6				44	10	28	2.6		38	121	40	.4	3.2	.20	288	151	120		459	--	4	.1
Aug. 1,7-11, 14-18, 26-31.....		4.1				52	13	36	3.2		31	156	46	.5	2.9	.15	328	183	158		554	--	5	.1
Sept. 1-25, 27-30.....		6.5				58	10	45	3.6		21	194	48	.5	4.3	.31	406	186	169		639	--	5	.1
Time-weighted average[a]		6.9				39	9.6	24	2.3		36	111	31	0.3	3.9	0.17	225	137	108		413	--	5	--

a Represents 89 percent of the days.

OHIO RIVER MAIN STEM--Continued

3-1596. OHIO RIVER AT LOCK AND DAM 22, AT RAVENSWOOD, W. VA.--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement between 6 a.m. and 7 a.m.)

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

3-1765. NEW RIVER AT GLENLYN, VA.

LOCATION.--At the Glenlyn steam electric plant of the Appalachian Electric Power Company at Glenlyn, Giles County, across the river from the gaging station, 0.3 mile upstream from East River, and 6.3 miles downstream from Wolf Creek.
DRAINAGE AREA.--3,768 square miles.
RECORDS AVAILABLE.--Chemical analyses: April 1930 to March 1931, October 1949 to September 1950, October 1951 to September 1956.
Water temperatures: October 1950 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 80°F Aug. 11; minimum, freezing point on several days during January and March.
EXTREMES, 1951-60.--Water temperatures: Maximum, 84°F June 28, 1952; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

KANAWHA RIVER BASIN--Continued

3-1800. NEW RIVER AT BLUESTONE DAM, W. VA.

LOCATION.--Temperature recorder at Bluestone Dam stilling basin, 1,000 feet upstream from gaging station, 0.9 mile upstream from mouth of Greenbrier River, and 2.2 miles upstream from Hinton, Summers County, W. Va.
DRAINAGE AREA.--4,604 square miles.
RECORDS AVAILABLE.--Water temperatures: May 1953 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 82°F July 26-29; minimum, 35°F Jan. 25, 26, Mar. 4-7, 11.
EXTREMES, 1953-60.--Water temperatures: Maximum, 85°F Aug. 26, 1959; minimum, freezing point on several days during February 1958.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

3-1820. KNAPP CREEK AT MARLINTON, W. VA.

LOCATION.--At city waterplant, at Marlinton, Pocahontas County, 1 mile upstream from mouth and 2 miles downstream from discontinued gaging station.
DRAINAGE AREA.--108 square miles (upstream from discontinued gaging station).
RECORDS AVAILABLE.--Water temperatures: October 1946 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 78°F July 26, 27, Aug. 9, 10; minimum, freezing point on many days during winter months.
EXTREMES, 1946-60.--Water temperatures: Maximum, 82°F July 24, 1952, July 2, 1959; minimum, freezing point on several days during winter months.

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

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

KANAWHA RIVER BASIN--Continued

3-1930. KANAWHA RIVER AT KANAWHA FALLS, W. VA.

LOCATION.--Temperature recorder at gaging station, 150 feet downstream from toll bridge, 0.8 mile downstream from Kanawha Falls, Fayette County, 2 miles downstream from Gauley Bridge, and 2 miles downstream from confluence of New River and Gauley River.
DRAINAGE AREA.--8,367 square miles.
RECORDS AVAILABLE.--Water temperatures: December 1957 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 82°F July 26-28; minimum, freezing point Mar. 6-11.
EXTREMES, 1958-60.--Water temperatures: Maximum, 83°F Aug. 20, 1959; minimum, freezing point on many days during December 1958, January 1959 and March 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

3-1937.7. KANAWHA RIVER AT CABIN CREEK, W. VA.

LOCATION.--At the Appalachian Electric Power Company steam electric plant cooling water intakes, at Cabin Creek, Kanawha County.
DRAINAGE AREA.--8,661 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1950 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 87°F Aug. 3; minimum, 34°F Mar. 4, 7-11.
EXTREMES, 1950-60.--Water temperatures: Maximum, 92°F on several days during August 1955 and August 1959; minimum, freezing point Feb. 10, 1951, Feb. 14-16, 1958.
REMARKS.--Temperature records furnished by the Appalachian Electric Power Company. No discharge records available.

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

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

KANAWHA RIVER BASIN--Continued

3-1980. KANAWHA RIVER AT CHARLESTON, W. VA.

LOCATION.--Temperature recorder at gaging station at old lock 6, at Charleston, Kanawha County, 1.0 mile upstream from Davis Creek, 1.5 miles downstream from Twomile Creek, 2.0 miles downstream from Patrick Street Bridge at Charleston, and 3.5 miles downstream from Elk River.
DRAINAGE AREA.--10,419 square miles.
RECORDS AVAILABLE.--Water temperatures: March 1953 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 87°F on many days during August and September; minimum, 38°F Mar. 7-9.
EXTREMES, 1953-60.--Water temperatures: Maximum, 95°F Aug. 25, 26, 1959; minimum, 36°F on several days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

3-2013. KANAWHA RIVER AT WINFIELD, W. VA.
(Formerly published as Kanawha River at Winfield Dam, at Winfield, W. Va.)

LOCATION.--About 1,200 feet upstream from Winfield Dam at Winfield, Putnam County, 0.7 mile upstream from Little Hurricane Creek, 2.6 miles downstream from Little Guano Creek, 4.7 miles downstream from Guano Creek, and 31.3 miles upstream from mouth.
DRAINAGE AREA.--11,809 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1956 to September 1960.
Water temperatures: October 1956 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 190 ppm Sept. 1-30; minimum, 88 ppm Feb. 1-29.
Hardness: Maximum, 98 ppm Sept. 1-30; minimum, 49 ppm Jan. 1-2, 4-31.
Specific conductance: Maximum daily, 586 micromhos Oct. 1; minimum daily, 78 micromhos Apr. 2.
Water temperatures: Maximum, 86°F on several days July to September; minimum, freezing point on Mar. 12.
EXTREMES, 1956-60.--Dissolved solids: Maximum, 311 ppm Oct. 21-31, 1958; minimum, 63 ppm May 1-10, 1958.
Hardness: Maximum, 155 ppm Oct. 21-31, 1958; minimum, 37 ppm May 1-10, 1958.
Specific conductance: Maximum daily, 590 micromhos Oct. 31, 1958; minimum daily, 77 micromhos Jan. 31, 1957.
Water temperatures: Maximum, 88°F Sept. 2, 1959; minimum, freezing point Feb. 14, 1958, Mar. 12, 1960.
REMARKS.--Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	Silica (SiO_2)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphorus as PO_4	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)	Ammonia nitrogen as NH_4	Nitrite (NO_2)
													Calcium, magnesium	Noncarbonate						
Oct. 1-31, 1959	6.8	22	5.6	14	2.1	54	23	27	0.2	4.5	0.15	a140	78	34	248	7.0	7	0.1	0.5	0.00
Nov. 1-30.....	9.3	22	4.4	12	1.7	46	29	27	.1	3.2	.40	b136	73	36	241	6.8	7	.1	1.1	.45
Dec. 1-31.....	6.3	14	3.6	7.1	1.3	30	23	12	.1	4.3	.20	94	50	26	158	6.7	3	.1	.3	.00
Jan. 1-2, 4-31, 1960.....	6.1	14	3.4	7.1	1.4	29	24	13	.1	5.4	.20	93	49	25	156	6.7	3	.1	.4	.05
Feb. 1-29.....	6.6	14	3.6	6.8	.8	30	24	12	.1	5.3	.20	c88	50	26	146	--	4	.0	.3	.00
Mar. 1-30.....	6.5	17	4.5	7.8	1.5	40	27	14	.1	3.9	.15	108	61	28	184	--	4	.1	.5	.00
Apr. 1-30.....	6.0	14	3.6	6.2	1.2	32	22	11	.2	4.5	.15	92	50	24	150	--	5	.0	.2	.00
May 1-31.....	5.4	17	4.6	8.8	1.3	42	25	17	.2	2.6	.20	107	62	27	188	--	5	.0	.6	.00
June 1-30.....	5.4	24	4.4	15	1.5	56	31	28	.2	.9	.20	146	78	32	259	--	10	.1	2.1	.10
July 1-31.....	5.6	26	5.9	19	1.6	56	35	37	.1	1.0	.45	167	89	43	300	--	5	.1	2.0	.00
Aug. 1-7, 9-31.	5.2	28	4.7	22	1.9	54	38	43	.1	.8	.30	174	90	46	326	--	8	.1	1.8	.15
Sept. 1-30.....	6.1	32	4.5	22	1.6	63	36	42	.1	3.2	.50	190	98	47	332	--	8	.1	1.8	.00
Time-weighted average d..	6.3	20	4.4	12	1.5	44	28	24	0.1	3.3	0.26	128	68	32	224	--	6	0.1	1.0	0.06

a Includes 0.02 parts per million Iron (Fe).
b Includes 0.03 parts per million Irom (Fe).
c Includes 0.03 parts per million Manganese (Mn).
d Represents 99 percent of the days.

KANAWHA RIVER BASIN--Continued

3-2013. KANAWHA RIVER AT WINFIELD, W. VA.--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement usually between 6 a.m. and 9 a.m.)

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

RACCOON CREEK BASIN

3-2018. SANDY RUN NEAR LAKE HOPE, OHIO

LOCATION.--At gaging station at bridge on King Hollow Road, 500 feet east of State Highway 278, and 0.5 mile upstream from upper end of Lake Hope, Vinton County.
DRAINAGE AREA.--4.98 square miles.
RECORDS AVAILABLE.--Chemical analyses: December 1959 to September 1960.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Dec. 14, 1959.	11			1.9	1.7					0	122							1.6	316	3.8	
Dec. 21.....	3.0			3.6	3.2					0	188							2.2	455	3.6	
Dec. 28.....	3.9			3.3	2.3					0	211							1.9	529	3.6	
Jan. 4, 1960..	9.8			1.6	1.1					0	102							.8	272	4.0	
Jan. 11.....	1.4			3.6	2.7					0	193							1.9	499	3.6	
Jan. 18.....	15			2.1	1.4					0	94							.8	243	4.1	
Jan. 25.....	3.0			3.5	2.0					0	140							.8	368	3.8	
Feb. 1.....	3.0			2.6	1.4					0	127							1.2	336	3.8	
Feb. 8.....	8.3			2.3	.38					0	91							.8	254	3.9	
Feb. 17.....	4.4			2.8	1.6					0	117				194			1.6	321	3.9	
Feb. 23.....	3.7			4.9	1.4					0	147							1.9	388	3.3	
Feb. 29.....	6.5			3.1	1.0					0	83							1.0	290	3.9	
Mar. 8.....	2.1			6.7	2.0					0	210							2.8	569	3.3	
Mar. 14.....	2.4			4.1	1.7					0	154							2.2	460	3.9	
Mar. 21.....	7.7			2.7	.58					0	96							.9	263	3.9	
Mar. 28.....	21			.97	.35					0	53							.4	149	4.5	
Apr. 4.....	15			.08	.54					0	74							.6	210	3.8	
Apr. 11.....	2.8			.16	1.2					0	128							1.5	344	3.7	

RACCOON CREEK BASIN--Continued

3-2018. SANDY RUN NEAR LAKE HOPE, OHIO--Continued

Chemical analyses, in parts per million, December 1959 to September 1960--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Apr. 19, 1960.	1.5			3.2	1.6					0	157							1.7	438	3.8	
May 2.....	2.1			1.4	1.3					0	118							1.2	353	3.7	
May 9.....	7.4			1.3	1.0					0	97							.8	260	4.0	
June 1.....	a .8			2.2	1.9					0	158							1.7	444	3.5	
June 7.....	a 1.1			1.1	3.0					0	194							2.0	482	3.7	
June 12.....	a .8			2.1	4.3					0	302							3.4	702	3.4	
June 20.....	a .4			1.9	3.9					0	286							3.0	680	3.4	
June 28.....	.3			.88	5.5					0	334							2.9	726	3.5	
July 11.....	.6			1.8	6.8					0	378							3.8	808	3.5	
July 19.....	3.2			3.2	7.0					0	311							3.6	727	3.4	
Aug. 2.....	.1			1.5	7.3					0	421							3.5	870	3.5	
Aug. 8.....	.3			1.3	8.8					0	410							3.7	830	3.6	
Aug. 15.....	.1			1.3	9.7					0	421							3.8	879	3.6	
Aug. 22.....	0			.81	9.0					0	386							2.8	782	3.6	
Aug. 29.....	0			.38	10					0	322							1.4	654	4.2	
Sept. 7.....	0			.79	10					0	348					380	380	1.8	822	3.9	
Sept. 12.....	.3			4.0	16					0	644							6.8	1200	3.4	
Sept. 19.....	.2			2.3	18					0	660							6.1	1220	3.4	
Sept. 26.....	0			1.5	16					0	662							5.5	1200	3.6	

a Daily mean discharge.

3-2052. GUYANDOTTE RIVER AT HUNTINGTON, W. VA.

LOCATION.--At highway bridge at Huntington, Cabell County, 2.9 miles upstream from mouth, and 0.1 mile upstream from Russell Creek.
DRAINAGE AREA.--1,674 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1959 to September 1960.
Water temperatures: October 1959 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 467 ppm Oct. 1-31; minimum, 98 ppm Dec. 9-15.
Hardness: Maximum, 176 ppm Oct. 1-31; minimum, 51 ppm Dec. 9-15, Mar. 16-31.
Specific conductance: Maximum daily, 992 micromhos Oct. 5; minimum daily, 125 micromhos Feb. 26.
Water temperatures: Maximum, not determined; minimum, freezing point on several days during March.
REMARKS.--Records of specific conductance and pH of daily samples are available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
																		Calcium, magnesium	Noncarbonate					
Oct. 1-31, 1959.....	5.8		0.02	0.04	39	19	89	4.6		110		224	32	0.2	1.9	0.12	467	176	86		732	7.3	4	0.0
Nov. 1-20.....	9.8		.01	--	33	15	48	2.4		68		148	22	.1	3.0	.15	315	144	88		511	7.1	1	.1
Dec. 1-8.....	8.4		--	--	18	8.6	14	1.7		22		76	10	.1	3.2	.14	152	80	62		247	--	3	.0
Dec. 9-15.....	8.3		--	--	12	5.1	8.6	1.5		20		44	4.8	.2	1.7	.06	98	51	34		162	--	3	.0
Dec. 16-31.....	10		--	--	17	7.2	17	1.8		28		76	8.0	.1	2.3	.12	154	72	49		241	--	3	.0
Jan. 1-30, 1960.....	7.9		--	--	16	6.7	16	1.2		31		63	6.2	.2	2.1	.12	138	68	42		229	--	3	.0
Feb. 17-29.....	7.4		--	.07	13	5.4	11	1.4		22		54	5.0	.1	2.3	.20	115	54	36		182	--	6	.0
Mar. 1-13.....	9.0		--	--	19	8.9	22	1.8		30		94	10	.1	2.1	.04	184	84	60		296	--	2	.0
Mar. 16-31.....	8.2		--	--	11	5.6	9.9	1.5		21		48	5.5	.1	1.6	.06	104	51	34		172	--	2	.0
Apr. 1-10.....	6.1		--	--	12	6.4	9.7	1.6		19		56	4.0	.1	1.8	.03	108	56	41		180	--	2	.0
Apr. 12-30.....	7.1		--	--	24	11	35	2.7		54		114	15	.3	1.6	.08	237	105	61		391	--	5	.0
May 1-8, 10-31.....	8.7		--	--	23	8.4	32	2.5		59		94	14	.2	1.4	.17	225	92	44		344	--	5	.0
June 1-14.....	9.4		--	--	30	12	51	3.1		82		131	24	.1	2.0	.35	306	125	58		491	--	4	.0
Sept. 9-30.....	7.3		--	--	39	14	78	4.3		121		178	30	.2	1.6	.33	394	155	56		672	--	5	.0

GUYANDOTTE RIVER BASIN--Continued

3-2052. GUYANDOTTE RIVER AT HUNTINGTON, W. VA.--Continued

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

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

3-2115. JOHNS CREEK NEAR VAN LEAR, KY.

LOCATION.--Temperature recorder at gaging station, 100 feet upstream from Long Branch, 0.3 mile upstream from Daniels Creek, 0.7 mile downstream from Dewey Dam, and 2.5 miles southeast of Van Lear, Johnson County.
DRAINAGE AREA (revised).--206 square miles.
RECORDS AVAILABLE.--Water temperatures: April 1954 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 83°F July 28, Aug. 3, 31; minimum, 34°F Feb. 26.
EXTREMES, 1954-60.--Water temperatures: Maximum, 90°F July 3, 1956; minimum, 34°F Feb. 2, 6, 1955, Feb. 26, 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705. Flow regulated by Dewey Reservoir.

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

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

BIG SANDY RIVER BASIN--Continued

3-2145. TUG FORK AT KERMIT, W. VA.

LOCATION.--At city waterplant at Kermit, Mingo County, 0.8 mile downstream from Wolf Creek, and 3 miles downstream from gaging station near Kermit.
DRAINAGE AREA.--1,274 square miles at waterplant; 1,185 square miles upstream from gaging station.
RECORDS AVAILABLE.--Water temperatures: October 1946 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 84°F July 26; minimum, 35°F Jan. 24, 25, Mar. 6, 11.
EXTREMES, 1946-60.--Water temperatures: Maximum, 90°F July 29, 1949; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for gaging station near Kermit for water year October 1959 to September 1960 given in WSP 1705.

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

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

3-2157. BIG SANDY RIVER AT CATLETTSBURG, KY.

LOCATION.--At the Catlettsburg, Kenova and Ceredo Water Company intake at Catlettsburg, Boyd County, 300 feet upstream from bridge on U.S. Highway 60, 0.3 mile upstream from Ice Dam Creek, and 0.9 mile upstream from mouth.
DRAINAGE AREA.--4,281 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1956 to September 1960.
Water temperatures: October 1956 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 338 ppm June 1, 3-4, 6-11, 13-18, 20-25, 27-30; minimum, 119 ppm Feb. 1-6, 8-9, 11-20, 22-27, 29, Apr. 1-2, 4-8, 11, 12.
Hardness: Maximum, 154 ppm Oct. 1-2, 5-10, 12-17, 19-24, 26-31; minimum, 62 ppm Apr. 1-2, 4-8, 11, 12.
Specific conductance: Maximum daily, 800 micromhos June 27; minimum daily, 135 micromhos Mar. 19.
Water temperatures: Maximum, 85°F Aug. 3-4; minimum, freezing point Feb. 20, Mar. 5.
EXTREMES, 1956-60.--Dissolved solids: Maximum, 499 ppm Oct. 21-31, 1958; minimum, 88 ppm May 1-9, 1958.
Hardness: Maximum, 208 ppm Nov. 2-10, 1958; minimum, 44 ppm May 1-9, 1958.
Specific conductance: Maximum daily, 876 micromhos Sept. 10, 1957; minimum daily, 109 micromhos Apr. 10, 1957, Apr. 29, 1958.
Water temperatures: Maximum, 88°F Aug. 25, 26, 1959; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
Oct. 1-2,5-10,12-17, 19-24,26-31, 1959..		6.5		--		35	16	52	3.8		88		134	37	0.1	2.3	0.16	330	154	82		556	7.2	4	0.1
Nov. 2-14, 16-17.....		10		0.01		27	13	31	2.6		66		94	27	.2	2.1	.10	249	121	67		441	7.3	4	.1
Nov. 18-21..		22		.03		31	14	45	2.6		90		104	36	.2	1.5	.04	304	135	61		494	7.4	2	.1
Nov. 23-25..		7.6		.00		30	13	38	2.6		72		98	41	.1	2.1	.15	278	129	70		471	6.9	4	.1
Nov.27-28, 30-Dec. 5, 7-12.....		9.3		--		17	7.1	12	2.0		30		53	13	.1	3.1	.10	138	72	47		228	6.7	8	.0
Dec. 14-19, 21-22, 24, 26, 28-31.		9.0		--		18	7.0	14	1.7		30		60	13	.1	2.3	.20	144	74	49		235	6.6	3	.0
Jan.1,4-9, 11-16,18-20,22-23, 25-27,29-30, 1960..		8.7		--		16	7.4	14	1.7		32		58	12	.1	2.2	.15	138	70	44		229	6.7	7	.0

BIG SANDY RIVER BASIN--Continued

3-2157. BIG SANDY RIVER AT CATLETTSBURG, KY.--Continued

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
																			Calcium, magnesium	Noncarbonate					
Feb.1-6,8-9, 11-20, 22-27,29,1960		8.8		--	0.07	14	5.6	12	1.4		28		49	10	0.2	2.3	0.12	119	58	35		193	--	7	0.0
Mar.1-5,7-12,14-19, 21-26, 28-31.....		9.0		--		14	7.7	14	1.4		29		57	11	.1	2.0	.06	132	66	42		214	--	1	.0
Apr.1-2,4-8, 11, 12....		8.7		--		15	6.1	10	1.6		28		52	7.0	.1	1.2	.10	119	62	39		192	--	5	.0
Apr.13-15, 18-23, 25-30.....		8.2		--		27	11	28	2.3		60		97	15	.2	1.2	.20	230	113	64		367	--	6	.0
May 2-3,5,7, 9-14, 16-21,23-28, 30-31.....		7.7		--		29	11	37	2.5		75		98	28	.2	1.2	.14	236	118	56		420	--	5	.0
June 1,3-4, 6-11,13-18,20-25, 27-30.....		5.9		--		35	15	54	3.2		98		125	39	.2	1.7	.08	338	149	69		551	--	8	.0
July 1-2,5-9,12-16, 18-23, 25-30.....		10		--		21	8.8	24	3.0		49		70	19	.2	1.7	.30	189	88	48		302	--	8	.0
Aug.1-13,15-20,22-27, 29-31.....		6.8		--		34	11	42	3.0		78		118	31	.3	1.4	.10	298	130	66		482	--	3	.1
Sept.1-3,6-10,12-14, 16-17,19-24,26-30..		6.8		--		35	14	53	3.6		91		119	42	.3	1.8	.36	334	145	70		550	--	5	.1
Time-weighted average.		8.3		--	--	25	10	31	2.5		60		88	24	0.2	1.9	0.15	225	106	57		373	--	5	--

BIG SANDY RIVER BASIN--Continued

3-2157. BIG SANDY RIVER AT CATLETTSBURG, KY.--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement at 8 a.m.)

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

TYGARTS CREEK BASIN

3-2170. TYGARTS CREEK NEAR GREENUP, KY.

LOCATION.--At gaging station at bridge on State Highway 7, 100 feet downstream from Lick Run, 0.4 mile upstream from White Oak Creek, and 6.5 miles west of Greenup, Greenup County.
DRAINAGE AREA.--242 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1956 to September 1960.
Sediment records: October 1956 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 82°F Aug. 3; minimum, freezing point on several days during winter months.
Sediment concentrations: Maximum daily, 1,500 ppm May 27; minimum daily, 1 ppm May 5, 16-17, 22.
Sediment loads: Maximum daily, 21,900 tons July 4; minimum daily, less than 0.05 ton on many days during October, August, and September.
EXTREMES, 1956-60.--Water temperatures: Maximum, 83°F July 16, 23, 31, 1957; minimum, freezing point on several days during winter months.
Sediment concentrations: Maximum daily, 1,500 ppm May 27, 1960; minimum daily, 1 ppm on many days during 1959-60.
Sediment loads: Maximum daily, 21,900 tons July 4, 1960; minimum daily, less than 0.05 ton on many days during 1957-60.
REMARKS.--Water temperature observations Nov. 17 to Jan. 14, Jan. 16-23 unreliable, but several days of freezing point assumed during period. Occasional regulation at low flow caused by withdrawing cooling water for gas transmission station. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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	54	54	54	60	60	59	59	54	54	49	49	49	49	49	46	46	49	49	44	44	44	44	49	47	44	34	34	40	40	41	41	48
November	40	37	40	40	34	34	33	33	33	32	32	35	35	35	35	35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--	--	--	--	--	--	--	32	--	--	--	--	--	--	--	--	32	32	36	36	41	41	40	41	--
February	41	40	40	40	40	42	42	42	45	45	45	40	40	34	34	35	37	34	34	34	35	35	35	36	36	38	40	33	33	--	--	38
March	34	34	34	34	34	34	34	33	33	33	35	35	37	37	38	38	38	38	38	38	38	40	40	40	40	40	45	54	54	48	40	38
April	55	55	51	51	46	46	40	45	45	55	55	55	58	60	61	58	62	62	65	65	68	70	70	70	68	67	67	66	66	66	--	59
May	66	64	65	65	65	66	61	60	55	53	51	50	51	59	61	63	65	68	68	71	70	69	69	72	69	71	63	61	63	65	68	63
June	68	69	72	75	76	72	70	70	72	72	74	73	73	73	72	75	71	71	72	72	71	74	66	68	66	71	71	69	73	75	--	72
July	73	71	69	70	70	70	71	73	74	73	71	72	74	73	73	74	75	75	75	76	77	78	75	76	79	78	81	80	81	80	78	75
August	80	81	82	77	81	81	79	81	79	79	77	75	77	76	77	74	80	75	78	75	77	77	78	77	78	79	79	79	79	78	--	78
September	81	81	80	80	80	78	78	79	76	71	69	69	70	70	69	70	65	67	66	66	67	69	71	70	70	69	68	65	68	66	--	72

TYGARTS CREEK BASIN--Continued

3-2170. TYGARTS CREEK NEAR GREENUP, KY.--Continued

Suspended sediment, water year October 1959 to September 1960
(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	1.5	11	T	6.8	C 4	0.07	122	17	5.6
2	1.3	10	T	5.6	C 4	.06	98	14	3.7
3	1.3	10	T	5.6	C 4	.06	115	C 8	2.5
4	1.3	8	T	7.4	C 4	.08	130	C 8	2.8
5	1.3	8	T	7.4	C 4	.08	132	C 8	2.9
6	1.3	8	T	9.2	C 4	1.0	112	C 8	2.4
7	1.3	8	T	8.0	C 4	.09	120	C 8	2.6
8	1.5	10	T	7.4	C 4	.08	125	C 8	2.7
9	1.6	8	T	6.8	C 4	.07	115	C 8	2.5
10	1.5	8	T	6.8	C 4	.07	89	15	3.6
11	1.6	8	T	6.8	C 4	.07	75	12	B 2
12	1.6	8	T	6.8	C 4	.07	188	20	S 14
13	2.1	10	0.1	6.2	C 4	.07	564	35	B 55
14	2.4	11	.1	6.2	C 4	.07	462	51	64
15	2.4	9	.1	6.2	C 4	.07	273	41	30
16	2.8	9	.1	6.8	C 4	.07	186	35	18
17	3.1	9	.1	6.2	C 4	.07	138	31	12
18	3.7	9	.1	5.0	C 4	.05	178	26	12
19	3.7	8	.1	5.0	C 4	.05	285	20	15
20	3.4	8	.1	4.7	C 4	.05	252	15	10
21	3.4	9	.1	4.7	6	.1	172	11	5.1
22	3.1	8	.1	4.4	9	.1	140	8	3.0
23	3.1	C 4	T	5.0	12	.2	108	8	2.3
24	2.8	C 4	T	8.0	11	.2	89	8	1.9
25	2.8	C 4	T	27	18	1.3	73	8	1.6
26	2.4	C 4	T	51	21	2.9	64	8	1.4
27	3.1	C 4	T	100	21	5.7	58	8	1.2
28	4.4	C 4	T	222	26	16	69	12	2.2
29	4.4	C 4	.05	222	19	11	194	17	8.9
30	5.0	C 4	.05	170	22	10	264	17	12
31	5.0	C 4	.05	--	--	--	225	8	4.9
Total	80.2	--	1.80	945.0	--	49.80	5215	--	307.8

	JANUARY			FEBRUARY			MARCH		
1	195	4	2.1	213	17	9.8	331	11	9.8
2	165	6	2.7	172	10	4.6	290	10	7.8
3	312	22	S 29	140	8	3.0	240	8	5.2
4	507	46	63	115	8	2.5	220	10	5.9
5	351	17	16	159	11	S 6.0	200	7	3.8
6	246	16	11	1130	127	S 430	180	5	2.4
7	186	17	8.5	1080	66	S 222	160	6	2.6
8	148	15	6.0	561	26	39	150	5	2.0
9	118	8	2.5	420	27	31	140	4	1.5
10	94	6	1.5	828	66	S 254	130	5	1.8
11	80	13	2.8	3590	658	6380	116	6	1.9
12	71	14	2.7	1470	211	S 1080	120	7	2.3
13	77	14	2.7	436	31	S 39	130	6	2.1
14	225	93	S 275	352	15	14	140	6	2.3
15	2760	1090	8120	275	18	13	172	12	5.6
16	1720	272	S 1400	222	22	13	662	43	S 99
17	555	46	69	205	21	12	1600	130	B 550
18	411	33	37	352	21	20	1400	65	246
19	417	27	30	412	23	26	896	20	48
20	372	24	24	350	21	20	606	10	16
21	300	18	14	300	14	11	546	10	15
22	246	15	9.9	250	12	8.1	522	11	16
23	195	13	6.8	210	9	5.1	459	10	12
24	160	13	5.6	222	10	6.0	620	13	22
25	135	13	4.7	310	23	S 26	718	17	33
26	112	9	2.7	1490	117	470	546	20	29
27	118	10	3.2	921	66	164	851	18	41
28	318	16	14	599	27	44	998	16	43
29	456	21	26	456	12	15	760	17	35
30	342	17	16	--	--	--	610	30	49
31	267	16	12	--	--	--	858	39	90
Total	11659	--	10220.4	17240	--	9368.1	15371	--	1401.0

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

TYGARTS CREEK BASIN--Continued

3-2170. TYGARTS CREEK NEAR GREENUP, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--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	543	24	35	61	4	0.6	205	46	25
2	382	16	16	70	4	.8	144	31	12
3	304	11	9.0	72	4	.8	108	23	6.7
4	290	10	7.8	66	2	.4	80	23	5.0
5	285	8	6.2	55	1	.1	58	14	2.2
6	258	8	5.6	50	2	.3	118	14	4.5
7	228	7	4.3	53	2	.3	92	14	3.5
8	205	8	4.4	76	2	.4	53	11	1.6
9	185	8	4.0	116	3	1.2	41	7	.8
10	166	7	3.1	136	6	2.2	34	8 B	1
11	144	4	1.6	324	16	14	30	17	1.4
12	132	4	1.4	280	10	7.6	30	16	1.3
13	118	5	1.6	240	7	4.5	108	30 S	10
14	110	6	1.8	258	4	2.8	175	34	16
15	98	8	2.1	225	2	1.2	170	47	22
16	92	7	1.7	168	1	.4	124	48	16
17	86	3	.7	136	1	.4	86	26	6.0
18	82	4	.9	108	5	1.4	108	22	6.4
19	74	6	1.2	88	6 B	1	80	18	3.9
20	66	8	1.4	70	5	.9	64	19	3.3
21	61	8	1.3	60	2	.3	45	17	2.0
22	60	11	1.8	50	1	.1	114	42 S	29
23	55	10	1.5	43	2	.2	2020	1170	6380
24	54	11	1.6	38	3	.3	1810	547 S	2820
25	51	9	1.2	37	3	.3	554	163	244
26	53	6	.8	40	3	.3	288	78	61
27	55	5	.7	1300	1500 A	5000	192	56	29
28	56	10	1.5	1250	292 S	1040	140	40	15
29	60	13	2.1	473	130	166	134	38	14
30	55	8	1.2	382	83	86	185	39	19
31	--	--	--	310	49	41	--	--	--
Total	4408	--	123.5	6635	--	6375.8	7390	--	9761.6
	JULY			AUGUST			SEPTEMBER		
1	864	320 S	1500	20	13	0.7	4.5	2	T
2	2980	822	6610	19	9	.5	4.5	2	T
3	2100	1370 S	12400	15	10	.4	4.2	2	T
4	6360	1360 S	21900	13	13	.4	3.9	3	T
5	2800	314 S	2720	12	11	.4	3.3	5	T
6	487	125	164	14	8	.3	3.0	4	T
7	319	76	65	16	13	.6	3.0	4	T
8	237	46	29	19	14	.7	3.0	4	T
9	175	36	17	42	13	1.5	3.0	4	T
10	154	35	14	53	17	2.4	3.0	3	T
11	1200	850 A	3000	41	16	1.8	3.6	4	T
12	818	700 S	1940	27	12	.9	3.9	4	T
13	285	230	177	23	12	.7	4.2	5	0.1
14	207	96	52	21	11	.6	4.2	7	.1
15	154	52	22	20	8	.4	4.2	9	.1
16	127	34	11	17	11	.5	3.9	9	.1
17	98	31	8.2	16	12	.5	7.6	15	.3
18	80	32	6.9	16	11	.5	58	23	3.6
19	68	27	5.0	14	10	.4	170	27	12
20	66	25	8.0	13	10	.4	84	24	5.4
21	55	23	3.4	14	7	.3	45	18	2.3
22	44	22	2.6	17	3	.1	32	15	1.3
23	38	26	2.7	14	5	.2	26	13	.9
24	34	24	2.2	11	5	.1	22	13	.8
25	48	19	2.5	11	3	.1	18	13	.6
26	61	20	3.3	12	4	.1	14	15	.6
27	38	19	1.9	11	4	.1	12	13	.4
28	29	18	1.4	10	2	.1	10	12	.3
29	25	18	1.2	8.1	2	T	9.0	12	.3
30	23	19	1.2	6.8	2	T	8.1	12	.3
31	22	20	1.2	5.4	3	T	--	--	--
Total	19981	--	50672.7	551.3	--	15.8	575.1	--	29.8

Total discharge for year (cfs-days)..... 90,050.6
Total load for year (tons)..... 88,328.1

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

TYGARTS CREEK BASIN--Continued

3-2170. TYGARTS CREEK NEAR GREENUP, KY.--Continued

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

Date of collection	Time (24 hour)	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. 15, 1960.....	1145			3260	1630		50	58	72	87	96	98	100	--				SBWC
Feb. 11.....	0845			3610	762		48	52	66	82	92	97	100	--				SBWC
Feb. 11.....	1530			3820	702		46	58	70	85	92	97	99	100				SBWC
Feb. 11.....	1530			3820	702		35	49	68	85	93	96	98	100				SBWC
May 27.....	1455			1930	1760		48	65	79	92	98	99	100	--				SBWC
June 23.....	1630			2440	1420		48	64	78	89	95	98	100	--				SBWC
July 3.....	2045			4000	2080		41	56	69	85	93	99	100	--				SBWC
July 3.....	2045			4000	2060		33	47	62	80	91	98	100	--				SBN

SCIOTO RIVER BASIN

3-2255. OLENTANGY RIVER NEAR DELAWARE, OHIO

LOCATION.--Temperature recorder at gaging station, 500 feet upstream from highway bridge, 1,000 feet downstream from Delaware Dam, 1,300 feet upstream from Pennsylvania Railroad bridge, and 4 miles north of Delaware, Delaware County.
DRAINAGE AREA.--387 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1946 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 81°F Sept. 8; minimum, 34°F Jan. 7-12, 21-31.
EXTREMES, 1946-60.--Water temperatures: Maximum, 93°F June 29, 1952; minimum, freezing point on several days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

3-2268. OLENTANGY RIVER NEAR WORTHINGTON, OHIO

LOCATION.--Temperature recorder at gaging station, 30 feet downstream from Wilson Bridge Road bridge, 1.5 miles northwest of Worthington, Franklin County, and 2.8 miles upstream from Rush Run.
DRAINAGE AREA.--493 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1955 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 82°F July 24; minimum, freezing point Feb. 3, Mar. 3, 4.
EXTREMES, 1955-60.--Water temperatures: Maximum, 86°F Aug. 22, 23, 1959; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960, given in WSP 1705.

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

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

SCIOTO RIVER BASIN--Continued

3-2315. SCIOTO RIVER AT CHILLICOTHE, OHIO

LOCATION.--Temperature recorder at gaging station at north end of Chillicothe, Ross County, 450 feet downstream from Bridge Street Bridge.
DRAINAGE AREA.--3,847 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1951.
Water temperatures: October 1950 to September 1951, October 1953 to February 1959, June to September 1960.
EXTREMES, June to September 1960.--Water temperatures: Maximum 82°F Aug. 28, 29, Sept. 2, 3.
EXTREMES, 1950-51, 1953-60.--Water temperatures: Maximum, 89°F July 14, 1954, Aug. 2, 3, 1955; minimum, freezing point on several days during December 1950 to February 1951.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

Temperature (°F) of water, June to September 1960

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	
June																																
Maximum	--	--	--	--	--	--	--	--	--	--	75	75	75	75	75	76	76	74	75	75	75	74	74	74	75	75	75	75	75	75	--	--
Minimum	--	--	--	--	--	--	--	--	--	--	72	75	75	75	75	74	74	73	72	74	74	74	73	73	73	73	74	75	75	75	--	--
July																																
Maximum	75	75	75	75	75	75	75	75	75	75	75	77	77	76	74	75	76	76	75	76	76	76	76	76	76	76	77	77	77	78	78	76
Minimum	75	75	75	73	74	74	74	73	74	75	74	75	76	73	73	73	73	75	75	74	75	75	76	75	75	76	76	77	77	77	77	75
August																																
Maximum	78	78	78	78	78	78	79	79	79	79	78	78	78	79	79	79	79	80	81	81	81	80	80	80	80	81	81	82	82	81	80	79
Minimum	75	76	77	77	75	78	78	78	78	78	77	77	77	78	78	78	77	78	80	81	80	79	79	79	78	79	80	80	81	80	78	78
September																																
Maximum	81	82	82	80	81	81	80	80	80	78	74	72	72	69	68	70	70	68	67	67	67	68	70	72	72	71	70	70	69	69	--	73
Minimum	78	79	78	78	79	78	78	78	78	74	72	70	69	66	66	67	68	67	67	66	65	66	67	69	69	69	68	69	67	66	--	71

3-2340. PAINT CREEK NEAR BOURNEVILLE, OHIO

LOCATION.--At gaging station at highway bridge, 1.2 miles southwest of Bourneville, Ross County, and 1.2 miles upstream from Upper Twin Creek.
DRAINAGE AREA.--808 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1956 to September 1960.
Sediment records: October 1956 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 76°F on several days during July and August; minimum, freezing point Dec. 10.
Sediment concentrations: Maximum daily, 1,730 ppm Jan. 15; minimum daily, 4 ppm Feb. 4.
Sediment loads: Maximum daily, 33,900 tons Jan. 15; minimum daily, 2 tons Nov. 20-21, 26.
EXTREMES, 1956-60.--Water temperatures: Maximum, 80°F June 30, July 1, 1959; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 2,010 ppm Jan. 21, 1959; minimum daily, 2 ppm on several days during November, December 1956, and January 1957.
Sediment loads: Maximum daily, 77,900 tons Jan. 22, 1959; minimum daily, less than 0.5 ton Nov. 26, Dec. 1-4, 1956.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705. Flow regulated slightly by Rocky Fork Reservoir (capacity 34,100 acre-feet).

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement at 7 a.m.)

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

SCIOTO RIVER BASIN--Continued

3-2340. PAINT CREEK NEAR BOURNEVILLE, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960

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..	52	82	12	52	C 25	3.5	295	15	12
2..	45	71	9	52	C 25	3.5	257	8	6
3..	43	76	9	50	C 25	3.4	250	5	3
4..	43	66	8	59	C 25	4.0	224	C 8	4.9
5..	42	68	8	104	34	10	206	C 8	4.4
6..	50	68	9	145	38	15	203	C 8	4.4
7..	80	72	16	99	30	8	238	C 8	5.1
8..	114	131 S	45	87	25	6	242	C 8	5.2
9..	261	106	75	89	16	4	224	C 8	4.8
10..	136	61	22	87	C 17	4	206	C 8	4.4
11..	92	59	15	78	C 17	4	203	7	4
12..	78	48	10	74	C 17	3.4	1940	726 S	5790
13..	67	41	7	69	C 17	3.2	3130	459	3880
14..	67	36	6	71	C 17	3.3	2330	169	1060
15..	65	36	6	82	C 17	3.8	1650	75	334
16..	58	32	5	85	C 17	4.0	1180	52	166
17..	56	30	4	87	C 17	4.0	896	48	116
18..	50	32	4	80	C 17	3.7	1000	44	119
19..	50	34	4	71	C 17	3.3	932	42	106
20..	50	32	4	71	10	2	705	24	46
21..	48	30	4	71	8	2	589	13	21
22..	48	29	4	71	14	3	515	7	10
23..	50	26	4	74	18	4	435	10	12
24..	52	27	4	87	19	4	397	13	14
25..	52	24	3	87	13	3	374	7	7
26..	52	C 28	4	85	9	2	360	12	12
27..	56	C 28	4	426	-- E	260	360	17	16
28..	56	C 28	4	582	100	157	710	82 S	177
29..	54	C 28	4	498	46	62	1080	90	262
30..	50	C 28	4	360	20	19	950	42	108
31..	48	C 28	4	--	--	--	720	23	45
Total	2065	--	321	3933	--	612	22801	--	12359

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..	569	8	12	765	18	37	750	C 20	41
2..	504	6	8	642	12	21	680	C 20	37
3..	1130	-- E	320	545	11	16	687	C 20	37
4..	1250	70	236	477	4	5	631	C 20	34
5..	950	22	56	487	5	6	530	C 20	29
6..	705	10	19	2140	192 S	1240	487	C 20	26
7..	589	9	14	2580	117	815	483	C 20	26
8..	521	13	18	2000	69	373	433	C 20	23
9..	440	9	11	1950	53	279	422	C 20	23
10..	383	10	10	5150	851 S	22700	433	C 20	23
11..	369	11	11	9610	830 S	24500	408	C 20	22
12..	352	15	14	5000	320 B	4300	405	C 20	22
13..	1040	110 S	388	2940	190 B	1500	350	C 20	19
14..	1070	58	168	1980	100 A	550	356	C 20	19
15..	5930	1730 S	33900	1550	50	209	372	C 20	20
16..	3840	340	3520	1220	34	112	405	33	36
17..	2670	177	1280	1050	-- E	80	483	20	26
18..	2190	78	461	1030	-- E	80	550	20	30
19..	2430	63	413	980	-- E	80	673	20	36
20..	1990	48	258	728	-- E	80	1070	44	127
21..	1480	-- E	85	735	-- E	80	1530	57	235
22..	1070	-- E	85	698	-- E	80	1620	42	184
23..	788	-- E	85	609	26	43	1600	44	190
24..	642	-- E	85	569	11	17	2220	134	803
25..	622	-- E	85	726	24 S	78	2080	74	416
26..	545	33	48	1830	107	529	1920	44	228
27..	521	20	28	1360	35	128	2800	-- E	3200
28..	869	32	75	1120	13	39	3820	600	6600
29..	1140	40	123	960	8	21	2960	155	1240
30..	1050	32	91	--	--	--	2300	98	608
31..	887	36	86	--	--	--	1760	78	371
Total	38536	--	41993	51431	--	57998	35218	--	14731

E Estimated.
S Computed by subdividing day.
A Computed from partly estimated-concentration graph.
B Computed from estimated-concentration graph.
C Composite period.

SCIOTO RIVER BASIN--Continued

3-2340. PAINT CREEK NEAR BOURNEVILLE, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960--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	1320	53	189	350	42	40	715	44	85
2	1050	38	108	293	20	16	535	40	58
3	930	33	83	261	19	13	440	35	42
4	1440	76	295	235	15	10	378	33	34
5	1940	67	351	220	14	8	323	33	29
6	1720	46	214	202	11	6	279	52	39
7	1340	39	141	215	12	7	242	51	33
8	1040	35	98	255	12	8	212	57	33
9	830	29	65	245	8	5	190	58	30
10	680	20	37	242	22	14	171	59	27
11	574	16	25	271	33	24	162	55	24
12	540	23	34	253	19	13	149	56	22
13	492	36	48	253	15	10	232	74	46
14	451	23	28	248	18	12	287	70	54
15	426	15	17	228	19	12	359	93	90
16	415	12	13	215	23	13	306	86	71
17	408	16	18	198	22	12	240	63	41
18	398	13	14	193	29	15	202	63	34
19	356	16	15	190	30	15	176	60	28
20	326	11	10	183	23	11	158	54	23
21	315	18	15	188	28	14	147	61	24
22	312	24	20	188	30	15	159	95 B	50
23	298	26	21	193	37	19	366	570	563
24	284	12	9	193	27	14	255	248	171
25	268	15	11	178	15	7	202	179	98
26	271	20	15	183	35	17	160	107	46
27	284	35	27	357	90 B	130	143	98	38
28	253	34	23	1370	222	821	133	90	32
29	232	22	14	1880	170	863	129	85	30
30	238	21	13	1470	117	464	127	103	35
31	--	--	--	1020	76	209	--	--	--
Total	19431	--	1971	11970	--	2837	7577	--	1930

Day	JULY			AUGUST			SEPTEMBER		
1	131	97	34	110	92	27	44	75	9
2	147	100	40	104	78	22	44	89	10
3	141	89	34	93	80	20	42	85	10
4	188	93	47	162	228 S	131	40	96	10
5	193	91	47	145	143	56	40	94	10
6	164	68	30	131	114	40	39	94	10
7	145	68	27	108	112	33	39	99	10
8	127	77	26	99	124	33	39	93	10
9	114	92	28	108	100	29	39	95	10
10	106	68	19	108	105	31	40	85	9
11	110	82	24	95	96	25	58	81	13
12	108	80	23	85	107	24	80	80	17
13	106	74	21	74	107	21	55	89	13
14	256	145	100	70	86	16	48	83	11
15	444	134	161	69	95	18	44	95	11
16	487	122	160	65	88	15	44	88	10
17	341	81	74	64	83	14	48	83	11
18	282	73	56	62	72	12	50	89	12
19	478	365 S	563	54	70	10	50	82	11
20	304	152	125	82	74	16	52	81	11
21	230	135	84	74	65	13	50	74	10
22	178	102	49	62	68	11	46	71	9
23	151	83	34	60	78	13	43	66	8
24	173	92	43	55	73	11	42	65	7
25	137	88	32	55	78	12	39	70	7
26	127	83	28	50	71	10	36	75	7
27	245	107	71	49	63	8	35	76	7
28	255	98	67	48	55	7	34	71	6
29	185	81	40	46	75	9	32	88	8
30	145	68	27	44	94	11	31	86	7
31	127	72	25	48	89	12	--	--	--
Total	6325	--	2139	2479	--	710	1323	--	294

Total discharge for year (cfs-days)..... 203089
Total load for year (tons)..... 125536

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

SCIOTO RIVER BASIN--Continued

3-2340. PAINT CREEK NEAR BOURNEVILLE, OHIO--Continued

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

Date of collection	Time (24 hour)	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, 1959.....	1700			4010	1380		43	57	71	78	90	97	98	100	--			SBWC
Dec. 12.....	1700			4010	1380		18	26	55	83	92	96	97	100	--			SBN
Jan. 15, 1960.....	1120			10200	3140		39	51	57	78	90	96	98	99	100			SBWC
Feb. 10.....	1700			7140	1460		30	37	44	61	82	89	95	97	100			SBWC
June 23.....	0700			412	710		59	76	90	97	99	100	--	--	--			SBWC

3-2345. SCIOTO RIVER AT HIGBY, OHIO

LOCATION.--At gaging station at highway bridge, 0.8 mile downstream from Walnut Creek and 4.2 miles north of Higby, Ross County.
DRAINAGE AREA.--5,129 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1953 to September 1960.
Sediment records: October 1953 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 84°F Sept. 7; minimum, freezing point Feb. 21, Mar. 2-5.
Sediment concentrations: Maximum daily, 1,200 ppm Dec. 13; minimum daily, 5 ppm Oct. 10, 16, Nov. 24-25.
Sediment loads: Maximum daily, 90,700 tons Feb. 11; minimum daily, 8 tons Oct. 16.
EXTREMES, 1953-60.--Water temperatures: Maximum, 84°F July 20, 1957, Sept. 7, 1960; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 2,130 ppm July 21, 1954; minimum daily, 1 ppm on several days during 1955-56.
Sediment loads: Maximum daily, 550,000 tons Jan. 23, 1959; minimum daily, 1 ton on several days during 1955-56.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705. Flow slightly regulated by O'Shaughnessy, Griggs, Delaware, Hoover and Rocky Fork Reservoirs.

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement between 5 p.m. and 7:30 p.m.)

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

SCIOTO RIVER BASIN--Continued

3-2345. SCIOTO RIVRR AT HIGBY, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960

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..	506	15	20	530	7	10	1740	59	277
2..	650	13	23	518	7	10	1820	52	256
3..	578	15	23	506	11	15	2200	58	344
4..	482	18	23	578	9 B	14	1810	65	318
5..	422	15	17	998	19 S	62	1620	68	297
6..	470	13	16	1560	36	152	1620	60 B	260
7..	746	7	14	1220	23	76	1940	59	309
8..	1340	115 S	557	1050	19	54	2380	46	296
9..	1680	24 S	121	938	13	33	2540	36	247
10..	1380	5	19	818	C 9	20	2220	46	276
11..	974	13	34	782	C 9	19	1900	45	231
12..	770	12	25	734	C 9	18	3890	560 S	8550
13..	674	14	25	710	C 9	17	10600	1200 A	34000
14..	626	11	18	710	C 9	17	13300	555	19900
15..	614	7	12	746	9 B	18	12800	342	11800
16..	590	5	8	938	11	28	9590	194	5020
17..	554	7	10	974	12	32	6950	122	2290
18..	518	13	18	950	12	31	5510	107	1590
19..	482	14	18	866	8 B	19	4650	98	1230
20..	470	15	19	806	8	17	3780	79	806
21..	458	15	18	770	10	21	3250	57	500
22..	458	14	17	734	8 B	16	2850	52	400
23..	470	15	19	722	8	16	2470	51	340
24..	554	10	15	734	5	10	2220	39	234
25..	626	10	17	818	5	11	2050	26	144
26..	650	12	21	842	6	14	1980	20	107
27..	614 C	8	13	1600	123 S	732	1980	24	128
28..	602 C	8	13	3070	190	1570	2670	88	634
29..	590 C	8	13	2740	-- E	600	4410	130 B	1500
30..	566 C	8	12	2060	73	406	4910	113	1500
31..	542 C	8	12	--	--	--	4390	90	1070
Total	20656	--	1190	31022	--	4056	126040	--	94854

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..	4110	70	777	4930	64	852	3690	35	349
2..	3460	55	514	4340	58	680	3230	39	340
3..	4110	69	766	3770	57	580	3140	40	339
4..	5390	110	1600	3610	42	409	2980	34	274
5..	5170	100	1400	3140	39	331	2640	48	342
6..	4890	75	990	6410	240 S	4460	2510	43	291
7..	3610	60	585	10500	223	6320	2420	24	157
8..	2980	53	426	12400	152	5090	2320	16	100
9..	2650	36	258	10800	108	3150	2230	15	90
10..	2370	30 B	190	13600	209 S	9530	2200	12	71
11..	2160	30	175	32300	1040	90700	2200	12	71
12..	2060	29	161	28800	558	43400	2460	10	66
13..	2940	40	318	24900	250	16800	2560	15	104
14..	8420	100 S	2430	14800	170	6790	2470	20	133
15..	22300	1190 S	78900	9110	117	2880	2490	23	155
16..	21500	505	29300	6830	95	1750	2180	30	176
17..	19000	244	12500	5530	79	1180	2220	47	282
18..	15700	186	7880	5170	69	963	2390	44	284
19..	12800	141	4870	4970	70	939	2780	53	398
20..	11500	101	3140	4260	75	863	3670	99	981
21..	8920	77	1850	3770	72	733	4570	88	1080
22..	6390	74	1280	3690	59	588	5050	65	886
23..	5050	84	1140	3370	53	482	5130	69	956
24..	4150	63	706	3180	41	352	5870	66	1050
25..	3750	57	577	3460	38	355	5730	73	1130
26..	3430	55	509	7090	59	1130	5470	73	1080
27..	3190	51	439	6410	51	883	6570	103	1830
28..	3690	61	608	5090	43	591	10200	240 A	6600
29..	4450	70	841	4340	39	457	12200	394	13000
30..	4770	77	992	--	--	--	13800	314	11700
31..	5610	62	939	--	--	--	13000	161	5650
Total	210520	--	157061	250570	--	203238	140370	--	49965

E Estimated.
S Computed by subdividing day.
A Computed from partly estimated-concentration graph.
B Computed from estimated-concentration graph.
C Composite period.

SCIOTO RIVER BASIN--Continued

3-2345. SCIOTO RIVER AT HIGBY, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960--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	11000	119	3530	1920	45	233	5370	145	2100
2	8610	110	2560	2110	51	290	4370	115	1360
3	6850	100	1850	1840	45	224	3370	75	682
4	6890	95 B	1800	1640	33	146	2780	52	390
5	12600	230	7820	1520	26	107	2370	49	314
6	13600	200	7340	1450	27	106	2050	42	232
7	9780	97	2560	1540	26	108	1820	31	152
8	7590	72	1480	1780	45	216	1700	30	138
9	5590	55 B	850	1730	21	98	1680	26	118
10	4550	50 B	600	1600	14	60	1550	24	100
11	4050	43	470	1670	15	68	1430	27	104
12	3580	40	387	1730	17	79	1310	26	92
13	3270	38	336	1820	17	84	1390	20	75
14	3030	37	303	1840	20	99	1550	24	100
15	2820	36	274	1810	20 B	100	2000	40	216
16	2690	37	269	1640	15	66	2000	41	221
17	2550	31	213	1670	18	81	2000	48	259
18	2470	30	200	2580	49	341	2100	50 B	280
19	2420	35	229	2060	26	145	1870	45 B	230
20	2250	30	182	1760	22	104	1740	40	188
21	2110	25 B	140	1600	17	73	1550	31	130
22	2020	24	131	1550	15	63	1420	19	73
23	1980	20	107	1610	20	87	1790	26	142
24	1900	20	103	2420	72	470	1870	--	202
25	1810	27	132	1970	23	122	1640	41	182
26	1790	26	126	1730	12	56	1560	--	168
27	1920	21	109	5170	102 S	1620	1430	39	151
28	1760	21	100	7670	255	5280	1290	--	139
29	1610	33	143	9260	1010	25200	1220	--	132
30	1550	30	126	8380	310	7010	1170	--	126
31	--	--	--	6410	162	2800	--	--	--
Total	134640	--	34470	83480	--	45536	59390	--	8796

Day	JULY			AUGUST			SEPTEMBER		
1	1280	32	110	788	29	62	566	14	21
2	1520	42	172	762	27	56	738	10	20
3	1450	26	102	706	30	57	645	11	19
4	1310	26	92	730	50 B	100	566	12 B	18
5	1330	40	144	815	130 A	290	532	10	14
6	1150	37	115	797	45	97	506	12	16
7	1050	30 A	85	770	30	62	500	13	18
8	971	37	97	806	25	54	500	11	15
9	910	23	56	950	20 B	50	506	9	12
10	890	20	48	940	20 B	50	506	8	11
11	900	16	39	824	15	33	566	25	38
12	890	14	34	960	23	60	566	19	29
13	860	18	42	870	20	47	545	15	22
14	1610	230 S	1440	722	34	66	519	17	24
15	2820	--	2600	675	31	56	506	17	23
16	2150	-- E	450	645	22	38	493	10	13
17	1580	33	141	690	45	84	500	12	16
18	1310	20 A	70	880	35	83	500	11	15
19	1980	--	1700	1220	36	118	500	13	18
20	1680	160 A	700	1060	24	69	493	15	20
21	1290	110 B	380	880	19	45	506	17 B	25
22	1020	101	278	860	20	46	545	17 B	25
23	910	119	292	1090	24	71	512	15	21
24	930	125	314	900	35	85	500	11	15
25	982	122	323	806	18	39	474	12 B	15
26	851	112	257	762	32	66	456	15	18
27	833	50	112	722	16	31	444	16 B	19
28	1070	30	87	668	15	27	420	15 B	17
29	1040	35	98	615	12	20	426	16	18
30	910	31	76	580	12	19	462	24	30
31	815	34	75	559	9	14	--	--	--
Total	38292	--	10529	25052	--	1995	15498	--	585

Total discharge for year (cfs-days)..... 1,135,530
Total load for year (tons)..... 612,275

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

SCIOTO RIVER BASIN--Continued

3-2345. SCIOTO RIVER AT HIGBY, OHIO--Continued

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

Date of collection	Time (24 hour)	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. 13, 1959.....	1700			11200	944		38	47	61	77	89	95	98	100				SBWC
Jan. 15, 1960.....	1700			26900	1780		44	54	66	84	95	98	99	100				SBWC
Feb. 11.....	1230			34200	1170		50	62	73	85	92	96	98	100				SBWC
Feb. 11.....	1230			34200	1170		14	24	54	83	93	96	98	100				SBN
Feb. 11.....	1700			35700	1300		63	69	77	85	91	95	97	100				SBWC
May 29.....	1700			9510	1050		63	74	89	95	98	99	100	--				SBWC

3-2371. SCIOTO RIVER AT LUCASVILLE, OHIO

LOCATION.--At bridge on State Highway 348 at Lucasville, Scioto County, 0.4 mile downstream from Miller Run, and 4.9 miles upstream from Scioto Brush Creek.
DRAINAGE AREA.--6,176 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1956 to September 1960.
Water temperatures: October 1956 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 453 ppm Oct. 1-8, Sept. 1-30; minimum, 224 ppm Oct. 9-11.
Hardness: Maximum, 308 ppm Sept. 1-30; minimum, 144 ppm Oct. 9-11.
Specific conductance: Maximum daily, 751 micromhos Sept. 30; minimum daily, 321 micromhos Feb. 12.
Water temperatures: Maximum, 80°F Aug. 30, Sept. 2, 6; minimum, freezing point on several days during December to March.
EXTREMES, 1956-60.--Dissolved solids: Maximum, 479 ppm Nov. 11-20, 1956; minimum, 194 ppm Jan. 21-23, 30-31, 1959.
Hardness: Maximum, 329 ppm Nov. 1-10, 1958; minimum, 143 ppm Jan. 21-23, 30-31, 1959.
Specific conductance: Maximum daily, 784 micromhos Nov. 19, 1956; minimum daily, 238 micromhos July 24, 1958.
Water temperatures: Maximum, 85°F July 22, 1957; minimum, freezing point on many days during winter months.
REMARKS.--Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
Oct.1-8,1959		12				75	29	35	4.4		272		104	36	0.5	2.6	2.0	453	306	83		730	7.9	20	0.2
Oct. 9-11...		11				36	13	14	3.9		122		55	14	.4	5.3	1.5	224	144	44		368	7.5	18	.1
Oct. 12-31..		11				62	24	24	4.1		218		86	25	.4	5.4	1.1	361	253	74		594	7.6	12	.1
Nov. 1-30...		9.3				58	22	21	3.5		188		84	24	.4	4.2	.80	322	235	81		550	7.4	8	.1
Dec. 1-31...		8.8				58	22	13	2.5		184		82	17	.3	8.9	1.0	329	235	84		506	7.3	6	.1
Jan. 1-31, 1960..		9.1				58	23	10	2.2		186		75	15	.3	11	.30	318	239	86		494	7.2	8	.1
Feb. 1-13, 15-29.....		7.7				57	21	8.7	1.8		184		67	14	.3	12	.39	290	229	78		478	--	14	.0
Mar. 1-31...		8.3				58	23	12	1.7		196		72	18	.2	1.7	.37	325	239	78		506	--	6	.1
Apr. 1-30...		6.2				64	24	10	2.2		218		74	15	.2	11	.60	343	258	80		531	--	8	.0
May 1-31....		7.4				56	22	14	2.5		200		74	17	.4	5.1	.80	312	230	66		500	--	7	.1
June 1-30...		6.4				66	25	16	2.7		226		79	20	.4	8.1	.64	361	268	82		570	--	13	.1
July 1-31...		10				67	26	20	3.4		236		80	23	.4	6.0	1.8	373	274	80		586	--	18	.1
Aug. 1-31...		10				75	21	26	3.7		230		93	27	.3	4.3	.90	396	274	85		616	--	12	.1
Sept. 1-30..		8.1				87	22	36	4.2		276		106	37	.4	2.2	.60	453	308	82		723	--	20	.2
Time-weighted average.		8.6				64	23	18	2.9		212		81	21	0.3	6.6	0.80	350	254	80		556	--	11	0.1

SCIOTO RIVER BASIN--Continued

3-2371. SCIOTO RIVER AT LUCASVILLE, OHIO--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement at 10:30 a.m.)

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	61	65	64	66	68	68	65	65	62	60	62	57	55	53	51	51	52	51	49	49	50	51	54	54	50	47	47	--	43	50	50	56
November	50	47	44	47	50	50	48	42	41	40	42	41	42	40	40	42	40	36	35	35	37	36	40	42	39	37	37	37	34	33	--	41
December	32	34	34	34	35	36	35	33	32	32	34	31	37	37	40	42	43	45	41	39	39	36	35	36	36	37	40	44	44	42	41	37
January	37	37	38	37	37	35	35	36	35	38	40	41	47	46	46	43	40	39	38	37	35	32	32	31	31	33	35	37	38	--	37	37
February	38	37	36	36	37	38	38	37	37	36	40	39	36	--	34	33	36	35	34	32	34	33	33	35	36	35	34	34	34	--	--	36
March	33	33	34	32	31	31	32	31	32	33	33	34	34	34	36	37	36	35	36	36	36	36	35	36	35	36	37	39	43	46	46	35
April	45	46	47	47	47	45	44	44	43	42	43	46	47	52	55	57	59	56	55	55	58	57	61	64	65	65	63	62	61	61	--	53
May	58	55	56	57	58	61	60	55	52	48	47	46	47	47	50	55	58	59	59	60	60	60	57	55	57	56	52	50	50	49	50	54
June	52	54	55	52	55	54	52	52	50	50	51	53	53	54	52	52	52	49	50	52	52	51	50	52	52	51	54	55	54	55	--	52
July	54	55	54	52	52	52	53	53	53	54	54	55	56	54	52	52	55	55	56	57	58	60	65	67	68	72	74	74	76	77	77	60
August	77	78	78	79	74	76	77	76	77	78	76	75	75	76	76	77	75	76	77	78	77	76	77	77	77	77	78	78	79	80	79	77
September	79	80	79	78	79	80	78	78	79	76	72	70	69	67	67	68	70	69	68	67	66	63	67	70	70	70	69	70	69	--	--	72

3-2495. LICKING RIVER AT FARMERS, KY.

LOCATION.--Temperature recorder at gaging station at bridge on U.S. Highway 60, 300 feet upstream from Chesapeake and Ohio Railroad bridge, 0.8 mile west of Farmers, Rowan County, and 1.1 miles upstream from Triplett Creek.
DRAINAGE AREA.--831 square miles.
RECORDS AVAILABLE.--Chemical analyses: September 1949 to August 1950.
Water temperatures: October 1949 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 78°F July 27, 28, Aug. 8, 9; minimum, 34°F on many days during January to March.
EXTREMES, 1949-60.--Water temperatures: Maximum, 92°F July 19, 1951; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 are given in WSP 1705.

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

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

3-2515. LICKING RIVER AT McKINNEYSBURG, KY.

LOCATION.--At gaging station at county highway bridge at McKinneysburg, Pendleton County, 6.5 miles southeast of Falmouth, 9.0 miles upstream from Blanket Creek, and 12.8 miles upstream from South Fork.
DRAINAGE AREA (revised).--2,326 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1952 to September 1960.
Water temperatures: October 1952 to September 1960.
Sediment records: October 1952 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 219 ppm Nov. 7-22; minimum, 85 ppm Mar. 31 to Apr. 3.
Hardness: Maximum, 170 ppm Nov. 7-22; minimum, 61 ppm Mar. 31 to Apr. 3.
Specific conductance: Maximum daily, 399 micromhos Nov. 26; minimum daily, 124 micromhos July 6.
Water temperatures: Maximum, 78°F Oct. 3, June 12; minimum, freezing point on several days during February and March.
Sediment concentrations: Maximum daily, 1,720 ppm July 4; minimum daily, 9 ppm Mar. 11, 12, July 28.
Sediment loads: Maximum daily, 120,000 tons July 4; minimum daily, 3 tons Oct. 24, 26, 30.
EXTREMES, 1952-60.--Dissolved solids: Maximum, 219 ppm Nov. 7-22, 1959; minimum, 57 ppm Apr. 16-17, 1953.
Hardness: Maximum, 170 ppm Nov. 17-30, 1955, Nov. 7-22, 1959; minimum, 42 ppm Mar. 8-12, 1955.
Specific conductance: Maximum daily, 399 micromhos Nov. 26, 1959; minimum daily, 90 micromhos Mar. 9, 1953.
Water temperatures: Maximum, 87°F July 31 to Aug. 1, 1953; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 4,230 ppm Feb. 25, 1956; minimum daily, 1 ppm on many days during 1952-56.
Sediment loads: Maximum daily, 223,000 tons Feb. 25, 1956; minimum daily, less than 0.5 ton on many days during 1952-56.
REMARKS.--Records of specific conductance of daily samples available in district office at Columbus, Ohio. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 1-7, 1959.....	65.3	--	--	--	--	--	--	--	--	--	--	--	156	123	--	262	--	--
Oct. 8-11.....	2551	--	--	--	--	--	--	--	--	--	--	--	122	81	--	177	--	--
Oct. 13-18, 20-21...	110	--	--	--	--	--	--	--	--	--	--	--	177	140	--	296	--	--
Oct. 22-Nov. 3.....	118	6.9	0.00	55	3.6	9.7	3.4	150	26	22	0.3	1.0	205	152	29	363	7.4	6
Nov. 4-6.....	2400	--	--	--	--	--	--	--	--	--	--	--	161	115	--	252	--	--
Nov. 7-22.....	248	--	--	--	--	--	--	--	--	--	--	--	219	170	--	342	--	--
Nov. 23-Dec. 11.....	2529	8.2	.04	41	6.8	8.5	2.6	116	28	19	.3	5.6	193	130	35	308	7.2	20
Dec. 12-31.....	3174	--	--	--	--	--	--	--	--	--	--	--	176	124	--	273	--	--

Jan. 1-12, 1960.....	2410	--	--	--	--	--	--	--	--	--	--	--	--	160	124	--	264	--	--
Jan. 13-20.....	8352	--	--	--	--	--	--	--	--	--	--	--	--	146	96	--	209	--	--
Jan. 21-28, 30-Feb.5	2290	--	--	--	--	--	--	--	--	--	--	--	--	156	116	--	253	--	--
Feb. 6-13, 15-16....	10630	--	--	--	--	--	--	--	--	--	--	--	--	120	86	--	191	--	--
Feb. 17, 20-25.....	3740	--	--	--	--	--	--	--	--	--	--	--	--	128	97	--	218	--	--
Feb. 27-Mar. 1.....	8745	--	--	--	--	--	--	--	--	--	--	--	--	112	86	--	191	--	--
Mar. 5-7, 10-12, 14-16.....	2289	--	--	--	--	--	--	--	--	--	--	--	--	137	106	--	236	--	--
Mar. 17-20, 22-30...	8883	7.8	.03	27	5.1	2.5	1.0	80	20	5.0	.2	5.0	124	88	22	198	7.4	8	
Mar. 31-Apr. 3.....	5395	--	--	--	--	--	--	--	--	--	--	--	--	85	61	--	144	--	--
Apr. 4, 6-20, 22....	1744	--	--	--	--	--	--	--	--	--	--	--	--	116	85	--	199	--	--
Apr. 23-30, May 2-9,11.....	921	--	--	--	--	--	--	--	--	--	--	--	--	138	101	--	239	--	--
May 12-23, 25, 27-28	1267	8.4	04	25	4.8	5.5	1.8	76	23	9.0	.1	1.5	118	82	20	202	7.3	7	
May 29-June 12, 14..	785	--	--	--	--	--	--	--	--	--	--	--	--	137	94	--	218	--	--
June 15-25.....	1986	--	--	--	--	--	--	--	--	--	--	--	--	160	109	--	261	--	--
June 26-27,29-July 3	6703	--	--	--	--	--	--	--	--	--	--	--	--	129	85	--	193	--	--
July 4-8.....	16160	--	--	--	--	--	--	--	--	--	--	--	--	121	68	--	151	--	--
July 9-19.....	1374	--	--	--	--	--	--	--	--	--	--	--	--	117	78	--	185	--	--
July 20-27, 29-Aug.7	280	--	--	--	--	--	--	--	--	--	--	--	--	132	90	--	222	--	--
Aug. 8-Sept. 9.....	232	--	--	32	6.2	7.8	3.1	105	16	14	--	--	--	146	106	--	250	7.2	--
Sept. 11-16, 18.....	446	--	--	--	--	--	--	--	--	--	--	--	--	178	106	--	302	--	--
Sept. 19-30.....	480	--	--	--	--	--	--	--	--	--	--	--	--	157	116	--	257	--	--
Weighted average..	--	--	--	--	--	--	--	--	--	--	--	--	--	137	95	--	214	--	--
Time-weighted average a		--	--	--	--	--	--	--	--	--	--	--	--	151	108	--	246	--	--
Tons per day.....	--	--	--	--	--	--	--	--	--	--	--	--	--	958	--	--	--	--	--

a Represents 93 percent of the days and 94 percent of the runoff.

LICKING RIVER BASIN--Continued

3-2515. LICKING RIVER AT McKINNEYSBURG, KY.--Continued

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

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

LICKING RIVER BASIN--Continued

3-2515. LICKING RIVER AT McKINNEYSBURG, KY.--Continued

Suspended sediment, water year October 1959 to September 1960
(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	64	54	9	224	34	20	1840	112	556
2	65	42	7	203	18	10	1940	64	335
3	66	46	8	175	23	11	2050	55	304
4	66	40	7	1990	384 S	2450	1620	57	249
5	66	40	7	3290	--	8200	1690	55	251
6	65	41	7	1920	420 A	2600	2140	56	324
7	65	44	8	866	54	126	2630	38	270
8	7000	830 S	21500	455	39	48	2100	37	210
9	2640	609 S	4780	265	34	24	1750	41	194
10	370	192	192	203	26	14	1550	30 B	130
11	195	98	52	167	20	9	1440	35 B	140
12	140	65 B	25	150	19	8	9790	500 S	15100
13	110	48	14	135	21	8	7870	417	8860
14	142	42	16	217	25	15	6020	238	3870
15	163	43	19	430	36	42	4440	181	2170
16	134	36	13	221	27	16	2920	139	1100
17	100	32	9	171	24	11	2240	86	520
18	85	30	7	157	19	8	3710	120	1200
19	78	25 B	4	146	17	7	3220	95	826
20	73	21	4	132	15	5	2720	67	492
21	71	21	4	126	16	5	2280	44	271
22	70	21	4	124	14 A	5	1830	34	168
23	70	19	4	234	150	270	1500	25	101
24	73	15	3	3790	1370 S	14400	1280	21	72
25	77	17	4	1940	464	2430	1120	18 B	55
26	79	16	3	1270	285	977	986	14	37
27	87	17	4	8640	559 S	14100	908	14 B	35
28	98	17	4	6010	560	9090	3230	249 S	2390
29	102	13	4	3350	240	2170	2490	117	786
30	104	11	3	2070	127	710	2510	73	495
31	166	31 S	16	--	--	--	2410	55	358
Total	12684	--	26741	39071	--	57789	84224	--	41869
	JANUARY			FEBRUARY			MARCH		
1	2040	40	220	2580	35	244	7430	123	2470
2	1780	29	139	2200	31	184	5860	100 B	1600
3	3440	92 S	894	1860	29	146	4370	60 B	700
4	3430	85 B	800	1620	26	114	3520	40 B	380
5	3720	108	1080	2680	--	1200	3100	30	251
6	3320	86	771	7350	260 A	5100	2600	23	161
7	2910	54	424	7920	304	6500	2200	16	95
8	2370	45	288	8220	234	5190	2000	13 B	70
9	1860	43	216	6340	162 A	2770	1900	11 B	55
10	1540	41	170	12700	850 A	39000	1700	10	46
11	1330	32	115	19300	1120	58400	1600	9 B	40
12	1180	26 A	83	17600	700	33300	1500	9	36
13	2440	750 A	5000	15300	488	20200	1500	10	40
14	2700	300 B	2900	11800	260 B	8300	1700	12	55
15	17300	1460	68200	7350	137	2720	1840	17	84
16	15800	905	38600	4200	150	1700	4360	104 S	1500
17	12000	455	14700	3150	96	816	10300	326	9070
18	7100	204	3910	3140	65 B	550	13100	345	12200
19	5180	110 B	1500	3620	60 B	600	13400	243	8790
20	4300	96	1110	4020	54	586	11900	178	5720
21	3520	60	570	4080	46	507	10700	150 B	4300
22	2760	43	320	3800	46	472	9340	127	3200
23	2170	33	193	3400	48	441	7750	100	2090
24	1780	31	149	3210	45	390	7500	90	1820
25	1540	32	133	4520	179 S	3310	7650	97	2000
26	1320	27	96	8550	258	5960	7050	84	1600
27	1540	29 S	132	9090	202	4960	7130	92	1770
28	2640	84	599	9750	198	5210	6840	80	1480
29	2910	45 B	350	8710	129	3030	6670	80	1440
30	3210	52	451	--	--	--	6850	89	1650
31	2940	49	389	--	--	--	6150	88	1460
Total	122070	--	144502	198060	--	211900	179510	--	66173

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

LICKING RIVER BASIN--Continued

3-2515. LICKING RIVER AT McKINNEYSBURG, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--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	5840	110		1730	1280	30	B	100	1330	72		258
2	5450	129		1900	974	26		68	980	53		140
3	4140	110	B	1200	1200	25		81	758	40		82
4	3360	74		671	896	23		56	600	28		45
5	2990	60	B	480	680	18		33	480	28		36
6	2860	54		417	585	14		22	380	22		22
7	2880	48		373	580	23		36	305	17		14
8	2920	44		347	866	38		89	254	19		13
9	2630	47		334	1460	65	B	270	215	12		7
10	2260	39		238	2460	--		1200	188	14		7
11	1920	34		176	2630	100	A	700	165	20		9
12	1690	32		146	2200	63		374	149	16		6
13	1480	30		120	2130	51		293	152	13	B	5
14	1310	29		102	1760	40		190	212	16		9
15	1170	22		69	1600	37		160	346	29		27
16	1080	20		58	1450	36		141	273	41		30
17	986	13		35	1210	28		91	237	29		18
18	902	14		34	1030	22		61	323	20		17
19	812	15		33	866	14		33	580	19		30
20	746	18		36	746	10		20	440	14		17
21	710	17	B	30	640	14		24	350	15		14
22	650	14		24	545	10		15	364	34		33
23	600	13		21	475	10		13	4060	--		5600
24	565	17		26	420	10	B	11	6620	697		12400
25	525	14		20	410	12		13	8250	688		15300
26	510	12		16	475	15	B	19	6090	389		6400
27	560	11		17	1830	350	B	3200	2890	197		1540
28	490	10		13	2110	350	B	2300	1690	92		420
29	1220	36	S	134	2180	123		724	1320	85	B	300
30	1320	45		160	2450	119		787	1030	81		225
31	--	--		--	1920	132		684	--	--		--
Total	54576	--		8960	40058	--		11808	41031	--		43024

Day	JULY				AUGUST				SEPTEMBER			
1	8090	--		38000	188	24		12	157	34		14
2	10500	1140	S	32300	175	25		12	137	39		14
3	17000	1120	S	66900	149	17		7	120	34		11
4	25900	1720		120000	137	14		5	107	39		11
5	21600	875		51000	132	14		5	102	34		9
6	18000	470		22800	148	16		6	96	34		9
7	10800	225		6560	237	16		10	91	33		8
8	4480	210		2540	530	20	S	30	87	39		9
9	2190	174		1030	1220	186	S	646	83	41		9
10	1500	104		421	830	198		444	85	40	A	9
11	1180	61		194	365	103		102	488	110	A	190
12	1230	55		183	237	90		58	350	68		64
13	2030	83		455	192	91		47	173	49		23
14	2120	98		561	195	89		47	126	35		12
15	1550	109		456	167	62		28	107	36		10
16	1120	120		363	152	54		22	96	38		10
17	880	71		169	144	44		17	340	--		310
18	722	38		74	134	45		16	2140	412	S	2620
19	595	22		35	132	34		12	1240	199		666
20	515	16		22	131	37		13	1240	120		402
21	465	22		28	136	39		14	848	82		188
22	440	17		20	132	35		12	565	45		69
23	435	16		19	119	37		12	410	49		54
24	336	13		12	138	35		13	360	49		48
25	450	15		18	167	34		15	281	37		28
26	318	13		11	171	31		14	218	30		18
27	293	10		8	190	35		18	178	27		13
28	297	9		7	445	32		38	154	23		10
29	234	11		7	332	34		30	137	26		10
30	206	16		9	230	30		19	125	20		7
31	185	18		9	190	32		16	--	--		--
Total	135661	--		344211	7845	--		1740	10641	--		4855

Total discharge for year (cfs-days)..... 925,431
Total load for year (tons)..... 963,572

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

LICKING RIVER BASIN--Continued

3-2515. LICKING RIVER AT McKINNEYSBURG, KY.--Continued

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

Date of collection	Time (24 hour)	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	
Nov. 24, 1959	0805			5290	1700		46	56	68	83	96	99	100					SBWC
Dec. 12	1630			12400	712		52	61	71	84	97	100	--					SBWC
Jan. 16, 1960	1530			14900	782		74	77	83	91	96	99	100					SBWC
Feb. 13	0915			15800	533		55	64	77	89	96	100	--					SBWC
June 23	1920			6770	466		47	55	68	80	91	98	100					SBWC
June 23	1920			6770	466		24	40	60	82	93	98	100					SBN
July 3	1930			26800	2300		43	55	70	84	95	99	100					SBWC
July 3	1930			26800	2300		36	49	65	81	95	99	100					SBN

3-2525. SOUTH FORK LICKING RIVER AT CYNTHIANA, KY.

LOCATION.--At gaging station at bridge on State Highways 356 and 36, at Cynthiana, Harrison County, 0.4 mile downstream from Grays Run, and in pool formed by old mill dam 2.6 miles downstream.
DRAINAGE AREA (revised).--621 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to August 1951.
Water temperatures: October 1949 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 86°F Sept. 5; minimum, 33°F on many days during January to March.
EXTREMES, 1949-60.--Water temperatures: Maximum, 87°F June 30, 1952, July 14, 1954; minimum, freezing point on several days during winter months 1953, 1958, and 1959.
REMARKS.--Records of discharge for water year October 1959 to September 1960 are given in WSP 1705.

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

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

3-2715. MIAMI RIVER AT MIAMISBURG, OHIO

LOCATION.--Temperature recorder at gaging station, 600 feet downstream from bridge on State Highway 725 at Miamisburg, Montgomery County, and 0.3 mile downstream from Bear Creek.
DRAINAGE AREA.--2,718 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1959 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 88°F July 24-26, Sept. 2, 3; minimum, 37°F Feb. 8, 9, 13-15.
REMARKS.--Recorder stopped Feb. 27-29; range, 41°F to 42°F. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

MIAMI RIVER BASIN--Continued

3-2740. MIAMI RIVER AT HAMILTON, OHIO

LOCATION.--Temperature recorder at gaging station, 1,000 feet downstream from Columbia Bridge at Hamilton, Butler County, and 3 miles downstream from Talawanda Creek.
DRAINAGE AREA.--3,639 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1951.
Water temperatures: October 1950 to September 1951, October 1957 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 93°F Sept. 2; minimum, 36°F Jan. 22-25.
EXTREMES, 1950-51, 1957-60.--Water temperatures: Maximum, 93°F Aug. 23, 24, 1959, Sept. 2, 1960; minimum, freezing point on several days during December 1950, January and February 1951.
REMARKS.--Recorder stopped Nov. 10, 11; range, 51°F to 52°F. No minimum temperatures Aug. 30 to Sept. 1, Sept. 6-24, 26-30; thermal unit out of water each night. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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	77	77	79	80	81	79	77	76	74	73	72	69	66	63	63	64	63	63	63	63	63	65	65	65	62	58	57	57	58	60	62	68
Minimum	75	75	75	76	77	77	76	74	73	71	69	66	63	63	61	62	63	61	61	60	61	62	64	62	58	57	57	56	56	58	60	65
November																																
Maximum	62	61	59	58	60	60	56	53	52	--	--	51	53	54	53	51	51	47	45	45	47	48	50	50	49	48	47	47	46	43	--	52
Minimum	61	59	57	56	57	56	53	52	51	--	--	50	51	53	51	51	47	44	44	44	45	46	48	49	48	47	47	46	43	42	--	50
December																																
Maximum	42	44	44	45	46	47	46	43	43	43	45	46	45	43	42	43	45	45	45	43	43	41	41	41	42	44	47	47	47	46	44	44
Minimum	42	42	44	44	45	46	43	43	43	43	43	45	43	41	41	42	43	45	43	43	41	41	41	41	41	42	44	47	46	44	42	43
January																																
Maximum	42	41	41	41	39	38	38	39	40	42	43	47	49	50	46	46	43	41	41	40	38	37	36	36	37	39	40	42	43	44	43	41
Minimum	41	41	41	39	38	37	37	38	39	40	42	43	47	46	45	43	41	41	40	38	37	36	36	36	36	37	39	40	42	43	42	40
February																																
Maximum	42	41	41	41	41	40	41	39	40	43	43	41	40	39	39	39	41	41	41	40	40	40	41	42	42	41	41	41	41	--	--	41
Minimum	41	41	40	41	40	40	39	38	39	40	41	40	38	38	38	38	39	41	39	39	40	39	39	41	41	41	40	41	40	--	--	40
March																																
Maximum	41	41	40	40	40	41	41	41	41	42	42	43	43	44	44	44	44	43	44	44	44	43	44	44	43	44	47	50	51	53	53	44
Minimum	39	40	39	39	38	38	40	40	40	40	41	42	42	42	43	44	43	42	43	43	42	41	42	43	42	43	44	47	50	51	53	42
April																																
Maximum	53	54	54	53	53	51	50	51	50	51	50	56	60	63	65	68	68	66	65	66	67	69	72	75	75	75	73	73	72	70	--	62
Minimum	52	53	53	52	51	49	48	50	49	48	49	49	55	60	63	65	66	64	62	64	65	66	69	72	74	73	71	70	70	67	--	60
May																																
Maximum	67	68	69	70	72	72	71	67	64	60	57	57	59	61	65	68	72	73	72	76	75	74	74	75	76	75	74	76	67	68	71	69
Minimum	65	65	66	63	70	71	67	64	60	56	56	57	57	57	61	65	68	71	72	73	74	73	72	73	74	73	68	67	64	66	67	66
June																																
Maximum	74	74	76	79	80	80	78	77	78	78	79	79	79	78	78	78	78	75	76	77	77	79	78	76	77	78	78	79	79	77	80	--	78
Minimum	70	73	72	75	73	73	76	75	75	76	78	78	78	77	75	77	74	73	72	74	76	76	69	71	74	76	77	77	76	72	--	75
July																																
Maximum	75	77	77	75	76	77	78	80	80	80	82	83	82	82	80	79	80	81	81	84	84	84	86	87	89	87	86	88	88	87	85	82
Minimum	72	74	71	73	74	75	76	77	79	79	79	81	81	76	77	77	78	79	78	81	82	82	84	86	87	86	85	85	86	85	84	80
August																																
Maximum	85	86	84	84	85	86	86	86	85	82	82	82	83	84	86	83	84	87	87	85	85	84	85	85	87	88	89	89	89	--	--	85
Minimum	82	83	84	82	82	84	83	83	83	80	80	80	80	80	82	81	82	82	84	82	82	81	84	82	84	85	85	85	86	--	--	83
September																																
Maximum	--	93	92	92	91	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	85	--	--	--	--	--	--	--
Minimum	--	88	87	87	86	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	79	--	--	--	--	--	--	--

3-2766. MIAMI RIVER AT ELIZABETHTOWN, OHIO

LOCATION.--At Lost Bridge on Lawrenceburg Road, 0.6 mile southeast of Elizabethtown, Hamilton County, 0.9 mile downstream from Whitewater River, and 5.4 miles upstream from mouth.
DRAINAGE AREA.--5,385 square miles (at mouth).
RECORDS AVAILABLE.--Chemical analyses: October 1956 to September 1960.
Water temperatures: October 1956 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 501 ppm Sept. 1-30; minimum, 392 ppm Feb. 1-29.
Hardness: Maximum, 344 ppm Sept. 1-30; minimum, 296 ppm July 1-31.
Specific conductance: Maximum daily, 829 micromhos Sept. 25; minimum daily, 392 micromhos July 3.
Water temperatures: Maximum, 88°F July 25, Sept. 1, 2, 7, 8; minimum, freezing point Jan. 22.
EXTREMES, 1956-60.--Dissolved solids: Maximum, 519 ppm Oct. 21-31, 1956; minimum, 232 ppm June 11-20, 1958.
Hardness: Maximum, 372 ppm Oct 21-31, 1956; minimum, 188 ppm June 11-20, 1958.
Specific conductance: Maximum daily, 852 micromhos Oct. 25, 1956; minimum daily, 303 micromhos July 20, 1958.
Water temperatures: Maximum, 89°F June 29, Aug. 23-24, 1959; minimum, freezing point on several days during winter months.
REMARKS.--Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
Oct.1-31,1959...		11				76	36	28	3.1		248		129	32	0.5	15	0.40	472	338	135		749	7.5	4	0.2
Nov. 1-30...		9.4				83	32	24	2.9		262		120	31	.4	16	.44	454	339	124		731	7.3	3	.2
Dec. 1-31...		7.5				79	32	20	2.8		256		101	26	.4	15	.45	417	329	119		682	--	4	.2
Jan.1-6,8-31, 1960..		8.0				79	31	13	1.9		262		95	21	.4	16	.40	398	325	110		649	--	5	.1
Jan. 7.....		7.7				82	30	14	2.4		252		93	22	--	16	--	407	328	122		654	--	2	--
Feb. 1-29...		7.4				77	28	13	2.1		251		81	22	.3	16	.49	392	307	102		626	--	4	.0
Mar. 1-31...		6.9				78	32	22	2.4		270		98	32	.4	16	.27	429	326	105		705	--	5	.1
Apr. 1-30...		4.0				79	32	16	2.2		266		95	22	.4	13	.32	403	329	111		665	--	9	.1
May 1-31...		5.6				80	29	19	2.8		264		102	26	.4	9.3	.45	419	319	102		660	--	3	.1
June 1-30...		7.9				75	29	15	3.4		244		91	21	.4	11	.60	395	306	106		627	--	3	.1
July 1-31...		6.8				74	27	17	2.8		248		84	24	.5	8.7	.80	395	296	92		620	--	4	.1
Aug. 1-31...		8.2				80	29	28	3.5		240		118	33	.6	8.2	.48	446	319	122		705	--	6	.1
Sept. 1-30..		9.3				100	23	33	4.0		252		140	38	.4	12	.60	501	344	138		787	--	8	.2
Time-weighted average.		7.7				80	30	21	2.8		255		104	27	0.4	13	0.47	427	323	114		684	--	5	0.1

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MIAMI RIVER BASIN--Continued

3-2766. MIAMI RIVER AT ELIZABETHTOWN, OHIO--Continued

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

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

3-2772. OHIO RIVER AT MARKLAND DAM, NEAR WARSAW, KY.

(Formerly published as 3-2772.05. Ohio River at lock and dam 39, near Florence, Ind.)

LOCATION (revised).--About 1,000 feet upstream from dam (mile 531.5), 0.2 mile upstream from site of lock and dam 39, 0.4 mile upstream from Stevens Creek, 1.4 miles downstream from Craigs Creek, and 3.5 miles west of Warsaw, Gallatin County.
DRAINAGE AREA (revised).--83,200 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1954 to September 1960.
Water temperatures: October 1954 to September 1959 (published as "at lock and dam 39, near Florence, Ind.").
EXTREMES, 1959-60.--Dissolved solids: Maximum, 366 ppm Oct. 1-31; minimum, 152 ppm Apr. 1-2, 4-30.
Hardness: Maximum, 199 ppm Oct. 1-31; minimum, 96 ppm Apr. 1-2, 4-30.
Specific conductance: Maximum daily, 791 micromhos Oct. 21; minimum daily, 176 micromhos Apr. 7.
Water temperatures: Maximum, 86°F on several days during July and September; minimum, 34°F Mar. 8, 9, 18.
EXTREMES, 1954-60.--Dissolved solids: Maximum, 418 ppm Oct. 11-20, 1957; minimum, 114 ppm Feb. 1-2, 4-10, 1957.
Hardness: Maximum, 228 ppm Nov. 1-10, 1955; minimum, 70 ppm Feb. 1-2, 4-10, 1957.
Specific conductance: Maximum daily, 791 micromhos Oct. 21, 1959; minimum daily, 103 micromhos July 31, 1958.
Water temperatures: Maximum, 94°F Aug. 26-28, 1959; minimum, freezing point on many days during winter months.
REMARKS.--Records of pH and specific conductance of daily samples available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
Oct. 1-31, 1959..		6.1				55	15	43	3.5		74		139	63	0.3	4.7	0.30	366	199	138		634	7.2	5	0.1
Nov.1-7,9-30		8.4				44	9.9	25	2.9		56		104	35	.3	5.1	.45	275	151	105		446	7.0	7	.1
Dec. 1-18, 21-31.....		8.6				30	8.2	11	1.7		49		62	16	.1	4.6	.11	165	109	68		290	6.8	2	.1
Jan. 1-16, 18-31,1960		7.5				32	7.6	10	1.2		54		63	14	.2	5.4	.30	174	111	67		284	7.0	3	.0
Feb. 1-23, 25-26.....		7.6			0.09	32	7.7	9.9	1.8		59		61	14	.2	6.2	.20	178	112	63		288	--	4	.1
Mar. 1-31...		6.8				34	10	13	1.2		62		71	18	.2	4.4	.11	194	126	75		327	--	7	.0
Apr.1-2,4-30		5.5				27	7.1	9.0	1.2		48		58	12	.3	4.3	.10	152	96	57		256	--	5	.0
May 1-11, 15-31.....		7.4				34	8.7	14	2.0		56		75	20	.2	4.1	.10	202	121	75		327	--	4	.0
June 1-6, 8-30.....		6.4				36	11	15	2.2		72		76	19	.4	3.7	.25	223	135	76		351	--	3	.0
July 1,3-31.		5.4				35	10	16	2.6		80		61	22	.3	3.4	.30	214	129	63		341	--	4	.1
Aug.1-14, 16-31.....		1.9				47	11	29	2.9		72		104	38	.5	3.8	.25	275	162	103		477	--	4	.1
Sept. 1-26, 28-30.....		4.3				52	12	35	3.3		70		126	44	.4	4.1	.20	342	179	122		546	--	7	.1
Time-weighted average.		6.3				38	9.9	19	2.2		63		84	26	0.3	4.5	0.22	231	136	84		383	--	5	0.1

OHIO RIVER MAIN STEM--Continued

3-2772. OHIO RIVER AT MARKLAND DAM, NEAR WARSAW, KY.--Continued

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

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

3-2775. NORTH FORK KENTUCKY RIVER AT HAZARD, KY.

LOCATION.--At gaging station at Woodland Park bridge at eastern limits of Hazard, Perry County, 150 feet upstream from city waterworks dam, and 4.0 miles upstream from Lotts Creek.
DRAINAGE AREA.--466 square miles.
RECORDS AVAILABLE.--Chemical analyses: November 1949 to August 1950, August 1957 to September 1959.
Water temperatures: October 1949 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 85°F Aug. 3; minimum, freezing point on several days during January to March.
EXTREMES, 1949-60.--Water temperatures: Maximum, 93°F Aug. 1, 1953; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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																																
a.m.	--	--	--	--	--	73	72	71	70	70	70	69	68	65	65	61	59	59	57	56	57	57	58	57	56	55	54	52	51	52	52	61
p.m.	--	--	--	--	--	75	74	73	73	72	72	70	67	66	66	62	60	60	59	58	58	61	59	58	57	58	56	53	53	54	53	63
November																																
a.m.	56	53	51	53	54	55	50	45	44	44	43	45	46	46	45	46	44	43	40	37	38	40	39	40	38	39	40	38	42	38	--	44
p.m.	58	58	54	55	56	51	49	46	45	45	44	46	48	45	47	47	46	42	41	39	41	42	40	41	41	42	40	37	40	38	--	45
December																																
a.m.	37	39	38	37	39	44	40	38	38	37	39	41	40	39	39	40	40	41	40	41	40	39	40	40	41	41	43	42	40	40	39	40
p.m.	40	39	39	40	41	43	39	40	40	39	40	41	41	40	41	41	40	42	40	42	40	40	41	42	43	43	42	41	41	40	41	41
January																																
a.m.	40	41	42	41	40	39	39	39	39	39	41	41	42	42	43	41	42	41	40	39	39	38	32	32	31	31	34	34	34	33	33	38
p.m.	40	42	43	42	41	40	40	40	41	42	43	44	44	44	43	41	42	43	40	40	39	34	33	33	32	33	35	35	35	34	35	39
February																																
a.m.	33	38	43	41	43	42	41	38	40	45	41	40	38	34	32	32	34	35	33	34	35	34	37	37	39	44	39	40	40	--	--	38
p.m.	36	44	45	44	45	41	42	41	44	44	41	39	36	33	32	32	36	34	35	36	36	37	38	39	44	43	41	40	41	--	--	39
March																																
a.m.	37	36	33	34	32	32	32	32	32	32	33	32	34	34	35	36	35	37	36	39	36	35	34	36	38	39	44	46	49	49	46	37
p.m.	39	37	35	33	33	33	32	34	33	33	34	36	36	37	38	37	42	39	37	40	38	36	38	44	42	43	47	49	51	49	47	39
April																																
a.m.	45	47	54	50	51	49	48	48	47	44	44	50	51	57	60	61	64	60	57	59	61	62	63	63	66	66	60	59	58	59	--	55
p.m.	50	49	54	53	50	50	50	52	49	46	50	54	61	64	65	64	66	62	61	62	64	65	67	69	70	68	63	61	62	60	--	59
May																																
a.m.	59	58	62	62	63	63	64	60	58	58	57	54	55	56	52	53	63	66	69	70	71	68	69	70	69	68	67	67	65	66	69	63
p.m.	61	60	64	65	65	66	63	62	59	58	55	55	57	55	57	62	68	71	73	74	73	72	71	73	70	70	69	68	67	71	72	65
June																																
a.m.	68	70	70	71	72	72	73	72	71	73	74	72	72	73	72	71	72	71	70	70	73	74	71	72	73	67	68	71	70	72	--	71
p.m.	72	72	73	74	74	76	74	75	75	76	75	74	74	74	74	75	73	74	73	75	76	77	74	74	74	70	72	73	74	74	--	74
July																																
a.m.	69	70	74	73	73	72	71	72	73	74	73	72	73	72	73	73	75	74	74	77	76	75	77	78	77	76	76	78	78	79	80	74
p.m.	71	73	75	75	76	74	75	76	75	74	74	74	75	74	75	76	76	78	75	78	79	79	79	79	80	82	83	84	83	84	82	77
August																																
a.m.	79	80	82	83	80	82	81	80	79	78	78	79	78	76	77	78	79	80	81	80	79	78	77	78	76	77	76	78	79	80	81	79
p.m.	83	84	85	84	83	84	83	82	83	80	80	82	81	80	81	82	83	84	83	83	82	80	81	82	80	81	81	82	83	84	84	82
September																																
a.m.	79	78	78	78	79	78	78	79	78	78	77	74	73	63	62	61	64	62	61	71	70	71	72	73	72	70	70	72	71	72	--	72
p.m.	83	82	83	82	83	92	83	83	82	80	79	76	74	65	64	67	65	64	66	74	75	76	77	76	74	75	76	75	74	73	--	76

KENTUCKY RIVER BASIN--Continued

3-2875. KENTUCKY RIVER AT LOCK 4, AT FRANKFORT, Ky.

LOCATION.--At gaging station at Broadway Street Bridge, at Frankfort, Franklin County, 300 feet upstream from Benson Creek, 0.9 mile upstream from lock 4, and at mile 65.9.
DRAINAGE AREA.--5,412 square miles (including that of Benson Creek), of which about 120 square miles does not contribute directly to surface runoff.
RECORDS AVAILABLE.--Chemical analyses: October 1949 to September 1960.
Water temperatures: October 1949 to September 1960.
Sediment records: October 1952 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 197 ppm Oct. 13-25, Oct. 27 to Nov. 2, Nov. 26 to Dec. 1; minimum, 101 ppm Apr. 1, 3-7, 10-30.
Hardness: Maximum, 136 ppm Nov. 4-12, 14-22, 24-25; minimum, 59 ppm Dec. 3-7.
Specific conductance: Maximum daily, 438 micromhos Nov. 28; minimum daily, 130 micromhos June 27.
Water temperatures: Maximum, 87°F Sept. 6; minimum, 36°F on several days during February and March.
Sediment concentrations: Maximum daily, 1,550 ppm June 24; minimum daily, 2 ppm Nov. 14.
Sediment loads: Maximum daily, 200,000 tons June 24; minimum daily, 4 tons Nov. 14.
EXTREMES, 1949-60.--Dissolved solids: Maximum, 224 ppm Nov. 21-30, 1949; minimum, 65 ppm Feb. 1-5, 1957.
Hardness: Maximum, 154 ppm Jan. 16-25, 27-30, 1956; minimum, 42 ppm May 10-13, 1953, Mar. 3, 1955.
Specific conductance: Maximum daily, 555 micromhos Dec. 7, 1952; minimum daily, 80 micromhos Feb. 4, 1951.
Water temperatures: Maximum, 88°F July 22, 1957; minimum, 34°F on several days during 1951, 1958, and 1959.
Sediment concentrations (1952-60): Maximum daily, 2,420 ppm Jan. 31, 1956; minimum daily, 1 ppm on many days during 1952-56.
Sediment loads (1952-60): Maximum daily, 248,000 tons Feb. 2, 1957; minimum daily, 1 ton on many days during 1952-56.
REMARKS.--Records of specific conductance of daily samples available in district office at Columbus, Ohio. Records of discharge, including flow of Benson Creek, for water year October 1959 to September 1960 given in WSP 1705. Flow regulated by Herrington Lake and by hydroelectric plant at lock 7 on Kentucky River.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 1-3, 6-12, 1959	480	--	--	--	--	--	--	--	--	--	--	--	152	98	--	234	--	--
Oct.13-25, 27-Nov.2.	951	7.8	0.00	44	5.0	10	2.9	118	31	18	0.4	2.2	197	131	34	309	7.4	12
Nov.4-12,14-22,24-25	1149	--	--	--	--	--	--	--	--	--	--	--	196	136	--	323	--	--
Nov. 26-Dec. 1.....	15380	--	--	--	--	--	--	--	--	--	--	--	197	114	--	328	--	--
Dec. 3-7.....	7740	--	--	--	--	--	--	--	--	--	--	--	103	59	--	159	--	--
Dec. 10-22, 25-30...	9143	--	--	--	--	--	--	--	--	--	--	--	133	88	--	212	--	--
Jan. 1-9, 1960.....	8813	--	--	--	--	--	--	--	--	--	--	--	138	93	--	226	--	--
Jan. 11-13, 15-28,31	9010	--	--	--	--	--	--	--	--	--	--	--	118	80	--	190	--	--
Feb. 1-3, 5-6, 9-12.	13270	--	--	--	--	--	--	--	--	--	--	--	137	98	--	229	--	--
Feb. 14, 16-17,19-26	13850	--	--	--	--	--	--	--	--	--	--	--	109	74	--	177	--	--

Feb. 29-Mar. 1- 3-4,7,1960	14640	--	--	--	--	--	--	--	--	--	--	--	102	67	--	161	--	--
Mar. 8, 10-16, 18...	9383	--	--	--	--	--	--	--	--	--	--	--	116	84	--	196	--	--
Mar. 19-22, 24-26, 28, 30-31.....	21520	--	--	--	--	--	--	--	--	--	--	--	105	74	--	171	--	--
Apr. 1, 3-7, 10-30..	4867	--	--	--	--	--	--	--	--	--	--	--	101	71	--	174	--	--
May 1-11.....	4004	--	--	--	--	--	--	--	--	--	--	--	120	83	--	207	--	--
May 12-21, 23-29....	2172	7.7	.00	27	6.6	12	1.7	68	43	18	.2	1.3	164	94	38	267	7.4	3
May 30-June 5, 7-10, 12-15, 17-18.....	1988	--	--	--	--	--	--	--	--	--	--	--	124	83	--	206	--	--
June 19-20, 22-25...	22530	--	--	--	--	--	--	--	--	--	--	--	146	93	--	235	--	--
June 26-29.....	22520	--	--	--	--	--	--	--	--	--	--	--	102	65	--	155	--	--
June 30-July 1, 3-4.	20980	--	--	--	--	--	--	--	--	--	--	--	129	92	--	202	--	--
July 5-9, 11-14, 16-17, 20-22,24-26	8646	--	--	--	--	--	--	--	--	--	--	--	106	68	--	163	--	--
July 27-Aug. 22, 25.	2256	--	--	--	--	--	--	--	--	--	--	--	124	91	--	203	--	--
Aug. 27-Sept. 1.....	1691	--	--	--	--	--	--	--	--	--	--	--	170	105	--	281	--	--
Sept. 18, 20-22, 24, 26-27.....	4130	--	--	--	--	--	--	--	--	--	--	--	150	111	--	257	--	--
Weighted average..	--	--	--	--	--	--	--	--	--	--	--	--	125	84	--	204	--	--
Time-weighted average a.....	7570	--	--	--	--	--	--	--	--	--	--	--	136	91	--	222	--	--
Tons per day.....	--	--	--	--	--	--	--	--	--	--	--	--	2560	--	--	--	--	--

a Represents 81 percent of the days and 81 percent of the runoff.

KENTUCKY RIVER BASIN--Continued

3-2875. KENTUCKY RIVER AT LOCK 4, AT FRANKFORT, KY.--Continued

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

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

KENTUCKY RIVER BASIN--Continued

3-2875. KENTUCKY RIVER AT LOCK 4, AT FRANKFORT, KY.--Continued

Suspended sediment, water year October 1959 to September 1960

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	137	28	10	1460	25	98	20000	436	23500
2	94	33	8	1240	28	94	10700	310 B	9000
3	186	34	17	1040	30 B	85	7160	164	3170
4	130	35 B	12	1260	30	102	7020	166	3150
5	112	35 B	10	1570	24	102	8400	180	4080
6	216	38	22	1130	19	58	8640	186	4340
7	216	37	22	1000	13	35	7480	182	3680
8	2530	234 S	2000	880	8	19	7380	150 B	3000
9	646	172 S	331	861	6	14	7340	100 B	2000
10	240	119	77	920	6	15	6540	68	1200
11	248	81	54	1060	6	17	5580	44	663
12	290	71	56	709	5	10	11500	60 B	1900
13	320	72	62	618	5 B	8	13100	80	2830
14	546	71	105	747	2	4	13000	73	2560
15	380	49	50	728	--	9	12700	67	2300
16	290	41	32	636	--	9	11000	57	1690
17	320	36	31	582	--	9	9020	48	1170
18	458	35	43	636	--	9	10500	55	1560
19	747	31	62	804	--	9	7980	37	797
20	804	24	52	1240	7	23	8020	27	585
21	690	19	35	1820	7	34	13200	33	1180
22	582	19	30	1630	4	18	14200	65	2490
23	528	24	34	2480	18 B	120	10200	58	1600
24	510	36	50	2850	14	108	7380	30 B	600
25	484	33	43	1910	12	62	5230	16	226
26	546	35 B	50	6800	24	441	4170	16	180
27	1570	54	229	21400	267	15400	3800	16	164
28	2580	39	272	11800	140	4460	7480	48	969
29	1850	30	150	11500	66	2050	8540	53	1220
30	1970	31	165	20800	202	11300	8160	54	1190
31	1690	27	123	--	--	--	7380	47	936
Total	21910	--	4237	102111	--	34722	282800	--	83930
	JANUARY			FEBRUARY			MARCH		
1	7120	42	807	4420	24	286	18300	221	10900
2	6230	42	706	4050	17	186	14100	168	6400
3	6620	30	536	3600	14	136	12200	126	4150
4	7560	26	531	3320	15 B	130	10900	97	2850
5	12200	31	1020	5830	33 S	715	9700	80 B	2100
6	13800	67	2500	12000	64	2070	8450	60 B	1400
7	10700	54	1560	13300	86	3090	6890	39	726
8	8070	38	828	12400	80	2680	6180	26	434
9	7020	32	606	11100	48	1440	5790	18 B	280
10	6890	30 B	550	17500	159 S	1180	6010	19	308
11	7430	25	502	30100	371	30200	5660	14	214
12	7660	39	806	30800	616	51200	5700	13	200
13	6760	44	803	28600	550 B	42000	5620	14	212
14	9020	-- E	2400	19200	392	20300	5060	14	191
15	21100	170 B	9700	13000	290 B	10000	5400	14	204
16	21900	204	12100	10200	228	6280	9220	16	398
17	20200	203	11100	8260	223	4970	26000	68 S	4980
18	14600	166	6540	8980	210 B	5100	35600	153	14700
19	11300	136	4150	12900	157	5470	39400	215	22900
20	9460	80	2040	16600	139	6230	35200	276	26200
21	8260	46	1020	15400	75	3120	26000	304	21300
22	6580	56	995	12600	54	1840	19000	194	9950
23	5060	59	806	11100	44	1320	17200	110 B	5100
24	4050	64	700	10700	22	636	16400	66	2920
25	3880	58	608	13200	37	1320	16200	50	2190
26	3080	42	349	22200	75	4500	14200	37	1420
27	2660	38	273	28600	200 B	15000	13400	30 B	1100
28	3280	36	319	29900	340 B	27000	13600	25	918
29	4500	40 B	490	24900	275	18500	15400	25 B	1000
30	5100	40 B	550	--	--	--	17400	29	1360
31	4930	29	386	--	--	--	17800	31	1490
Total	267020	--	66281	434760	--	266899	457980	--	148495

E Estimated.
S Computed by subdividing day.
B Computed from estimated-concentration graph.

KENTUCKY RIVER BASIN--Continued

3-2875. KENTUCKY RIVER AT LOCK 4, AT FRANKFORT, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--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	17200	36	1670	3040	7	57	2410	6	39
2	14200	35 B	1300	2890	4	31	1780	12	58
3	11900	25	803	2660	3	22	1340	22	80
4	10300	23	640	2620	3	21	1130	9	27
5	8880	26	623	2300	5	31	1000	5	14
6	9410	29	737	1940	5	26	861	5 B	12
7	10100	29	791	2010	10	54	842	5	11
8	9310	25 B	650	3280	14	124	636	4	7
9	8590	20 B	470	7750	22	460	636	5	8
10	7200	19	369	9020	30	730	582	6	9
11	5880	17	270	6540	27	477	546	5 B	7
12	5020	15	203	4930	15	200	801	5	11
13	4340	9	105	3960	9	96	4800	6	78
14	3800	6	62	3160	12	102	4420	9	107
15	3440	8	74	2770	6	45	2810	10	76
16	3120	C 16	135	2520	3	20	2010	8	43
17	2890	C 16	125	2100	4	23	1850	7	35
18	2660	C 16	115	1850	4	20	3800	6	62
19	2520	C 16	109	1540	4	17	7250	8	157
20	2380	C 16	103	1430	4	15	6490	9	158
21	2040	C 16	88	1290	4	14	4000	6 B	65
22	1940	C 10	52	1060	4	11	3640	13	128
23	1850	C 10	50	1040	3	8	24800	782 S	65400
24	1820	C 10	49	1000	5	14	47800	1550	200000
25	1690	C 10	46	1180	4	13	45200	910	111000
26	1630	C 10	44	1370	6	22	35900	682	66100
27	1910	C 10	52	1510	21	86	19900	540	29000
28	2300	C 10	62	2620	16	113	17900	424	20500
29	2580	C 10	70	2660	5	36	16400	293	13000
30	2620	C 10	71	2410	7	46	11100	209	6260
31	--	--	--	2550	6	41	--	--	--
Total	163520	--	9930	87000	--	2975	272634	--	512452

Day	JULY			AUGUST			SEPTEMBER		
1	14200	266	10200	618	39	65	1110	13	39
2	20200	360 B	20000	1290	46	160	1060	C 4	11
3	27900	465	35000	861	34	79	1040	C 4	11
4	30700	615	51000	1540	34	141	842	C 4	9
5	23900	346	22300	3120	41	345	654	C 4	7
6	16300	310	13600	1600	30	130	516	C 4	6
7	11100	240	7190	1060	55	157	672	C 4	7
8	8020	168	3640	2100	68	386	546	C 4	6
9	5450	90	1320	2440	41	270	1060	C 4	11
10	4290	70 B	800	3040	32	263	2480	--	950
11	8880	88	2110	3800	41	421	1540	-- E	440
12	15200	153	6280	3720	39	392	1060	78	223
13	19100	243	12500	3040	35	287	804	C --	360
14	15800	281	12000	2770	33	247	1330	C --	360
15	10100	153	4170	2520	31	211	3000	C --	360
16	6490	72	1260	1880	35	178	2270	C --	360
17	4380	83	982	1510	63	257	8030	-- E	5500
18	3400	83	762	2770	109	815	14900	324	13000
19	3080	66	549	3720	63	633	7250	170 B	3300
20	2850	64	492	4460	49	590	4420	84	1000
21	2520	77	524	2700	42	306	3600	61	593
22	2040	76	419	2340	29	183	2480	41	274
23	1910	81	418	6800	90 B	1600	1940	35 B	180
24	1510	72	294	5830	65 B	1000	1430	44	170
25	1480	49	196	4930	43	572	1110	45 B	130
26	1970	41	218	3240	40 B	350	1080	36	105
27	1480	38	152	2270	33	202	1000	30	81
28	766	38	78	1500	28	113	940	30	76
29	861	44	102	1240	20	67	861	25 B	60
30	1180	41	131	1400	24	91	804	18 B	40
31	1040	37	104	1080	13	38	--	--	--
Total	268097	--	208791	81189	--	10549	69829	--	27669

Total discharge for year (cfs-days)..... 2,508,850
Total load for year (tons)..... 1,376,930

E Estimated.
S Computed by subdividing day.
B Computed from estimated-concentration graph.
C Composite period.

KENTUCKY RIVER BASIN--Continued

3-2875. KENTUCKY RIVER AT LOCK 4, AT FRANKFORT, KY.--Continued

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

Date of collection	Time (24 hour)	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. 1, 1959.....	1715			19000	441		60	68	78	89	96	99	100	--				SBWC
Feb. 12, 1960.....	1230			30400	649		42	51	66	81	94	97	99	100				SBWC
Mar. 20.....	1745			32600	290		35	49	69	86	93	98	100	--				SBWC
June 23.....	1645			34200	955		36	47	52	73	84	96	99	100				SBWC
June 23.....	1645			34200	955		13	24	40	63	85	94	99	100				SBN

KENTUCKY RIVER BASIN--Continued

3-2915. EAGLE CREEK AT GLENCOE, KY.

LOCATION.--At gaging station at bridge on State Highway 16 at Gallatin-Owen County line, 0.5 mile south of Glencoe, Gallatin County, 5.9 miles downstream from Tenmile Creek, and 22 miles upstream from mouth.
DRAINAGE AREA.--437 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1949 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 88°F Sept. 1, 2; minimum, freezing point on many days during winter months.
EXTREMES, 1949-60.--Water temperatures: Maximum, 93°F Sept. 1, 2, 1953; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

Temperature (°F) of water, water year October 1959 to September 1960
(Twice-daily measurement at approximately 7 a.m. and 4 p.m.)

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

SALT RIVER BASIN

3-2975. PLUM CREEK AT WATERFORD, KY.

LOCATION.--At gaging station, 0.7 mile downstream from Little Plum Creek, 1.0 mile north of Waterford, Spencer County, and 3.2 miles upstream from Salt River.
DRAINAGE AREA (revised).--31.8 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1954 to September 1960.
Sediment records: October 1954 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 91°F July 25, Aug. 3; minimum, freezing point Feb. 20.
Sediment concentrations: Maximum daily, 1,600 ppm June 23; minimum daily, no flow on several days during October and September.
Sediment loads: Maximum daily, 27,000 tons June 23; minimum daily, 0 tons on several days during October and September.
EXTREMES, 1954-60.--Water temperatures: Maximum, 92°F July 19, 1957; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 2,350 ppm Jan. 21, 1959; minimum daily, no flow on many days during 1955-60.
Sediment loads: Maximum daily, 27,000 tons June 23, 1960; minimum daily, 0 tons on many days during 1955-60.
REMARKS.--This station is operated as a part of the Soil Conservation Service Demonstration project. Records of discharge for water year October 1959 to September 1960 given in WSP 1705. Flow affected by ice Jan. 21, 23-26, Feb. 13-16, 20-22, Mar. 1-8, 10, 13.

Temperature (°F) of water, water year October 1959 to September 1960
(Once-daily measurement between 5 p.m. and 7 p.m.)

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	71	72	70	72	70	70	--	71	68	55	67	62	62	63	64	--	--	62	61	60	61	61	61	60	60	60	58	58	58	56	56	63
November	56	50	49	50	51	40	35	45	45	46	48	48	44	42	40	41	--	--	33	35	36	40	44	40	38	40	36	35	34	35	--	42
December	36	37	38	37	37	37	35	35	35	36	38	40	38	37	38	40	--	38	35	38	36	36	36	36	38	39	39	38	39	39	38	37
January	39	40	40	40	38	40	41	41	38	41	42	44	45	44	--	39	42	40	34	--	--	--	--	--	34	36	39	42	40	39	40	40
February	41	40	40	44	--	40	37	40	47	44	36	37	33	33	33	35	38	34	33	32	34	36	37	37	34	35	34	35	34	--	--	37
March	--	--	--	--	--	--	--	--	--	--	--	--	--	33	34	35	34	36	36	34	37	37	38	37	40	39	40	44	57	59	50	--
April	52	55	50	50	51	54	62	59	40	60	55	65	70	--	70	70	70	71	70	74	68	80	80	84	80	74	70	75	65	65	--	65
May	71	76	78	79	74	68	64	50	51	50	54	54	61	50	77	79	80	--	--	80	67	80	80	81	85	--	68	62	82	80	81	70
June	85	80	84	81	85	80	80	81	82	82	82	81	81	84	84	84	69	64	81	--	87	--	71	79	68	85	81	71	85	81	--	80
July	81	72	74	81	84	85	86	87	70	79	85	85	86	84	86	--	90	89	89	--	90	90	89	--	91	90	90	89	--	80	87	85
August	89	90	91	80	--	78	87	80	85	85	86	--	85	87	88	89	89	80	--	90	87	85	--	87	89	88	90	88	90	90	--	87
September	89	89	89	90	90	90	89	87	80	76	72	71	70	69	74	74	70	72	--	--	73	76	79	70	77	--	75	--	60	70	--	78

SALT RIVER BASIN--Continued

3-2975. PLUM CREEK AT WATERFORD, KY.--Continued

Suspended sediment, water year October 1959 to September 1960

Day	OCTOBER			NOVEMBER			DECEMBER		
	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..	0	--	0	1.2	3	T	16	17	0.7
2..	0	--	0	1.0	4	T	13	18	.6
3..	0	--	0	.9	5	T	11	21	.6
4..	0	--	0	9.5	40 S	1.1	10	26	.7
5..	0	--	0	21	80 B	6	9.6	24	.6
6..	.2	23	T	6.0	14	.2	12	24	.8
7..	.1	10	T	3.6	5	T	10	26	.7
8..	6.7	53 S	1.2	2.4	5	T	8.9	26	.6
9..	4.8	38	.5	1.9	6	T	7.8	30	.6
10..	1.0	19	.1	1.5 C	4	T	6.7	26	.5
11..	5.6	--	5	1.3 C	4	T	25	61 S	10
12..	1.2	54	.2	1.2 C	4	T	885	-- E	1900
13..	3.6	31	.3	1.0 C	4	T	108	60	17
14..	3.6	23	.2	14	-- E	2	51	42	5.8
15..	1.7	21	.1	8.8	18 A	.4	37	39	3.9
16..	.9	18	T	5.2	7	.1	28	36	2.7
17..	.6	16	T	3.3	3	T	147	160 S	230
18..	.5	13	T	2.4	7	T	373	-- E	750
19..	.4	13	T	2.2	4	T	61	40	6.6
20..	.3	15	T	1.9	9	T	40	38	4.1
21..	.2 C	7	T	1.7	18	.1	33	38	3.4
22..	.2 C	7	T	1.5	9	T	22	34	2.0
23..	.2 C	7	T	34	119 S	37	19	31	1.6
24..	.9 C	--	T	100	-- E	95	18	28	1.4
25..	1.0 C	--	T	22	38 S	2.4	15	28	1.1
26..	2.9 C	--	T	100	-- S	600	15	28	1.1
27..	3.3 C	--	T	601	740 S	3900	80	-- E	290
28..	1.9 C	--	T	48	22	2.8	247	222 S	323
29..	1.7 C	--	T	28	19	1.4	76	45	9.2
30..	1.3 C	--	T	19	20	1.0	51	33	4.5
31..	1.2 C	--	T	--	--	--	38	25	2.6
Total	46.0	--	8.0	1045.5	--	4649.9	2474.0	--	3576.4

Day	JANUARY			FEBRUARY			MARCH		
	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..	33	24	2.1	11	26	0.8	25	18	1.2
2..	51	-- E	20	10	41	1.1	16	24	1.0
3..	126	-- E	55	9.6	24	.6	14	20 B	.8
4..	47	29	3.7	13	17	.6	12	16	.5
5..	37	24	2.4	958	465 S	1820	10	21	.6
6..	30	23	1.9	247	76 S	71	9.0	27	.6
7..	24	23	1.5	66	28	5.0	8.0	15	.3
8..	19	20	1.0	46	26	3.2	7.5	10	.2
9..	16	19	.8	41	32	3.5	6.9	10	.2
10..	15	20	.8	994	900 B	4900	20	13	.7
11..	14	20	.8	98	114 S	32	13	12	.4
12..	13	20	.7	51	71	9.8	9.6	3	.1
13..	16	19	.8	40	54	5.8	8.0	8	.2
14..	1150	-- E	16000	34	51	4.7	9.6	16	.4
15..	391	-- E	1300	29	49	3.8	34	42	3.8
16..	66	54	9.6	27	39	2.8	185	105	52
17..	47	28	3.6	47	45	5.7	120	41	13
18..	49	31	4.1	57	43	6.6	134	49 S	23
19..	41	38	4.2	40	26	2.8	89	30	7.2
20..	33	31	2.8	32	27	2.3	89	30	7.2
21..	21	25	1.4	27	21	1.5	78	34	7.2
22..	16	22	1.0	23	32	2.0	85	39	9.0
23..	15	38	1.5	21	30	1.7	61	30	4.9
24..	14	19	.7	22	20	1.2	55	42	6.2
25..	13	33	1.2	300	243 S	336	38	33	3.4
26..	13	38	1.3	82	93 S	23	34 C	13	1.2
27..	16	30	1.3	49	32	4.2	31 C	13	1.0
28..	16	32	1.4	43	22	2.6	27 C	13	1.0
29..	15	16	.6	34	16	1.5	24 C	13	1.0
30..	13	4	.1	--	--	--	59	-- E	12
31..	17	5	.2	--	--	--	37	23	2.3
Total	2382	--	17426.5	3451.6	--	7255.8	1348.6	--	162.6

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.
C Composite period.

SALT RIVER BASIN--Continued

3-2975. PLUM CREEK AT WATERFORD, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--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	28	8		0.6	14	45	A	2	3.6	14		0.1
2	31	12		1.0	6.0	20		.3	2.4	7		T
3	55	23		3.4	3.6	11		.1	1.7	15		.1
4	63	18		3.1	2.4	9		.1	1.2	15		T
5	43	8		.9	1.9	13		.1	.8	13		T
6	34	7		.6	1.5	12		T	.5	12		T
7	26	7		.5	2.2	18	C	.1	.4	13		T
8	20	8	C	.4	1.9	18	C	.1	.3	20		T
9	16	8	C	.3	1.7	18	C	.1	.2	19		T
10	14	8	C	.3	1.7	18	C	.1	.1	16		T
11	13	8	C	.3	1.9	18	C	.1	.1	21		T
12	12	8	C	.3	1.5	10		T	.2	17		T
13	11	6		.2	1.3	5		T	3.0	13		.1
14	9.6	5		.1	1.0	5		T	6.5	9		.2
15	9.0	8	C	.2	.8	5		T	4.0	22		.2
16	8.4	8	C	.2	.7	8		T	2.4	13		.1
17	8.4	8	C	.2	.6	10		T	250	1000	S	1200
18	6.5	8	C	.1	.4	10		T	16	82	S	4.1
19	5.2	8	C	.1	.4	13		T	8.0	38		.8
20	4.8	8	C	.1	.6	17		T	5.6	30	B	.4
21	8.0	8	C	.2	1.0	20		.1	6.7	42	S	1.0
22	7.0	8	C	.2	.6	24		T	6.0	35	B	.6
23	5.6	8	C	.1	.4	19		T	3560	1600	A	27000
24	4.0	8	C	.1	1.2	19		.1	283	428	S	435
25	3.3	8		.1	2.6	25		.2	37	89		8.9
26	14	82	S	8.4	1.0	10		T	20	67		3.6
27	13	91		3.2	200	470	A	450	13	52		1.8
28	6.5	27		.5	27	53		3.9	900	721	S	4740
29	4.8	11		.1	13	17		.6	72	81	S	17
30	9.9	--	E	2	7.0	19		.4	136	365	S	245
31	--	--		--	5.2	26		.4	--	--		--
Total	494.0	--		27.8	305.1	--		459.1	5340.7	--		33659.2

Day	JULY				AUGUST				SEPTEMBER			
1	255	550	S	700	1.7	50		0.2	0.3	8		T
2	54	64	S	10	.7	20		T	.1	10		T
3	1050	650	A	5800	.5	15		T	.1	12		T
4	104	95	S	31	323	800	A	2400	.1	9		T
5	42	41		4.6	46	--	E	200	.1	13		T
6	22	25		1.5	52	--	E	120	0	--		0
7	15	19		.8	21	--	E	15	0	--		0
8	11	18		.5	14	110	S	4.4	0	--		0
9	8.0	21		.4	7.4	33		.6	.5	9		T
10	33	49	S	5.4	4.8	28		.4	3.0	32		.2
11	13	16		.6	3.6	17		.2	1.3	25		.1
12	8.4	16		.4	2.7	16		.1	.5	15		T
13	16	30	A	3	2.2	16		.1	.3	14		T
14	11	32		1.0	1.7	12		.1	.1	6		T
15	6.0	22		.4	1.5	18		.1	0	--		0
16	4.4	18		.2	1.3	27		.1	0	--		0
17	3.3	16		.1	1.3	27		.1	13	70	S	3.6
18	2.7	15		.1	1.2	24		.1	4.7	20		.2
19	2.2	15		.1	1.3	24		.1	1.5	7	B	.3
20	1.7	14		.1	1.9	33		.2	1.0	5		T
21	1.3	15		T	2.2	14		.1	.6	5		T
22	1.0	29		.1	2.2	7		T	.4	5		T
23	.9	23		.1	.8	9		T	.2	5		T
24	.7	14		T	.5	11		T	.2	8		T
25	.5	9		T	.4	10		T	.1	12		T
26	.4	15		T	.3	13		T	.1	13		T
27	.5	20		T	.2	13		T	.1	12		T
28	.5	25		T	.1	10		T	.1	10		T
29	.3	26		T	.1	11		T	0	--		0
30	6.0	--	E	15	.7	11		T	0	--		0
31	11	--	E	12	.5	10		T	--	--		--
Total	1685.8	--		6587.6	497.8	--		2742.1	28.4	--		4.5

Total discharge for year (cfs-days)..... 19,099.5
Total load for year (tons)..... 76,559.5

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.
C Composite period.

SALT RIVER BASIN--Continued

3-2975. PLUM CREEK AT WATERFORD, KY.--Continued

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

Date of collection	Time (24 hour)	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. 23, 1959.....	1000			286	914		50	58	70	83	95	98	100	--				SBWC
Jan. 14, 1960.....	1630			2170	1220		41	49	61	76	94	99	99	100				SBWC
Jan. 14.....	1630			2170	1220		30	38	54	72	95	98	99	100				SBN
Feb. 10.....	0800			4410	3270		40	49	59	73	92	98	99	100				SBWC
May 27.....	0700			272	842		65	78	89	95	99	100	--	--				SBWC
June 17.....	0700			443	2120		56	68	83	95	99	100	--	--				SBWC
July 3.....	1530			2490	1360		47	55	68	83	95	99	100	--				SBWC
July 3.....	1530			2490	1360		27	41	61	85	97	99	100	--				SBN

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3-2985. SALT RIVER AT SHEPHERDSVILLE, KY.

LOCATION.--Temperature recorder at gaging station at bridge on State Highway 61 at Shepherdsville, Bullitt County, 500 feet downstream from Louisville and Nashville Railroad bridge, and 2.5 miles downstream from Floyds Fork.
DRAINAGE AREA (revised).--1,197 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1949 to September 1950, October 1952 to September 1959.
Water temperatures: October 1952 to September 1960.
Sediment records: October 1952 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 91°F Sept. 7, 8; minimum, 33°F Mar. 6, 9-12.
Sediment concentrations: Maximum daily, 3,430 ppm June 23; minimum daily, 8 ppm Feb. 3, Mar. 6, 15.
Sediment loads: Maximum daily, 139,000 tons June 23; minimum daily, less than 0.5 ton on several days during October and September.
EXTREMES, 1952-60.--Water temperatures: Maximum, 92°F June 27, 1954; minimum, freezing point on many days during 1957-59.
Sediment concentrations: Maximum daily, 3,430 ppm June 23, 1960; minimum daily, no flow on many days during September to November 1953, and September 1954.
Sediment loads: Maximum daily, 139,000 tons June 23, 1960; minimum daily, 0 tons on many days during September to November 1953 and September 1954.
REMARKS.--Records of specific conductance of daily samples available in district office at Columbus, Ohio. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

Temperature (°F) of water, water year October 1959 to September 1960
(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	84	86	86	87	85	79	82	76	75	69	70	68	67	65	63	60	60	60	61	61	63	64	60	57	56	55	55	56	54	53	53	67
Minimum	66	65	68	72	74	72	70	72	69	69	68	66	65	63	60	59	59	58	58	57	57	57	56	55	55	54	54	54	53	53	53	62
November																																
Maximum	55	56	54	56	57	57	55	52	50	49	48	48	49	49	49	48	49	47	45	43	43	43	50	52	52	51	49	49	47	45	--	50
Minimum	53	52	52	53	54	55	52	50	49	47	48	48	48	49	48	48	47	45	43	42	42	42	42	50	51	49	49	47	45	42	--	48
December																																
Maximum	42	42	42	42	43	44	43	43	42	41	41	50	50	50	47	46	47	51	50	47	45	44	42	42	42	44	48	52	52	50	47	46
Minimum	41	41	42	42	42	43	43	42	41	40	40	41	50	47	46	46	46	47	47	45	44	42	41	41	42	42	44	48	50	47	44	44
January																																
Maximum	44	43	44	44	43	41	41	42	42	43	44	47	51	53	53	53	50	46	45	42	40	38	37	35	35	34	36	37	38	39	39	43
Minimum	43	42	43	43	41	40	40	41	41	41	43	44	47	51	53	50	46	45	42	40	38	37	34	34	34	34	34	36	37	38	39	41
February																																
Maximum	39	40	40	40	41	42	42	41	40	47	47	46	42	39	37	36	38	39	39	38	36	36	37	37	38	38	38	38	38	--	--	40
Minimum	39	39	40	40	40	41	41	39	39	40	46	42	39	37	36	36	36	38	38	36	36	36	36	37	37	38	37	38	38	--	--	38
March																																
Maximum	38	37	36	35	35	34	34	34	34	34	34	34	34	35	36	37	37	38	39	39	40	41	41	42	42	42	44	48	52	54	54	39
Minimum	37	36	35	35	34	33	34	34	33	33	33	33	34	34	35	36	36	36	38	38	39	40	41	41	41	41	42	44	48	52	51	38
April																																
Maximum	51	53	53	53	52	52	52	54	54	53	51	52	56	59	61	64	65	65	64	63	63	65	67	69	71	71	71	70	69	67	--	60
Minimum	50	51	53	52	52	51	51	52	53	51	50	50	52	56	59	61	64	64	62	61	62	62	64	66	69	70	70	68	67	65	--	59
May																																
Maximum	65	64	63	64	65	65	64	63	61	58	55	53	54	57	59	63	64	73	71	71	72	72	75	76	71	71	71	66	65	67	69	65
Minimum	64	62	61	62	63	64	63	61	58	55	53	53	52	53	55	58	61	64	67	68	66	67	70	70	69	70	65	65	64	65	67	62
June																																
Maximum	71	71	73	74	76	79	77	78	80	80	80	76	76	76	76	78	74	68	71	73	75	77	77	69	70	70	69	69	67	69	--	74
Minimum	69	70	70	71	73	74	73	72	72	73	74	74	73	72	72	73	67	67	68	70	72	74	67	67	69	69	69	66	67	67	--	70

SALT RIVER BASIN--Continued

3-2985. SALT RIVER AT SHEPHERDSVILLE, KY.--Continued

Temperature (°F) of water, water year october 1959 to September 1960--Continued

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	
July																																
Maximum	70	70	71	70	70	70	71	71	71	71	71	73	74	74	74	74	75	74	76	77	80	78	80	81	82	80	82	82	85	82	83	76
Minimum	69	70	70	70	69	69	70	71	71	71	71	71	73	73	73	73	73	74	74	75	75	75	76	76	78	78	78	78	78	78	78	73
August																																
Maximum	80	80	82	81	72	74	76	77	76	76	76	75	75	74	75	77	77	78	78	77	77	76	74	76	77	76	78	78	79	80	79	77
Minimum	78	78	79	72	71	72	74	76	75	75	75	74	73	73	73	74	73	74	75	75	75	73	70	71	73	74	74	75	75	76	75	74
September																																
Maximum	81	83	83	84	86	89	91	91	81	74	73	72	67	66	66	68	65	64	63	64	64	65	66	67	69	68	68	68	71	71	--	73
Minimum	75	75	76	75	76	76	75	75	73	71	72	67	65	65	64	64	64	63	63	63	64	64	64	66	66	67	66	66	66	65	--	68

SALT RIVER BASIN--Continued

3-2985. SALT RIVER AT SHEPHERDSVILLE, KY.--Continued

Suspended sediment, water year October 1959 to September 1960
(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	0.4	26	T	47	32	4	1100	56	166
2	.3	33	T	40	27	3	823	35	78
3	.3	25	T	35	29	3	664	26	47
4	.3	21	T	38	22	2	544	25	37
5	.3	16	T	284	82	S 97	565	23	35
6	.7	25	T	1240	188	629	551	20	30
7	.7	34	T	648	97	170	736	19	38
8	35	62	S 44	328	74	66	728	16	31
9	2920	1300	S 11000	212	51	29	586	18	28
10	484	139	S 225	156	41	17	482	19	25
11	174	96	45	116	34	11	470	15	19
12	101	79	22	95	31	8	6300	552	S 11900
13	70	80	15	78	32	7	11600	585	18300
14	125	84	28	88	41	10	7290	178	S 3780
15	310	80	67	468	55	69	2750	91	676
16	184	64	32	446	48	58	1920	56	290
17	101	46	12	254	69	47	1720	58	S 284
18	66	43	8	188	55	28	7650	362	S 7820
19	46	52	6	146	32	13	6210	204	3420
20	35	56	5	122	27	9	2900	102	S 832
21	31	47	4	101	24	6	2020	48	262
22	25	56	4	90	27	6	1560	31	130
23	21	49	3	630	285	S 10900	1240	20	67
24	22	29	2	3270	1190	10500	1030	17	47
25	24	38	2	2310	342	S 2230	886	17	41
26	27	36	3	1030	152	423	787	13	28
27	41	46	5	6510	1850	S 37800	769	14	29
28	58	41	6	9020	795	19400	5080	551	S 8820
29	122	38	12	3590	262	2720	5440	329	S 5180
30	85	26	6	1610	102	443	3010	146	1190
31	60	32	5	--	--	--	2200	74	440
Total	5170.0	--	11561	33190	--	75898	79611	--	64070
	JANUARY			FEBRUARY			MARCH		
1	1790	36	174	616	14	23	1790	34	164
2	1530	25	103	551	12	18	1400	26	98
3	2760	83	S 666	500	8	11	1200	19	62
4	2980	131	1050	482	9	12	1000	15	40
5	2200	64	380	3450	310	B 5600	900	11	27
6	1690	47	214	15400	725	30100	800	8	17
7	1440	30	117	11800	360	11500	700	13	24
8	1180	12	38	4540	138	S 1800	650	18	32
9	976	18	47	2440	70	461	600	13	21
10	832	19	43	9570	1790	S 66600	650	17	30
11	736	15	30	15200	1530	62800	700	17	32
12	680	17	31	6110	475	7840	650	12	21
13	672	22	40	2710	201	1470	551	13	19
14	2190	139	S 2400	2400	104	674	586	13	20
15	16700	1240	55900	1940	62	325	868	8	19
16	15800	520	22200	1650	47	209	2650	116	S 1040
17	4280	186	2150	1640	36	159	5760	299	4650
18	2250	116	705	2230	109	656	4950	177	2360
19	2100	56	318	2240	57	345	4610	115	1430
20	1800	38	185	1820	31	152	3490	84	792
21	1400	33	125	1670	20	90	3230	67	584
22	1100	19	56	1570	16	68	3140	63	534
23	877	17	40	1390	11	41	3070	65	539
24	850	13	30	1330	9	32	2940	66	524
25	800	17	37	2650	211	S 2260	2720	53	389
26	760	11	22	6390	527	9090	2200	47	279
27	744	15	30	4170	198	S 2370	1850	48	240
28	787	13	28	2550	88	606	1690	42	192
29	985	14	37	2200	51	303	1480	30	120
30	868	12	28	--	--	--	1960	62	S 349
31	712	15	29	--	--	--	2400	145	940
Total	74469	--	87253	111209	--	205615	61185	--	15588

S Computed by subdividing day.
T Less than 0.5 ton.
B Computed from partly estimated-concentration graph.

SALT RIVER BASIN--Continued

3-2985. SALT RIVER AT SHEPHERDSVILLE, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--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	1650	126	561	376	28	28	324	74	65
2	1350	54	197	373	27	27	246	68	45
3	1340	37	134	315	27	23	216	56	33
4	2540	64	439	226	33	20	164	51	22
5	2180	82	483	178	26	12	122	43	14
6	1480	32	128	142	25	10	95	39	10
7	1300	25	88	122	24	8	72	33	6
8	1020	17	47	119	21	7	58	37	6
9	950	15	38	142	25	10	46	46	6
10	800	13	28	139	22	8	38	30	3
11	700	14	26	113	20	6	51	53	7
12	600	16	26	92	16	4	119	52	17
13	550	25	37	85	20	4	47	46	6
14	500	27	36	75	17	3	56	43	6
15	482	26	34	66	19	3	70	33	6
16	458	25	31	60	21	3	54	30	4
17	446	24	29	52	21	3	2230	521	S 3660
18	434	31	36	46	20	2	696	231	434
19	400	26	28	41	11	1	375	161	163
20	385	27	28	36	13	1	254	118	81
21	422	22	25	47	14	2	184	72	36
22	524	22	31	47	17	2	142	43	16
23	558	22	33	46	20	2	16500	3430	S 139000
24	527	22	31	67	20	4	28200	1500	114000
25	482	22	29	226	68	41	17900	560	27100
26	458	22	27	188	68	34	9170	188	4650
27	470	17	22	2590	--	9300	1510	120	489
28	456	23	28	2800	763	S 6300	7590	1600	S 45400
29	362	20	20	1160	176	551	11200	1300	S 41300
30	331	24	21	680	106	195	5920	585	9350
31	--	--	--	434	79	92	--	--	--
Total	24155	--	2721	11083	--	16706	103649	--	385935

Day	JULY			AUGUST			SEPTEMBER		
1	3660	610	S 6310	181	50	S 27	60	20	3
2	7930	832	17800	66	19	3	41	13	A 1
3	4280	583	S 7950	36	16	2	33	22	2
4	9720	1130	29600	1520	--	3700	26	26	2
5	4720	658	S 9380	4850	1860	26600	19	16	A 1
6	1820	216	1060	976	469	1240	14	18	1
7	1130	88	268	428	189	218	11	25	1
8	760	73	150	592	140	B 240	7.3	13	T
9	551	67	100	922	130	A 320	8.1	32	1
10	458	57	70	405	109	119	23	35	A 2
11	517	54	75	338	118	108	172	--	40
12	410	48	53	270	91	66	686	87	161
13	333	49	44	195	83	44	246	83	55
14	360	64	62	132	75	27	142	80	31
15	266	55	40	92	47	12	90	80	19
16	209	47	26	78	35	7	68	68	12
17	164	39	17	60	36	6	1120	--	3000
18	136	30	11	47	22	3	5190	1600	B 22000
19	113	29	9	35	34	3	2260	299	S 2170
20	95	20	5	60	32	5	530	67	96
21	82	15	3	82	21	5	302	60	49
22	72	17	3	454	--	550	212	52	30
23	66	16	3	334	--	220	153	44	18
24	58	19	3	122	--	30	116	30	9
25	50	24	3	92	42	10	90	33	8
26	46	36	4	104	40	11	70	27	5
27	41	20	2	80	37	8	58	34	5
28	35	17	2	58	26	4	47	39	5
29	34	24	2	44	20	2	35	54	5
30	31	33	3	40	17	2	35	50	5
31	82	35	S 11	101	45	S 14	--	--	--
Total	38224	--	73069	12794	--	33606	11864.4	--	27737

Total discharge for year (cfs-days)..... 566,603.4
Total load for year (tons)..... 999,759

S Computed by subdividing day.
T Less than 0.5 ton.
A Computed from partly estimated-concentration graph.
B Computed from estimated-concentration graph.

3-2985. SALT RIVER AT SHEPHERDSVILLE, KY.--Continued

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

Date of collection	Time (24 hour)	Water temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	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. 24, 1959.....	0830			3450	1430		54	61	72	85	96	99	100					SBWC
Nov. 28.....	0915			9660	799		56	66	78	88	98	99	100					SBWC
Dec. 13.....	1230			12100	578		57	66	75	89	96	99	100					SBWC
Jan. 15, 1960.....	0745			16400	1420		52	60	70	82	98	100	--					SBWC
Jan. 15.....	0745			16400	1420		41	52	66	82	97	99	100					SBN
Feb. 11.....	0810			16800	1780		47	58	69	84	98	100	--					SBWC
June 17.....	0630			2620	709		57	72	86	96	98	99	100					SBWC
June 23.....	0745			12000	6680		32	42	46	62	80	99	100					SBWC
June 23.....	0745			12000	6680		17	26	40	60	90	99	100					SBN
July 4.....	0710			10500	1240		52	60	72	90	98	99	100					SBWC

SALT RIVER BASIN--Continued

3-3015. ROLLING FORK NEAR BOSTON, KY.

LOCATION.--At gaging station at bridge on U.S. Highway 62 and State Highway 61, 0.4 mile downstream from Beech Fork, and 2.3 miles southwest of Boston, Nelson County.
DRAINAGE AREA (revised).--1,299 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1952.
Water temperatures: October 1949 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 84°F Aug. 3; minimum, freezing point on several days during January to March.
EXTREMES, 1949-60.--Water temperatures: Maximum, 87°F July 4, 1950, June 22, 25, 28, 1954; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

Temperature (°F) of water, water year October 1959 to September 1960
(Twice-daily measurements at approximately 7 a.m. and 5 p.m.)

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

3-3064.9. GREEN RIVER NEAR GREENSBURG, KY.

LOCATION.--At Sardins Ford bridge on Kentucky Highway 487, 1.4 miles east of Greensburg, Green County, and 2 miles upstream from gaging station.
DRAINAGE AREA.--736 square miles upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1959 to September 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^+	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Oct. 14, 1959..	72	6.5		0.24	0.21	28	6.9	17	2.1	93	14	36	0.0	0.4	171	98	22		289	7.1	6
Dec. 8.....	786	6.2		.14	--	23	4.3	3.5	1.2	68	17	8.0	.1	2.8	98	75	20		173	7.3	5
Jan. 5, 1960...	1,480	5.8		.14	--	19	3.7	2.4	.8	59	14	4.0	.4	3.2	83	62	14		141	7.3	7
Feb. 17.....	1,160	7.8		.20	.00	23	1.7	4.3	.4	62	14	6.0	.1	3.8	83	64	14		148	7.2	10
Mar. 29.....	2,780	5.3		.21	.09	13	3.3	1.8	.6	44	11	2.0	.1	2.8	66	46	10		108	7.0	10
Apr. 26.....	272	1.3		.08	.41	20	5.7	4.2	1.0	73	13	9.0	.1	.9	107	74	14		178	6.7	1
May 24.....	140	2.6		.12	.12	20	5.2	3.6	1.2	76	14	5.0	.1	.9	94	72	10		171	6.9	3
June 28.....	1,360	7.0		1.1	.38	23	3.6	7.8	1.6	70	11	14	.2	3.2	125	72	15		209	6.6	14
July 19.....	143	5.7		.14	.15	24	4.9	3.2	1.2	84	12	5.0	.1	1.2	104	80	11		175	6.8	2
Aug. 16.....	92	4.9		.15	.21	24	6.0	4.6	1.7	80	13	10	.2	.5	114	84	19		188	6.7	4
Sept. 22.....	131	6.6		.11	.03	19	4.3	4.0	2.2	64	14	7.0	.4	.7	98	65	12		154	6.8	10

Date of collection	Dissolved oxygen		Phenols as C_6H_5OH	Turbidity
	Parts per million	Percent saturation		
Oct. 14, 1959.....	9.0	91	0.000	10
Feb. 17, 1960.....	13.0	97	.000	8
June 28.....	8.2	89	--	30
Sept. 22.....	6.7	73	.000	25

GREEN RIVER BASIN--Continued

3-3085. GREEN RIVER AT MUNFORDVILLE, KY.

LOCATION.--At gaging station on right bank at downstream side of pier of bridge on U.S. Highway 31W at Munfordville, Hart County.
DRAINAGE AREA.--1,673 square miles, of which about 180 square miles does not contribute directly to surface runoff.
RECORDS AVAILABLE.--Chemical analyses: October 1949 to September 1960.
Water temperatures: October 1950 to September 1960.
Sediment records: April 1951 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 5,830 ppm Oct. 10; minimum, 218 ppm Mar. 18-26.
Hardness: Maximum, 1,220 ppm Oct. 10; minimum, 102 ppm June 25 to July 4.
Specific conductance: Maximum daily, 9,420 micromhos Oct. 10; minimum daily, 150 micromhos June 26.
Water temperatures: Maximum, not determined; minimum, 34°F Mar. 5, 6.
Sediment concentrations: Maximum daily, 1,380 ppm June 24; minimum daily, 2 ppm Sept. 16.
Sediment loads: Maximum daily, 27,000 tons June 24; minimum daily, 1 ton Sept. 16.
EXTREMES, 1950-60.--Dissolved solids: Maximum, 5,830 ppm Oct. 10, 1959; minimum, 73 ppm Feb. 19-21, 1956.
Hardness: Maximum, 1,220 ppm Oct. 10, 1959; minimum, 44 ppm Jan. 30 to Feb. 2, 1957.
Specific conductance: Maximum daily, 9,420 micromhos Oct. 10, 1959; minimum daily, 59 micromhos Mar. 25, 1952.
Water temperatures (1950-59): Maximum, 82°F July 20, 1957; minimum, freezing point on several days during 1957 to 1959.
Sediment concentrations (1951-60): Maximum daily, 3,180 ppm June 14, 1952; minimum daily, 1 ppm on many days during 1952 to 1957.
Sediment loads (1951-60): Maximum daily, 153,000 tons Mar. 23-24, 1952; minimum daily, less than 0.50 ton on many days during 1953 to 1956.
REMARKS.--Additional samples were collected to further define the quality of water at this station. Records of specific conductance and chloride of daily samples available in district office at Columbus, Ohio. Records of discharge for water year October 1959 to September 1960 given in WSP 1705. Flow affected by ice Mar. 7-11.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 1-9, 1959.....	428	--	--	171	25	554	--	157	26	1120	--	--	1120	530	401	3800	7.6	8
Oct. 10.....	923	--	--	356	80	1610	--	84	58	3250	--	--	5830	1220	1150	9420	6.6	15
Oct. 11-25.....	370	--	--	134	25	438	--	145	21	885	--	--	1710	438	319	3040	7.3	10
Oct. 26-30.....	402	--	--	183	40	703	--	186	21	1400	--	--	2570	622	469	4580	7.0	9
Oct. 31-Nov. 8.....	522	--	--	152	20	478	--	147	18	965	--	--	1900	461	340	3310	7.5	11
Nov. 9-26.....	479	6.4	0.00	138	22	459	5.2	157	11	865	0.2	3.0	1720	435	306	3010	7.7	5
Nov. 27-Dec. 2.....	6983	--	--	52	7.3	73	--	108	15	152	--	--	422	160	71	732	7.4	10
Dec. 3-12.....	2250	--	--	68	9.9	128	--	127	18	260	--	--	610	210	106	1100	7.4	8
Dec. 13-16.....	7820	--	--	41	4.0	50	--	97	9.0	98	--	--	267	119	39	486	7.3	13
Dec. 17-28.....	2624	--	--	74	2.9	107	--	126	16	220	--	--	528	197	94	971	7.4	5

Dec. 29-Jan. 1, 1960	7788	--	--	41	3.2	43	--	96	12	84	--	--	253	115	36	462	7.2	22
Jan. 2-14.....	2719	--	--	56	6.8	82	--	117	16	166	--	--	422	168	72	781	7.3	8
Jan. 15-19.....	9066	--	--	40	3.3	36	--	98	12	71	--	--	244	114	34	424	7.1	20
Jan. 20-23.....	3105	--	--	47	6.7	66	--	110	13	131	--	--	376	145	55	642	7.2	11
Jan. 24-Feb. 6.....	1941	--	--	53	15	109	--	122	18	218	--	4.8	570	194	94	966	7.3	2
Feb. 7-11.....	6814	--	--	36	10	42	--	97	16	88	--	4.5	296	131	51	498	6.8	5
Feb. 12-14.....	8553	--	--	30	7.4	27	--	79	13	60	--	2.9	222	106	41	353	6.6	14
Feb. 15-26.....	4488	--	--	42	9.4	57	--	102	16	115	--	6.0	351	144	60	584	7.1	3
Feb. 27-Mar. 5.....	5809	--	--	35	9.1	40	--	94	14	83	--	4.9	279	125	48	450	6.9	3
Mar. 6-17.....	2864	--	--	45	13	78	--	106	16	161	--	5.3	451	166	79	744	6.9	3
Mar. 18-26.....	8984	5.6	.03	30	7.0	27	1.0	82	13	53	.2	3.0	218	104	37	344	6.8	7
Mar. 27-Apr. 6.....	5226	--	--	35	6.5	41	--	94	14	78	--	2.9	267	114	37	445	7.2	6
Apr. 7-13.....	2456	--	--	45	8.9	69	--	108	14	138	--	2.5	287	149	60	659	7.4	3
Apr. 14-25.....	1162	--	--	60	12	141	--	126	16	270	.1	5.8	598	199	96	1060	7.6	5
Apr. 26-May 9.....	1137	--	--	61	13	145	--	126	18	280	.2	5.2	632	206	103	1130	8.1	4
May 10-13.....	1592	--	--	36	8.3	62	--	88	15	120	.2	1.7	347	124	52	582	7.1	4
May 14-23.....	649	5.9	.00	59	12	129	2.1	122	17	260	.1	1.8	633	197	97	1050	7.9	6
May 24-30.....	662	--	--	71	17	195	--	136	18	380	.2	5.7	817	247	135	1410	7.7	5
May 31-June 4.....	662	--	--	49	9.5	94	--	112	15	180	.2	5.0	468	161	69	792	7.5	5
June 5-12.....	304	--	--	65	16	174	--	128	17	340	.1	5.2	751	228	123	1270	7.7	5
June 13-18.....	1230	--	--	79	18	255	--	118	18	500	.2	5.3	1030	271	174	1760	7.5	6
June 19-24.....	2802	--	--	39	8.2	60	2.2	94	18	118	--	2.9	320	131	54	579	7.4	14
June 25-July 4.....	7546	--	--	32	5.3	32	2.0	86	13	64	--	2.8	225	102	32	381	7.4	38
July 5-8.....	2812	--	--	39	7.7	47	--	106	12	92	--	2.6	272	129	42	496	6.7	5
July 9-25.....	768	--	--	56	12	98	--	130	15	198	--	2.1	473	189	82	892	7.1	4
July 26-29.....	571	--	--	54	11	82	--	132	16	165	--	1.5	427	180	72	777	7.2	5
July 30-Aug. 11.....	388	--	--	61	16	134	--	136	16	270	--	1.3	651	218	106	1100	7.1	3
Aug. 12.....	430	--	--	160	61	816	--	110	47	1620	--	1.2	3020	651	561	4940	7.1	5
Aug. 13-21.....	326	--	--	60	12	113	--	144	17	218	--	1.3	488	199	81	960	7.2	4
Aug. 22-23.....	593	--	--	83	25	258	--	128	20	528	--	1.3	1050	310	205	1960	7.3	5

GREEN RIVER BASIN--Continued

3-3085. GREEN RIVER AT MUNFORDVILLE, KY.--Continued

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Aug. 24-29, 1960....	314	--	--	61	11	112	--	134	16	222	--	0.8	510	197	87	992	7.2	5
Aug. 30-Sept. 11....	252	--	--	66	19	164	--	146	19	325	--	1.0	732	243	123	1320	7.5	4
Sept. 12-14.....	286	--	--	109	30	423	--	115	20	850	--	2.3	1610	396	302	2790	7.1	5
Sept. 15-18.....	667	--	--	65	16	138	--	140	17	280	--	1.4	632	228	113	1220	7.5	5
Sept. 19-30.....	361	--	--	69	17	160	--	139	17	325	--	1.2	728	242	122	1330	7.2	5
Weighted average..	--	--	--	47	8.6	79	--	104	15	159	--	--	410	154	69	714	2.9	10
Time-weighted average.....	2339	--	--	70	14	171	--	123	16	340	--	--	733	231	130	1290	2.4	7
Tons per day.....	--	--	--	300	54	501	--	656	93	1000	--	--	2590	--	--	--	--	66

Analyses of additional samples

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 15, 1959....	497	--	0.02	--	--	--	--	140	24	850	0.2	5.8	--	428	313	2900	7.1	--
Feb. 18, 1960....	3620	--	--	--	--	--	--	110	15	138	.1	3.4	--	156	66	664	6.9	--
May 19.....	560	--	--	67	18	192	--	116	19	380	--	--	--	241	146	1470	7.7	--
June 29.....	10300	6.0	.88	40	6.8	57	2.3	96	12	110	.4	2.7	320	128	50	537	6.5	18
Sept. 22.....	394	6.4	.20	58	12	108	3.3	136	18	215	.3	5.5	533	194	82	965	6.9	4

Date of collection	Dissolved oxygen		Phenols as C_6H_5OH	Turbidity
	Parts per million	Percent saturation		
Oct. 15, 1959.....	9.4	93	0.002	9
Feb. 18, 1960.....	12.1	93	.002	14
May 19.....	--	--	--	--
June 29.....	7.0	75	--	25
Sept. 22.....	8.5	94	.000	15

GREEN RIVER BASIN--Continued

3-3085. GREEN RIVER AT MUNFORDVILLE, KY.--Continued

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

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

GREEN RIVER BASIN--Continued

3-3085. GREEN RIVER AT MUNFORDVILLE, KY.--Continued

Suspended sediment, water year October 1959 to September 1960

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	120	14	4	340	C 3	3	3290	71	631
2	128	21	7	320	C 3	3	2430	55	361
3	135	17	6	308	C 3	2	2180	50	294
4	135	16	6	312	C 3	3	2190	34	201
5	146	12	5	532	--	E 25	2020	15	82
6	149	12	5	1130	20	61	1860	14	70
7	155	14	6	792	10	21	2100	12	68
8	1340	--	E 2000	600	3	5	2290	20	124
9	1540	260	B 1200	524	3	4	2080	22	124
10	923	31	77	461	3	4	1800	18	87
11	625	22	37	425	C 4	5	1640	18	80
12	492	18	24	389	C 4	4	4340	250	B 3800
13	448	19	23	360	C 4	4	9490	276	7070
14	528	17	24	348	C 4	4	9790	182	4810
15	497	18	24	360	C 4	4	7620	101	2080
16	402	13	14	368	C 4	4	4380	59	698
17	352	13	12	384	C 4	4	3230	46	401
18	328	12	11	394	C 4	4	3080	42	349
19	304	12	10	402	C 4	4	3190	34	293
20	276	10	7	420	C 4	5	2940	28	222
21	254	8	5	434	C 4	5	2640	30	214
22	234	C 6	4	425	C 4	5	2270	31	190
23	227	C 6	4	416	C 4	4	1960	17	90
24	248	C 6	4	456	C 4	5	1730	17	79
25	340	C 6	6	881	18	43	1530	18	74
26	398	C 6	6	1170	26	82	1380	13	48
27	412	C 6	7	6450	728	S 15600	1320	15	53
28	416	C 6	7	13100	465	16400	6220	502	S 10800
29	402	C 6	7	10700	227	6560	11200	362	10900
30	380	C 6	6	5930	133	2130	9510	146	3750
31	360	C 6	6	--	--	--	6260	73	1230
Total	12694	--	3564	49131	--	41007	117960	--	49273

Day	JANUARY			FEBRUARY			MARCH		
1	4180	48	542	1670	11	50	5050	21	286
2	3310	42	375	1520	11	45	4270	23	265
3	2990	33	266	1390	8	30	3880	21	220
4	3340	39	352	1300	8	28	3620	26	254
5	3460	34	318	1440	22	S 97	3100	30	251
6	3120	20	168	5600	254	S 4300	2570	31	215
7	2740	16	118	7800	246	5180	2240	22	133
8	2580	14	98	7340	94	1860	2150	13	75
9	2560	18	124	5300	54	773	2100	13	74
10	2460	12	80	4660	136	1710	2050	17	94
11	2260	7	43	8970	388	9400	2150	13	75
12	2060	9	50	10200	272	7490	2260	13	79
13	1900	9	46	9740	228	6000	2110	13	74
14	2570	124	S 1250	5720	58	896	2020	27	147
15	9390	509	12900	4040	28	305	2060	12	67
16	12100	267	8720	3330	23	207	3260	74	S 913
17	11500	168	5220	3010	24	195	9400	313	7940
18	7680	57	1180	3620	24	234	12100	219	7150
19	4660	38	478	4800	42	544	11800	107	3410
20	3870	26	272	5050	48	654	9220	53	1320
21	3350	18	1630	4370	52	614	7800	49	1030
22	2800	14	106	3970	37	397	7740	46	961
23	2400	12	78	3880	25	262	8300	48	1080
24	2060	20	111	3900	18	190	8550	47	1080
25	1820	10	49	4670	40	S 568	8160	49	1080
26	1630	8	35	9220	215	5350	7190	45	874
27	1540	10	42	10600	136	3890	6090	43	707
28	1660	12	54	9460	73	1860	5310	37	530
29	1820	8	39	6490	37	648	5120	40	553
30	1910	8	41	--	--	--	5220	70	986
31	1820	8	39	--	--	--	6450	113	1970
Total	111540	--	34824	153060	--	53777	163340	--	33893

E Estimated.
S Computed by subdividing day.
B Computed from partly estimated-concentration graph and subdividing day.
C Composite period.

GREEN RIVER BASIN--Continued

3-3085. GREEN RIVER AT MUNFORDVILLE, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--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	6120	57	942	1040	6	17	754	13	26
2	5050	44	600	983	6	16	610	14	23
3	4560	45	554	905	5	12	515	9	12
4	4850	65	851	836	3	7	448	10	12
5	4630	42	525	792	5	11	398	10	11
6	4090	32	353	760	4	8	364	14	14
7	3590	25	242	748	5	10	340	15	14
8	3080	24	200	1400	15	57	300	19	15
9	2650	25	179	2710	58	424	276	18	13
10	2300	25	155	2430	78	512	258	10	7
11	2050	15	83	1610	33	143	248	10	7
12	1840	13	64	1270	17	58	244	20	13
13	1680	13	59	1060	11	31	328	21	18
14	1540	8	33	935	9	23	380	16	16
15	1420	9	34	831	5	11	368	16	16
16	1330	11	40	743	6	12	443	34	41
17	1260	13	44	680	7	13	1960	550 B	4200
18	1200	10	32	615	7	12	3900	758	7980
19	1110	8	24	560	4	6	3560	298	2860
20	1040	5	14	533	4	6	2190	162	958
21	1020	5	14	595	4	6	1280	61	211
22	1070	3	9	528	6	8	941	35	89
23	1030	5	14	470	6	8	1580	320 B	2800
24	995	5	13	420	9	10	7260	1380	27000
25	935	4	10	416	11	12	10100	974	26600
26	923	6	15	407	13	14	11000	700	20800
27	995	10	27	484	11	14	4840	185	2420
28	1370	10	37	585	18	28	3130	286 S	2680
29	1300	9	32	965	30	78	10300	736	20500
30	1160	10	31	1360	23	84	10900	344	10100
31	--	--	--	983	16	42	--	--	--
Total	66188	--	5230	28654	--	1693	79215	--	129456
	JULY			AUGUST			SEPTEMBER		
1	8760	288	6810	368	29	29	206	12	7
2	6310	411	7000	510	33	45	188	17	9
3	5440	178	2610	398	25	27	182	12	6
4	4680	157	1980	344	18	17	170	11	5
5	4010	138	1490	312	11	9	164	9	4
6	3250	102	895	279	19	14	161	16	7
7	2290	72	445	262	15	11	155	18	8
8	1700	49	225	262	20	14	152	12	5
9	1350	38	138	515	26	36	340	16	15
10	1120	28	85	605	70	114	650	27	47
11	965	18	47	438	34	40	497	40	54
12	1050	12	34	430	28	32	360	30	29
13	881	13	31	364	13	13	272	22	16
14	965	62	162	368	16	16	227	7	4
15	953	99	255	336	18	16	206	3	2
16	695	38	71	348	21	20	191	2	1
17	595	37	59	394	22	23	610	114 S	275
18	538	30	44	332	22	20	1660	279	1250
19	492	23	30	262	13	9	814	60	132
20	448	20	24	254	16	11	670	34	62
21	420	20	23	279	20	15	484	23	30
22	394	16	17	630	19	32	394	10	11
23	528	65 B	120	556	22	33	340	8	7
24	875	154	364	466	31	39	296	9	7
25	782	39	82	389	53	56	265	7	5
26	502	28	38	308	20	17	240	7	4
27	650	53	93	265	10	7	221	9	5
28	635	86	147	237	14	9	212	4	2
29	497	28	38	221	22	13	203	3	2
30	402	23	25	209	24	14	197	3	2
31	352	19	18	209	17	10	--	--	--
Total	52529	--	23400	11150	--	761	10727	--	2013

Total discharge for year (cfs-days)..... 856,188
Total load for year (tons)..... 378,891

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

GREEN RIVER BASIN--Continued

3-3085. GREEN RIVER AT MUNFORDVILLE, KY.--Continued

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

Date of collection	Time (24 hour)	Sampling point	Water temperature (°F)	Discharge (cfs)	Sediment concentration (ppm)	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. 27, 1959.....	1600			8800	1090	40	50	60	78	94	98	100	--				SBWC
Dec. 28.....	1200			6260	761	42	50	59	73	86	93	97	100				SBWC
Dec. 28.....	1200			6260	761	42	51	64	78	87	93	95	100				SBN
Jan. 15, 1960.....	1600			10700	524	46	58	70	82	94	97	99	100				SBWC
June 18.....	0700			4340	899	50	63	80	92	99	99	100	--				SBWC
June 24.....	1630			8040	924	46	61	77	90	99	99	100	--				SBWC
June 29.....	0700			9840	1140	41	51	62	80	92	96	98	100				SBWC
June 29.....	0700			9840	1140	3	16	40	78	93	95	98	100				SBN

3-3090. GREEN RIVER AT MAMMOTH CAVE, KY.

LOCATION.--At Mammoth Cave Ferry crossing, 350 feet upstream from gaging station, which is 0.15 mile downstream from Echo River, and 0.75 mile southwest of Mammoth Cave, Edmonson County.
DRAINAGE AREA.--1,983 square miles, of which about 444 square miles does not contribute directly to surface runoff.
RECORDS AVAILABLE.--Chemical analyses: September 1959 to September 1960.
Water temperatures: October 1959 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 82°F Aug. 3, 6; minimum, 34°F Dec. 2, 3.
REMARKS.--Records of specific conductance and chloride (Cl) of daily samples are available at the district office at Columbus, Ohio.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Sept. 25, 1959			--					--	--	708	--	--		--	--	2480	--	
Sept. 26			--					--	--	730	--	--		--	--	2550	--	
Sept. 27			--					--	--	721	--	--		--	--	2510	--	
Sept. 28			--					--	--	740	--	--		--	--	2570	--	
Oct. 7			--					--	--	798	--	--		--	--	2700	--	
Oct. 9			--					--	--	1410	--	--		--	--	4640	--	
Oct. 13			--					--	--	1040	--	--		--	--	3520	--	
Oct. 14			--					--	--	440	--	--		--	--	1660	--	
Oct. 14			--					--	--	740	--	--		--	--	2630	--	
Oct. 15			--					--	--	402	--	--		--	--	1530	--	
Oct. 15			--					--	--	380	--	--		--	--	1510	--	
Jan. 18, 1960 a			0.06					98	11	56	0.2	3.9		110	30	366	7.4	
Jan. 19 b			.36					106	12	73	.2	4.0		128	41	455	7.5	
Feb. 19			.03					122	14	108	.1	3.8		154	54	594	7.3	
Mar. 18			.71					86	12	36	.1	3.3		95	24	289	7.2	
Mar. 21			.18					98	10	43	.2	3.6		110	30	334	7.0	
Mar. 26			--					--	--	53	--	--		--	--	355	--	
Mar. 31			.38					100	13	83	.2	2.7		122	40	469	7.1	

a Manganese (Mn), 0.01 parts per million.
b Manganese (Mn), 0.17 parts per million.

GREEN RIVER BASIN--Continued

3-3090. GREEN RIVER AT MAMMOTH CAVE, KY.--Continued

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Apr. 6, 1960			0.25					114	12	79	0.1	3.2		133	40	475	7.2	
Apr. 14			.16					126	14	160	.1	2.8		175	72	777	7.4	
Apr. 22			.12					132	15	201	.1	2.5		194	86	916	6.8	
Apr. 29			.12					136	18	279	.1	1.8		220	109	1160	6.6	
May 6			.00					134	14	212	.1	1.9		201	91	938	7.0	
May 13			.20					104	16	118	.2	1.5		147	62	584	6.7	
May 20			.13					128	19	225	.1	1.7		200	95	984	6.9	
May 20			--	65	16	152		126	19	300	--	--		228	125	1230	7.8	
May 27			.11					143	20	345	.1	1.8		256	139	1400	7.1	
June 3			.11					119	18	132	.1	1.7		154	56	660	6.8	
June 9			.10					138	19	248	.1	1.8		210	97	1090	7.6	
June 17			.09					131	18	320	.1	1.4		230	123	1300	7.5	
June 24			2.3					88	14	320	.1	3.2		194	122	1220	7.3	
June 29			1.4					108	9.4	53	.1	3.8		114	26	382	7.1	
July 7			.36					107	12	64	.1	3.4		121	34	414	7.4	
July 15			.16					143	15	143	.1	3.4		187	70	731	7.4	
July 22			.11					150	17	158	.1	2.0		193	70	800	7.4	
July 29			.10					143	15	134	.1	2.8		181	64	718	7.3	
Aug. 5			.06					140	18	280	.1	1.8		228	114	1170	7.1	
Aug. 12			.08					132	16	212	.1	1.7		196	88	952	7.5	
Aug. 19			.07					146	16	180	.1	2.0		198	78	882	7.9	
Aug. 26			.08					140	18	163	.1	1.8		194	80	818	7.8	
Sept. 2			.12					150	18	210	.1	2.2		216	93	1000	7.6	
Sept. 7			.15					155	18	210	.1	2.1		220	93	1000	7.4	
Sept. 14			.13					124	30	960	.3	1.5		464	362	3230	7.5	
Sept. 21			.15					127	22	720	.2	2.7		376	272	279	7.0	
Sept. 28			.16					153	20	240	.1	1.9		240	115	1070	7.5	
Weighted average			--					--	--	--	--	--		--	--	--	--	
Time-weighted average			0.21					138	18	301	0.1	2.2		214	102	1200	7.3	
Tons per day			--					--	--	--	--	--		--	--	--	--	

GREEN RIVER BASIN--Continued

3-3090. GREEN RIVER AT MAMMOTH CAVE, KY.--Continued

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

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	--	--	58	--	58	59	59	58	58	55	54	54	54	53	54	55	--
November	58	56	52	54	59	55	52	51	50	50	49	50	52	50	49	48	48	45	46	44	56	56	48	48	47	48	50	44	46	44	--	50
December	46	34	34	45	41	36	36	36	36	35	35	43	40	44	38	40	44	44	48	48	48	46	45	46	41	42	46	48	--	--	--	42
January	--	--	--	--	--	45	39	43	42	40	41	44	43	44	43	46	35	--	40	--	45	38	42	40	39	42	39	45	44	45	46	--
February	45	45	45	45	58	50	47	--	--	51	48	47	42	45	44	42	43	44	44	43	40	42	44	44	45	44	44	42	44	--	--	45
March	44	42	40	40	40	40	40	40	--	40	--	40	40	40	40	45	42	45	--	44	45	47	47	48	48	50	50	52	54	53	52	45
April	56	58	55	55	55	55	56	55	53	54	55	55	57	60	62	62	63	62	63	65	62	63	67	66	69	68	68	68	65	66	--	60
May	65	64	72	66	64	65	63	60	60	--	55	55	58	60	64	64	65	68	68	68	70	72	--	72	72	73	71	68	70	70	70	66
June	71	72	74	75	75	78	75	77	75	74	78	76	76	75	77	76	65	71	70	70	70	74	74	76	71	71	70	68	68	72	--	73
July	69	71	71	72	73	72	75	73	73	72	73	78	74	74	74	76	76	75	77	78	80	77	76	76	78	78	78	75	78	78	78	75
August	80	80	82	80	79	82	80	80	77	76	76	75	74	75	78	78	78	78	77	80	79	78	76	78	77	78	77	77	78	78	78	78
September	80	79	79	79	79	78	78	79	80	75	70	70	72	69	70	68	65	66	66	68	70	70	69	70	71	70	68	70	70	69	--	72

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GREEN RIVER BASIN--Continued

3-3105. NOLIN RIVER AT WAX, KY.

LOCATION.--At gaging station at bridge on Kentucky Highway 88 at Wax, Grayson County, 5.3 miles upstream from Dog Creek, 14 miles northwest of Munfordville, and 28 miles upstream from mouth.
DRAINAGE AREA.--600 square miles, of which about 220 square miles does not contribute directly to surface runoff.
RECORDS AVAILABLE.--Chemical analyses: October 1959 to September 1960.
Sediment records: December 1959 to September 1960.
EXTREMES, December 1959 to September 1960.--Sediment concentrations: Maximum daily, 1,120 ppm June 30; minimum daily, 8 ppm Feb. 4.
Sediment loads: Maximum daily, 7,770 tons Feb. 11; minimum daily, 6 tons Aug. 28-31.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Oct. 15, 1959..	250	7.6		0.21	0.18	50	6.5	9.9	2.8	161	12	20	0.1	2.2	210	152	20		331	7.3	16
Nov. 12.....	170	5.4		.18	.03	67	9.2	22	1.6	219	15	42	.2	1.7	267	205	26		484	7.9	5
Dec. 8.....	448	7.7		.27	--	61	3.3	5.7	.9	183	11	11	.1	4.4	185	166	16		335	7.8	4
Jan. 11, 1960..	654	7.8		.11	--	59	2.6	3.1	.9	174	9.2	8.4	.1	6.6	181	158	15		318	7.6	2
Feb. 19.....	1,280	8.4		.00	.00	50	5.7	2.3	.4	158	9.2	5.5	.2	5.2	162	149	19		293	7.3	3
June 28.....	952	6.4		1.1	.60	32	2.7	2.6	1.8	100	9.6	3.0	.4	3.1	116	91	9		192	6.7	16
July 26.....	242	8.8		.15	.45	56	6.2	5.7	1.6	180	14	12	.6	3.2	207	165	18		343	7.0	2
Aug. 23.....	147	7.0		.11	.03	57	5.7	5.2	1.5	190	10	8.0	.2	2.7	202	166	10		340	7.0	3
Sept. 23.....	340	8.4		.08	.02	49	4.9	3.2	1.6	164	9.6	5.0	.2	3.9	174	142	8		288	7.1	4

Date of collection	Dissolved oxygen		Phenols as C_6H_5OH	Turbidity
	Parts per million	Percent saturation		
Oct. 15, 1959.....	--	--	0.003	8
Feb. 19, 1960.....	12.2	92	.000	13
June 28.....	8.2	91	.000	30
Sept. 23.....	8.4	91	.000	60

GREEN RIVER BASIN--Continued

3-3105. NOLIN RIVER AT WAX, KY.--Continued

Suspended sediment, December 1959 to September 1960

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..							--	--	--
3..							--	--	--
4..							--	--	--
5..							--	--	--
6..							--	--	--
7..							--	--	--
8..							--	--	--
9..							--	--	--
10..							--	--	--
11..							--	--	--
12..							--	--	--
13..							--	--	--
14..							--	--	--
15..							--	--	--
16..							--	--	--
17..							1190	56	180
18..							2100	135	765
19..							2640	198	1410
20..							1730	124	579
21..							1340	75 A	270
22..							1130	52	159
23..							962	--	55
24..							864	--	55
25..							780	--	55
26..							726	--	55
27..							765	50 B	150
28..							2590	416 S	2990
29..							3540	567	5420
30..							2220	370 B	2200
31..							1560	-- E	900
Total							24137	--	15243

	JANUARY			FEBRUARY			MARCH		
1..	1300	--	390	561	11 B	17	1120	C 15	45
2..	1130	--	390	532	10	14	1000	C 15	40
3..	1110	--	390	512	10	14	956	C 15	39
4..	1140	--	390	498	8	11	900	C 15	36
5..	1000	60	162	885	83 S	274	828	C 15	34
6..	914	--	94	2380	241	1550	765	C 15	31
7..	864	--	89	2520	224	1520	720	C 15	29
8..	816	--	84	1670	105	473	696	C 15	28
9..	750	--	77	1370	65 A	240	702	C 15	28
10..	696	--	71	2530	552 S	4240	690	C 15	28
11..	660	--	68	4450	632 S	7770	675	C 15	27
12..	621	--	64	3880	459	4810	645	C 15	26
13..	606	15	25	2060	--	260	627	C 15	25
14..	1750	750 A	4300	1690	--	260	612	C 15	25
15..	4210	473	5380	1420	--	260	618	18	30
16..	4220	376	4300	1280	--	260	1120	73 S	257
17..	2260	190 B	1200	1220	--	260	2090	139	784
18..	1670	130 B	600	1250	40	135	2440	110	725
19..	1470	--	139	1260	36	122	2310	74	462
20..	1270	--	120	1150	--	80	2170	40 B	230
21..	1080	--	107	1050	--	80	2000	20 B	110
22..	952	--	90	1010	--	80	2120	56	320
23..	864	35	82	966	--	80	2360	81	516
24..	792	30 B	65	907	--	80	2380	103	662
25..	735	25 B	50	1130	51 S	163	2100	--	450
26..	693	19 B	35	1730	103	481	1730	--	100
27..	675	18	33	1700	--	340	1520	--	100
28..	687	16	30	1370	--	160	1360	--	100
29..	711	15 B	30	1240	--	130	1230	--	100
30..	654	14 B	25	--	--	--	1670	134 S	625
31..	603	13 B	20	--	--	--	2180	185	1090
Total	36903	--	18900	44221	--	24164	42334	--	7102

E Estimated.
S Computed by subdividing day.
A Computed from partly estimated-concentration graph.
B Computed from estimated-concentration graph.
C Composite period.

GREEN RIVER BASIN--Continued

3-3105. NOLIN RIVER AT WAX, KY.--Continued

Suspended sediment, December 1959 to September 1960--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..	1720	--	700	398	27	29	224	--	12
2..	1420	--	270	412	44	49	207	--	12
3..	1270	--	120	370	--	18	201	--	12
4..	1200	--	120	346	--	18	192	--	12
5..	1190	--	120	330	--	18	186	--	12
6..	1050	--	120	320	--	18	177	--	12
7..	952	--	120	316	28	24	201	--	12
8..	882	--	120	314	--	16	178	--	12
9..	816	C 22	48	320	--	16	162	--	12
10..	750	C 22	45	314	--	16	156	--	12
11..	709	C 22	42	296	--	16	152	--	12
12..	666	C 22	40	286	--	16	165	45 A	25
13..	633	C 22	38	278	--	16	302	165	134
14..	600	C 22	16	268	--	16	274	168	124
15..	570	C 22	34	260	--	16	210	90 B	50
16..	558	C 22	33	250	--	16	195	35 B	18
17..	540	C 22	32	242	--	16	392	197 S	216
18..	515	C 22	31	232	--	16	386	208	217
19..	492	C 22	29	224	--	16	380	--	220
20..	465	C 22	28	224	--	16	266	--	120
21..	489	15	20	242	16	10	208	110 B	60
22..	525	16	23	230	23	14	190	--	35
23..	530	14	20	242	25 B	16	216	--	45
24..	472	C 14	18	210	21	12	822	412 S	962
25..	442	C 14	17	204	32	18	711	410 A	800
26..	422	C 14	16	246	32	21	386	--	210
27..	405	C 14	15	310	36	30	310	-- E	45
28..	384	C 14	15	310	38	32	726	398 S	897
29..	372	22	22	288	34	26	2360	1050 S	7510
30..	368	21	21	268	30 B	20	2480	1120	7500
31..	--	--	--	248	30 B	20	--	--	--
Total	21393	--	2313	8798	--	601	13015	--	19320
	JULY			AUGUST			SEPTEMBER		
1..	1940	600 A	3500	147	--	15	298	50 A	45
2..	1090	--	750	138	--	11	195	44	23
3..	768	--	270	133	--	8	129	--	7
4..	672	--	270	154	--	50	113	--	7
5..	657	--	270	141	--	50	105	--	7
6..	505	--	270	166	--	50	101	--	7
7..	430	--	45	201	--	50	98	--	7
8..	382	--	45	222	130 A	80	94	--	7
9..	348	--	45	636	335 S	612	283	370 A	400
10..	380	--	45	530	268	384	395	800 A	1000
11..	450	--	45	342	--	140	864	-- E	2200
12..	450	--	45	234	--	39	744	450 A	1000
13..	350	116	110	188	--	39	348	--	220
14..	300	195	158	166	--	39	258	--	110
15..	270	--	110	150	--	39	202	--	60
16..	250	--	70	138	--	39	176	--	40
17..	240	--	45	133	--	39	1080	425 S	1440
18..	270	--	13	202	90 A	50	1970	642 S	3500
19..	232	--	13	172	--	18	1360	503 S	1950
20..	226	--	13	150	--	18	660	270 B	480
21..	195	--	13	130	--	18	485	180 B	240
22..	184	--	13	130	--	18	386	110 B	120
23..	183	--	13	159	82	35	336	45	41
24..	196	--	110	236	110 A	70	300	--	11
25..	234	95 A	60	156	50 A	20	270	--	11
26..	242	62	40	131	35 A	12	244	--	11
27..	196	C 54	29	118	31	10	232	--	11
28..	178	C 54	26	111	--	6	220	--	11
29..	186	C 54	27	107	--	6	204	--	11
30..	170	C 54	25	106	--	6	196	--	11
31..	153	C 54	22	104	--	6	--	--	--
Total	12327	--	6510	5831	--	1977	12346	--	12988

Total discharge for period (cfs-days)..... 221,305
Total load for period (tons)..... 109,118

E Estimated.
S Computed by subdividing day.
A Computed from partly estimated-concentration graph.
B Computed from estimated-concentration graph.
C Composite period.

GREEN RIVER BASIN--Continued

3-3105. NOLIN RIVER AT WAX, KY.--Continued

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

Date of collection	Time (24 hour)	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. 28, 1959.....	1600			2930	561		44	57	65	80	94	98	99	100				SBWC
Jan. 14, 1960.....	1200			1250	3010		29	37	47	63	82	89	98	100				SBWC
Jan. 14.....	1200			1250	3010		17	26	37	56	83	89	98	100				SBN
Jan. 16.....	1400			4670	441		49	58	68	84	95	98	99	100				SBWC
Feb. 11.....	1600			4890	1140		41	52	65	83	95	97	99	100				SBWC
June 14.....	0600			320	215		75	85	90	94	97	98	100	--				SBWC
June 29.....	1715			3170	1640		37	51	64	84	97	98	100	--				SBWC
June 29.....	1715			3170	1640		23	33	53	79	95	98	100	--				SBN

GREEN RIVER BASIN--Continued

3-3145. BARREN RIVER AT BOWLING GREEN, KY.

LOCATION.--At bridge on U.S. Highways 31W and 68, 600 feet upstream from gage on College Street Bridge at Bowling Green, Warren County, 6 miles downstream from Drakes Creek, and 8.9 miles upstream from Jennings Creek.
DRAINAGE AREA.--1,848 square miles, of which about 490 square miles does not contribute directly to surface runoff.
RECORDS AVAILABLE.--Chemical analyses: October 1949 to September 1950, October 1959 to September 1960.
Water temperatures: October 1949 to September 1960.
Sediment records: November 1952 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 83°F Aug. 7, Sept. 7; minimum, freezing point Mar. 5.
Sediment concentrations: Maximum daily, 1,280 ppm June 29; minimum daily, 1 ppm Jan. 25, Mar. 15.
Sediment loads: Maximum daily, 60,100 tons June 29; minimum daily, 5 tons Jan. 25.
EXTREMES, 1949-60.--Water temperatures: Maximum, 87°F July 1, 2, 22, 29, 1952; minimum, freezing point on several days during 1951, 1958-60.
Sediment concentrations (1952-60): Maximum daily, 1,880 ppm June 17, 1953; minimum daily, 1 ppm on many days during 1952, 1953, 1956, and 1960.
Sediment loads (1956-60): Maximum daily, 107,000 tons Jan. 30, 1957; minimum daily, less than 0.5 ton on several days during 1953 and 1956.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 16, 1959..	522	7.0		0.20	0.28	38	8.5	3.2	1.4	139	15	8.0	0.1	2.2	157	130	16		273	7.6	5
Dec. 9.....	1,470	6.6		--	--	42	12	3.2	.7	146	18	8.6	--	3.6	397	155	38		274	7.0	--
Jan. 6, 1960...	2,600	7.4		.11	--	37	5.4	2.4	.5	126	12	6.0	.1	.1	142	115	12		232	7.1	5
Feb. 19.....	4,910	7.3		.23	.00	39	3.3	4.1	1.3	118	14	5.0	.2	3.8	145	111	14		223	7.5	9
Mar. 29.....	3,140	5.7		.14	.03	34	5.6	2.1	.5	116	11	5.0	.1	4.8	124	108	13		221	7.1	3
Apr. 26.....	1,210	3.1		.12	.38	38	8.1	3.2	1.1	135	14	7.5	.1	2.3	150	129	18		250	6.9	2
May 24.....	610	5.9		.19	.20	37	8.2	3.9	1.1	132	17	9.0	.1	2.7	146	126	18		274	7.1	5
June 29.....	19,200	4.8		2.4	2.4	17	2.3	2.2	1.6	56	8.0	4.0	.3	2.6	82	52	6		116	6.6	38
July 19.....	718	7.9		.14	.21	41	7.6	3.3	1.2	140	14	10	.1	3.3	156	133	18		275	6.9	2
Aug. 16.....	350	6.9		.11	.18	40	8.5	3.9	1.6	140	16	8.0	.1	1.8	158	135	20		275	7.0	3
Sept. 20.....	775	6.5		.00	.00	35	6.6	4.8	2.0	122	16	8.0	.3	.6	144	115	14		252	7.1	5

Date of collection	Dissolved oxygen: Parts per million	Dissolved oxygen: Percent saturation	Phenols as C_6H_5OH	Turbidity
Oct. 16, 1959.....	8.6	88	0.001	19
Feb. 19, 1960.....	11.7	89	.000	17
June 29.....	7.4	82	.000	50
Sept. 20.....	7.8	88	.000	40

3-3145. BARREN RIVER AT BOWLING GREEN, KY.--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Twice-daily temperature measurements at 6:30 a.m. and 5 p.m.)

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																																
a.m.	69	70	69	73	72	71	70	70	66	64	65	61	62	59	56	56	54	57	53	54	54	56	60	57	53	53	52	49	50	53	56	60
p.m.	73	74	73	75	74	73	72	72	69	70	70	64	64	61	61	64	60	59	59	59	61	62	60	59	55	55	54	53	54	57	57	64
November																																
a.m.	56	54	48	54	54	50	47	52	45	44	48	44	50	46	46	47	35	42	42	42	42	42	47	49	45	46	45	45	44	42	--	46
p.m.	56	55	54	55	50	53	52	53	49	60	61	51	52	47	49	48	42	44	43	44	44	46	48	43	46	48	46	43	44	44	--	49
December																																
a.m.	43	43	43	43	44	42	41	41	39	40	42	42	47	45	47	45	48	49	46	44	43	42	42	43	44	47	49	49	48	47	44	44
p.m.	46	44	45	46	47	45	42	42	45	42	43	44	48	48	48	48	50	46	47	47	44	45	44	45	46	48	49	50	49	48	48	46
January																																
a.m.	41	42	40	41	42	39	41	40	39	44	45	47	54	52	53	50	49	47	42	37	40	38	36	35	36	36	40	41	44	44	45	43
p.m.	44	45	44	43	44	42	43	44	43	47	47	50	55	54	52	52	49	48	44	38	42	40	40	41	38	40	41	44	45	45	45	45
February																																
a.m.	45	44	43	43	44	45	46	45	45	46	47	46	43	47	38	40	40	40	40	38	39	38	39	41	41	43	42	42	40	--	--	42
p.m.	46	46	47	47	46	48	46	47	48	48	46	46	41	41	41	43	41	39	41	39	40	42	42	42	43	43	43	42	42	--	--	44
March																																
a.m.	41	39	37	34	32	35	35	37	36	36	37	38	38	38	40	41	44	42	43	43	42	45	45	45	45	46	46	49	51	55	52	42
p.m.	41	40	38	34	32	35	39	40	38	38	39	40	40	40	42	43	43	43	43	44	46	46	48	47	49	50	51	50	54	55	53	43
April																																
a.m.	51	53	53	52	52	50	52	52	53	52	50	54	55	58	60	61	65	58	58	60	60	62	65	69	68	69	68	68	65	65	--	59
p.m.	57	55	56	55	54	54	55	53	51	54	55	57	59	61	61	63	64	62	64	64	64	66	71	70	71	70	70	68	70	68	--	61
May																																
a.m.	65	59	57	61	62	63	60	59	56	54	53	53	53	55	63	61	55	65	68	69	67	70	70	70	70	72	70	70	70	68	68	63
p.m.	67	63	64	65	65	65	64	60	59	59	55	55	55	59	66	65	67	69	71	70	71	71	71	71	75	74	73	74	72	73	70	66
June																																
a.m.	68	70	70	70	74	73	70	71	70	72	74	77	75	73	71	72	72	68	67	68	71	74	74	75	73	73	73	71	67	70	--	72
p.m.	74	73	73	76	77	76	76	76	76	76	77	78	76	75	76	76	74	74	73	73	73	77	77	76	75	76	75	75	73	74	--	75
July																																
a.m.	72	68	71	70	69	70	70	70	72	74	70	71	72	72	70	71	74	72	73	73	74	75	76	76	75	77	77	77	77	76	70	73
p.m.	73	73	73	75	72	73	75	74	76	76	74	74	75	74	73	74	76	76	76	76	79	79	77	79	80	79	79	80	81	80	81	76
August																																
a.m.	77	77	79	79	76	75	80	80	78	78	75	74	72	77	75	75	76	76	75	76	75	75	75	75	76	75	75	76	75	75	78	76
p.m.	80	82	82	81	81	81	83	81	81	80	80	78	79	80	79	79	80	80	78	80	78	77	80	80	80	79	80	80	80	80	82	80
September																																
a.m.	75	76	77	80	76	77	78	78	--	76	74	70	68	69	68	70	70	69	62	68	67	67	68	68	70	69	69	68	68	66	--	71
p.m.	80	81	82	82	81	82	83	81	80	78	77	74	75	73	73	73	71	71	72	71	71	71	71	72	71	72	71	70	71	70	--	75

GREEN RIVER BASIN--Continued

3-3145. BARREN RIVER AT BOWLING GREEN, KY.--Continued

Suspended sediment, water year October 1959 to September 1960

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	184	45	22	426	20	23	3500	51	482
2	232	50	31	410	23	25	2650	37	265
3	215	41	24	406	21	23	2150	20	116
4	194	43	22	402	18	20	1890	19	97
5	180	40	19	402	17	18	1670	15	68
6	190	42	22	812	29	64	1500	16	65
7	198	40	21	1040	19	53	1480	16	64
8	382	68	70	885	24	57	1560	13	55
9	2080	150 A	850	746	24	48	1480	8	32
10	1920	103	534	660	18	32	1340	8	29
11	1280	58	200	592	39	62	1240	11	37
12	850	50	115	546	54	80	2610	116 S	1330
13	687	44	82	510	60	83	9120	275	6770
14	588	39	62	490	50	66	8200	138	3060
15	538	44	64	474	33	42	5170	60	838
16	526	37	52	474	21	27	3890	40	420
17	514	35 B	50	486	20	26	3080	26	216
18	486	35	46	494	10	13	2890	26	203
19	446	24	29	502 C	9	12	3320	30	269
20	414	23	26	506 C	9	12	3780	32	326
21	386	20	21	506 C	9	12	3410	29	267
22	366	20	20	494 C	9	12	2830	21	160
23	350	18	17	490 C	9	12	2310	15	94
24	354	20	19	498 C	9	12	2010	7	38
25	418	18	20	810	25 A	65	1790	6	29
26	602	19	31	1430	21	81	1610	7	30
27	606	18	29	5000	94 S	1730	1530	17	70
28	542	16	23	14100	508	19300	6520	412 S	10300
29	494	15	20	10500	180	5100	17300	435	20300
30	458	18	22	5220	90	1270	12500	110	3710
31	438	20	24	--	--	--	6640	74	1330
Total	17118	--	2587	50311	--	28380	120970	--	51070
	JANUARY			FEBRUARY			MARCH		
1	4590	46	570	1710	10	46	4780	29	374
2	3580	31	300	1600	7	30	4020	22	239
3	3140	23	195	1500	10	40	3850	10	104
4	3110	23	193	1410	11	42	4350	10	117
5	2920	17	134	1540	23	96	4080	10	110
6	2620	12	85	7390	270 S	6290	3440	5	46
7	2470	11	73	8820	147	3500	3040	3	25
8	2450	11	73	6100	59	972	2820	5	38
9	2700	14	102	4800	35	454	2760	3	22
10	2780	12	90	4250	37	424	2830	5	38
11	2720	16	118	5620	260 A	4400	2760	5	37
12	2510	24	163	6880	298	5540	2610	2	14
13	2330	16	101	5100	84	1160	2490	2	13
14	2850	45 S	386	4130	23	256	2440	2	13
15	6520	232	4080	3620	26	254	2540	1	7
16	7140	155	2990	3030	18	147	3560	8 S	99
17	5650	66	1010	2890	13	101	10400	204 S	6160
18	4690	44	557	3450	20	186	13400	160	5790
19	4160	26	292	4680	23	291	11600	63	1970
20	3600	20	194	4850	32	419	9550	48	1240
21	3060	15	124	4370	20	236	8530	42	967
22	2670	10	72	4100	13	144	7800	39	821
23	2300	4	25	3930	10	106	7350	34	675
24	2040	2	11	3900	13	137	6710	34	616
25	1860	1	5	4840	17	222	5780	30	468
26	1730	5	23	9700	160 S	4430	4890	20	264
27	1650	8	36	10800	168	4900	4190	15	170
28	1850	6	30	8100	62	1360	3580	11	106
29	2020	10	54	5670	34	520	3200	10	86
30	1930	8	42	--	--	--	3160	16	136
31	1810	9	44	--	--	--	4980	51	686
Total	95450	--	12172	138780	--	36703	157490	--	21451

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

GREEN RIVER BASIN--Continued

3-3145. BARREN RIVER AT BOWLING GREEN, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--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	5690	105	1610	1050	11	31	579	19	30
2	4590	44	545	990	15	40	530	15	21
3	4150	33	370	935	15	38	498	13	17
4	5670	110	1680	900	11	27	474	15	19
5	5220	58	817	870	10	23	454	15	18
6	4460	28	337	835	9	20	430	15	17
7	3830	23	238	845	16	36	410	12	13
8	3320	15	134	1150	25	A 90	386	15	16
9	2860	10	77	1580	18	77	362	15	15
10	2450	11	73	1250	14	47	342	13	12
11	2170	12	70	1050	13	37	334	19	17
12	2010	10	54	965	11	29	326	20	18
13	1880	7	36	905	12	29	330	17	15
14	1770	8	38	860	10	23	370	16	16
15	1660	7	31	820	10	22	418	17	19
16	1610	9	39	775	11	23	438	15	18
17	1590	9	39	736	12	24	2120	372	S 4840
18	1550	7	29	700	10	19	4930	1240	16500
19	1450	8	31	674	11	20	2340	380	2400
20	1350	8	29	696	24	45	1330	112	402
21	1310	10	35	885	17	41	915	66	163
22	1440	7	27	830	28	63	714	33	64
23	1500	7	28	728	23	45	610	52	86
24	1380	7	26	633	21	36	620	47	79
25	1290	9	31	588	20	32	687	45	83
26	1230	14	46	579	16	25	558	45	68
27	1170	10	32	628	16	27	498	39	52
28	1350	11	40	746	12	24	3310	191	1710
29	1250	11	37	765	24	50	17400	1280	60100
30	1120	14	42	736	16	32	17700	540	25800
31	--	--	--	656	18	32	--	--	--
Total	72320	--	6621	26360	--	1107	60413	--	112628
	JULY			AUGUST			SEPTEMBER		
1	14800	255	10200	466	27	34	187	23	12
2	6420	145	2510	414	28	31	180	21	10
3	4230	153	1750	390	30	32	162	16	7
4	3590	180	1740	366	35	34	156	26	11
5	2840	131	1000	462	32	40	145	30	12
6	2220	63	378	602	24	39	139	20	8
7	1740	50	235	478	29	37	133	19	7
8	1420	45	172	438	35	41	127	19	6
9	1190	33	106	426	34	39	121	23	8
10	2100	--	E 1800	750	30	61	136	23	8
11	2140	310	A 1800	664	25	45	208	27	15
12	1540	126	524	542	32	47	222	24	14
13	1480	80	320	494	34	45	194	28	15
14	1320	59	210	466	32	40	133	28	10
15	1310	61	216	402	25	27	95	25	6
16	1070	50	144	358	18	17	110	35	10
17	880	48	114	334	24	22	240	45	29
18	765	38	78	306	29	24	722	30	58
19	728	40	79	290	24	19	1450	29	114
20	718	31	60	278	25	19	830	26	58
21	664	38	68	278	21	16	558	27	41
22	624	32	54	274	25	18	434	26	30
23	579	26	41	278	34	26	354	30	29
24	546	33	49	370	29	29	310	22	18
25	606	33	54	362	28	27	270	21	15
26	737	30	59	322	28	24	240	24	16
27	620	25	42	282	25	19	222	19	11
28	615	25	42	250	26	18	212	20	11
29	656	25	44	226	29	18	198	15	8
30	554	29	43	212	25	14	187	16	8
31	482	30	39	201	25	14	--	--	--
Total	59179	--	23971	11981	--	916	8675	--	605

Total discharge for years (cfs-days)..... 819,047
Total load for year (tons)..... 298,211

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

GREEN RIVER BASIN--Continued

3-3145. BARREN RIVER AT BOWLING GREEN, KY.--Continued

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

Date of collection	Time (24 hour)	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. 28, 1959.....	0630			14300	698		43	58	73	91	97	99	100					BSWC
Dec. 29.....	0630			17700	599		63	77	86	93	97	99	100					BSW
Dec. 29.....	0630			17700	599		32	47	71	89	97	99	100					BSN
Feb. 12, 1960.....	0630			7270	424		45	58	73	89	96	99	100					BSWC
June 18.....	0630			5770	1500		45	64	82	96	99	99	100					BSWC
June 18.....	0630			5770	1500		24	46	74	95	98	99	100					BSN
June 29.....	0630			16400	2500		43	55	74	94	99	100	--					BSWC

3-3155. GREEN RIVER AT LOCK 4, AT WOODBURY, KY.

LOCATION.--At gaging station, 0.1 mile upstream from lock 4, at woodbury, Butler County, 0.4 mile downstream from Barren River, and at mile 149.1.
DRAINAGE AREA.--5,403 square miles, of which about 1,360 square miles does not contribute directly to surface runoff.
RECORDS AVAILABLE.--Water temperatures: October 1958 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 85°F Aug. 3, 4, 8, 9; minimum, 41°F Mar. 8-12.
EXTREMES, 1958-60.--Water temperatures: Maximum, 87°F Aug. 25; minimum, 37°F Dec. 25-27, 1958, Jan. 11-13, 1959.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

GREEN RIVER BASIN--Continued

3-3155.2. GREEN RIVER AT ABERDEEN, KY.

LOCATION.--At Aberdeen-Morgantown Bridge on U.S. Highway 231 at auxiliary gage, 7.7 miles downstream from gaging station at lock 4, 2.5 miles downstream from Welch Creek at Aberdeen, Butler County.
DRAINAGE AREA.--5,403 square miles at gage at Woodbury, of which about 1,360 square miles does not contribute directly to surface runoff.
RECORDS AVAILABLE.--Chemical analyses: October 1959 to September 1960.
Water temperatures: October 1959 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 806 ppm Oct. 15-18; minimum, 122 ppm June 25 to July 3.
Hardness: Maximum, 271 ppm Nov. 10-19; minimum, 72 ppm June 29.
Specific conductance: Maximum daily, 1,860 micromhos Oct. 24; minimum daily, 177 micromhos June 29.
Water temperatures: Maximum, 85°F on several days during August and September; minimum, not determined.
REMARKS.--Records of specific conductance of daily samples available in district office at Columbus, Ohio. Records of discharge at Woodbury for water year October 1959 to September 1960 given in WSP 1705.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 1-14, 1959....	1680	9.7	0.01	64	13	110	2.8	156	17	220	0.2	2.5	547	213	85	1000	7.3	4
Oct. 15-18.....	1692	7.1	.03	75	20	177	3.9	130	21	360	.2	2.3	806	269	162	1410	6.9	7
Oct. 19-21.....	1163	8.4	.01	52	12	96	3.4	122	17	200	.2	2.3	490	179	79	911	7.1	6
Oct. 22-Nov. 9.....	1425	10	.10	73	17	166	3.4	146	19	330	.2	2.9	765	252	132	1380	7.2	5
Nov. 10-19.....	1397	8.0	.01	79	18	179	2.9	162	22	344	.2	2.5	798	271	138	1460	7.3	4
Nov. 20-28.....	5607	7.9	.00	70	17	130	2.5	159	22	256	.2	2.7	639	245	115	1160	7.3	4
Nov. 29-Dec. 4.....	14750	7.6	.02	34	6.9	22	1.4	100	13	45	.1	3.9	200	114	32	346	7.0	6
Dec. 5-12.....	6108	9.0	.02	44	11	46	1.1	120	16	92	.1	4.0	312	155	57	534	6.9	4
Dec. 13-20.....	18260	8.5	.03	37	7.5	22	1.2	112	12	41	.2	4.1	212	124	32	346	6.8	9
Dec. 21-27.....	7897	9.0	.09	23	6.6	9.0	1.2	70	27	14	.2	1.8	142	84	27	224	6.4	10
Dec. 28, 30, 31....	25470	9.6	.01	40	10	26	1.2	126	15	51	.1	4.6	232	141	38	399	6.8	4
Jan. 5-18, 1960....	13280	9.2	.02	42	9.2	27	1.2	127	15	52	.1	4.0	238	143	39	415	6.9	4
Jan. 19, 21-23.....	12270	8.8	.03	36	8.7	20	1.2	114	13	38	.1	4.2	192	126	32	336	6.8	7
Jan. 24-27, 30-Feb. 7.....	8043	8.3	.01	44	7.8	28	1.2	128	15	55	.1	4.3	241	142	37	430	6.9	3
Feb. 8-24.....	16320	9.1	.01	33	5.8	15	1.0	104	14	28	.2	2.7	180	107	22	291	7.1	5
Mar. 30-Apr. 10....	14240	10	.01	34	6.4	17	.8	108	14	32	.1	3.7	163	112	23	306	7.6	4

Apr. 11-21, 1960...	5280	9.9	.01	42	8.0	27	.9	128	13	54	.1	3.5	223	138	33	403	7.7	3
Apr. 22-May 4.....	3531	6.8	.00	47	9.1	42	1.2	133	17	83	.1	2.8	288	155	46	518	7.6	3
May 7-15.....	3078	8.5	.00	52	10	57	1.5	142	18	117	.1	2.5	355	171	55	615	7.6	2
May 16-19, 21, 23, 25.....	1944	9.0	.00	42	7.6	27	1.3	127	19	53	.1	2.7	231	136	32	410	7.4	4
May 26-June 2, 4...	2058	6.8	.00	45	9.9	44	1.2	138	17	82	.2	2.3	280	153	40	531	7.0	2
June 5-7, 9-14.....	1117	6.9	.00	53	11	76	1.8	140	17	140	.2	21	386	177	62	728	7.0	1
June 15-17, 20, 23-24.....	2608	9.3	.00	46	9.9	59	2.2	123	17	116	.2	2.6	338	156	55	625	6.9	3
June 25-July 3.....	24070	9.6	.14	25	4.1	8.0	1.8	81	9.2	16	.2	3.2	122	80	14	211	6.7	17
July 4-8, 10-14, 16, 20.....	6272	12	.01	42	6.0	21	1.5	128	13	41	.1	4.0	184	130	25	371	7.2	3
July 22-Aug. 11, 15-17, 19-20.....	1562	8.3	.01	52	8.2	42	2.5	146	15	83	.1	2.2	267	163	43	535	7.1	3
Aug. 21-25, 27-30, Sept. 1-10, 12-15	843	6.6	.01	52	9.5	67	2.5	136	16	129	.2	2.1	349	169	57	683	7.0	4
Sept. 16-20.....	3682	6.8	.02	44	8.9	49	2.0	121	15	97	.2	1.2	281	147	48	555	7.0	6
Sept. 21-23.....	2177	6.2	.01	52	9.5	72	3.4	130	16	140	.2	2.1	385	169	62	705	6.7	5
Sept. 24-30.....	1063	7.2	.01	44	8.2	30	2.7	130	14	60	.2	2.2	220	144	37	445	7.0	6
Weighted average.	--	9.0	0.03	39	7.9	31	1.4	115	14.0	61	0.1	3.5	237	131	37	419	6.9	6
Time-weighted average a.....	6345	8.6	0.02	48	9.8	58	1.9	129	16.0	114	0.2	3.5	338	161	55	618	7.0	4
Tons per day.....	--	155.0	0.53	637	135.0	353	24.0	1970	248.0	1040	2.5	60.0	4060	--	--	--	--	106

a Represents 82 percent of the days and 72 percent of the runoff.

GREEN RIVER BASIN--Continued

3-3155.2. GREEN RIVER AT ABERDEEN, KY.--Continued

Analyses of additional samples

Date of collection	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 16, 1959.	5.7	0.20	0.20	66	16	148	4.3	130	26	310	0.1	2.0	678	231	124	1630	7.1	8
Feb. 20, 1960.	7.4	.09	.00	41	7.6	23	1.2	120	13	46	.2	3.3	211	133	34	385	7.3	6
June 29.....	--	--	--	--	--	--	--	72	8.4	12	.4	2.1	--	72	13	177	7.0	--
Sept. 20.....	4.7	.04	.04	42	7.2	38	3.2	109	14	75	.3	2.1	233	135	45	471	6.9	7

Date of collection	Dissolved oxygen		Phenols as C_6H_5OH	Turbidity
	Parts per million	Percent saturation		
Oct. 16, 1959	8.8	95	0.001	15
Feb. 20, 1960	12.7	99	.000	12
June 29	7.0	78	.000	35
Sept. 20	10.2	100	.000	90

3-3155.2. GREEN RIVER AT ABERDEEN, KY.--Continued

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

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	72	73	72	74	75	75	74	74	71	70	71	68	68	63	64	62	64	63	61	61	61	61	62	61	59	56	58	57	56	56	56	65
November	57	56	55	55	57	56	53	52	51	52	52	51	52	50	50	50	49	47	47	46	46	47	47	47	47	47	46	47	47	46	--	50
December	47	46	45	45	44	44	43	44	42	45	45	44	45	46	46	45	47	46	47	45	46	45	46	45	45	45	46	41	45	45	46	45
January	--	--	--	--	47	43	43	43	43	43	45	46	48	48	47	47	45	45	50	--	45	44	44	48	48	48	45	--	41	42	42	45
February	42	42	42	43	43	43	42	42	43	43	44	41	41	40	40	40	40	40	40	42	41	40	40	40	--	--	--	--	--	--	--	41
March	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	72	72	72	73	73	73	--
June	75	75	--	76	77	78	77	--	77	78	78	80	78	77	78	78	76	--	--	73	--	--	75	75	73	73	72	--	70	70	--	--
July	70	72	73	72	72	73	74	74	--	75	77	75	--	--	--	--	--	--	--	74	--	78	78	78	79	79	80	80	82	82	82	--
August	83	84	85	84	85	85	84	83	82	81	82	--	--	--	83	83	83	--	83	83	84	84	83	83	83	--	--	83	84	84	--	--
September	84	84	85	85	84	83	85	84	80	78	--	77	77	77	77	76	75	74	73	72	72	72	73	72	73	72	--	72	72	72	--	77

GREEN RIVER BASIN--Continued

3-3195. ROUGH RIVER AT DUNDEE, KY.

LOCATION.--At auxiliary gaging station at bridge on State Highway 69 at Dundee, Ohio County, 7.1 miles downstream from Caney Creek, and 5.6 miles downstream from gaging station near Dundee.
DRAINAGE AREA.--770 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1949 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 85°F Sept. 6, 8; minimum, freezing point on Mar. 6-8, 13, 14.
EXTREMES, 1949-60.--Water temperatures: Maximum, 89°F Aug. 3, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Discharge records for gaging station near Dundee, for water year October 1959 to September 1960 are given in WSP 1705.

Temperature (°F) of water, water year October 1959 to September 1960
(Twice-daily measurements at approximately 7 a.m. and 5 p.m.)

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

3-3211. POND RIVER NEAR SACRAMENTO, KY.

LOCATION.--At bridge on State Highway 85, 12 miles upstream from mouth, 3.0 miles southwest of Sacramento, McLean County, 3.9 miles downstream from Log Creek, and 45.5 miles downstream from gaging station near Apex.
DRAINAGE AREA.--523 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1955 to September 1960.
REMARKS.--Stream receives drainage from strip mine area. Supplementary samples for determining iron and manganese were filtered clear when collected. Acidity determined to pH 7.0. No discharge records available.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Oct. 17, 1959.		9.8	2.9	1.1	3.1	60	25	32	3.8	0	276	43	0.3	0.4	478	253	253	1.1	714	3.9	2
Dec. 2.....		7.3	.4	.75	1.4	32	11	10	3.1	29	108	16	.2	.8	213	125	101	.1	333	6.6	17
Jan. 11, 1960.		8.0	.1	1.3	2.6	62	15	20	1.6	16	227	15	.3	.5	360	216	203	.1	525	6.6	4
Feb. 8.....		7.2	.0	.71	1.6	55	11	17	1.4	22	173	14	.2	.6	320	182	164	.0	448	6.6	5
Feb. 21.....		7.2	.0	.99	1.7	45	17	14	1.3	24	174	11	.3	.6	294	182	163	.0	449	6.7	3
Mar. 23.....		6.5	.2	.49	.22	21	6.1	6.0	.9	20	65	6.0	.3	1.1	132	78	61	.0	206	6.3	14
Apr. 27.....		7.2	.1	.49	1.1	35	9.4	7.4	1.4	42	88	9.0	.3	.7	200	126	92	.1	302	6.4	4
May 23.....		16	9.9	.24	9.6	140	63	41	2.9	0	716	20	1.9	.3	1,120	609	609	2.9	1,310	4.2	1
June 30.....		6.2	1.6	.95	2.0	43	15	12	2.2	0	195	9.0	.5	1.0	300	169	169	.8	469	3.8	1
July 20.....		10	.4	.09	3.8	79	30	26	2.8	4	351	18	.4	1.0	557	321	318	.3	737	5.2	1
Sept. 7.....		5.0	.0	.21	1.6	68	23	39	3.3	28	255	44	.3	.1	489	264	241	.1	716	6.5	4
Sept. 22.....		22	16	.27	17	204	112	42	4.0	0	1,060	24	3.2	.1	1,670	970	970	3.3	1,830	4.5	2

Date of collection	Dissolved oxygen		Phenols as C_6H_5OH	Turbidity
	Parts per million	Percent saturation		
Oct. 17, 1959.....	8.6	78	0.001	4
Feb. 21, 1960.....	12.0	90	.000	16
June 30.....	6.8	79	.000	0
Sept. 22.....	8.2	88	.000	2

3-3215. GREEN RIVER AT LOCK AND DAM 1, AT SPOTTSVILLE, KY.

LOCATION.--At lock and dam 1, at Spottsville, Henderson County, 9.1 miles upstream from mouth.
DRAINAGE AREA.--9,181 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1956 to September 1960.
Water temperatures: October 1956 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 572 ppm Nov. 19-30; minimum, 174 ppm Mar. 1-31.
Hardness: Maximum, 225 ppm Nov. 3-12; minimum, 98 ppm June 30.
Specific conductance: Maximum daily, 1,190 micromhos Nov. 22-23; minimum daily, 177 micromhos July 6.
Water temperatures: Maximum, 85°F Aug. 14; minimum, 38°F Mar. 12-15, 18.
EXTREMES, 1956-60.--Dissolved solids: Maximum, 572 ppm Nov. 19-30, 1959; minimum, 88 ppm Nov. 21-30, 1957.
Hardness: Maximum, 225 ppm Nov. 3-12, 1959; minimum, 58 ppm Nov. 21-30, 1957.
Specific conductance: Maximum daily, 1,320 micromhos July 28, 1959; minimum daily, 113 micromhos Nov. 25, 1957.
Water temperatures: Maximum, 85°F Aug. 14, 1960; minimum, 34°F Dec. 27, 1958.
REMARKS.--Records of specific conductance of daily samples available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
Oct.1-10, 12-14,1959		11		--		36	11	26	2.6		80		62	44	0.2	1.5	0.12	239	135	69		416	7.3	3	0.0
Oct. 15-31..		13		--		55	16	80	3.5		104		79	145	.2	1.9	.20	448	203	118		812	7.3	3	.0
Nov. 3-12...		10		0.00		62	17	100	3.4		116		82	185	.2	1.9	.27	515	225	130		961	7.0	4	.1
Nov. 13-18..		7.8		.00		45	13	68	4.1		74		70	130	.2	1.3	.10	374	166	105		702	6.8	8	.1
Nov. 19-30..		8.4		.00		60	18	108	3.8		96		79	212	.2	1.6	.29	572	224	145		1020	7.1	4	.1
Dec. 1.....		8.2		--		60	16	132	2.9		132		22	254	--	2.1	--		216	108		1080	7.4	2	--
Dec. 2-31...		9.5		--		36	8.2	23	1.6		86		37	42	.2	2.4	.08	207	124	53		376	--	5	.0
Jan. 1-31, 1960..		10		--		33	9.2	17	1.0		86		36	32	.2	2.4	.14	184	121	50		319	--	8	.0
Feb. 1-29...		8.2		--	0.07	34	6.2	18	1.1		90		33	30	.2	3.5	.10	186	111	37		316	--	10	.0
Mar. 1-31...		9.5		--		31	7.2	14	1.0		78		29	28	.1	3.2	.08	174	107	43		295	--	2	.0
Apr.1-8,10-25, 27-30.		7.3		.07		34	8.2	17	1.1		96		36	28	.2	2.7	.07	186	119	40		323	--	6	.0
May 1-31....		8.1		--		43	9.5	33	1.5		107		47	62	.2	2.2	.12	270	146	58		457	--	5	.0
June 1-28...		8.1		--		43	9.2	35	1.4		118		36	64	.2	2.2	.04	288	145	48		478	--	4	.0
June 29.....		4.9		--		47	10	86	2.7		104		17	172	--	3.2	--	--	158	73		763	7.7	--	.0
June 30.....		6.0		--		30	5.5	29	2.1		80		17	58	--	3.3	--	--	98	32		381	7.7	--	.0
July 1-31...		9.3		--		32	8.7	13	1.8		80		44	24	.3	2.4	.20	225	116	50		303	--	9	.0
Aug. 1-17, 19-31.....		9.0		--		46	9.3	24	1.8		124		36	47	.3	2.4	.12	261	153	51		432	--	2	.0
Sept. 1-30..		10		--		50	10	39	2.0		145		27	73	.1	1.9	.19	313	166	47		526	--	5	.1
Time-weighted average [a]		9.2		--	--	40	9.7	32	1.8		100		42	60	0.2	2.4	0.13	262	141	59		449	--	5	0.0

a Represents 98 percent of the days.

GREEN RIVER BASIN--Continued

3-3215. GREEN RIVER AT LOCK AND DAM 1, AT SPOTTSVILLE, KY.--Continued

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

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	73	73	74	74	74	74	74	74	73	72	--	71	70	68	68	68	68	67	60	62	63	64	68	66	66	64	66	62	62	62	62	68
November	62	61	60	60	60	56	56	55	54	54	55	54	53	53	53	52	50	50	--	--	--	--	--	--	--	--	--	--	--	--	--	--
December	45	46	46	45	45	44	45	44	44	44	44	45	44	44	44	45	47	47	47	45	46	46	46	46	45	45	46	46	46	46	46	45
January	47	47	47	47	47	46	45	45	44	44	44	45	46	47	48	48	48	50	49	47	47	45	45	45	41	40	40	40	40	40	41	45
February	41	42	42	42	42	42	44	44	45	45	45	46	45	45	45	45	45	43	43	42	41	41	41	41	41	41	40	40	41	--	--	43
March	42	42	41	39	39	39	39	39	39	39	39	38	38	38	38	39	40	38	39	40	41	43	42	43	44	45	45	46	48	50	51	41
April	51	52	53	54	54	54	55	55	55	55	54	55	52	52	56	58	58	58	60	61	61	64	64	64	65	65	66	66	66	66	--	58
May	65	65	65	65	65	66	65	64	64	62	62	60	60	61	64	65	65	65	65	68	67	67	60	68	68	69	71	71	69	69	70	65
June	71	73	73	74	75	75	74	74	74	74	75	75	75	75	75	75	75	75	71	77	77	77	80	80	80	80	80	79	75	73	--	76
July	73	72	71	70	71	73	74	73	74	74	74	75	75	75	75	76	76	78	78	70	78	79	79	79	80	80	80	81	81	81	81	76
August	81	82	83	82	82	82	84	84	83	83	82	82	82	85	82	82	82	83	83	82	81	82	82	82	82	82	83	82	83	83	83	83
September	83	83	82	82	83	84	84	83	82	83	80	79	78	78	78	78	78	77	77	77	77	77	78	77	77	77	77	77	67	71	71	--	79

WABASH RIVER BASIN

3-3355. WABASH RIVER AT LAFAYETTE, IND.

LOCATION.--Temperature recorder at gaging station, 20 feet downstream from Brown Street Bridge in Lafayette, Tippecanoe County, 5.1 miles downstream from Wildcat Creek, and at mile 311.9.
DRAINAGE AREA.--7,247 square miles.
RECORDS AVAILABLE.--Water temperatures: July 1954 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 79°F on many days during July to September; minimum, freezing point on many days during January and February.
EXTREMES, 1954-60.--Water temperatures: Maximum, 90°F July 30, 31, 1954; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705. Some regulation at low stages caused by powerplants upstream from station.

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

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

3-3369. SALT FORK NEAR ST. JOSEPH, ILL.

LOCATION.--Temperature recorder at gaging station at township highway bridge, 2.5 miles north and 0.7 mile east of St. Joseph, Champaign County.
DRAINAGE AREA.--134 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1958 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 95°F Sept. 2, 5, 6; minimum, freezing point on several days during December, January and March.
EXTREMES, 1958-60.--Water temperatures: Maximum, 96°F July 30, 1959; minimum, freezing point on several days during winter months.
REMARKS.--Recorder stopped; range from Mar. 10-13, 32°F to 34°F; Apr. 17-24, 41°F to 69°F. Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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	71	73	72	73	69	69	62	72	66	59	58	57	55	53	59	66	58	50	51	64	63	62	63	57	47	50	51	48	54	54	56	61
Minimum	53	57	62	61	64	61	58	56	49	49	53	49	50	47	47	50	49	44	46	47	49	51	57	47	46	46	44	41	41	49	52	51
November																																
Maximum	59	54	49	56	56	45	42	44	46	51	46	42	38	41	41	42	36	35	34	36	43	44	43	42	39	38	38	35	34	34	--	43
Minimum	49	44	42	49	45	37	34	38	40	40	42	34	34	38	36	36	35	34	33	33	36	38	41	39	34	34	34	34	34	34	--	38
December																																
Maximum	34	34	40	42	42	39	35	34	36	34	42	42	38	39	42	42	43	43	36	38	37	35	36	39	42	40	36	36	44	41	39	40
Minimum	33	33	33	36	39	35	34	34	34	32	34	39	37	36	36	37	41	35	34	35	34	34	34	36	38	42	40	44	41	39	37	37
January																																
Maximum	39	41	41	36	35	35	34	34	34	29	39	49	49	46	43	39	38	37	36	34	33	33	33	34	34	33	33	35	35	37	38	37
Minimum	37	38	36	35	35	34	34	34	34	38	39	46	43	39	35	35	35	34	33	33	33	33	33	33	33	33	33	32	32	35	37	35
February																																
Maximum	38	38	37	37	39	39	38	38	38	39	39	39	38	39	39	41	41	41	38	34	35	34	38	38	38	34	34	34	34	--	--	38
Minimum	37	35	33	35	37	38	37	36	38	38	37	36	35	34	36	37	38	36	34	33	33	33	33	34	34	34	33	33	33	--	--	35
March																																
Maximum	34	33	33	34	34	33	34	33	--	--	--	--	33	33	33	33	33	33	41	40	42	42	38	41	38	48	47	41	49	49	44	38
Minimum	32	33	33	33	34	30	33	33	33	--	--	--	--	32	32	33	32	32	32	32	34	33	34	34	34	34	38	37	41	44	44	34
April																																
Maximum	48	52	48	42	45	48	50	46	44	50	42	55	59	56	61	58	--	--	--	--	--	--	--	--	69	62	63	64	58	56	--	--
Minimum	42	43	41	41	39	39	40	40	36	36	39	40	47	50	52	53	--	--	--	--	--	--	--	--	62	55	49	50	52	49	--	--
May																																
Maximum	59	62	66	64	62	61	57	50	47	45	45	60	67	72	78	71	62	68	68	75	68	72	81	73	79	69	63	64	73	77	81	66
Minimum	45	47	50	53	57	56	50	47	45	44	43	42	47	53	58	63	59	55	60	63	59	58	60	63	62	59	57	56	58	62	64	55
June																																
Maximum	82	81	85	88	75	78	78	79	82	81	83	76	74	68	80	79	67	72	78	74	75	83	78	71	69	72	70	72	72	73	--	77
Minimum	65	68	66	69	70	63	62	61	62	65	70	72	68	63	60	67	62	60	67	65	65	68	68	66	64	64	66	66	67	68	--	66
July																																
Maximum	76	82	80	75	82	78	82	84	81	79	86	90	92	74	76	77	80	82	84	87	88	90	94	92	92	86	92	93	94	90	88	84
Minimum	66	66	72	68	64	69	66	67	69	70	71	72	71	65	65	67	68	69	70	72	72	74	76	75	78	76	73	74	76	77	70	71
August																																
Maximum	99	93	90	84	91	90	93	90	89	88	85	87	88	86	86	88	90	92	83	87	86	90	90	90	90	90	93	90	90	94	94	89
Minimum	68	72	78	75	74	75	77	76	76	72	68	68	69	70	72	68	69	72	74	73	72	72	73	74	74	74	76	75	75	76	74	73
September																																
Maximum	94	95	93	94	95	95	94	94	81	78	84	78	79	79	78	85	77	82	75	72	71	78	80	79	77	74	70	74	73	70	--	82
Minimum	76	77	77	76	76	77	77	77	75	66	61	62	59	60	66	67	71	69	69	67	62	62	66	67	66	63	60	56	56	56	--	67

WABASH RIVER BASIN--Continued

3-3420. WABASH RIVER AT RIVERTON, IND.

LOCATION.--Temperature recorder at gaging station at Illinois Central Railroad bridge at Riverton, Sullivan County, 0.6 mile downstream from Turtle Creek, and at mile 162.0.
DRAINAGE AREA.--13,100 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: July 1954 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 81°F Aug. 2-7; minimum, 33°F on several days during January and February.
EXTREMES, 1954-60.--Water temperatures: Maximum, 91°F July 20 and Aug. 29,1954; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

3-3490. WHITE RIVER AT NOBLESVILLE, IND.

LOCATION.--Temperature recorder at gaging station at Logan Street Bridge in Noblesville, Hamilton County, 1.5 miles upstream from Cicero Creek, and 3.5 miles below dam at Clare.
DRAINAGE AREA.--837 square miles.
RECORDS AVAILABLE.--Water temperatures: November 1952 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 85°F July 25; minimum, 33°F on several days during January and March.
EXTREMES, 1952-60.--Water temperatures: Maximum, 94°F Aug. 1, 1953; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705. Flow regulated by powerplant upstream from station.

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

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

WABASH RIVER BASIN--Continued

3-3510. WHITE RIVER NEAR NORA, IND.

LOCATION.--Temperature recorder at gaging station at bridge on State Highway 100, 2 miles east of Nora, Marion County, and 14 miles upstream from Fall Creek.
DRAINAGE AREA.--1,200 square miles.
RECORDS AVAILABLE.--Water temperatures: June 1954 to May 1960.
EXTREMES, 1959-60.--Water temperatures: Minimum, freezing point on Jan. 21-23, 26.
EXTREMES, 1954-60.--Water temperatures: Maximum, 89°F July 14, 1954; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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	70	70	72	69	66	65	62	60	59	57	56	54	54	54	54	54	54	54	55	56	56	54	52	49	49	48	50	52	56
Minimum	65	64	65	67	68	69	66	65	62	59	58	57	56	54	53	53	54	54	52	52	53	54	55	54	51	49	49	48	48	48	50	57
November																																
Maximum	53	52	50	51	53	50	49	47	46	--	--	--	45	45	45	44	44	41	40	40	42	42	44	44	44	42	41	39	37	36	--	45
Minimum	52	50	48	48	51	49	47	46	46	--	--	--	43	43	44	44	41	40	39	39	40	42	42	44	42	41	39	37	36	34	--	43
December																																
Maximum	34	36	37	37	33	32	33	35	37	36	34	41	41	41	41	40	41	42	42	40	40	39	38	37	40	42	43	46	46	44	41	40
Minimum	34	34	36	37	37	35	36	36	36	36	36	39	41	41	40	40	40	41	40	40	39	38	37	37	37	40	42	43	44	41	40	39
January																																
Maximum	40	39	37	--	--	--	--	--	--	--	--	--	--	46	46	44	42	40	39	38	36	36	35	34	34	36	37	36	37	38	38	--
Minimum	39	39	39	--	--	--	--	--	--	--	--	--	--	46	44	42	40	39	38	36	36	36	35	34	33	34	34	36	37	37	37	--
February																																
Maximum	38	38	36	35	40	39	38	37	37	41	41	40	38	37	36	36	37	37	37	36	36	35	36	37	37	36	36	36	--	--	--	37
Minimum	38	36	34	34	35	38	37	36	36	37	41	38	37	36	35	36	36	37	34	35	35	34	34	36	35	34	34	36	34	--	--	36
March																																
Maximum	35	35	35	35	34	34	35	36	36	35	36	36	37	38	40	40	39	41	42	42	41	41	40	40	39	42	43	44	45	47	47	39
Minimum	34	34	34	34	34	34	34	34	34	34	35	36	35	36	37	38	38	38	40	40	38	39	38	39	37	38	41	43	43	45	45	37
April																																
Maximum	46	48	48	48	48	47	43	42	48	47	47	51	57	59	62	64	63	60	62	61	62	64	68	70	71	71	65	65	65	66	--	57
Minimum	45	46	47	47	47	46	46	48	46	45	46	46	51	57	58	61	59	57	55	52	59	59	64	66	68	65	62	62	60	58	--	54

3-3655. EAST FORK WHITE RIVER AT SEYMOUR, IND.

LOCATION.--Temperature recorder at gaging station, 1,700 feet downstream from highway bridge, 1 mile north of Seymour, Jackson County, 9.6 miles downstream from Sand Creek, and at mile 219.2.
DRAINAGE AREA.--2,333 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1954 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 81°F Sept. 2-6; minimum, 33°F Jan. 6-7, 22-25.
EXTREMES, 1954-60.--Water temperatures: Maximum, 84°F Aug. 2-7, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705. Regulation at low flow by pumping plant 1,200 feet upstream from recorder.

Temperature (°F) of water, water year October 1959 to September 1960
(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	68	71	72	73	72	71	69	68	65	64	62	60	56	54	56	56	55	54	55	55	57	56	56	54	51	51	50	50	52	54	60
Minimum	67	66	68	69	71	71	69	66	65	63	62	60	56	54	53	54	55	54	53	54	55	55	56	54	51	51	50	49	49	50	52	58
November																																
Maximum	56	55	52	52	55	55	49	47	45	44	44	44	47	47	45	43	43	39	37	38	40	41	43	44	43	42	42	40	38	37	--	45
Minimum	54	52	50	50	52	49	47	45	44	43	44	44	44	45	43	43	39	37	36	36	38	40	41	43	42	42	40	38	37	36	--	43
December																																
Maximum	37	37	38	39	40	40	39	38	38	37	39	40	40	40	40	40	41	42	42	40	39	38	37	37	39	41	45	45	43	44	42	40
Minimum	36	37	37	38	39	39	38	38	37	36	37	39	40	40	40	40	40	41	40	39	38	37	36	36	37	39	41	43	44	42	39	39
January																																
Maximum	39	38	38	37	35	34	34	35	36	38	40	44	47	47	47	46	43	39	39	38	36	34	33	33	34	35	37	37	37	36	39	38
Minimum	38	38	37	35	34	33	33	34	35	36	39	40	44	47	46	43	39	38	38	36	34	33	33	33	33	34	35	37	37	37	38	37
February																																
Maximum	39	39	39	38	39	39	40	38	39	42	43	43	40	37	37	38	39	39	39	38	38	38	38	39	39	38	38	39	39	--	--	39
Minimum	39	39	38	38	39	39	38	37	38	39	43	40	37	37	37	37	38	39	38	38	37	36	37	38	38	38	37	38	38	--	--	38
March																																
Maximum	38	39	37	36	36	37	37	37	37	37	37	38	38	39	40	40	40	40	40	40	40	40	39	40	40	41	44	49	53	54	54	40
Minimum	37	37	36	35	35	35	36	36	36	35	37	37	37	38	39	40	39	39	39	39	38	39	39	39	39	39	41	44	49	53	52	39
April																																
Maximum	52	52	53	52	52	51	52	53	51	50	49	53	58	61	62	64	64	63	62	62	62	65	68	70	70	70	68	67	67	63	--	60
Minimum	51	51	52	52	51	50	50	51	49	47	48	49	53	57	60	62	63	60	59	59	61	61	64	67	69	68	66	65	63	62	--	57
May																																
Maximum	62	62	64	65	66	66	65	61	57	54	52	52	55	59	62	65	68	69	69	68	68	68	70	70	71	71	69	69	67	67	69	65
Minimum	60	60	61	63	65	65	61	57	54	52	51	51	52	55	59	62	65	67	68	67	66	67	67	68	68	68	69	67	66	67	67	62
June																																
Maximum	70	70	71	72	75	76	74	72	73	74	74	75	75	74	74	75	75	72	74	75	75	78	78	74	75	75	74	73	71	72	--	74
Minimum	70	70	69	70	72	72	72	70	70	72	73	74	74	72	70	72	71	68	71	73	74	75	71	71	72	73	72	71	70	70	--	72
July																																
Maximum	71	73	73	72	72	72	72	71	72	72	73	75	74	73	73	73	73	73	74	76	76	76	76	76	78	78	77	76	78	76	76	74
Minimum	71	71	73	73	72	72	70	70	71	71	71	71	73	72	71	72	72	71	71	73	73	73	74	75	75	76	75	75	76	77	76	73
August																																
Maximum	76	77	77	76	77	78	79	80	80	80	79	76	75	76	76	76	75	77	77	77	77	78	78	78	78	79	79	78	80	80	79	78
Minimum	75	75	76	74	75	77	76	78	79	78	76	75	74	74	75	74	74	75	76	76	76	77	77	77	77	77	78	76	76	79	76	76
September																																
Maximum	80	81	81	81	81	81	79	78	78	76	72	72	70	69	69	69	70	70	70	70	70	70	71	73	73	72	72	70	70	69	--	74
Minimum	78	79	80	80	80	79	78	78	76	72	71	70	68	68	68	68	69	69	69	69	69	69	70	71	71	71	70	69	68	67	--	72

WABASH RIVER BASIN--Continued

3-3788. WABASH RIVER NEAR NEW HAVEN, ILL.

LOCATION.--At bridge connecting Illinois State Highway 141 and Indiana State Highway 762, 5.2 miles northeast of New Haven, Gallatin County, 2.1 miles upstream from Mackeys Ferry, and 9.2 miles upstream from Little Wabash River.
DRAINAGE AREA.--29,500 square miles (approximately).
RECORDS AVAILABLE.--Chemical analyses: October 1956 to September 1960.
Water temperatures: October 1956 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 379 ppm Mar. 1-23, 25-31; minimum, 179 ppm June 28-30.
Hardness: Maximum, 275 ppm Mar. 1-23, 25-31; minimum, 133 ppm June 28-30.
Specific conductance: Maximum daily, 692 micromhos Dec. 10; minimum daily, 278 micromhos June 29.
Water temperatures: Maximum, 94°F Sept. 6; minimum, 34°F Dec. 7.
EXTREMES, 1956-60.--Dissolved solids: Maximum, 455 ppm Nov. 21-27, 29-30, 1956; minimum, 176 ppm Dec. 21-31, 1957.
Hardness: Maximum, 326 ppm Feb. 21-28, 1958; minimum, 126 ppm July 1, 3-10, 1957.
Specific conductance: Maximum daily, 797 micromhos Nov. 26, 1956; minimum daily, 191 micromhos Feb. 23, 1959.
Water temperatures: Maximum, 94°F Sept. 6, 1960; minimum, freezing point on many days during winter months.
REMARKS--Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. No discharge records available for this station.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^+	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
Oct. 1-30, 1959..		9.5				65	24	24	2.9		224		82	30	0.2	3.9	0.40	368	261	77		600	7.6	8	0.0
Nov. 1-30...		12				69	24	20	2.4		224		77	29	.2	6.1	.50	359	271	87		605	7.4	5	.1
Dec. 1-31...		11				70	22	16	1.7		220		77	25	.1	7.9	.41	349	265	85		574	7.8	5	.1
Jan. 1-4, 6-31, 1960		11				64	19	13	1.2		198		69	18	.3	10	.60	314	238	76		516	7.8	8	.1
Feb. 1-29...		11				59	18	10	1.9		186		58	15	.2	12	.48	292	221	68		470	--	15	.0
Mar. 1-23, 25-31.....		12				74	22	17	1.6		240		74	24	.2	9.6	.30	379	275	78		589	--	6	.1
Apr. 1-30...		9.3				62	19	9.9	1.5		200		59	15	.3	12	.30	329	233	69		487	--	10	.0
May 1-31....		9.2				64	20	14	1.9		218		68	22	.3	4.5	.30	322	242	63		526	--	6	.0
June 1-27...		11				58	18	12	2.4		196		54	17	.1	8.8	.25	289	219	58		470	--	6	.0
June 28-30...		8.4				37	9.7	4.3	2.1		120		31	8.1	.1	6.5	.35	179	133	35		287	--	32	.0
July 1-31...		11				58	16	9.3	2.1		198		43	14	.3	4.8	.30	297	211	49		438	--	7	.0
Aug. 1-31...		7.9				67	19	13	2.2		232		56	18	.2	2.6	.30	308	245	55		509	--	7	.0
Sept. 1-30..		5.4				76	16	17	2.2		244		62	22	.2	1.6	.40	329	256	56		549	--	6	.1
Time-weighted average [a]		10				65	20	15	2.0		214		65	21	0.2	6.9	0.37	327	244	68		526	--	8	--

a Represents 99 percent of the days.

WABASH RIVER BASIN--Continued

3-3788. WABASH RIVER NEAR NEW HAVEN, ILL.--Continued

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

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	72	70	70	72	72	74	74	75	65	69	68	60	58	50	60	55	54	52	50	51	48	48	49	48	54	56	50	50	56	57	--	60
November	56	57	57	56	54	56	57	57	56	57	57	45	53	48	37	38	35	36	40	42	40	41	42	40	40	40	42	40	38	40	--	47
December	41	43	42	40	39	36	34	40	43	43	40	39	42	43	41	42	42	43	40	38	38	39	41	42	43	44	45	47	45	44	43	41
January	53	43	40	37	--	37	38	40	41	44	45	46	45	48	49	37	36	40	41	38	37	--	38	--	--	40	42	40	40	40	39	41
February	41	40	41	40	40	43	40	42	37	38	37	37	--	--	37	38	38	38	40	38	39	38	38	38	--	38	40	38	38	--	--	39
March	37	38	40	38	38	37	39	37	36	37	36	36	36	38	38	38	40	45	40	39	40	39	40	39	38	42	41	42	46	47	48	40
April	40	50	46	45	47	48	52	48	50	53	54	65	--	56	58	62	60	59	60	60	59	62	66	68	68	67	66	66	67	65	--	57
May	66	68	64	66	68	66	68	67	65	67	68	64	68	67	69	68	69	70	70	70	69	70	69	68	73	74	73	74	74	73	74	69
June	73	74	74	75	76	75	74	76	76	74	75	79	79	78	75	75	78	79	71	78	75	78	80	79	80	79	78	74	75	79	--	76
July	80	79	80	85	86	80	80	80	79	79	81	80	79	85	80	81	80	81	76	71	74	75	80	77	78	80	81	81	82	83	84	80
August	83	84	82	84	85	86	85	84	83	83	85	81	82	84	85	81	82	84	83	84	83	84	83	84	83	84	84	82	81	85	86	84
September	88	89	92	92	93	94	--	--	--	73	75	79	80	81	80	74	76	73	74	75	74	75	77	78	78	78	79	75	74	72	--	80

TRADEWATER RIVER BASIN

3-3830. TRADEWATER RIVER AT OLNEY, KY.

LOCATION.--At gaging station on downstream side of left abutment of highway bridge at Olney, Hopkins County, 1.1 miles from Cave Creek, 5.1 miles downstream from Flynn Creek, and 9.5 miles northeast of Princeton.
DRAINAGE AREA.--255 square miles, of which about 9 square miles does not contribute directly to surface runoff.
RECORDS AVAILABLE--Chemical analyses: October 1949 to August 1950, October 1951 to September 1960.
Water temperatures: October 1951 to September 1960.
Sediment records: October 1952 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 918 ppm Oct. 15-16; minimum, 95 ppm Jan. 16-17.
Hardness: Maximum, 548 ppm Oct. 15-16; minimum, 38 ppm June 29 to July 3.
Specific conductance: Maximum daily, 1,190 micromhos Oct. 15; minimum daily, 75 micromhos July 1.
Water temperatures: Maximum, 84°F Aug. 9; minimum, freezing point on several days during January and March.
Sediment concentrations: Maximum daily, 354 ppm June 29; minimum daily, 1 ppm on several days during December to February, April, and May.
Sediment loads: Maximum daily, 1,910 tons July 1; minimum daily, less than 0.05 ton on many days during June and September.
EXTREMES, 1951-60.--Dissolved solids: Maximum, 1,700 ppm Nov. 22-24, 1958; minimum, 54 ppm Sept. 21-30, 1954.
Hardness: Maximum, 1,000 ppm Nov. 22-24, 1958; minimum, 31 ppm Sept. 21-30, 1954.
Specific conductance: Maximum daily, 2,040 micromhos Nov. 23, 1958; minimum daily, 51 micromhos Mar. 23, 1952.
Water temperatures: Maximum, 87°F July 26, 29, 1952; minimum, freezing point on many days during winter months.
Sediment concentrations (1952-60): Maximum daily, 764 ppm June 5, 1954; minimum daily, no flow on many days during 1952 to 1957.
Sediment loads (1952-60): Maximum daily, 2,220 tons Jan. 22, 1959; minimum daily, 0 tons on many days during 1952 to 1957.
REMARKS.--Acidity determined to pH 7.0. *Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio.* Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Oct. 1-14,1959	35.0														420	255			559	--	
Oct. 15-16....	284														918	548			1150	--	
Oct. 17-Nov. 5	46.8														412	257			571	--	
Nov. 6-7.....	534														274	163			377	--	
Nov. 8-28.....	126														325	209			458	--	
Nov. 29-Dec. 7	160														241	158			360	--	
Dec. 8-11.....	82.5														367	222			496	--	
Dec. 12-20....	1213	8.6	0.2	0.05	0.74	18	8.4	3.4	1.9	18	70	3.0	0.2	1.2	132	80	65	0.0	207	6.6	10
Dec. 21-31....	640														209	111			292	--	
Jan. 1-15,1960	314														275	116			326	--	
Jan. 16-17....	1445														95	62			136	--	
Jan. 18-22....	962														166	84			243	--	

Jan. 23-Feb. 7, 1960	212														235	118			348	--	
Feb. 8-15.....	735														166	95			243	--	
Feb. 16-25.....	151														218	117			367	--	
Feb. 26-Mar. 6	464														176	114			274	--	
Mar. 7-16.....	212														241	163			365	--	
Mar. 17-19.....	1317														112	72			187	--	
Mar. 20-27.....	887														153	94			233	--	
Mar. 28-Apr. 8.	420														208	122			285	6.4	
Apr. 9-21.....	138														302	183			398	6.3	
Apr. 22-26.....	848														158	94			237	--	
Apr. 27-May 3.	219														205	132			309	--	
May 4-20.....	84.5														297	188			419	--	
May 21-25.....	107														250	162			371	--	
May 26-June 21	13.9														408	255			543	--	
June 22-28.....	25.4														460	300			621	--	
June 29-July 3	2866														97	38			104	--	
July 4-8.....	849														258	156			355	--	
July 9-14.....	37.3														377	232			507	--	
July 15-26.....	40.4														536	346			695	--	
July 27-29.....	43.0														125	79			223	--	
July 30-Aug.16	7.1														217	145			333	--	
Aug. 17-23.....	5.8														269	178			402	--	
Aug.24-Sept.14	3.4														367	240			508	--	
Sept. 15-30...	.2														373	253			540	--	
Weighted average...	--	--	--	--	--	--	--	--	--	--	--	--	--	--	190	108	--	--	268	--	-
Time-weighted average a.	277	--	--	--	--	--	--	--	--	--	--	--	--	--	296	182	--	--	414	--	-
Tons per day	--	--	--	--	--	--	--	--	--	--	--	--	--	--	142	--	--	--	--	--	-

a Represents 100 percent of days and 100 percent of runoff.

TRADEWATER RIVER BASIN--Continued

3-3830. TRADEWATER RIVER AT OLNEY, KY.--Continued

Analyses of additional samples

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Feb. 3, 1960..	120	10	--	0.02	3.2	38	16	5.7	1.2	18	149	4.0	0.2	0.6	237	161	146	--	359	6.6	2
May 25.....	42	11	0.0	.24	4.5	42	27	7.6	1.5	18	198	5.0	.2	.9	355	216	201	0.1	454	6.3	2
June 21.....	1.9	10	.1	.15	9.1	60	38	10	2.1	8	310	5.0	.4	1.0	484	306	299	1.5	631	6.0	3
Sept. 14.....	.1	4.8	.2	.02	7.2	37	35	8.3	3.8	12	242	7.0	.3	1.3	387	237	227	.3	571	6.1	3

3-3830. TRADEWATER RIVER AT OLNEY, KY.--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Twice-daily measurements at approximately 8 a.m. and 5 p.m.)

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																																
a.m.	69	68	69	70	71	71	69	70	66	65	66	62	60	57	57	56	56	55	53	53	53	54	57	56	55	53	52	49	48	52	52	57
p.m.	70	71	70	72	72	72	72	70	67	67	66	62	58	58	57	57	57	56	56	55	56	57	58	56	56	54	53	52	50	53	54	61
November																																
a.m.	54	52	53	55	57	55	52	49	46	46	47	46	48	47	46	45	42	39	38	38	41	42	44	45	44	45	45	40	38	38	--	46
p.m.	55	55	54	56	60	58	58	49	47	49	49	49	50	47	45	46	42	39	39	40	44	44	46	46	44	46	45	41	40	39	--	47
December																																
a.m.	38	39	39	38	40	40	37	37	37	38	41	46	46	46	44	44	46	47	45	45	42	41	41	42	42	45	47	48	48	46	42	44
p.m.	39	40	39	40	41	40	38	39	39	39	42	48	47	46	44	44	46	48	46	44	42	42	42	43	44	46	47	48	47	47	43	43
January																																
a.m.	41	42	42	38	38	38	38	38	39	41	43	45	46	52	52	48	47	45	42	39	36	34	32	32	32	33	37	38	38	39	39	40
p.m.	42	44	42	39	39	39	38	39	39	42	45	49	52	58	52	48	46	44	40	38	37	34	32	32	34	35	38	40	39	41	41	41
February																																
a.m.	40	40	40	41	42	44	44	41	43	46	46	44	40	36	35	37	38	37	35	33	37	35	35	37	--	37	36	37	35	--	--	39
p.m.	41	41	41	43	44	44	44	43	45	48	47	43	39	37	38	38	38	38	37	35	38	36	37	37	--	37	38	37	37	--	--	40
March																																
a.m.	34	34	32	32	32	32	32	32	32	33	32	32	32	32	34	36	36	36	37	38	38	39	39	39	41	40	42	44	48	52	54	53	37
p.m.	35	33	33	32	32	32	32	32	32	32	33	33	34	34	36	37	37	37	38	38	39	40	42	44	42	45	47	52	55	55	55	53	39
April																																
a.m.	49	52	54	52	52	50	50	52	52	50	52	55	53	60	62	64	66	64	59	60	62	63	65	65	68	67	64	63	63	61	--	58
p.m.	52	56	53	55	54	53	55	55	54	52	55	59	62	63	65	68	67	63	60	65	61	66	67	67	69	68	66	65	63	62	--	61
May																																
a.m.	58	57	57	58	61	62	60	58	59	55	53	52	53	54	57	60	63	64	65	67	66	67	67	68	69	71	69	67	69	69	69	62
p.m.	60	59	60	61	62	64	62	58	54	55	57	53	55	54	59	63	64	66	67	67	67	68	69	70	72	71	71	71	71	72	72	64
June																																
a.m.	69	70	70	70	72	72	71	71	70	72	73	74	72	74	73	73	72	71	72	73	74	76	76	76	74	74	74	72	69	74	--	72
p.m.	74	72	72	74	74	74	72	73	73	74	76	77	77	75	74	76	73	73	74	75	77	80	80	79	76	76	75	74	71	75	--	75
July																																
a.m.	73	74	76	76	76	75	72	72	72	73	75	75	76	74	73	72	72	73	75	75	76	76	77	76	77	77	77	76	75	76	77	75
p.m.	74	76	78	77	78	74	74	74	74	76	77	77	77	76	75	74	75	75	76	77	78	77	78	77	78	77	77	77	78	78	78	76
August																																
a.m.	76	77	78	79	78	78	78	78	79	78	77	74	74	74	75	75	75	76	75	76	76	76	77	76	76	76	75	78	76	78	76	76
p.m.	79	79	80	79	79	81	81	80	84	79	78	76	76	76	77	77	77	77	77	77	76	77	78	78	77	77	77	77	78	78	78	78
September																																
a.m.	76	76	77	77	77	77	77	77	77	75	73	70	68	67	69	69	70	70	70	68	67	68	69	69	69	68	68	67	67	66	--	71
p.m.	78	78	79	79	79	79	79	78	78	74	73	72	69	70	72	73	71	72	72	70	69	70	71	70	71	69	69	66	66	67	--	73

TRADEWATER RIVER BASIN--Continued

3-3830. TRADEWATER RIVER AT OLNEY, KY.--Continued

Suspended sediment, water year October 1959 to September 1960
(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..	14	5	0.2	25	C 4	0.3	170	4	1.8
2..	11	4	.1	24	C 4	.3	131	3	1.1
3..	10	5	.1	25	C 4	.3	104	3	.8
4..	9.2	7	.2	29	C 4	.3	87	5	1.2
5..	8.4	6	.1	253	8	S 6.0	76	2	.4
6..	12	5	.2	512	34	47	74	3	.6
7..	17	2	.1	556	64	96	79	3	.6
8..	32	3	.2	309	5	4.2	87	3	.7
9..	32	5	.4	150	3	1.2	81	4	.9
10..	35	2	.2	93	5	1.2	72	4	.8
11..	34	7	.6	71	4	.8	90	20	S 6.6
12..	25	6	.4	62	5	.8	942	109	S 291
13..	55	8	1.2	56	6	.9	1270	112	384
14..	196	9	4.8	58	9	1.4	1220	86	283
15..	366	10	9.9	98	4	1.0	1230	42	139
16..	202	10	5.4	164	4	1.8	1040	30	84
17..	95	4	1.0	160	5	2.2	949	15	38
18..	62	3	.5	111	10	3.0	1400	42	159
19..	48	6	.8	80	8	1.7	1440	62	241
20..	39	6	.6	66	5	.9	1430	38	147
21..	32	8	.7	61	3	.5	1430	38	147
22..	28	C 3	.2	58	4	.6	1060	14	40
23..	25	C 3	.2	55	4	.6	681	8	15
24..	24	C 3	.2	108	12	S 4.2	442	4	4.8
25..	28	C 3	.2	185	10	5.0	213	4	2.3
26..	38	C 3	.3	161	6	2.6	154	1	.4
27..	37	C 3	.3	150	5	2.0	148	4	S 1.7
28..	34	C 3	.3	384	25	S 28	600	98	S 214
29..	32	C 3	.3	448	22	27	948	84	215
30..	31	C 3	.3	272	11	8.1	797	47	101
31..	27	C 3	.3	--	--	--	563	24	36
Total	1638.6	--	30.5	4784	--	249.9	19008	--	2558.7

	JANUARY			FEBRUARY			MARCH		
1..	342	14	13	160	2	0.9	401	37	40
2..	213	8	4.6	137	1	.4	297	19	15
3..	296	11	8.8	120	5	1.6	242	15	9.8
4..	395	19	20	111	12	3.6	204	10	5.5
5..	333	19	17	137	16	5.9	180	10	4.5
6..	239	10	6.4	457	62	76	171	10	4.6
7..	206	7	3.9	666	74	133	146	12	4.7
8..	195	8	4.2	530	42	60	131	12	4.2
9..	179	5	2.4	368	30	30	125	12	4.0
10..	162	5	2.2	783	174	S 498	152	12	4.9
11..	147	5	2.0	1320	215	766	173	11	5.1
12..	135	1	.4	1140	79	243	177	10	4.8
13..	126	5	1.7	845	48	110	177	4	1.9
14..	261	52	S 59	571	33	51	209	3	1.7
15..	1480	162	647	326	28	25	267	7	5.0
16..	1430	102	394	200	25	14	568	34	S 66
17..	1460	60	236	174	19	8.9	1280	102	352
18..	1510	27	110	166	17	7.6	1300	57	200
19..	1430	18	69	158	15	6.4	1370	30	111
20..	912	16	39	138	16	6.0	1370	22	81
21..	614	9	15	122	20	6.6	1320	17	60
22..	345	4	3.7	118	18	5.7	1200	11	36
23..	174	5	2.3	113	12	3.7	1030	19	53
24..	130	5	1.8	105	14	4.0	825	16	36
25..	112	4	1.2	216	31	S 22	614	19	31
26..	106	6	1.7	993	172	461	432	15	17
27..	124	7	2.3	931	111	279	302	13	11
28..	221	7	4.2	696	39	73	218	7	4.1
29..	297	16	13	520	32	45	182	5	2.4
30..	248	12	8.0	--	--	--	300	19	S 18
31..	192	5	2.6	--	--	--	872	114	268
Total	14014	--	1696.4	12321	--	2947.3	16235	--	1462.6

S Computed by subdividing day.
C Composite period.

TRADEWATER RIVER BASIN--Continued

3-3830. TRADEWATER RIVER AT OLNEY, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--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	968	137	358	362	28	27	21	C 11	0.6
2	789	43	92	234	5 S	3.5	21	C 11	.6
3	563	29	44	174	1	.5	18	C 11	.5
4	369	15	15	134	1	.4	15	C 11	.4
5	255	13	9.0	108	1	.3	15	C 9	.4
6	207	9	5.0	92	1	.2	17	C 9	.4
7	168	9	4.1	95	5	1.3	13	C 9	.3
8	143	11	4.2	143	5	1.9	9.6	C 9	.2
9	124	9	3.0	172	2	.9	7.2	C 22	.4
10	106	5	1.4	124	3	1.0	6.0	C 22	.4
11	94	10	2.5	95	1	.2	5.1	C 22	.3
12	86	11	2.6	79	3	.6	4.1	C 22	.2
13	80	5	1.1	68	3	.6	4.1	C 22	.2
14	75	6	1.2	59	2	.3	5.7	16	.2
15	71	12	2.3	53	1	.1	5.4	15	.2
16	70	18	3.4	47	3	.4	4.8	C 12	.2
17	80	16	3.4	42	1	.1	3.8	C 12	.1
18	107	19	5.5	37	1	.1	3.5	C 12	.1
19	112	11	3.3	34	1	.1	3.2	C 12	.1
20	101	5	1.4	54	66 S	15	2.5	C 12	.1
21	687	148 S	413	207	151	84	1.9	10	.1
22	1340	176	637	149	32 S	14	1.3	18	.1
23	1150	82	255	83	12	2.7	.8	6	T
24	876	34	80	54	12	1.7	.5	5	T
25	567	13	20	42	12	1.4	.4	8	T
26	309	8	6.7	39	9	.9	.3	12	T
27	190	7	3.6	35 C	9	.9	.3	14	T
28	153	1	.4	31 C	9	.8	174	214 S	184
29	128	4	1.4	30 C	9	.7	1200	354	1150
30	290	23	18	28 C	9	.7	1720	306	1420
31	--	--	--	26 C	9	.7	--	--	--
Total	10258	--	1997.5	2930	--	163.0	3284.5	--	2760.1

	JULY			AUGUST			SEPTEMBER		
1	4180	169	1910	14	39	1.5	2.5	8	0.1
2	4090	106	1170	11	35	1.0	2.3	10	.1
3	3140	46	390	8.4	44	1.0	1.9	15	.1
4	2180	23	135	6.8	29	.5	1.3	15	.1
5	1120	28	85	5.7	39	.6	.7	22	T
6	600	109	177	4.8	17	.2	.4	10	T
7	280	166 S	136	3.8	14 B	.1	.3	7	T
8	66	74	13	2.7	17	.1	.3	11	T
9	46	88	11	3.5	30	.3	.3	11	T
10	38	58	6.0	3.8	20	.2	.3	8	T
11	34	133	12	4.4	20	.2	.3	18	T
12	30	183	15	4.1	23	.2	.2	20	T
13	32	124	11	3.8	12	.1	.1	10	T
14	44	86	10	3.2	15	.1	.1	12	T
15	60	24	3.9	2.9	15	.1	.2	16	T
16	44	22	2.6	2.7	15	.1	.2	8	T
17	33	33	2.9	2.3	14	.1	.2	5	T
18	24	20	1.3	2.1	16	.1	.2	10	T
19	18	30	1.4	1.7	18	.1	.2	8	T
20	14	31	1.2	3.2	13	.1	.2	6	T
21	12	52	1.7	5.7	15	.2	.2	9	T
22	10	70	1.9	8.8	12	.3	.2	7	T
23	9.2	37	.9	17	11	.5	.2	10	T
24	8.0	43	.9	18	11	.5	.2	17	T
25	136	87 S	37	14	9	.3	.2	7	T
26	116	--	19	9.2	10	.2	.2	15	T
27	52	--	5	6.8	15	.3	.2	24	T
28	40	--	5	5.1	10	.1	.2	15	T
29	37	--	5	3.8	9	.1	.2	18	T
30	25	--	5	3.5	14	.1	.2	25	T
31	18	45 B	2	2.9	11	.1	--	--	--
Total	16536.2	--	4177.7	189.7	--	9.4	14.2	--	0.6

Total discharge for year (cfs-days)..... 101,213.2
Total load for year (tons)..... 18,053.7

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

TRADEWATER RIVER BASIN--Continued

3-3830. TRADEWATER RIVER AT OLNEY, KY.--Continued

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

Date of collection	Time (24 hour)	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	
Feb. 10, 1960	1515			1040	279		58	67	79	90	98	99	100					SBWC
Apr. 1	0810			970	148		70	85	87	95	97	98	100					SBWC
Apr. 21	1720			1130	268		50	61	81	93	99	99	100					SBWC
May 21	0755			221	175		80	94	96	98	99	99	100					SBWC
June 28	1745			330	349		51	64	75	87	95	99	100					SBWC
June 28	1745			330	349		39	59	77	87	96	99	100					SBN
July 1	0740			4140	176		76	86	87	92	96	98	100					SBWC

3-3845. OHIO RIVER AT LOCK AND DAM 51, AT GOLCONDA, ILL.

LOCATION.--About 950 feet upstream from dam and gaging station at lock and dam 51, at Golconda, Pope County, 0.5 mile upstream from McGilligan Creek, 0.7 mile downstream from Lusk Creek, and at mile 903.1.
DRAINAGE AREA.--143,900 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1954 to September 1960.
Water temperatures: October 1954 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 345 ppm Nov. 1-11, 13, 15-26, 29-30; minimum, 184 ppm Apr. 1-28, 30.
Hardness: Maximum, 197 ppm Nov. 1-11, 13, 15-26, 29-30; minimum, 132 ppm Apr. 1-28, 30.
Specific conductance: Maximum daily, 722 micromhos Nov. 6; minimum daily, 211 micromhos Jan. 15.
Water temperatures: Maximum, 86°F Aug. 5, Sept. 8; minimum, 34°Mar. 7, 9, 10.
EXTREMES, 1954-60. --Dissolved solids: Maximum, 356 ppm Sept. 21-30, 1959; minimum, 132 ppm Feb. 1-10, 1957.
Hardness: Maximum, 228 ppm Oct. 21-31, 1957; minimum, 88 ppm Feb. 1-10, 1957.
Specific conductance: Maximum daily, 722 micromhos Nov. 6, 1959; minimum daily, 129 micromhos Feb. 19, 1958.
Water temperatures: Maximum, 89°F July 31 to Aug. 3, Aug. 5, 1955; minimum, freezing point on several days during winter months.
REMARKS.--Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. Records of discharge when navigation dam was in lowered position for water year October 1959 to September 1960 given in WSP 1705.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
																			Calcium, magnesium	Noncarbonate					
Oct. 1-30, 1959..	--	6.7				54	15	35	3.3		115		104	48	0.3	2.9	0.30	338	196	102		564	7.7	5	0.1
Nov.1-11,13, 15-26, 29-30.....	--	6.9				56	14	34	3.2		97		117	51	.3	4.9	.50	345	197	117		567	7.3	5	.0
Dec. 1-10, 13-31.....	225000	8.8				38	9.4	16	2.8		77		63	25	.3	5.8	.30	210	134	71		350	6.9	7	.1
Jan. 1-31, 1960..	251700	8.7				38	9.4	11	2.2		90		58	17	.3	6.3	.25	196	134	60		328	7.0	7	.1
Feb. 1-29...	278800	8.6				42	9.2	11	1.8		100		58	14	.2	7.3	.20	206	143	61		339	--	7	.1
Mar.1-11,13-18, 20-31.	204500	7.0				38	10	12	1.2		94		58	18	.2	4.7	.31	218	136	59		342	--	6	.0

OHIO RIVER MAIN STEM--Continued

3-3845. OHIO RIVER AT LOCK AND DAM 51, AT GOLCONDA, ILL.--Continued

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
																			Calcium, magnesium	Noncarbonate					
Apr. 1-28, 30, 1960..	299500	6.2				33	12	9.7	1.4		86		55	14	0.4	5.7	0.21	184	132	61		311	--	7	0.0
May 1, 5-8, 11-25, 27-31.....	133000	7.9				42	11	15	2.0		96		72	22	.2	4.5	.10	237	150	71		377	--	6	.0
June 1-28...	129700	6.7				42	12	14	2.0		109		62	18	.3	4.8	.18	240	155	66		375	--	5	.1
July 1-13, 15-31.....	--	8.6				41	12	9.4	2.1		128		41	16	.1	3.7	.35	228	152	47		335	--	7	.0
Aug. 1-3, 5-28, 30-31.	--	2.9				44	14	18	2.4		130		62	26	.3	2.6	.42	236	168	61		416	--	4	.1
Sept. 1-20, 22-23, 25-28, 30.	--	2.4				47	14	25	2.7		107		83	36	.4	2.2	.72	305	175	87		479	--	6	--
Weighted average.	--	7.7				38	10	12	1.9		92		60	18	0.3	5.8	0.23	207	138	63		339	--	7	--
Time-weighted average a	219900	6.8				43	12	17	2.3		103		69	25	0.3	4.6	0.31	244	156	71		397	--	6	--
Tons per day.....	--	2690				13300	3570	4230	657		31800		20700	6120	97	2020	80	72000	--	--		--	--	--	--

a Represents 93 percent of the days.

OHIO RIVER MAIN STEM--Continued

3-3845. OHIO RIVER AT LOCK AND DAM 51, AT GOLCONDA, ILL.--Continued

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

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

CUMBERLAND RIVER BASIN

3-4035. CUMBERLAND RIVER AT BARBOURVILLE, KY.

LOCATION.--At gaging station at bridge on State Highway 11, at Barbourville, Knox County, 0.4 mile upstream from Richland Creek.
DRAINAGE AREA.--960 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1949 to August 1950.
Water temperatures: October 1949 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 86°F Aug. 4, 7; minimum, freezing point Jan. 26, Mar. 6.
EXTREMES, 1949-60.--Water temperatures: Maximum, 91°F June 28, 1952; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

Temperature (°F) of water, water year October 1959 to September 1960
(Twice-daily measurements made at approximately 8 a.m. and 5 p.m.)

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																																
a.m.	72	70	69	70	73	72	73	72	73	71	72	65	66	64	60	59	60	60	57	58	58	60	62	60	55	55	54	50	50	54	56	63
p.m.	74	75	76	75	75	74	76	75	74	74	73	67	69	68	62	63	62	62	62	61	60	63	63	61	54	58	52	52	53	55	57	65
November																																
a.m.	52	55	52	55	55	48	49	49	49	48	47	50	47	49	49	50	42	40	41	40	43	41	50	54	46	47	47	45	44	39	--	46
p.m.	57	56	56	58	56	50	50	52	50	49	49	49	50	50	53	51	45	42	43	43	45	45	55	50	49	48	48	46	43	40	--	49
December																																
a.m.	39	42	42	43	42	43	39	35	40	40	41	44	41	43	43	46	45	49	45	44	43	42	41	41	43	45	47	47	46	46	45	43
p.m.	40	43	43	44	45	44	39	40	41	42	40	45	42	45	47	48	47	47	45	45	42	44	43	44	46	48	46	46	46	44	46	44
January																																
a.m.	41	40	44	43	42	41	43	42	43	44	44	46	47	49	52	47	47	45	44	39	35	36	34	33	33	32	36	37	39	35	42	41
p.m.	43	44	45	43	43	44	44	44	45	45	45	48	52	51	50	49	46	46	42	37	37	35	26	34	34	37	36	38	42	41	43	43
February																																
a.m.	44	43	42	42	45	43	40	39	42	44	44	44	40	38	35	36	36	36	35	34	39	36	37	38	40	40	40	43	39	--	--	40
p.m.	46	45	43	47	44	42	42	41	43	45	46	42	39	37	36	37	40	37	36	37	37	38	39	41	42	41	43	40	39	--	--	41
March																																
a.m.	38	36	35	35	34	32	35	34	35	35	36	37	34	35	36	40	40	40	40	40	39	40	39	43	40	41	43	46	48	49	50	39
p.m.	40	37	34	37	36	37	36	36	38	37	39	40	37	38	39	42	41	42	39	41	41	41	42	45	43	45	49	50	50	50	51	41
April																																
a.m.	49	52	52	53	51	50	52	52	52	52	53	54	56	57	60	62	63	63	56	60	63	61	63	64	66	69	64	63	64	64	--	58
p.m.	53	54	54	53	52	53	54	54	53	52	55	58	60	62	64	64	65	64	64	65	67	68	65	70	70	70	66	67	66	66	--	61
May																																
a.m.	62	60	61	63	64	65	64	62	55	53	53	51	50	52	55	61	65	66	69	70	72	70	71	69	73	75	74	70	70	70	71	64
p.m.	64	66	65	68	67	66	66	63	54	55	54	53	54	53	60	64	69	70	72	73	74	75	75	74	77	78	75	74	73	75	75	67
June																																
a.m.	72	75	72	72	74	80	77	77	78	78	78	75	70	70	71	69	69	69	66	68	72	73	70	70	65	65	67	69	69	70	--	71
p.m.	76	74	75	79	81	82	79	80	80	80	79	78	72	72	75	72	66	65	71	75	75	77	60	69	66	66	66	73	73	75	--	74
July																																
a.m.	70	69	69	70	72	71	72	73	74	75	65	66	69	70	70	74	70	74	74	76	76	77	80	80	80	82	79	80	80	80	79	74
p.m.	74	70	75	74	75	76	76	77	75	70	68	69	71	73	73	77	77	77	78	79	79	80	81	81	82	83	83	83	84	83	82	77
August																																
a.m.	80	80	82	80	82	82	80	80	79	78	78	75	74	75	74	75	74	79	78	76	78	77	76	75	73	75	76	78	79	80	80	78
p.m.	84	84	85	86	84	85	80	82	82	79	79	76	76	77	78	79	80	81	80	82	82	78	79	77	76	77	79	80	82	83	81	81
September																																
a.m.	79	80	79	81	80	81	80	82	81	80	77	69	71	68	69	70	69	68	71	70	71	72	73	72	71	72	70	70	68	67	--	74
p.m.	82	81	83	83	82	84	85	85	83	82	72	73	74	70	71	71	71	70	73	72	74	75	74	75	73	73	72	71	69	69	--	76

3-4040. CUMBERLAND RIVER AT WILLIAMSBURG, KY.

LOCATION.--At gaging station at bridge on U.S. Highway 25W and State Highway 92 at Williamsburg, Whitley County, and 2.1 miles downstream from Clear Fork.
DRAINAGE AREA.--1,607 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1951 to September 1960.
Water temperatures: October 1951 to September 1960.
Sediment records: October 1953 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 244 ppm Oct. 1-25; minimum, 65 ppm Mar. 17-22.
Hardness: Maximum, 92 ppm Oct. 1-25; minimum, 30 ppm Mar. 17-22, June 24-28.
Specific conductance: Maximum daily, 515 micromhos Oct. 18; minimum daily, 80 micromhos June 26.
Water temperatures: Maximum, 85°F Aug. 3; minimum, freezing point Mar. 13.
Sediment concentrations: Maximum daily, 1,350 ppm July 11; minimum daily, 3 ppm Oct. 1-4, 8.
Sediment loads: Maximum daily, 59,000 tons July 11; minimum daily, less than 0.5 ton Oct. 1-4.
EXTREMES, 1951-60.--Dissolved solids: Maximum, 409 ppm Dec. 9-14, 1953; minimum, 55 ppm Jan. 1-2, 1955.
Hardness: Maximum, 126 ppm Dec. 9-14, 1953; minimum, 26 ppm Jan. 26 to Feb. 5, 1957.
Specific conductance: Maximum daily, 754 micromhos Dec. 11, 1953; minimum daily, 60 micromhos Mar. 24-25, 1952.
Water temperatures: Maximum, 91°F on several days during June and July 1952; minimum, freezing point Jan. 9, 1958 and Mar. 13, 1960.
Sediment concentrations (1953-60): Maximum daily, 1,590 ppm Jan. 23, 1959; minimum daily, 1 ppm on many days during each year except 1960 water year.
Sediment loads: Maximum daily, 113,000 tons Jan. 23, 1959; minimum daily, less than 0.5 ton each year except 1958 water year.
REMARKS.--Records of specific conductance of daily samples available in district office at Columbus, Ohio. Flow affected by ice Mar. 7-14. Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 1-25, 1959....	252	4.8	0.00	25	7.3	57	3.3	132	84	11	0.3	0.7	244	92	0	420	7.3	10
Oct. 26-Nov. 1,3-24	806	--	--	--	--	--	--	--	--	--	--	--	150	68	--	228	--	
Nov. 25-Dec. 2.....	10330	--	--	--	--	--	--	--	--	--	--	--	80	33	--	120	--	--
Dec. 3-18.....	4788	10	.06	8.6	4.5	7.0	1.2	26	31	3.0	.2	1.1	85	40	18	139	6.8	7
Dec. 19-24.....	10970	--	--	--	--	--	--	--	--	--	--	--	74	35	--	115	--	--
Dec. 25-31.....	3008	--	--	--	--	--	--	--	--	--	--	--	110	50	--	168	--	--
Jan. 1-3, 1960.....	3010	--	--	--	--	--	--	--	--	--	--	--	78	50	--	167	--	--
Jan. 4-21.....	5213	--	--	--	--	--	--	--	--	--	--	--	85	40	--	134	--	--
Jan. 22-Feb. 8.....	1782	--	--	--	--	--	--	--	--	--	--	--	118	56	--	193	--	--
Feb. 9-21, 23-29...	5706	--	--	--	--	--	--	--	--	--	--	--	76	40	--	120	--	--
Mar. 1-16.....	3486	--	--	--	--	--	--	--	--	--	--	--	86	42	--	138	--	--
Mar. 17-22.....	9983	6.6	.04	6.9	3.3	5.7	1.0	18	25	2.5	.2	1.5	65	30	16	101	7.0	7

CUMBERLAND RIVER BASIN--Continued

3-4040. CUMBERLAND RIVER AT WILLIAMSBURG, KY.--Continued

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Mar. 23-30, 1960....	5390	--	--	--	--	--	--	--	--	--	--	--	84	39	--	128	--	--
Mar. 31-Apr. 3.....	9850	--	--	--	--	--	--	--	--	--	--	--	71	32	--	102	--	--
Apr. 4-15.....	3364	--	--	--	--	--	--	--	--	--	--	--	94	47	--	151	--	--
Apr. 16-28.....	1082	--	--	--	--	--	--	--	--	--	--	--	128	64	--	226	--	--
Apr. 29-May 7.....	1284	8.1	0.02	12	5.6	16	1.3	49	44	3.5	0.2	.4	118	53	13	196	7.4	6
May 8-15.....	2752	--	--	--	--	--	--	--	--	--	--	--	88	43	--	149	--	--
May 16-25.....	649	--	--	--	--	--	--	--	--	--	--	--	124	59	--	207	--	--
May 26-June 13.....	515	--	--	--	--	--	--	--	--	--	--	--	149	75	--	289	--	--
June 14-23.....	2784	--	--	--	--	--	--	--	--	--	--	--	122	44	--	147	--	--
June 24-28.....	14440	--	--	--	--	--	--	--	--	--	--	--	72	30	--	91	--	--
June 29-July 4.....	4490	--	--	--	--	--	--	--	--	--	--	--	90	44	--	132	--	--
July 5-10.....	2363	--	--	--	--	--	--	--	--	--	--	--	102	50	--	157	--	--
July 11-14.....	14170	--	--	--	--	--	--	--	--	--	--	--	87	34	--	103	--	--
July 15-19.....	1848	--	--	--	--	--	--	--	--	--	--	--	112	54	--	163	--	--
July 20-26.....	807	--	--	--	--	--	--	--	--	--	--	--	142	72	--	232	--	--
July 27-Aug. 13.....	686	--	--	--	--	--	--	--	--	--	--	--	202	88	--	321	--	--
Aug. 14-26.....	735	--	--	--	--	--	--	--	--	--	--	--	162	72	--	255	--	--
Aug. 27-Sept. 13....	787	--	--	--	--	--	--	--	--	--	--	--	142	63	--	221	--	--
Sept. 14-30.....	498	--	--	--	--	--	--	--	--	--	--	--	130	59	--	196	--	--
Weighted average..	--	--	--	--	--	--	--	--	--	--	--	--	91	42	--	140	--	--
Time-weighted average a.....	3094	--	--	--	--	--	--	--	--	--	--	--	125	57	--	202	--	--
Tons per day.....	--	--	--	--	--	--	--	--	--	--	--	--	761	--	--	--	--	--

a Represents 99 percent of the days and 99 percent of the runoff.

3-4040. *CUMBERLAND RIVER AT WILLIAMSBURG, KY.*--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(Twice-daily measurements at approximately 7 a.m. and 6 p.m.)

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

CUMBERLAND RIVER BASIN--Continued

3-4040. CUMBERLAND RIVER AT WILLIAMSBURG, KY.--Continued

Suspended sediment, water year October 1959 to September 1960
(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	44	3	T	708	38	73	8140	109	S 2670
2	45	3	T	570	29	45	3330	56	503
3	45	3	T	475	30	38	3610	59	575
4	55	3	T	405	16	17	4880	82	1080
5	180	13	6	376	9	9	4040	69	753
6	156	9	4	390	5	5	3180	37	318
7	126	4	1	465	7	9	3260	41	361
8	108	3	1	445	9	11	3090	39	325
9	141	11	4	386	7	7	2830	34	260
10	285	28	22	341	10	9	2730	26	192
11	285	19	15	309	17	14	2700	21	153
12	329	13	12	285	12	9	4220	61	S 827
13	289	17	13	262	8	6	10300	252	7010
14	281	26	20	251	11	7	11800	431	13700
15	301	16	13	248	10	7	8540	155	3570
16	345	15	14	285	15	12	4860	72	945
17	606	54	88	445	19	23	3330	33	297
18	510	16	22	876	14	33	3230	140	S 1430
19	363	12	12	1130	14	43	13500	640	23300
20	285	9	7	1140	13	40	20800	492	27600
21	234	10	6	954	18	46	16000	111	4800
22	198	8	4	768	12	25	8080	54	1180
23	192	6	3	696	26	S 58	4330	54	631
24	248	16	11	3960	446	S 5650	3100	33	276
25	654	34	60	10300	630	17500	2650	32	229
26	1040	73	205	8820	343	8170	2250	22	134
27	1400	87	329	4960	349	4670	2000	27	146
28	1710	77	356	13600	431	15800	1990	90	484
29	1530	86	355	18100	430	21000	3040	42	345
30	1200	57	185	15400	542	22500	4860	42	551
31	900	50	B 120	--	--	--	4270	23	265
Total	14085	--	1890	87350	--	95836	174940	--	94910
	JANUARY			FEBRUARY			MARCH		
1	3210	43	373	1510	9	37	4260	39	448
2	2580	22	153	1460	7	28	3390	44	403
3	3240	34	297	1370	11	41	4160	41	460
4	6900	150	B 3000	1270	15	51	6090	29	477
5	7840	370	B 7800	1230	12	40	5340	34	490
6	5780	210	3280	1480	27	108	4010	41	444
7	5190	59	827	3390	74	S 750	3100	37	310
8	6020	55	894	4640	124	1550	2850	23	177
9	6640	46	825	3720	83	834	2600	28	196
10	6120	63	1040	3220	44	382	2500	22	148
11	5330	50	720	5340	187	S 2910	2500	27	182
12	4800	42	544	8680	413	9680	2300	23	143
13	4420	24	286	7540	180	3660	2100	21	119
14	4660	44	554	5230	59	833	2000	12	65
15	4940	103	1370	3850	48	499	2300	35	S 237
16	5920	120	1920	2980	35	282	6270	168	S 3070
17	5610	101	1530	2870	33	256	13600	242	8890
18	4550	72	884	4850	64	838	14600	196	7730
19	3700	37	370	7070	73	1390	12500	132	4460
20	2980	26	209	6660	96	1730	9170	89	2200
21	2430	38	249	5230	102	1440	5680	62	951
22	2090	16	90	4620	100	B 1200	4350	43	505
23	1830	13	64	4630	81	1010	3800	26	267
24	1620	22	96	4730	40	511	3640	33	324
25	1480	17	68	5180	57	797	3990	33	356
26	1380	17	63	8220	152	3380	4450	44	529
27	1350	19	69	10300	172	4780	4370	51	602
28	1420	13	50	8250	73	1630	5240	54	764
29	1510	10	41	5560	58	871	7430	116	2330
30	1520	15	62	--	--	--	10200	294	8900
31	1530	19	78	--	--	--	14000	483	18200
Total	118590	--	27806	135080	--	41518	172790	--	64377

S Computed by subdividing day.
T Less than 0.5 ton.
B Computed from estimated-concentration graph.

CUMBERLAND RIVER BASIN--Continued

3-4040. CUMBERLAND RIVER AT WILLIAMSBURG, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--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	12200	360	11800	1460	33	130	635	8	14
2	7890	144	3070	1580	52	222	440	7	8
3	5310	97	1390	1330	7	25	400	8	9
4	4760	83	1070	1130	5	15	346	6	6
5	5260	82	1160	965	4	10	310	10	8
6	5650	77	1170	852	10	23	282	9	7
7	5230	74	1040	1080	57 S	216	254	7	5
8	3350	72	651	4210	285	3240	226	7	4
9	3570	44	424	5580	156	2350	202	10	5
10	2920	39	307	3540	87	832	184	7	3
11	2460	37	246	2470	30	200	187	8	4
12	2080	25	140	1940	34	178	320	14 S	15
13	1880	21	106	1640	53	235	2390	196	1260
14	1690	22	100	1420	42	161	1510	381	1550
15	1520	16	66	1220	32	105	924	153	382
16	1390	17	64	1040	33	93	1060	106	303
17	1290	14	49	900	32	78	1760	693 S	3870
18	1220	14	46	792	29	62	6870	1020	18900
19	1150	10	31	696	24	45	5080	576 S	8340
20	1040	7	20	635	17	29	2060	165 S	997
21	930	7	18	575	19	29	1180	52	166
22	894	27	65	515	22	30	852	41	94
23	894	27	65	470	20	25	6540	1110 S	21100
24	834	23	52	445	26	31	16700	780	35200
25	774	32	67	422	18	20	17600	602	28600
26	798	35 B	75	427	29	33	17100	638	29400
27	1060	35	100	460	12	15	14400	232	9020
28	1790	42	203	670	10	18	6410	100	1730
29	1730	20	93	738	13	26	3130	95	803
30	1430	25	96	685	16	30	2510	94	637
31	--	--	--	635	13	22	--	--	--
Total	82994	--	23784	40522	--	8528	111862	--	162440

	JULY			AUGUST			SEPTEMBER		
1	2290	107	662	505	14	19	372	33	33
2	4970	196 S	2910	490	13	17	372	45	45
3	8360	440 B	9900	480	15	19	303	72	59
4	5680	287 S	4670	470	14	18	310	40	33
5	3420	89	822	450	17	21	240	27	17
6	2500	56	378	431	23	27	199	23	12
7	1770	41	196	418	30	34	175	17	8
8	1350	31	113	413	18	20	157	17	7
9	1060	38	109	520	24	34	148	19	8
10	4080	296 S	5440	665	26	47	148	17	7
11	16200	1350	59000	1270	80 B	270	924	106 S	449
12	18400	639	31700	1740	107	503	5120	1050 S	15300
13	14400	185	7190	1290	95	331	3870	1160 S	12900
14	7670	95	1970	840	89	202	1700	362 S	1780
15	3040	73	599	708	91	174	1030	124	345
16	2050	35	194	804	54	117	702	61	116
17	1600	23	99	665	52	93	570	42	65
18	1350	19	69	495	64	86	550	28	42
19	1200	24	78	400	36	39	590	19	30
20	1110	23	69	382	24	25	540	20	29
21	965	17	44	426	23	26	450	20	24
22	828	13	29	418	27	30	377	14	14
23	720	12	23	980	52 S	155	318	15	13
24	645	13	23	1560	95	400	286	13	10
25	645	17	30	1130	125	381	254	13	9
26	738	18	36	750	239	484	230	9	6
27	696	16	30	540	400	583	208	7	4
28	640	16	28	413	202	225	193	7	4
29	665	17	30	334	78	70	193	7	4
30	655	13	23	282	41	31	268	7	5
31	555	14	21	258	34	24	--	--	--
Total	110252	--	126485	20527	--	4505	20797	--	31378

Total discharge for year (cfs-days)..... 1,089,789
Total load for year (tons)..... 683,457

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

CUMBERLAND RIVER BASIN--Continued

3-4040. CUMBERLAND RIVER AT WILLIAMSBURG, KY.--Continued

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

Date of collection	Time (24 hour)	Sampling point	Water temperature (°F)	Discharge (cfs)	Sediment concentration (ppm)	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. 30, 1959.....	0700			16300	958	63	66	80	90	94	95	96	97	100			SBWC
Dec. 20.....	0700			21100	584	48	62	77	89	95	97	99	100				SBWC
June 19, 1960.....	0700			5980	699	49	69	89	95	98	99	100	--				SBWC
June 19.....	0700			5980	699	11	43	77	98	99	99	100	--				SBN

3-4071. CANE BRANCH NEAR PARKERS LAKE, KY.

LOCATION.--At gaging station on left bank, 2,100 feet upstream from West Fork, 2.5 miles northeast of Parkers Lake, McCreary County, and 2.6 miles east of Greenwood.
DRAINAGE AREA.--0.67 square mile.
RECORDS AVAILABLE.--Chemical analyses: January 1956 to September 1960.
Water temperatures: January to September 1956, unpublished; October 1956 to September 1960.
Sediment records: January 1956 to September 1960.
EXTREMES, 1959-60.--Sediment concentrations: Maximum daily, 8,500 ppm June 23; minimum daily, less than 10 ppm on many days.
Sediment loads: Maximum daily, 360 tons June 23; minimum daily, less than 0.005 ton on many days.
EXTREMES, 1956-60.--Sediment loads: Maximum daily, 520 tons Apr. 24, 1958; minimum daily, less than 0.005 ton on many days during 1956 to 1960.
REMARKS.--Acidity determined to pH 7.0. Records of discharge for water year October 1959 to September 1960 given in WSP 1706. Flow affected by ice on Jan. 24, Feb. 13-16, 20-23, and Mar. 2-15.

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

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)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 6, 1959..	0.1		5.6	5.9	9.8					0	208				298	122	122	1.9	629	3.2	
Oct. 13.....	.1		--	--	--					0	341				508	--	--	3.5	978	3.0	
Oct. 20.....	.1		--	--	--					0	359				515	--	--	3.8	986	3.0	
Oct. 27.....	.3		--	--	--					0	234				320	--	--	2.5	709	3.1	
Nov. 2.....	.2		--	--	--					0	314				--	152	152	2.8	911	3.0	
Nov. 3.....	.1		10	18	14					0	318				457	158	158	2.8	907	3.0	
Nov. 10.....	.1		--	--	--					0	260				378	102	102	2.2	766	3.0	
Nov. 17.....	1.2		--	--	--					0	214				272	--	--	2.6	666	3.1	
Nov. 24.....	5.5		--	--	--					0	126				176	70	70	1.4	414	3.4	
Dec. 1.....	.8		7.0	2.5	1.8					0	162				237	113	113	1.6	490	3.4	
Dec. 8.....	.7		--	--	--					0	173				231	--	--	1.8	528	3.2	
Dec. 15.....	1.6		--	--	--					0	150				207	--	--	1.2	416	3.5	
Dec. 29.....	1.3		--	--	--					0	170				281	--	--	1.4	506	3.4	
Jan. 5, 1960..	1.5		2.1	2.2	4.7					0	120				206	103	103	.9	369	3.6	
Jan. 12.....	1.4		--	--	--					0	132				198	--	--	1.0	392	3.5	
Jan. 19.....	1.0		--	--	--					0	142				205	--	--	1.2	438	3.7	
Jan. 26.....	.4		--	--	--					0	206				295	--	--	1.5	554	3.5	
Feb. 2.....	.4		6.4	7.3	8.5					0	199				268	143	143	1.5	551	3.4	
Feb. 9.....	1.1		--	--	--					0	118				170	--	--	.9	346	3.4	
Feb. 16.....	1.1		--	--	--					0	140				--	--	--	1.0	411	3.6	
Mar. 1.....	1.9		3.2	6.4	4.0					0	97				138	67	67	.8	295	3.8	
Mar. 8.....	1.0		--	--	--					0	160				234	--	--	1.2	394	4.0	
Mar. 17.....	5.3		--	--	--					0	86				117	--	--	.8	265	3.6	
Mar. 22.....	1.9		--	--	--					0	104				162	--	--	.8	290	3.7	
Mar. 29.....	3.0		--	--	--					0	67				108	--	--	.5	215	3.8	
Apr. 5.....	2.0		6.2	8.4	6.3					0	142				193	78	78	1.3	417	3.3	
Apr. 12.....	.5		--	--	--					0	170				249	--	--	1.4	482	3.5	
Apr. 19.....	.3		--	--	--					0	228				336	--	--	1.6	650	3.3	

CUMBERLAND RIVER BASIN--Continued

3-4071. CANE BRANCH NEAR PARKERS LAKE, KY.--Continued

Chemical analyses, in parts per million, water year October 1959 to September 1960--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)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Apr. 26, 1960.	0.2		--	--	--					0	270				390	--	--	2.4	743	3.6	
May 3.....	.6		3.1	3.4	6.2					0	137				233	89	89	1.0	411	3.4	
May 10.....	1.6		--	--	--					0	88				135	--	--	.8	273	3.6	
May 17.....	.3		--	--	--					0	218				328	--	--	1.7	604	3.2	
May 24.....	.1		--	--	--					0	313				452	--	--	2.0	821	3.2	
May 31.....	.1		--	--	--					0	308				458	--	--	2.0	854	3.1	
June 7.....	.1		--	--	--					0	360				560	--	--	2.4	984	3.4	
June 14.....	.2		--	--	--					0	309				460	--	--	2.4	859	3.0	
June 21.....	.3		--	--	--					0	227				348	--	--	1.6	649	3.2	
June 28.....	8.6		--	--	--					0	134				189	--	--	1.4	396	3.4	
July 5.....	1.3		2.2	4.2	4.3					0	100				151	71	71	.8	326	3.6	
July 12.....	2.4		--	--	--					0	68				122	--	--	.5	224	3.8	
July 19.....	1.1		--	--	--					0	120				192	--	--	1.0	394	3.4	
July 26.....	.2		--	--	--					0	282				436	--	--	1.9	772	3.2	
Aug. 2.....	.2		5.7	7.2	15					0	317				462	224	224	2.1	848	3.1	
Aug. 9.....	.2		--	--	--					0	327				504	--	--	2.9	874	3.1	
Aug. 16.....	.1		--	--	--					0	326				513	--	--	2.4	879	3.2	
Aug. 23.....	.1		--	--	--					0	333				536	--	--	2.5	908	3.0	
Aug. 30.....	.1		--	--	--					0	335				505	--	--	2.6	931	3.0	
Sept. 6.....	.1		6.0	6.0	15					0	295				447	218	218	2.0	819	3.0	
Sept. 13.....	.1		--	--	--					0	318				504	--	--	2.7	914	2.9	
Sept. 20.....	.1		--	--	--					0	289				459	--	--	2.4	828	3.0	
Sept. 27.....	.1		--	--	--					0	246				378	--	--	1.8	704	3.2	

3-4071. CANE BRANCH NEAR PARKERS LAKE, KY.--Continued

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

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	61	65	63	--	--	--	55	53	--	--	--	--	--	49	--	--	55	54	47	--	47	--	49	--	--	--
November	--	--	40	--	55	--	--	--	--	46	--	--	42	46	--	45	42	--	--	--	--	--	45	50	42	42	45	40	--	--	--	--
December	35	41	40	37	--	38	35	--	--	--	42	46	42	39	40	--	--	48	40	--	40	36	--	--	--	--	--	--	49	42	--	--	--
January	--	--	38	--	37	--	--	37	39	42	--	45	50	47	46	--	39	44	36	34	--	--	--	--	--	34	33	--	--	--	--	--
February	--	35	--	--	40	42	--	--	40	47	39	35	--	--	--	33	42	--	--	--	--	--	--	--	39	36	36	38	33	--	--	--
March	33	--	--	--	33	--	--	31	--	--	--	--	--	--	--	--	40	38	--	--	--	35	44	--	34	--	--	--	45	46	43	--
April	43	--	50	44	44	--	--	44	--	--	--	48	--	--	--	--	--	--	45	--	--	--	--	--	--	57	54	--	--	--	--	--
May	--	--	46	--	--	--	54	48	48	48	--	--	--	--	--	--	58	--	--	--	--	--	--	56	--	65	58	--	--	--	56	--
June	--	--	--	--	--	--	56	--	--	--	--	64	--	64	--	65	60	--	--	--	60	--	62	65	63	--	67	63	68	64	--	--
July	64	67	68	--	63	--	--	--	--	65	65	62	--	--	--	--	--	66	65	--	--	--	65	--	--	65	--	--	--	--	--	--
August	--	66	--	--	--	--	--	--	68	73	--	--	67	--	--	64	--	--	--	--	--	66	65	--	--	--	--	--	--	65	--	--
September	--	--	--	--	--	65	--	--	--	--	63	--	57	--	--	--	61	--	--	61	--	--	--	--	--	--	58	--	60	--	--	--

CUMBERLAND RIVER BASIN--Continued

3-4071. CANE BRANCH NEAR PARKERS LAKE, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--Continued
(Where concentrations are not 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	0.08	--		T	0.2	--		0.01	0.96	17	A	0.04
2	.08	--		T	.16	--		.01	1.50	75	A	.4
3	.08	--		T	.15	12		T	1.59	20		.08
4	.08	--		T	.25	--		.01	1.20	7		.02
5	.10	--		T	1.1	--		.2	.91	7	B	.02
6	.14	10		T	.5	--		.01	1.33	60	A	.2
7	.10	11		T	.25	--		.01	.96	--		.04
8	.93	550	A	8.0	.17	--		.01	.86	15		.04
9	.29	120	A	.2	.14	--		.01	.86	17		.04
10	.13	--		T	.14	17		.01	.86	--		.04
11	.12	--		T	.14	--		T	1.45	279	S	1.83
12	.10	8		T	.14	--		T	7.2	729	S	13.7
13	.22	25		.01	.13	5		T	3.9	95	S	1.07
14	.34	83	S	.11	.31	19		.02	2.3	38		.24
15	.18	19		.01	.20	--		T	1.59	30		.13
16	.14	12	C	T	1.45	120	A	.8	1.20	25	B	.08
17	.13	12	C	T	1.11	22		.03	1.08	--		.08
18	.13	12	C	T	.59	--		.03	19.5	1900	A	100
19	.12	12	C	T	.42	--		.03	8.5	215	S	6.32
20	.10	12	C	T	.34	--		T	3.2	75	B	.6
21	.10	12	C	T	.29	--		T	2.10	29		.16
22	.10	12	C	T	.23	--		T	1.59	22		.09
23	.30	300	S	.80	2.6	590	S	8.36	1.26	--		.05
24	.79	140	A	1.0	4.4	230	A	3.5	1.02	--		.05
25	.74	80	A	.2	1.60	32		.14	.81	--		.05
26	.43	--		.1	.91	25		.06	.71	--		.05
27	.39	38		.04	3.0	300	A	2.4	.76	--		.05
28	.3	33	C	.03	3.2	93		.80	1.64	--		1.2
29	.2	33	C	.02	1.66	--		.2	1.20	40	C	.13
30	.2	33	C	.02	1.14	--		.07	1.14	40	C	.12
31	.25	33	C	.02	--	--		--	.96	40	C	.1
Total	7.410	--		10.60	26.92	--		16.75	74.14	--		126.98

Day	JANUARY				FEBRUARY				MARCH			
1	0.86	--		0.04	0.39	5		0.01	1.94	26		0.14
2	1.10	--		.9	.39	3		T	2.0	--		.12
3	2.3	--		.7	.36	--		T	2.0	--		.12
4	1.73	--		.10	.39	--		T	1.4	--		.09
5	1.53	14	A	.06	1.13	176	S	.86	1.1	24		.07
6	1.40	--		.08	1.47	42		.17	.9	--		.06
7	1.66	--		.09	1.33	--		.03	.8	--		.05
8	1.73	24	A	.11	1.20	--	A	.03	.7	18		.03
9	1.80	33	A	.16	1.08	7		.02	1.7	--		.10
10	1.66	20	A	.09	1.0	3300	A	180	1.1	--		.07
11	1.53	--		.09	5.1	1200	A	18	.8	--		.05
12	1.40	12	A	.05	2.6	--		6.4	.7	--		.04
13	1.94	70	A	.4	1.8	--		.10	.7	--		.04
14	1.98	190	S	1.08	1.3	--		.07	.7	--		.04
15	2.02	--		.5	1.1	--		.06	1.2	--		.8
16	1.66	17	B	.08	1.1	20		.06	7.7	--		25
17	1.47	12		.05	2.3	313	S	2.73	6.0	260	A	4.2
18	1.40	39		.15	5.2	--		5.8	4.0	151		1.63
19	1.08	13	A	.04	3.0	--		.4	3.0	60	B	.5
20	.86	7	A	.02	2.0	--		.1	2.4	--		.19
21	.71	--		.03	1.8	--		.1	2.02	--		.16
22	.59	--		.02	1.6	--		.1	2.18	29		.17
23	.54	--		.02	1.6	--		.1	2.5	--		.21
24	.52	--		.02	1.87	--		.1	3.0	--		.24
25	.48	--	A	.02	6.8	985	S	23.4	2.8	30		.20
26	.52	6	A	.01	5.4	253	S	4.40	2.8	--		.22
27	.71	32	A	.06	3.0	57		.46	3.5	--		.3
28	.55	--		.02	2.6	52		.36	4.2	--		.3
29	.48	--		.02	2.4	32		.21	3.3	29		.3
30	.45	--		.02	--	--		--	5.1	280	A	4.8
31	.42	--		.02	--	--		--	3.0	48		.39
Total	37.08	--		49.70	70.31	--		244.16	75.24	--		40.76

S Computed by subdividing day.
T Less than 0.005 ton.
A Computed from partly estimated-concentration graph
B Computed from estimated-concentration graph
C Composite period.

CUMBERLAND RIVER BASIN--Continued

3-4071. CANE BRANCH NEAR PARKERS LAKE, KY.--Continued

Suspended sediment, water year October 1959 to September 1960--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	2.4	22		0.14	1.0	2 --		1.4	0.10	11		T
2	1.8	20	B	.1	.67	--		.1	.15	--		0.01
3	1.73	21		.10	.55	C 28		.04	.12	--		T
4	1.53	28		.12	.48	C 28		.04	.10	--		T
5	1.59	270	A	1.5	.39	C 28		.01	.10	--		T
6	1.40	55	B	.2	.34	C 28		.01	.10	--		T
7	1.20	--		.05	17.0	2940	S	214	.08	4		T
8	.96	16		.04	5.1	194	S	3.20	.08	--		T
9	.81	--		.03	2.4	68		.44	.08	--		T
10	.63	--		.02	1.47	C 7		.03	.08	--		T
11	.55	--		.02	1.08	C 7		.02	.34	900	A	6.1
12	.52	8		.01	.81	C 7		.02	1.95	--		61 1
13	.45	--		.02	.67	C 7		.01	.21	35	B	.02
14	.42	--		.02	.52	C 7		.01	.16	20	A	.01
15	.39	--		.02	.42	C 7		.01	.12	14		T
16	.36	--		.01	.34	C 7		.01	.24	410	A	1.0
17	.39	--		.01	.29	C 7		.01	9.8	2200	A	130
18	.39	--		.01	.25	C 7		.01	1.28	65	B	.2
19	.31	18		.02	.20	C 7		.01	.52	C 11		.03
20	.29	--		.01	.18	C 11		T	.31	C 11		.03
21	.31	--		.01	.16	C 11		T	.29	C 11	A	.03
22	.29	--		.01	.14	C 11		T	.37	1400	A	16
23	.25	--		.01	.13	C 11		T	15.5	8500	A	360
24	.23	--		.01	.16	C 11		T	4.0	130	S	1.62
25	.23	7		T	.14	15	B	.01	1.89	35	A	.20
26	.68	220	A	.7	.31	1820	S	5.33	1.00	25	B	.1
27	.88	79	S	.22	.72	1720	S	6.37	1.88	965	S	25.9
28	.52	18	B	.02	.23	--		.02	6.4	653		11.3
29	.45	18	B	.02	.18	--		.02	3.6	99	S	1.04
30	.96	--		8.0	.13	--		.02	2.5	347	S	5.76
31	--	--		--	.12	13		T	--	--		--
Total	22.92	--		11.48	36.60	--		231.22	53.35	--		620.37

Day	JULY				AUGUST				SEPTEMBER			
1	2.4	--		9.2	0.15	C 6		T	0.08	C 6		T
2	1.89	--		.2	.13	C 6		T	.08	C 6		T
3	2.5	1120	S	18.5	.13	C 6		T	.08	C 6		T
4	1.98	100	B	.6	.15	C 6		T	.08	C 6		T
5	1.06	C 16		.05	.15	C 6		T	.08	C 6		T
6	.63	C 16		.03	.12	C 6		T	.08	C 6		T
7	.42	C 16		.02	.13	C 6		T	.08	C 6		T
8	.32	C 16		.01	.15	C 6		T	.06	C 6		T
9	.28	C 16		.01	.18	24		0.01	.05	C 6		T
10	25.0	3790	S	271	.79	1800	A	31	.25	--		0.5
11	5.7	332	S	7.96	.20	19	B	.01	.32	350	A	.6
12	2.07	43		.24	.15	12		T	.11	19	B	.01
13	1.12	--		.04	.16	--		.03	.08	C 8		T
14	.67	--		.04	.15	13	B	.01	.08	C 8		T
15	.45	--		.04	.13	C 10		T	.08	C 8		T
16	.34	--		.04	.12	C 10		T	.09	C 8		T
17	.32	--		.04	.11	C 10		T	.66	350	A	.9
18	.42	78	S	.12	.11	C 10		T	.15	--		.02
19	1.75	1600	A	37	.11	C 10		T	.11	--		.01
20	.34	--		.03	.11	C 10		T	.09	C 2		T
21	.28	--		.02	.10	C 10		T	.08	C 2		T
22	.22	--		.02	.13	15		.01	.08	C 2		T
23	.34	40		.04	.20	279	S	.50	.08	C 2		T
24	.26	--		.02	.10	55	B	.01	.08	C 2		T
25	.20	--		.01	.09	--		T	.06	C 2		T
26	.22	15		.01	.09	--		T	.06	C 2		T
27	.20	--		.01	.08	--		T	.08	C 2		T
28	.17	--		T	.10	--		.01	.08	C 2		T
29	.17	--		T	.10	--		.01	.20	--		.02
30	.17	--		T	.09	15		T	.09	16		T
31	.16	--		T	.08	--		T	--	--		--
Total	52.05	--		345.25	4.57	--		31.65	3.53	--		2.08

Total discharge for year (cfs-days)..... 530.81
Total load for year (tons)..... 1,731.00

S Computed by subdividing day.
B Computed from estaimate-concentration graph.
T Less than 0.005 ton.
C Composite period.
A Computed from partly estimated-concentration graph.

CUMBERLAND RIVER BASIN--Continued

3-4071. CANE BRANCH NEAR PARKERS LAKE, KY.--Continued

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

Date of collection	Time (24 hour)	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. 8, 1959.....	1620			1.3	2530		59	69	82	90	92	93	94	96	99	100		SBWC
Oct. 23.....	1100			3.0	1930		61	74	87	96	99	99	100	--	--			SBWC
Oct. 23.....	1100			3.0	1930		7	10	17	53	--	99	100	--	--			SBN
Nov. 23.....	1355			2.6	1770		69	83	93	99	99	100	--	--	--			SBWC
Dec. 18.....	1120			34	6100		32	38	46	55	66	77	94	99	100			SBWC
Dec. 18.....	1120			34	6100		2	3	4	24	59	73	94	99	100			SBN
May 7, 1960.....	0715			3.2	894		68	77	84	89	93	96	98	100	--			SBWC
May 7.....	1130			19.5	7790		26	35	45	57	68	78	92	97	100			SBWC
May 7.....	1130			19.5	7790		1	1	2	20	71	77	93	98	100			SBN
May 7.....	1700			34	3020		16	21	29	37	48	57	76	93	100			SBWC
May 26.....	1630			.3	4400		54	64	78	93	97	99	100	--	--			SBWC
June 16.....	1800			.4	825		71	85	96	99	99	99	100	--	--			SBWC

3-4072. WEST FORK CANE BRANCH NEAR PARKERS LAKE, KY.

LOCATION.--At gaging station, 2,900 feet upstream from mouth and 2.2 miles northeast of Parkers Lake, McCreary County.
DRAINAGE AREA.--0.26 square mile, approximately.
RECORDS AVAILABLE.--Chemical analyses: July 1956 to September 1959, March to May 1960 (periodic).
Water temperatures: October 1958 to September 1959, February to May 1960.
Sediment records: July 1956 to September 1959 (unpublished), February to May 1960.
REMARKS.--Discharge records for this station are unpuhlished. Published and unpublished records are on file in districe office at Columbus, Ohio.

Chemical analyses, in parts per million, March to May 1960

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)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Mar. 1, 1960..	0.7		--	0.15	0.14					4	13				--	5			23	6.1	
Mar. 8.....	.2		--	--	--					--	4.0				16	5			21	6.5	
Mar. 17.....	1.9		--	--	--					--	5.6				8	5			22	6.7	
Mar. 22.....	1.9		--	--	--					--	5.6				12	5			18	6.7	
Mar. 29.....	1.0		--	--	--					--	6.8				20	5			19	6.0	
Apr. 5.....	.5		0.1	.21	.05					8	4.4				16	5			23	6.8	
Apr. 12.....	.2		--	--	--					--	5.6				13	6			22	7.6	
Apr. 19.....	.2		--	--	--					--	5.6				19	6			26	6.8	
Apr. 26.....	.1		--	--	--					--	4.8				34	7			21	6.9	
May 3.....	.2		.1	.12	.08					8	6.8				34	6			23	6.8	
May 10.....	.5		--	--	--					--	4.6				23	6			19	6.2	
May 17.....	.1		--	--	--					--	4.8				26	7			24	6.7	

CUMBERLAND RIVER BASIN--Continued

3-4072. WEST FORK CANE BRANCH NEAR PARKERS LAKE, KY.--Continued

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

Date of collection	Time (24 hour)	Water temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Percent finer than size indicated, in millimeters										Method of analysis
Feb. 25, 1960.....	1200	41		1.86	2	0.01											
Feb. 25.....	1420	41		2.82	11	.08											
Feb. 26.....	0930	37		2.10	2	.01											
Feb. 26.....	1030	37		2.10	2	.01											
Feb. 27.....	0945	32		1.19	2	.01											
Feb. 27.....	1045	32		1.19	3	.01											
Feb. 27.....	1600	40		1.19	2	.01											
Feb. 27.....	1725	40		1.19	4	.01											
Feb. 28.....	1130	39		.70	4	.01											
Feb. 28.....	1245	39		.70	1	t											
Feb. 29.....	1130	34		.70	1	t											
Mar. 1.....	0940	35		.70	4	.01											
Mar. 5.....	1230	34		.32	21	.02											
Mar. 8.....	1100	32		.25	6	t											
Mar. 17.....	1200	40		1.86	2	.01											
Mar. 17.....	1300	40		2.10	2	.01											
Mar. 17.....	1530	40		2.34	3	.02											
Mar. 18.....	1100	39		1.62	2	.01											
Mar. 18.....	1400	39		1.62	2	.01											
Mar. 22.....	0940	36		1.86	2	.01											
Mar. 23.....	1400	45		1.02	6	.02											
Mar. 23.....	1500	45		1.10	2	.01											
Mar. 25.....	1130	36		1.38	1	t											
Mar. 29.....	1000	45		1.02	2	.01											
Mar. 30.....	0800	46		2.58	42	.29											
Mar. 30.....	0900	46		2.58	43	.30											
Mar. 30.....	1115	49		2.58	36	.25											
Mar. 30.....	1215	49		2.82	175	1.33											
Mar. 30.....	1400	50		2.34	16	.10											
Mar. 30.....	1520	50		2.10	18	.10											

Mar. 31, 1960......	0900	43		1.38	6	.02												
Apr. 1............	0920	44		1.02	4	.01												
Apr. 3............	1330	49		.54	4	.01												
Apr. 4............	2035	44		.32	4	t												
Apr. 5............	1000	43		.54	6	.01												
Apr. 8............	1040	46		.39	2	t												
Apr. 12...........	0915	47		.16	5	t												
Apr. 19...........	0915	44		.16	7	t												
Apr. 26...........	0830	57		.09	12	t												
Apr. 26...........	1430	60		.25	28	.02												
Apr. 26...........	1600	60		.25	30	.02												
Apr. 26...........	1830	59		.25	18	.01												
Apr. 26...........	2000	59		.39	38	.04												
Apr. 27...........	0800	54		.39	10	.01												
Apr. 27...........	0900	54		.54	13	.02												
Apr. 27...........	1300	56		.39	8	.01												
May 3.............	0830	49		.25	6	t												
May 7.............	0600	54		.25	22	.01												
May 7.............	1930	55		.70	98	.18												
May 7.............	0915	55		3.38	425	3.88												
May 7.............	1145	55		12	786	25.5												
May 7.............	1300	52		30	1220	98.8												
May 7.............	1445	52		30	254	20.6												
May 7.............	1545	52		29	198	15.5												
May 8.............	0930	50		2.10	10	.06												
May 8.............	1120	50		1.86	11	.06												
May 9.............	1200	48		1.02	8	.02												
May 10............	0830	48		.54	4	.01												
May 17............	0945	56		.05	6	t												

t Less than 0.005 ton.

CUMBERLAND RIVER BASIN--Continued

3-4141.1. CUMBERLAND RIVER NEAR BURKESVILLE, KY.

LOCATION.--At Neelys Ferry on State Highway 61, 0.5 mile downstream from Raft Creek, 3.2 miles south of Burkesville, Cumberland County, and about 37 miles downstream from gaging station near Rowena.
DRAINAGE AREA.--6,050 square miles.
RECORDS AVAILABLE.--Chemical analyses: January 1952 to September 1954.
Water temperatures: October 1949 to September 1951 (at Burkesville), January 1952 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 63°F Sept. 28, 30; minimum, 40°F on several days during March.
EXTREMES, 1949-60.--Water temperatures: Maximum, 84°F July 30, 1956; minimum, 34°F Feb. 2-4, 1951, Jan. 22, 1956.
REMARKS.--No discharge records available.

Temperature (°F) of water, water year October 1959 to September 1960
(Twice-daily measurements made at approximately 7 a.m. and 3 p.m.)

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																																
a.m.	55	57	57	56	56	56	56	56	56	57	56	56	55	54	54	54	54	54	54	55	55	55	55	56	55	55	54	54	55	55	55	55
p.m.	56	57	58	56	57	56	57	57	57	58	56	56	55	55	55	54	54	54	55	56	56	56	56	56	56	55	53	55	55	55	55	56
November																																
a.m.	55	55	55	55	55	54	53	54	54	54	55	55	54	53	53	54	53	52	51	51	52	52	52	52	51	51	51	50	50	50	--	53
p.m.	55	55	56	56	55	54	54	54	54	55	54	55	55	53	54	54	53	52	52	52	52	52	53	52	52	52	51	50	50	50	--	53
December																																
a.m.	50	49	49	48	48	49	47	47	47	48	48	48	48	48	49	48	47	47	47	48	47	47	47	48	48	47	47	47	47	47	47	48
p.m.	51	50	50	49	48	48	48	47	48	48	49	49	48	49	49	48	48	48	48	48	48	48	47	48	47	47	48	48	48	47	47	48
January																																
a.m.	47	47	47	47	46	46	46	47	47	47	47	48	47	47	46	44	44	44	44	44	44	44	44	44	43	43	43	43	43	43	44	45
p.m.	48	48	48	47	47	46	46	47	48	48	48	48	48	47	46	45	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	46
February																																
a.m.	44	43	43	44	44	43	44	45	46	47	47	46	46	46	46	46	45	45	45	45	44	44	43	43	43	42	42	42	41	--	--	44
p.m.	44	44	44	44	44	44	45	46	47	48	47	47	46	46	47	46	46	46	45	45	44	44	44	44	43	43	43	42	42	--	--	45
March																																
a.m.	41	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	41	41	41	41	41	42	43	43	43	43	41
p.m.	41	41	41	40	40	40	40	40	41	40	41	41	41	41	41	41	41	41	41	41	41	42	42	42	42	42	43	43	43	43	43	41
April																																
a.m.	43	43	42	42	42	42	42	42	43	43	43	43	44	44	44	45	46	45	45	45	45	45	46	46	46	46	45	45	45	45	--	44
p.m.	43	43	43	43	43	43	42	43	43	43	44	44	45	45	45	46	46	46	46	46	46	46	46	46	46	46	46	46	45	45	--	45
May																																
a.m.	45	45	45	45	45	45	45	45	45	45	45	46	46	47	47	48	47	47	47	47	48	48	48	47	47	47	47	47	46	46	47	46
p.m.	45	45	45	45	45	45	45	45	45	45	45	46	47	47	48	48	48	48	48	48	48	49	48	48	46	46	46	46	45	46	46	47
June																																
a.m.	47	47	47	48	48	49	47	47	50	54	55	55	57	56	56	56	57	58	59	59	59	58	57	56	48	49	49	49	46	46	46	52
p.m.	48	48	48	48	49	48	48	48	52	55	55	56	57	57	57	57	58	59	60	59	59	59	58	56	49	49	49	49	48	48	--	53
July																																
a.m.	48	48	48	48	48	48	48	49	49	49	49	49	50	51	51	52	52	53	52	52	52	52	52	52	53	53	53	53	53	54	54	51
p.m.	48	49	49	49	49	49	49	49	50	50	50	51	51	51	52	53	53	53	52	52	52	52	53	53	54	54	54	54	54	54	54	51
August																																
a.m.	54	55	55	55	55	55	55	55	55	55	55	55	55	55	56	55	55	55	55	55	55	56	57	57	57	57	57	58	59	58	58	56
p.m.	55	55	55	55	55	55	55	55	55	55	55	55	55	55	56	55	55	55	55	55	56	57	58	58	58	58	58	59	59	59	59	56
September																																
a.m.	58	58	58	60	60	58	58	58	58	58	58	60	58	58	58	58	58	58	60	59	58	58	58	58	58	60	61	62	62	63	--	59
p.m.	59	58	59	61	61	59	58	58	58	59	59	61	58	59	59	58	59	59	60	59	59	59	59	59	59	61	62	63	63	63	--	60

3-4380.1. LITTLE RIVER ABOVE CADIZ, KY.

LOCATION.--At bridge on State Highway 272, 0.8 mile upstream from Sinking Fork, 3.7 miles southeast of Cadiz, Trigg County, and 10.5 miles downstream from gaging station and Casey Creek.
DRAINAGE AREA.--244 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1959 to September 1960.
REMARKS.--No discharge records available for this station.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
Oct. 17, 1959.		8.8		0.14	0.14	65	5.7	6.2	1.3	220	12	8.0	0.2	6.2	221	186	6		386	7.6	4
Nov. 20.....		8.0		.19	.00	65	7.5	7.4	2.6	223	13	8.0	.2	6.2	225	193	10		406	7.4	4
Dec. 18.....		8.3		.30	--	42	3.5	2.5	1.6	133	11	4.0	.3	5.4	147	120	10		243	7.4	10
Jan. 22, 1960.		8.7		.00	--	56	2.7	3.3	1.1	168	13	4.0	.2	7.0	177	151	13		304	7.6	6
Feb. 20.....		10		.08	.00	67	1.4	5.5	1.3	196	12	4.0	.2	6.8	216	173	12		335	7.6	7
Mar. 14.....		4.7		.12	.11	54	5.9	3.8	.5	174	11	6.0	.1	5.0	224	159	16		327	7.6	2
Apr. 13.....		5.4		.08	.55	56	5.2	3.1	1.2	184	7.8	6.0	.1	5.8	179	161	10		315	7.1	1
June 30.....		6.8		2.0	.22	30	2.3	3.0	2.8	84	12	3.0	.4	5.8	118	84	16		180	6.6	10
July 22.....		9.4		.16	.28	54	5.6	1.9	1.4	180	8.0	3.5	.2	5.5	180	158	10		309	7.1	1
Aug. 19.....		8.6		.19	.06	56	6.2	2.8	2.5	188	9.2	3.0	.4	3.9	201	165	11		330	6.9	4
Sept. 21.....		9.0		.11	.01	58	5.7	4.8	2.3	202	8.0	5.0	.2	3.1	198	168	2		340	7.0	2

Date of collection	Dissolved oxygen		Phenols as C_6H_5OH	Turbidity
	Parts per million	Percent saturation		
Oct. 17, 1959.....	8.1	79	0.001	8
Feb. 20, 1960.....	12	96	.000	6
June 30.....	6.4	71	.000	35
Sept. 21.....	7.7	83	.002	45

3-4385. CUMBERLAND RIVER AT SMITHLAND, KY.

LOCATION.--At gaging station at bridge on U.S. Highway 60 at Smithland, Livingston County, 1 mile downstream from McCormick Creek, and 2.8 miles upstream from mouth.
DRAINAGE AREA.--17,913 square miles, of which 355 square miles in Kentucky are noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1949 to September 1950, October 1956 to September 1960.
Water temperatures: October 1949 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 253 ppm Sept. 8-13; minimum, 91 ppm Aug. 1-31.
Hardness: Maximum, 161 ppm Sept. 8-13; minimum, 66 ppm Aug. 1-31.
Specific conductance: Maximum daily, 416 micromhos Sept. 10; minimum daily, 149 micromhos Aug. 14-15, 18-20, 22.
Water temperatures: Maximum, 79°F on several days in August and September; minimum, 38°F Mar. 4, 6, 7, 9, 12.
EXTREMES, 1949-60.--Dissolved solids (1949-50, 1956-60): Maximum, 253 ppm Sept. 8-13, 1960; minimum, 77 ppm Feb. 11-20, 1950.
Hardness (1949-50, 1956-60): Maximum, 161 ppm Sept. 8-13, 1960; minimum, 53 ppm Feb. 11-20, 1950.
Specific conductance (1949-50, 1956-60): Maximum daily, 416 micromhos Sept. 10, 1960; minimum daily, 112 micromhos Feb. 13, 1950.
Water temperatures: Maximum, 90°F Aug. 3, 1955; minimum, 34°F on several days during February 1951 and February 1958.
REMARKS.--Records of specific conductance and pH of daily samples are available in district office at Columbus, Ohio. Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
Oct.1-20,23-31, 1959..	11710	7.0				27	4.2	5.2	1.1		86		22	5.0	0.2	1.8	0.40	118	84	13		201	7.4	4	0.0
Nov. 1-30...	20420	8.0				26	5.1	4.0	1.2		84		22	4.0	.2	1.7	.28	118	86	17		197	7.1	4	.0
Dec. 1-7....	28060	8.2				33	3.8	3.7	1.0		102		18	3.0	.1	2.7	.35	129	98	14		213	7.0	4	.0
Dec. 8.....	20600	70				38	6.2	11	1.5		150			3.0	--	.9	.21	230	121	0		262	8.2	--	--
Dec. 9-31...	49800	9.6				33	4.0	2.7	1.0		103		16	2.5	.1	3.0	.35	128	99	15		212	7.2	5	.0
Jan. 1-31, 1960..	45590	6.7				32	3.5	3.7	.9		98		18	3.0	.1	2.5	.15	120	94	14		204	7.1	4	.0
Feb. 1-29...	36920	6.9				35	3.9	3.4	1.1		110		17	3.0	.2	3.4	.30	130	104	14		223	--	5	.0
Mar. 1-29,31	50460	7.7				31	4.3	2.7	.7		96		14	4.5	.1	3.1	.09	124	95	16		206	--	1	.0

Apr. 1-30, 1960..	35760	5.6				28	4.6	3.1	.8		89		17	3.0	.2	2.8	.25	120	89	16		197	--	5	.0
May 1-31....	18620	7.0				26	3.6	3.5	1.0		80		17	5.0	.2	2.1	.20	108	80	14		186	--	5	.0
June 1-30...	17700	4.8				25	3.6	3.5	1.1		76		17	3.5	.2	2.1	.49	110	78	16		175	--	8	.0
July 1-31...	27380	6.6				24	4.2	3.8	1.3		76		18	3.0	.2	2.4	.30	98	77	15		168	--	4	.0
Aug. 1-31...	18560	6.1				21	3.2	4.7	1.1		62		21	2.0	.3	1.5	.25	91	66	15		155	--	3	.0
Sept. 1-7, 14-30.....	16530	8.4				22	3.8	3.8	1.1		69		19	3.0	.2	2.1	.48	105	70	13		167	--	5	.0
Sept. 8-13..	9561	6.2				43	13	19	2.5		122		63	25	.4	2.5	.16	253	161	61		406	--	7	.1
Weighted average.	--	7.3				29	4.1	3.6	1.0		91		18	3.5	0.2	2.6	0.26	118	89	15		198	--	4	--
Time-weighted average a	28570	7.1				28	4.2	4	1.1		87		19	3.8	0.2	2.4	0.28	117	87	16		195	--	4	--
Tons per day.....	--	560				2240	314	275	77		6990		1370	269	13	199	20	9120	--	--		--	--	--	--

a Represents 99 percent of days and 100 percent of runoff.

CUMBERLAND RIVER BASIN--Continued

3-4385. CUMBERLAND RIVER AT SMITHLAND, KY.--Continued

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

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

TENNESSEE RIVER BASIN

3-4390. FRENCH BROAD RIVER AT ROSMAN, N. C.

LOCATION.--At bridge on U.S. Highway 178 at Rosman, Transylvania County, 1.0 mile upstream from East Fork.
DRAINAGE AREA.--67.9 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1957 to September 1960.
REMARKS.--Records of discharge for water year October 1957 to September 1960 given in WSP 1706.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 13, 1959	353	7.4	0.02	1.7	0.1	1.2	0.4	8	0.5	0.5	0.1	0.1	19	5	0	15	6.6	10
Nov. 16	194	8.3	.04	1.8	1.1	1.1	.7	12	.3	1.0	.1	.3	21	9	0	17	6.4	15
Dec. 9	169	8.3	.01	1.3	.2	1.3	.5	7	1.2	.5	.0	.2	23	4	0	15	6.2	5
Jan. 8, 1960	316	11	.00	.7	.6	1.2	.4	7	1.7	1.2	.0	.1	28	4	0	15	6.3	5
Feb. 4	289	7.5	.00	2.0	.1	1.1	.5	7	1.5	1.3	.0	.3	18	6	0	17	6.6	5
Mar. 8	256	8.1	.01	1.8	.4	1.0	.4	6	1.4	1.4	.0	.3	a18	6	1	15	6.4	5
Apr. 20	277	7.7	.01	1.6	.3	.9	.3	7	1.6	.7	.0	.0	16	5	0	16	6.4	12
May 4	213	8.2	.01	1.4	.1	1.0	.3	7	1.4	.5	.0	.0	a16	4	0	14	6.8	7
June 2	147	8.5	.02	1.6	.2	1.3	.5	10	.2	1.0	.2	.1	21	5	0	17	6.5	12
July 5	119	8.9	.01	1.4	.2	1.2	.5	7	.4	1.3	.0	.2	21	4	0	15	6.4	5
Aug. 2	117	8.3	.01	1.8	.2	1.6	.8	10	1.6	1.2	.0	.2	21	6	0	21	6.2	10
Sept. 7	147	8.7	.00	1.4	.5	1.4	.6	8	.8	.7	.0	.2	25	6	0	20	6.4	10

a Calculated from determined constituents.

TENNESSEE RIVER BASIN--Continued

3-4414.82. LITTLE RIVER NEAR CEDAR MOUNTAIN, N. C.

LOCATION.--Approximately 5 miles northeast of Cedar Mountain, Transylvania County, and 200 yards downstream from Grassy Creek about halfway between High Falls and Triple Falls on Little River.
DRAINAGE AREA.--33.0 square miles.
RECORDS AVAILABLE.--Chemical analyses: February 1957 to August 1960.
REMARKS.--Records of suspended matter, Aluminum (Al), Manganese (Mn), Zinc (Zn), Ammonium (NH_4), Nitrite (NO_2), Phosphate (PO_4), available in district office at Raleigh, N.C. No discharge records available for this station.

Chemical analysis, in parts per million, October 1959 to August 1960

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 19, 1959.....		8.2	0.07	1.0	0.6	1.0	0.4	6	0.2	1.0	0.0	0.1	16	5	0	13	6.4	5
Dec. 23.....		8.3	.07	1.4	.1	.9	.3	5	.2	1.7	.0	.0	15	5	0	15	6.5	5
Mar. 23, 1960.....		9.3	.02	1.8	.3	.9	.4	5	.3	1.5	.0	.4	a17	6	2	16	6.7	5
Apr. 14.....		7.6	.01	1.0	.3	1.2	.4	6	.7	2.0	.0	.5	a17	4	0	14	6.6	5
June 15.....		10	.03	2.8	.3	1.2	.2	7	.2	3.7	.0	.2	a22	8	3	26	6.6	5
Aug. 15.....		7.1	.02	1.4	.1	.9	.2	5	.3	.5	.0	.4	17	4	0	14	6.5	10

a Calculated from determined constituents.

3-4430. FRENCH BROAD RIVER AT BLANTYRE, N. C.

LOCATION.--At highway bridge, 700 feet east of Blantyre Railroad station, Transylvania County, 3.5 miles downstream from Little River.
DRAINAGE AREA.--296 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1952 to September 1953, October 1957 to September 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 15, 1959	2,500	8.0	0.04	3.0	0.5	6.8	0.7	14	7.9	2.0	0.1	0.6	38	10	0	52	6.4	25
Nov. 17	890	9.5	.10	2.9	.7	12	.9	18	19	3.2	.1	.6	61	10	0	96	6.2	30
Dec. 10	758	9.3	.06	3.7	.4	16	1.0	19	24	4.5	.0	.0	78	11	0	112	6.2	25
Jan. 12, 1960	1,080	8.3	.03	2.7	.4	12	.7	14	18	3.0	.1	.2	57	8	0	80	6.2	10
Feb. 8	2,020	25	.02	2.9	.2	7.4	.7	10	10	3.5	.1	.3	73	8	0	57	6.5	10
Mar. 8	1,160	8.1	.03	3.4	.4	9.5	.6	10	16	3.6	.0	.4	48	10	2	73	6.3	5
Apr. 11	1,710	7.8	.01	2.4	.1	8.7	.7	11	12	2.5	.2	.2	46	6	0	61	6.3	20
May 4	931	8.6	.03	3.7	.2	13	.6	15	24	3.3	.1	.1	64	10	0	96	6.1	22
June 2	613	9.7	.05	4.4	.9	21	.6	21	38	3.9	.1	.4	91	14	0	138	6.2	20
July 5	588	9.4	.01	5.9	1.5	15	.8	17	35	2.7	.0	.0	78	21	7	120	6.4	5
Aug. 2	485	9.8	.06	5.3	.4	31	1.5	29	40	11	.1	1.0	128	14	0	190	6.5	60
Sept. 7	549	9.9	.04	4.0	.6	24	1.1	22	36	5.5	.1	.6	100	12	0	150	6.4	30

TENNESSEE RIVER BASIN--Continued

3-4480. FRENCH BROAD RIVER AT BENT CREEK, N. C.

LOCATION.--At gaging station, 50 feet downstream from Bent Creek, 6.2 miles upstream from Hominy Creek, 6.7 miles south of Asheville, Buncombe County.
DRAINAGE AREA.--676 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1957 to September 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 15, 1959	4,800	7.9	0.05	3.1	1.1	4.1	1.0	13	8.7	1.8	0.1	0.5	37	12	2	45	6.4	20
Nov. 25	2,120	8.9	.05	3.0	.4	5.2	1.2	14	6.1	3.0	.1	.5	41	9	0	59	6.2	20
Dec. 16	1,520	9.4	.01	1.6	1.0	4.6	.7	12	5.7	1.5	.1	.2	33	8	0	41	6.3	10
Jan. 15, 1960	1,680	9.0	.02	2.1	.5	5.1	.7	13	5.4	2.0	.1	.1	32	7	0	41	6.5	5
Feb. 17	2,900	9.1	.01	1.0	.7	2.1	.7	8	.9	2.2	.1	.3	22	6	0	23	6.3	10
Mar. 18	3,280	7.7	.01	2.6	.9	2.8	.7	10	5.5	2.0	.0	.4	a28	10	2	36	6.3	5
Apr. 18	2,240	8.3	.02	1.8	.1	2.2	.4	10	3.1	.5	.0	.0	a21	5	0	26	6.3	12
May 10	2,150	8.8	.01	1.6	1.1	2.4	.4	11	4.0	.5	.0	.0	a24	8	0	30	6.4	5
June 9	1,360	9.3	.00	2.2	.4	3.9	.8	13	3.5	1.5	.0	.3	31	8	0	38	6.8	5
July 12	1,090	10	.07	2.4	.7	4.8	.6	14	8.8	1.0	.0	.1	35	9	0	46	6.4	15
Aug. 8	960	10	.03	5.3	.5	15	1.2	21	24	5.5	.1	.4	77	15	0	120	6.4	30
Sept. 19	1,220	9.2	.00	2.4	.7	5.4	.8	13	9.4	1.2	.0	.7	36	9	0	43	6.3	10

a Calculated from determined constituents.

3-4515. FRENCH BROAD RIVER AT ASHEVILLE, N. C.

LOCATION.--At gaging station at downstream side of Pearson Bridge at Asheville, Buncombe County, 2.3 miles downstream from Southern Railway station, 3.2 miles downstream from Swannanoa River.
DRAINAGE AREA.--945 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1951, October 1956 to September 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 16, 1959	4,190	8.9	0.02	3.3	1.1	5.0	1.4	14	6.7	3.2	0.1	1.4	44	13	1	63	6.1	15
Nov. 25	2,540	9.1	.04	3.1	1.0	12	1.7	16	13	7.0	.1	1.0	57	12	0	96	6.0	45
Dec. 16	1,790	10	.01	3.4	.5	15	1.3	26	13	4.5	.1	.9	68	10	0	92	7.0	5
Jan. 15, 1960	2,000	10	.01	3.2	.6	16	1.4	22	14	7.7	.1	1.4	71	11	0	109	6.8	5
Feb. 17	3,440	9.4	.01	2.4	1.0	9.4	1.1	20	8.1	3.3	.1	1.3	47	10	0	72	6.2	5
Mar. 15	2,460	10	.02	3.2	1.2	8.1	1.0	15	9.9	5.0	.0	.7	49	13	1	70	6.2	5
Apr. 18	2,790	9.3	.01	2.7	.4	7.6	.8	15	8.5	2.7	.1	.5	44	8	0	61	6.7	13
May 10	2,570	9.1	.01	3.0	.3	7.4	1.0	14	7.6	3.0	.2	1.2	45	9	0	61	6.5	15
June 9	1,640	11	.04	4.2	1.1	19	1.4	29	21	9.3	.0	2.0	85	15	0	130	6.2	15
July 12	1,350	11	.04	3.6	1.2	15	1.5	29	14	4.3	.1	1.3	73	14	0	112	6.3	15
Aug. 8	1,170	11	.01	4.7	.9	13	1.7	19	21	4.5	.0	1.6	73	16	0	110	6.0	10
Sept. 19	1,410	10	.00	4.5	.7	12	1.6	15	19	4.8	.1	3.1	63	14	2	94	6.1	10

3-4535. FRENCH BROAD RIVER AT MARSHALL, N. C.

LOCATION.--At gaging station on right bank, 0.7 mile upstream from Hayes Creek, 1.0 mile downstream from Ivy River, and 1.5 miles southeast of Marshall, Madison County.
DRAINAGE AREA.--1,332 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1956 to September 1960.
Water temperatures: October 1957 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 135 ppm Aug. 1-12; minimum, 42 ppm Mar. 28-31.
Hardness: Maximum, 19 ppm July 1-20; minimum, 12 ppm Nov. 1-3, Mar. 28-31.
Specific conductance: Maximum daily, 158 micromhos July 23; minimum daily, 39 micromhos Mar. 31.
Water temperatures: Maximum, 79°F June 18, July 11, Aug. 6, 7; minimum, freezing point on several days during December, January, February, and March.
EXTREMES, 1957-60.--Dissolved solids: Maximum, 135 ppm Aug. 1-12, 1960; minimum, 42 ppm Apr. 11-20, 1958, Mar. 28-31, 1960.
Hardness: Maximum, 26 ppm Oct. 12, 1957; minimum, 12 ppm Apr. 11-20, 1958, June 11-20, Nov. 1-3, 1959, Mar. 28-31, 1960.
Specific conductance: Maximum daily, 219 micromhos Oct. 12, 1957; minimum daily, 39 micromhos Mar. 31, 1960.
Water temperatures: Maximum, 79°F June 18, July 11, Aug. 6, 7, 1960; minimum, freezing point on many days during winter months.
REMARKS.--Records of suspended matter of composite samples and records of specific conductance of samples collected from October 1957 to September 1960 available in district office at Raleigh, N. C. Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 1-10, 1959	4,087	11	0.03	3.3	1.6	7.7	1.7	17	12	2.0	0.2	0.9	62	15	1	76	7.0	10
Oct. 11-20	5,502	10	.01	2.3	1.8	6.2	1.4	16	8.8	1.5	.0	1.8	52	13	0	63	7.1	10
Oct. 21-31	3,045	11	.01	3.0	1.3	8.9	1.1	16	16	1.0	.1	1.3	54	13	0	76	7.1	10
Nov. 1-3	3,137	10	.06	3.2	.9	7.1	1.1	14	8.6	2.5	.0	1.4	47	12	0	63	7.0	10
Nov. 4-30	2,145	12	.05	3.8	1.3	11	1.2	19	19	2.5	.2	1.2	65	15	0	90	7.4	10
Dec. 1-31	2,472	12	.02	3.6	1.4	9.6	1.2	19	13	2.5	.2	1.6	69	15	0	84	7.3	10
Jan. 1-10, 1960	3,362	11	.07	4.1	.9	7.0	1.1	16	10	2.2	.1	2.2	a47	14	1	76	6.9	25
Jan. 11-20	2,544	12	.04	4.2	1.0	8.5	.9	18	12	2.5	.2	1.6	a52	15	0	82	7.1	20
Jan. 21-30	2,150	12	.06	3.7	1.0	11	.8	17	17	2.0	.1	1.2	a57	13	0	94	6.8	20
Jan. 31	5,990	--	--	--	--	--	--	14	8.3	1.5	--	--	--	18	7	68	7.4	--
Feb. 1-29	5,437	11	.02	3.5	1.2	5.3	.9	13	8.4	3.0	.2	1.1	50	14	3	61	6.8	8
Mar. 1-27	3,613	12	.03	4.2	1.0	6.6	1.0	14	12	2.0	.1	4.2	52	14	3	72	7.3	5
Mar. 28-31	7,035	10	.04	3.6	.9	4.9	1.0	12	11	1.5	.0	2.7	a42	12	2	50	7.1	--
Apr. 1-14	6,871	9.5	.06	3.0	1.8	4.3	.9	12	9.0	2.5	.0	1.3	49	15	5	53	7.4	20
Apr. 15-30	2,914	11	.03	3.7	.9	7.5	1.0	17	13	2.0	.1	1.0	52	13	0	75	6.9	10
May 1-31	2,392	11	.03	3.8	1.6	8.8	1.1	18	16	2.5	.2	3.6	62	16	1	84	6.8	8
June 1-30	1,804	12	.03	4.6	1.1	14	1.3	21	21	3.5	.1	1.8	77	16	0	101	6.6	25
July 1-20	1,522	13	.03	4.3	1.9	14	1.1	21	24	4.0	.1	3.0	76	19	2	108	6.8	10

July 21-31, 1960....	1,299	12	.10	4.4	1.6	19	1.8	27	29	3.3	.1	1.6	89	18	0	135	7.4	20
Aug. 1-12.....	1,637	12	.10	5.0	1.5	16	1.7	22	26	5.0	.2	3.8	135	18	0	124	7.5	35
Aug. 13-16.....	5,752	9.1	.09	3.6	1.6	4.9	1.7	14	12	2.1	.1	4.1	a46	16	4	63	6.2	--
Aug. 17-31.....	2,036	12	.15	5.5	1.3	12	1.6	22	20	3.5	.1	1.8	70	18	0	98	7.3	20
Sept. 1-30.....	1,365	12	.08	4.6	1.7	18	2.0	23	19	15	.1	2.8	a36	18	0	124	6.4	25
Time-weighted average.....	2,932	12	0.05	4.0	1.4	10	1.2	18	16	3.7	0.1	2.1	66	15	1	88	--	15

a Calculated from determined constituents.

TENNESSEE RIVER BASIN--Continued

3-4535. FRENCH BROAD RIVER AT MARSHALL, N. C.--Continued

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

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	64	55	37	--	45	40	50	59	69	72	77	75
2	63	54	35	39	44	39	54	58	69	74	77	73
3	64	45	38	42	44	36	52	60	68	75	77	73
4	65	48	40	39	43	34	52	59	72	76	78	74
5	63	56	40	39	44	32	50	60	69	75	76	72
6	66	60	38	38	44	35	48	59	68	74	79	73
7	67	46	33	42	41	34	52	60	70	72	79	75
8	68	43	32	40	40	35	52	56	70	73	74	74
9	67	41	35	--	42	35	55	55	67	75	76	73
10	65	38	38	--	46	35	--	58	67	72	76	74
11	63	37	40	45	47	39	--	56	69	79	74	74
12	60	50	42	45	48	35	--	53	71	71	72	71
13	60	44	45	43	44	39	53	51	72	74	70	68
14	62	50	40	48	38	38	52	52	72	76	70	65
15	57	52	40	51	35	41	56	57	71	73	71	65
16	56	54	42	46	32	40	59	65	70	76	--	66
17	56	51	45	--	40	40	60	63	72	75	--	66
18	57	47	43	--	43	41	58	67	79	75	--	66
19	54	40	40	40	36	40	52	68	73	75	73	67
20	54	40	40	36	34	41	56	67	75	75	71	68
21	53	48	40	34	40	39	58	70	74	75	72	68
22	55	46	39	32	40	39	58	68	73	77	72	68
23	56	48	37	32	39	40	--	66	72	72	72	69
24	50	54	37	32	40	42	60	68	71	71	72	71
25	48	50	40	--	44	43	66	68	73	72	71	65
26	--	45	43	34	43	43	66	69	72	77	70	64
27	52	46	45	36	40	45	65	68	68	77	72	65
28	48	43	40	42	41	47	61	65	70	75	73	64
29	50	44	46	43	42	50	60	67	69	72	74	63
30	50	37	42	45	--	51	60	67	71	72	75	65
31	55	--	40	43	--	49	--	66	--	78	75	--
Average	58	47	40	40	41	40	56	62	71	74	74	69

3-4545. FRENCH BROAD RIVER AT HOT SPRINGS, N. C.

LOCATION.--At Hot Springs, Madison County, at bridge on U. S. Highways 25 and 70, a quarter of a mile upstream from Spring Creek.
DRAINAGE AREA.--1,567 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1946, October 1957 to September 1960.
REMARKS.--No discharge records available for this station.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 15, 1959		9.4	0.05	4.2	1.2	6.0	1.7	16	9.8	2.8	0.1	1.0	49	15	2	60	6.6	20
Nov. 16		11	.03	4.2	.9	8.0	1.2	17	15	3.1	.1	.4	56	14	0	88	6.6	20
Dec. 15		10	.12	3.4	1.4	5.9	1.3	22	5.5	4.0	.2	1.0	45	14	0	64	6.7	20
Jan. 16, 1960		11	.00	3.5	.8	9.9	1.2	20	12	3.5	.1	.4	53	12	0	78	6.7	5
Feb. 17		11	.02	3.3	1.3	6.3	1.1	16	7.7	3.5	.1	.7	50	14	1	60	6.3	10
Mar. 15		11	.01	3.6	1.6	6.6	1.1	15	11	3.2	.0	1.0	54	15	3	68	6.3	5
Apr. 15		9.5	.00	3.0	.5	6.5	.8	15	8.9	2.5	.0	.2	41	10	0	62	7.0	5
May 16		10	.01	3.7	.7	7.7	1.0	18	12	1.8	.1	.2	50	12	0	75	6.6	17
June 16		12	.01	4.2	.9	14	1.3	24	20	4.0	.0	.6	73	14	0	100	6.4	10
July 16		11	.02	4.6	1.1	11	1.9	27	16	3.7	.1	.2	65	16	0	98	6.2	10
Aug. 16		9.3	.03	5.1	.7	5.0	1.9	25	6.6	3.0	.0	.4	47	16	0	67	6.2	10
Sept. 15		12	.03	4.2	1.4	17	1.5	23	28	4.8	.0	1.2	84	16	0	120	6.7	20

TENNESSEE RIVER BASIN--Continued

3-4565. EAST FORK PIGEON RIVER NEAR CANTON, N. C.

LOCATION.--Temperature recorder at gaging station 800 feet upstream from U.S. Highway 276, 0.3 mile downstream from Dix Creek, 1.7 miles upstream from confluence with West Fork Pigeon River, and 5.2 miles southwest of Canton, Haywood County.
DRAINAGE AREA.--51.5 square miles.
RECORDS AVAILABLE.--Water temperatures: July 1954 to September 1960 (discontinued).
EXTREMES, 1959-60.--Water temperatures: Maximum, 80°F July 3; minimum, 34°F on several days during December, January and February.
EXTREMES, 1954-60.--Water temperatures: Maximum, 84°F July 15, 20, 30, Aug. 16, 1954; minimum, freezing point on several days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 9, 1959.....	1,390	4.7	0.00	1.3	0.1	0.8	0.5	5	1.0	0.5	0.0	0.5	11	4	0	16	6.1	7
May 3, 1960.....	117	7.6	.01	1.3	.8	.7	.4	9	1.0	.5	.0	.3	17	6	0	18	6.5	10

3-4565. EAST FORK PIGEON RIVER NEAR CANTON, N. C.--Continued

Temperature (°F) of water, water year October 1959 to September 1960
/Continuous ethyl alcohol-actuated thermograph/

Day	October		November		December		January		February		March		April		May		June		July		August		September	
	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
1	62	59	58	55	42	36	39	36	45	42	43	38	53	44	66	57	70	58	73	67	78	67	71	67
2	63	57	56	52	42	40	44	37	46	42	41	35	50	47	64	52	67	60	78	68	79	67	75	65
3	64	58	52	47	42	40	45	42	45	42	36	35	49	48	65	54	64	60	80	68	78	68	73	66
4	64	58	55	50	43	38	42	39	43	42	38	35	49	47	64	52	66	60	76	69	78	68	75	67
5	64	58	56	55	43	41	40	39	43	42	36	35	48	45	60	52	67	61	74	68	74	68	77	67
6	64	59	58	54	43	40	42	40	44	43	37	35	50	42	61	54	67	61	72	68	77	66	76	67
7	63	61	54	46	40	35	45	42	44	40	41	35	55	48	58	55	69	61	75	66	73	68	75	69
8	62	61	48	43	39	34	43	41	43	38	42	35	53	46	58	52	66	61	76	67	76	67	75	69
9	62	61	48	44	42	36	43	39	45	42	41	35	54	46	60	49	66	59	72	68	77	68	72	68
10	61	60	48	43	42	38	45	41	46	45	44	35	50	42	57	49	67	59	71	67	74	67	75	66
11	61	60	48	44	43	40	48	45	46	43	43	38	52	41	55	50	67	60	70	66	73	66	71	68
12	60	56	50	45	47	43	49	44	43	39	43	37	58	46	50	48	69	62	79	66	66	65	73	66
13	60	56	52	46	47	43	53	49	43	37	43	35	61	49	53	45	72	62	79	68	68	63	70	62
14	60	59	54	52	43	39	51	48	39	36	43	35	60	51	59	46	70	65	77	70	69	63	66	58
15	60	58	55	53	43	40	52	48	40	34	42	40	58	51	64	51	73	63	77	65	71	64	65	59
16	58	56	55	54	44	41	48	44	42	37	43	37	57	52	66	54	75	62	74	67	70	63	64	63
17	58	56	55	45	46	43	45	42	46	41	47	39	60	53	68	57	73	66	72	66	72	65	64	62
18	60	56	45	40	49	46	48	44	44	39	45	40	59	54	70	58	77	66	74	66	71	65	66	61
19	57	52	46	41	49	42	45	38	40	35	44	37	60	47	68	60	78	65	74	67	72	64	71	62
20	57	51	47	41	42	38	39	35	40	34	42	38	60	50	70	59	75	66	79	67	73	65	71	62
21	56	54	48	45	42	40	37	34	40	39	44	36	58	53	68	61	72	65	79	66	73	65	71	61
22	56	55	49	44	41	38	34	34	44	40	46	44	65	52	68	58	74	64	79	68	71	67	70	63
23	59	56	51	47	40	38	34	34	44	36	47	38	66	54	66	58	72	65	75	68	72	67	70	64
24	58	55	52	51	41	39	34	34	45	38	49	39	68	56	69	58	78	65	78	67	74	65	69	61
25	55	52	51	44	46	41	35	34	47	42	46	38	66	56	67	60	72	67	79	69	73	65	67	62
26	53	48	48	42	47	44	40	34	45	40	52	42	64	57	68	60	70	64	77	70	73	65	65	59
27	55	52	50	46	47	44	41	39	42	37	51	41	63	58	64	60	70	63	75	69	72	66	62	59
28	53	49	50	42	50	47	42	39	44	39	49	44	64	56	65	56	68	63	72	65	74	66	64	60
29	51	50	42	36	47	43	42	40	45	40	48	46	65	53	65	58	73	64	72	65	74	66	65	61
30	53	51	38	36	43	40	42	41	--	--	47	46	62	56	68	59	75	65	75	64	76	66	69	62
31	58	53	--	--	42	38	44	42	--	--	51	45	--	--	70	59	--	--	79	66	73	67	--	--
Average	59	56	51	46	44	40	43	40	44	39	44	38	58	50	64	55	71	63	76	67	73	66	70	64

TENNESSEE RIVER BASIN--Continued

3-4570. PIGEON RIVER AT CANTON, N. C.

LOCATION.--At gaging station, 0.5 mile upstream from U. S. Highways 19 and 23 at Canton, Haywood County.
DRAINAGE AREA.--133 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1957 to September 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 13, 1959.....	675	6.8	0.03	1.6	0.2	1.2	0.5	8	1.2	0.5	0.1	0.3	20	5	0	17	6.5	20
Nov. 5.....	355	6.9	.03	1.8	.6	.7	.7	8	2.4	.7	.1	.4	18	7	1	19	6.5	20
Dec. 4.....	250	7.8	.03	1.7	.4	1.1	.6	8	2.2	1.5	.0	.5	20	6	0	21	6.4	20
Jan. 7, 1960.....	705	6.8	.00	1.1	.6	1.1	.6	7	1.7	1.3	.0	.2	17	5	0	18	6.3	5
Feb. 4.....	517	6.9	.00	1.8	.5	1.1	.5	7	2.0	1.5	.1	.7	20	6	1	18	6.6	5
Mar. 8.....	334	8.0	.04	2.0	.8	1.4	.8	9	3.4	1.8	.0	.9	a23	8	1	24	6.6	5
Apr. 5.....	1,580	5.4	.00	1.3	.2	.5	.3	7	1.2	.7	.0	.2	13	4	0	15	6.7	5
May 4.....	253	8.1	.02	1.6	.6	1.2	.7	9	1.4	.4	.0	.3	21	6	0	22	6.2	5
June 6.....	232	7.9	.01	1.4	.7	1.0	.8	11	.2	1.0	.0	.0	19	6	0	21	6.4	5
July 5.....	123	8.1	.01	2.4	.5	1.8	1.2	12	.8	1.3	.0	1.2	27	8	0	29	6.3	10
Aug. 3.....	95	8.3	.00	2.1	.5	1.4	.7	12	1.2	1.0	.0	.1	22	7	0	23	7.0	5
Sept. 1.....	216	7.5	.02	2.6	.1	1.5	1.2	10	1.0	1.3	.1	1.4	23	7	0	27	6.3	10

a Calculated from determined constituents.

3-4595. PIGEON RIVER NEAR HEPCO, N. C.

LOCATION.--At gaging station, 0.8 mile downstream from Jonathan Creek, 2.0 miles south of Hepco, Haywood County, and 2.4 miles upstream from Fines Creek.
DRAINAGE AREA.--350 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1955 to September 1956, October 1957 to September 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 13, 1959	1,330	9.1	0.08	13	0.8	18	1.2	28	12	27	0.2	0.2	117	36	13	167	6.6	80
Nov. 4	590	9.4	.39	18	.7	38	1.6	26	24	60	.2	1.5	198	48	27	302	6.0	140
Dec. 4	575	10	.37	24	1.4	34	1.6	34	22	65	.3	1.6	199	65	38	319	7.3	280
Jan. 5, 1960	764	11	.21	19	1.8	40	1.7	45	27	54	.3	.6	201	55	18	295	6.4	140
Feb. 3	1,100	9.1	.11	12	1.6	19	1.2	24	13	32	.2	.3	121	37	18	178	6.4	50
Mar. 14	774	10	.03	19	1.2	24	1.3	22	21	50	.2	.3	176	54	36	250	6.9	60
Apr. 6	2,220	7.7	.00	7.4	.8	8.5	.6	12	7.0	18	.1	.4	65	22	12	100	6.8	20
May 5	497	11	.18	28	1.1	46	1.1	40	24	79	.2	1.4	266	74	40	392	7.0	120
June 7	456	11	.18	35	2.0	52	2.2	57	23	99	.3	.2	304	96	49	470	6.6	--
July 7	370	11	.19	48	1.7	55	2.5	87	29	102	.4	.2	369	127	56	540	6.8	160
Aug. 4	231	13	.58	54	3.5	86	3.0	67	44	165	.0	.4	516	150	94	750	6.4	--
Sept. 6	251	11	.33	24	2.3	86	3.0	100	23	108	.3	.3	341	68	0	560	6.8	--

TENNESSEE RIVER BASIN--Continued

3-4607.66. PIGEON RIVER AT WATERVILLE, N. C.

LOCATION.--From tailrace of Carolina Power and Light powerplant, about 7 miles below Waterville Lake at Waterville, Haywood County.
DRAINAGE AREA.--536 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1957 to September 1960.
REMARKS.--No discharge records available for this station.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 12, 1959		7.5	0.16	13	0.9	19	1.2	34	14	27	0.2	0.3	115	36	9	170	6.7	80
Nov. 10		9.3	.54	15	1.2	23	7.5	35	12	42	.3	1.3	142	41	13	238	6.7	120
Dec. 19		11	.19	15	.8	21	1.5	39	11	32	.2	.2	133	40	8	185	6.8	60
Jan. 19, 1960		9.7	.45	15	1.7	21	1.4	36	11	34	.2	.3	137	44	15	202	6.5	80
Feb. 17		9.4	.09	11	1.2	14	1.2	23	8.4	24	.1	.4	89	32	13	138	6.6	60
Mar. 15		10	.04	17	1.0	24	1.2	36	14	38	.1	.9	138	46	17	230	7.3	50
Apr. 16		8.4	.10	9.5	.9	12	.9	19	7.6	22	.0	.5	87	28	12	130	7.1	40
May 16		9.8	.17	20	1.2	24	1.4	34	14	48	.1	.6	179	55	27	262	6.7	100
June 20		11	.31	27	1.6	30	2.0	53	16	56	.2	.3	218	75	32	320	7.4	--
July 18		11	.46	25	2.2	34	2.0	51	16	61	.2	.4	217	70	28	320	7.5	120
Aug. 15		9.9	.30	23	2.0	29	2.2	41	17	54	.2	.6	193	65	32	280	6.8	--
Sept. 17		12	1.0	30	1.4	45	2.4	64	18	76	.3	.3	267	80	27	400	6.7	--

3-4633. SOUTH TOE RIVER NEAR CELO, N. C.

LOCATION.--Temperature recorder at gaging station, 800 feet upstream from county road bridge, 0.3 mile downstream from Whiteoak Creek, and 1.9 miles southeast of Celo, Yancey County.
DRAINAGE AREA.--43.4 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1958 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 75°F July 20, 22, Aug. 9; minimum, freezing point Feb. 20, Mar. 6, 7.
EXTREMES, 1958-60.--Water temperatures: Maximum, 76°F June 30, 1959; minimum, freezing point on several days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 16, 1959.....	203	6.5	0.02	1.0	0.4	0.8	0.3	6	1.2	0.4	0.0	0.1	14	4	0	14	6.4	5
Apr. 18, 1960.....	167	6.1	.01	1.3	.5	1.0	.4	6	.6	1.1	.3	.8	15	5	0	15	5.9	10

TENNESSEE RIVER BASIN--Continued

3-4633. SOUTH TOE RIVER NEAR CELO, N.C.--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(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	62	61	62	62	63	62	62	61	62	61	62	59	59	58	58	56	56	57	55	54	53	54	54	54	51	52	52	50	48	50	54	57
Minimum	58	58	57	58	57	58	60	60	60	60	58	54	54	57	56	54	53	53	49	48	50	52	54	51	48	46	50	46	47	48	50	54
November																																
Maximum	57	53	50	53	55	57	52	46	45	46	46	48	49	52	52	52	51	43	43	43	46	45	45	48	47	43	47	48	40	36	---	48
Minimum	53	49	45	48	53	52	46	42	42	41	42	44	43	49	51	50	42	39	39	40	43	40	44	45	40	38	43	40	35	33	---	44
December																																
Maximum	38	40	42	41	41	42	38	37	40	41	42	45	44	40	41	42	45	46	46	41	40	39	38	39	43	44	45	48	46	41	41	42
Minimum	34	37	39	37	39	38	33	33	37	38	38	42	40	37	38	39	41	45	41	38	36	36	36	37	39	42	42	45	41	39	37	39
January																																
Maximum	38	42	43	40	40	40	42	42	42	46	47	45	50	50	50	46	42	46	43	37	35	33	33	33	33	35	39	41	41	40	41	41
Minimum	35	36	40	38	36	36	40	38	38	40	44	45	44	46	46	42	40	42	37	33	33	33	33	33	33	33	35	38	39	40	40	38
February																																
Maximum	40	43	41	39	40	43	40	40	43	43	44	41	40	36	37	39	42	41	35	37	37	41	40	40	40	40	38	41	42	--	--	40
Minimum	38	39	39	39	39	40	37	35	39	43	39	37	34	34	33	35	37	35	33	32	36	36	34	35	39	36	34	37	37	--	--	37
March																																
Maximum	39	38	33	33	33	34	34	36	36	37	37	38	38	38	38	37	42	41	38	37	40	42	44	46	43	48	48	47	44	43	45	40
Minimum	34	33	33	33	33	32	32	33	34	34	35	34	33	33	37	33	34	37	34	35	34	34	34	38	37	38	39	41	41	40	42	35
April																																
Maximum	50	46	44	46	45	49	53	52	52	49	50	53	56	54	54	53	57	55	55	56	58	59	59	59	59	59	58	59	59	57	---	54
Minimum	42	44	44	44	42	40	46	45	45	42	40	44	47	48	48	49	50	52	46	47	50	51	51	53	53	54	55	53	50	53	---	48
May																																
Maximum	60	58	59	60	58	57	56	56	56	54	52	49	49	56	61	61	64	65	63	64	63	66	66	66	66	66	61	60	60	65	66	60
Minimum	53	50	50	50	52	53	53	50	46	48	49	47	45	45	52	54	56	59	59	58	59	57	58	59	60	60	59	54	56	57	59	54
June																																
Maximum	65	62	62	63	64	67	64	63	65	66	65	68	67	68	70	69	70	70	72	69	65	65	65	72	68	65	64	64	70	69	---	67
Minimum	57	59	59	59	60	59	60	59	58	5	59	63	61	62	63	61	64	62	63	63	63	61	62	62	63	60	59	59	61	63	---	61
July																																
Maximum	67	70	73	73	69	66	68	67	66	64	67	67	70	70	69	68	68	67	70	75	72	75	69	73	74	70	67	65	66	69	69	69
Minimum	63	63	64	65	65	63	61	63	63	61	61	61	62	65	61	64	62	62	63	66	66	67	67	65	67	63	64	62	63	61	63	63
August																																
Maximum	71	72	72	73	71	72	71	73	75	72	70	65	65	66	69	68	66	69	67	69	67	66	70	67	69	67	68	69	70	73	70	69
Minimum	63	64	65	67	67	66	67	66	67	68	65	63	62	62	62	62	63	62	62	62	63	63	63	63	63	62	63	63	63	64	65	64
September																																
Maximum	67	71	68	72	71	71	70	69	69	71	67	68	64	61	61	61	60	63	67	67	64	64	66	66	65	64	61	59	61	64	--	66
Minimum	63	63	63	64	64	64	66	64	65	65	63	63	60	56	57	60	59	59	60	60	59	62	60	60	60	57	58	58	58	59	---	61

3-5105. TUCKASEGEE RIVER AT DILLSBORO, N. C.

LOCATION.--At gaging station, 0.4 mile downstream from Scott Creek and 0.5 mile downstream from U. S. Highway 23 at Dillsboro, Jackson County.
DRAINAGE AREA.--347 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1957 to September 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 21, 1959	728	8.4	0.04	1.8	0.4	3.5	0.6	12	6.3	1.0	0.0	0.4	a28	6	0	30	6.7	15
Oct. 30	694	8.3	.07	1.8	.5	6.1	.8	14	6.8	1.3	.1	.7	34	7	0	49	6.8	50
Nov. 30	717	8.0	.07	2.1	.5	5.2	.8	14	5.4	1.2	.1	.6	35	7	0	41	6.2	30
Dec. 8	713	8.1	.02	2.0	.4	8.5	.8	15	13	.5	.1	.2	48	7	0	53	6.2	50
Jan. 28, 1960	988	8.0	.03	1.4	.6	5.9	.7	13	7.1	1.0	.2	.5	34	6	0	40	6.4	30
Feb. 25	1,090	8.9	.03	1.8	.6	3.1	.7	12	3.9	.5	.1	.3	27	7	0	29	6.5	20
Mar. 29	1,860	8.4	.01	2.0	.6	1.5	.7	9	1.2	1.3	.0	.5	23	8	0	20	6.7	5
Apr. 29	1,050	8.9	.00	1.6	.4	11	.7	19	12	1.0	.0	.5	69	6	0	70	6.5	60
May 18	690	8.3	.01	1.4	.4	4.3	.7	13	6.4	.4	.1	.2	39	6	0	39	6.5	20
June 30	662	7.8	.05	1.2	.8	6.2	.6	14	7.4	.4	.0	.3	44	6	0	49	6.3	35
July 28	592	7.4	.02	2.2	.2	1.4	.6	10	1.3	.7	.0	.1	23	6	0	21	6.5	5
Sept. 9	796	7.0	.08	1.6	.1	1.6	.5	9	.8	.7	.0	.4	19	4	0	20	6.6	5

a Calculated from determined constituents.

TENNESSEE RIVER BASIN--Continued

3-5130. TUCKASEGEE RIVER AT BRYSON CITY, N. C.

LOCATION.--At bridge on State Highway 288, at Bryson City, Swain County, 400 feet upstream from gaging station, and 0.6 mile downstream from Deep Creek.
DRAINAGE AREA.--655 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1951, October 1957 to September 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Oct. 19, 1959	1,400	8.9	0.05	2.2	0.3	3.1	0.9	13	1.9	0.7	0.1	1.3	a26	7	0	31	6.6	20
Oct. 30	1,220	8.4	.14	2.5	.2	18	1.2	20	31	1.6	.2	1.1	83	7	0	100	6.0	95
Nov. 30	1,970	7.7	.04	1.3	.6	1.5	.8	8	.8	1.2	.1	.7	19	6	0	25	5.9	10
Dec. 15	2,160	7.6	.05	1.8	.4	6.2	.8	13	8.1	1.0	.1	.5	35	6	0	42	6.1	30
Jan. 18, 1960	2,160	8.4	.00	1.3	1.0	1.7	.8	10	2.0	1.3	.1	.5	35	7	0	24	6.1	10
Feb. 22	2,000	8.8	.01	1.7	.4	1.4	.6	10	.5	.5	.2	.3	19	6	0	21	6.8	10
Apr. 30	1,660	8.1	.00	1.4	.5	1.2	.4	9	1.2	.8	.0	.3	20	6	0	21	6.7	5
May 26	1,570	8.0	.04	1.7	.4	18	1.0	26	20	.4	.2	1.2	b110	6	0	109	6.8	110
June 27	1,230	8.3	.01	2.1	.5	1.6	.8	12	1.5	.5	.0	.2	24	7	0	26	6.0	5
July 29	886	9.2	.03	2.6	.5	24	1.2	34	32	2.0	.2	.3	122	8	0	130	6.8	120
Sept. 15	844	7.6	.00	2.0	.2	8.2	.8	15	8.6	.5	.0	1.0	41	6	0	51	6.3	30

a Calculated from determined constituents.
b Organic matter present; sum of mineral constituents 64 parts per million.

3-6095. TENNESSEE RIVER AT KENTUCKY DAM, NEAR PADUCAH, KY.

LOCATION.--At tailrace of powerplant at Kentucky Dam at Gilbertsville, Marshall County, 3,500 feet upstream from base gage, 3.0 miles upstream from Shadie Creek, and 16 miles east of Paducah, McCracken County.
DRAINAGE AREA.--40,200 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1949 to August 1950, October 1951 to September 1954, October 1956 to September 1960.
Water temperatures: October 1952 to September 1954, October 1956 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 126 ppm Dec. 1-31; minimum, 79 ppm June 1-30.
Hardness: Maximum, 79 ppm Dec. 1-31; minimum, 56 ppm May 1-31.
Specific conductance: Maximum daily, 227 micromhos Mar. 4; minimum daily, 127 micromhos May 1.
Water temperatures: Maximum, 86°F Aug. 3, 12; minimum, 34°F Mar. 6, 7, 12.
EXTREMES, 1952-54, 1956-60.--Dissolved solids: Maximum, 127 ppm Dec. 11-20, 1956; minimum, 63 ppm May 21-31, 1953.
Hardness: Maximum, 86 ppm Jan. 1-10, 1954; minimum, 48 ppm Mar. 11-20, Apr. 2-10, 1953.
Specific conductance: Maximum daily, 228 micromhos Dec. 16, 1956; minimum daily, 107 micromhos Apr. 9-10, 1953.
Water temperatures: Maximum, 88°F June 11, 1958; minimum, freezing point Feb. 20, 1958.
REMARKS.--Chemical quality samples prior to 1952 were collected at auxiliary gaging station, 17.0 miles downstream. Records of pH and specific conductance of daily samples available in district office at Columbus, Ohio. Records of discharge from October 1959 to September 1960 given in WSP 1706.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
Oct. 1-31, 1959..	47500	10				24	3.4	6.4	0.9		76		13	11	0.2	0.8	0.35	114	74	12		190	7.3	7	0.0
Nov. 1-29...	49610	7.3				21	4.0	6.8	.9		68		14	12	.1	1.2	.20	102	69	13		183	7.1	3	.1
Dec. 1-31...	122200	8.4				23	5.2	8.6	1.1		70		16	17	.2	1.5	.35	126	79	22		203	6.9	2	.1
Jan. 1-31, 1960..	95120	8.1				21	3.3	5.7	.9		62		13	11	.2	1.9	.30	108	66	15		164	6.7	13	.1
Feb. 1-29...	100700	6.6				22	3.5	5.1	1.2		68		11	10	.1	2.5	.16	99	70	14		174	--	6	.0
Mar. 3-31...	107700	8.0				21	4.8	3.6	.9		64		10	10	.1	2.1	.20	92	72	20		155	--	6	.1
Apr. 1-30...	45560	11				20	2.9	3.4	.8		62		9.2	5.0	.1	1.9	.40	92	62	11		141	--	7	.0
May 1-31....	36200	6.1				19	2.2	4.2	.8		62		10	5.7	.1	1.4	.50	80	56	5		139	--	3	.0
June 1-30...	39460	4.4				20	2.8	4.0	.9		62		11	7.0	.1	1.6	.25	79	62	11		141	--	3	.0
July 1-31...	34980	3.8				20	2.8	4.8	.8		66		9.6	6.0	.1	.9	.50	80	62	7		148	--	3	.0
Aug. 1-28...	36770	3.0				21	3.3	5.1	1.0		65		11	8.0	.2	1.9	.35	94	66	13		165	--	4	.0
Sept. 1-30..	51920	6.0				20	3.7	6.3	1.1		62		13	11	.1	1.1	.25	100	65	14		166	--	4	.0
Weighted average.	--	7.3				21	3.8	5.6	1.0		66		12	11	0.1	1.7	0.29	101	69	15		169	--	5	--
Time-weighted average a	64000	6.9				21	3.5	5.3	0.9		66		12	9.5	0.1	1.6	0.32	97	67	13		164	--	5	--
Tons per day....	--	1270				3690	655	968	168		11400		2100	1830	24	291	51	17500	--	--		--	--	952	--

a Represents 90 percent of days and 88 percent of runoff.

TENNESSEE RIVER BASIN--Continued

3-6095. TENNESSEE RIVER AT KENTUCKY DAM, NEAR PADUCAH, KY.--Continued

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

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	76	76	76	76	76	78	76	76	76	76	74	74	72	72	73	73	71	73	--	69	--	--	68	67	67	--	63	63	--	63	62	72
November	62	62	60	62	62	62	62	61	61	60	60	--	58	58	54	54	53	53	51	50	50	51	50	50	50	48	46	46	46	46	--	55
December	47	47	46	46	45	46	47	46	47	46	46	45	46	46	48	48	44	44	44	45	45	45	45	45	44	45	48	48	--	--	46	46
January	47	46	45	--	--	--	44	44	45	45	45	--	--	45	44	44	44	44	44	44	43	43	42	41	40	40	42	40	40	39	39	43
February	39	42	42	43	43	43	44	44	42	42	43	44	45	45	41	--	--	39	40	40	41	41	41	41	42	42	42	42	42	--	--	42
March	--	--	40	38	38	34	34	--	--	35	35	34	40	40	40	40	40	40	40	--	41	41	41	40	41	41	42	42	48	48	48	40
April	48	48	--	50	48	50	50	51	51	52	52	49	50	54	54	53	53	54	--	--	60	60	65	65	65	--	--	65	65	65	--	55
May	65	65	68	68	65	65	65	66	66	63	64	63	63	62	67	67	65	66	69	70	70	68	68	68	67	69	69	70	--	--	68	67
June	70	76	76	76	79	80	--	--	80	80	80	78	78	78	--	80	80	80	80	80	84	84	78	78	78	78	78	80	80	78	--	79
July	78	78	79	80	80	80	78	78	78	83	80	80	83	80	80	80	80	82	84	84	--	84	82	83	84	84	83	84	84	84	83	81
August	83	85	86	84	85	85	85	85	80	80	85	86	85	85	83	83	83	84	84	84	84	82	82	82	85	85	84	84	--	--	--	84
September	85	85	85	85	85	--	--	85	85	82	82	82	--	--	83	83	82	81	81	80	79	81	81	81	83	81	80	80	80	80	--	82

OHIO RIVER MAIN STEM

3-6115. OHIO RIVER AT METROPOLIS, ILL.

LOCATION.--At gaging station at Paducah and Illinois Railroad bridge at Metropolis, Massac County, 9.5 miles downstream from Tennessee River, and 37 miles upstream from mouth.
DRAINAGE AREA.--203,000 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1952 to September 1953.
Water temperatures: March 1954 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 86°F Aug. 8-11; minimum, 37°F on Mar. 14-17.
EXTREMES, 1954-60.--Water temperatures: Maximum, 88°F Aug. 3-6, 1955; minimum, freezing point on Feb. 20-24, 1958.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1705.

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

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

OHIO RIVER MAIN STEM--Continued

3-6125. OHIO RIVER AT LOCK AND DAM 53, NEAR GRAND CHAIN, ILL.

LOCATION.--About 1,500 feet upstream from dam, lock and dam 53 (mile 962.6) near Grand Chain, Pulaski County, 7,300 feet downstream from Bledsoe Creek, 18.5 miles downstream from gage at Metropolis, and 29.7 miles downstream from Tennessee River.
DRAINAGE AREA.--203,100 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1954 to September 1960.
Water temperatures: October 1954 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 282 ppm Nov. 2-4, 6-10, 12-14, 18, 20-25, 27-30; minimum, 158 ppm Aug. 1-4, 7-31.
Hardness: Maximum, 167 ppm Nov. 2-4, 6-10, 12-14, 18, 20-25, 27-30; minimum, 105 ppm Sept. 1-7, 9-15, 17-21, 23-30.
Specific conductance: Maximum daily, 628 micromhos Nov. 9; minimum daily, 233 micromhos Sept. 9.
Water temperatures: Maximum, 82°F Aug. 2, 3, 10; minimum, 35°F on several days during February and March.
EXTREMES, 1954-60.--Dissolved solids: Maximum, 310 ppm Dec. 1-9, 1958; minimum, 128 ppm Mar. 11-20, 1955.
Hardness: Maximum, 192 ppm Dec. 1-9, 1958; minimum, 84 ppm Mar. 11-20, 1955, Feb. 11-20, 1957.
Specific conductance: Maximum daily, 628 micromhos Nov. 9, 1959; minimum daily, 170 micromhos Feb. 9, 1957.
Water temperatures (1954-58, 1960): Maximum, 87°F Aug. 5, 1955; minimum, freezing point on several days during February and December 1958.
REMARKS.--Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. Records of discharge for gaging station at Metropolis, Ill., for water year October 1959 to September 1960 given in WSP 1705.

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

Date of collection	Mean 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)	Phosphate (PO_4)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color	Detergent (MBAS)
																			Calcium, magnesium	Noncarbonate					
Oct. 1-31, 1959..	110200	6.8				37	8.7	19	2.3		90		56	26	0.3	1.9	0.25	210	129	54		360	7.3	5	0.1
Nov.2-4,6-10,12-14, 18,20-25, 27-30.....	150000	9.1				47	12	28	2.4		88		91	40	.3	4.0	.30	282	167	95		471	7.2	6	.1
Dec.1-3,5-6, 8,10-18, 20-25, 27-31.....	392800	9.3				36	9.0	13	2.2		78		61	22	.3	4.7	.30	200	127	63		337	7.1	7	.0
Jan. 2-31, 1960..	397300	7.8				36	9.2	11	1.6		85		56	16	.3	5.8	.15	200	128	58		319	7.2	7	.0
Feb. 1-23, 25-29.....	407800	9.3			0 03	40	8.7	11	1.8		96		56	14	.2	7.0	.30	201	136	57		330	--	7	.1
Mar. 1-25, 27-31.....	365400	7.2				36	10	11	1.6		92		54	17	.2	4.4	.15	190	131	56		327	--	7	.0

Apr.1-15, 17-30,1960	375400	6.9				33	9.7	9.3	1.4		82		54	13	.4	5.0	.14	178	123	56		298	--	7	.0
May 1-31....	186500	7.3				38	11	13	1.7		92		64	20	.2	3.9	.12	216	140	65		350	--	6	.0
June 1-4,5-13,17-18, 24-25.....	--	--					--	--	--						--	--	--					288	--		--
July 1-2,5, 8-14,17-20,24-28,31.....	189900	8.7				34	9.7	7.8	1.9		106		33	14	.3	3.0	.45	191	125	38		282	--	7	.0
Aug.1-4,7-31	103400	3.8				32	7.4	10	1.7		91		36	16	.3	1.7	.25	158	111	36		278	--	2	.0
Sept.1-7,9-15,17-21, 23-30.....	103400	5.1				29	7.8	12	1.6		79		41	20	.4	1.5	.32	162	105	40		286	--	6	.0
Weighted average.	--	7.8			--	36	9.4	12	1.8		88		56	18	0.3	4.7	0.22	197	130	57		327	--	7	--
Time-weighted average [a]	255800	7.3			--	36	9.3	13	1.8		89		55	20	0.3	3.9	.23	198	129	56		327	--	6	--
Tons per day.....	--	5380			--	25100	6510	8360	1220		60900		38500	12500	194	3230	155	136400	--	--		--	--	--	--

a Represents 83 percent of the days and 86 percent of the runoff.

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OHIO RIVER MAIN STEM--Continued

3-6125. OHIO RIVER AT LOCK AND DAM 53, NEAR GRAND CHAIN, ILL.--Continued

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

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	71	70	70	75	75	75	74	75	75	75	70	72	65	68	65	66	66	65	64	--	64	--	63	63	63	63	62	59	57	64	64	68
November	--	64	64	64	--	54	54	54	54	54	--	53	53	55	--	--	--	46	--	49	49	49	50	50	46	--	49	49	46	44	--	--
December	44	43	44	--	43	44	43	43	42	42	45	45	43	42	43	43	43	43	--	43	42	41	42	42	42	--	--	--	--	--	--	--
January	42	42	42	42	42	42	41	42	41	41	42	43	45	45	44	44	43	43	42	41	41	42	41	40	40	40	40	39	38	38	38	41
February	37	38	38	38	39	42	41	39	40	39	39	40	40	39	39	39	39	39	40	40	38	36	36	--	36	37	37	36	35	--	--	38
March	36	36	36	36	36	35	35	35	35	35	35	35	35	35	35	36	36	36	35	37	37	40	38	42	39	--	41	41	43	45	46	37
April	50	50	48	49	49	50	51	51	51	51	50	49	50	51	53	--	54	55	55	56	57	58	59	60	62	63	64	64	65	65	--	55
May	64	63	64	64	65	65	66	63	63	63	63	63	60	60	60	60	63	64	64	66	65	64	65	67	67	67	68	68	70	70	70	65
June	70	70	70	70	73	74	74	74	74	75	75	71	71	--	--	--	76	76	--	--	--	--	--	79	79	--	--	--	--	--	--	--
July	78	78	--	--	75	--	--	77	77	77	77	77	78	78	--	--	78	77	78	78	78	--	--	78	80	80	81	81	--	--	81	--
August	81	82	82	81	--	--	76	77	80	82	77	80	80	80	78	81	80	78	76	78	78	78	78	78	78	80	80	80	80	80	80	79
September	80	80	79	79	79	79	79	--	80	--	78	79	76	77	77	--	78	76	76	74	76	--	78	77	80	75	75	75	75	68	--	77

MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
																Calcium, magnesium	Noncarbonate				
ALLEGHENY RIVER MAIN STEM																					
3-125. ALLEGHENY RIVER NEAR KINZUA, PA.																					
Oct. 22, 1959..	490	--		--	--	--	--	a26	--	38	24	80	--	0.6	252	112	81		427	8.1	8
Nov. 23.....	3,280	4.4		0.00	0.01	21	3.6	38	1.8	25	17	75	0.0	1.0	186	68	47		325	6.7	2
Jan. 28, 1960..	2,760	10		.01	.03	23	4.4	38	1.3	26	14	90	--	2.0	230	76	54		378	7.2	3
Mar. 3.....	1,800	7.1		.02	.15	27	4.4	41	1.2	33	14	95	.1	1.2	248	86	59		411	7.1	5
Apr. 14.....	6,540	14		.02	.02	12	2.8	12	1.4	27	18	22	.1	1.4	125	42	20		151	7.0	4
May 5.....	1,760	1.3		.02	.01	31	5.0	59	2.0	35	16	121	.0	1.5	296	98	70		482	7.1	2
TIONESTA CREEK BASIN																					
3-175. TIONESTA CREEK AT LYNCH, PA.																					
Oct. 26, 1959..	470	5.6		0.00	0.00	4.9	1.9	5.0	1.2	10	15	5.2	0.2	1.1	47	20	12		67	6.1	3
May 5, 1960....	156	4.2		.02	.03	5.7	2.2	6.8	1.2	16	11	10	.0	.7	59	23	10		77	6.5	3
CROOKED CREEK BASIN																					
3-390. CROOKED CREEK AT CROOKED CREEK DAM, PA.																					
Oct. 23, 1959..	51	9.3	1.2	0.01	1.8	39	9.2	37	3.1	1	180	30	0.2	2.2	319	136	135		495	4.6	1
May 3, 1960....	241	8.7	1.0	.02	.94	25	9.0	19	2.5	1	124	14	.1	1.3	211	100	99		315	4.7	2
KISKIMINETAS RIVER BASIN																					
3-400. STONY CREEK AT FERNDALE, PA.																					
Oct. 23, 1959..	22	20	12	0.98	4.0	122	45	36	3.7	0	670	8.5	0.4	0.1	960	490	490	2.6	1,340	3.4	1
May 2, 1960....	196	12	7.2	.30	2.5	58	22	4.0	1.8	0	312	2.5	.1	1.4	456	235	235	1.6	749	3.2	2

a Sodium, potassium calculated as sodium (Na).

MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN--Continued

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Total acidity as H^{+1}	Specific conductance (micromhos at 25°C)	pH	Color
KISKIMINETAS RIVER BASIN--Continued																					
3-415. CONEMAUGH RIVER AT SEWARD, PA.																					
Oct. 23, 1959..	190	16	10	0.39	3.5	92	31	22	4.2	0	491	7.5	0.4	0.3	694	357	357	2.1	985	3.3	2
May 2, 1960....	545	19	2.1	.05	8.4	75	27	12	10	0	357	7.5	.2	2.0	537	298	298	.6	748	4.4	12
3-420. BLACKLICK CREEK AT JOSEPHINE, PA.																					
Oct. 23, 1959..	35	39	75	9.9	5.3	118	52	114	4.0	0	1,420	12	0.9	7.2	1,990	509	509	18	2,670	2.4	22
May 3, 1960....	117	23	24	9.1	2.1	55	21	43	2.0	0	560	8.0	.3	1.2	712	224	224	5.4	1,390	2.8	5
3-425. TWO LICK CREEK AT GRACETON, PA.																					
Oct. 23, 1959..	24									0	374	12				280	280	0.6	824	4.2	3
May 3, 1960....	158	12	7.7	0.27	1.3	41	15	19	2.0	0	278	6.5	0.1	1.3	396	164	164	1.8	720	3.2	2
3-450. LOYALHANNA CREEK AT KINGSTON, PA.																					
Oct. 23, 1959..	4.3	6.4		0.00	0.00	30	8.4	9.0	2.0	26	64	25	0.3	5.5	186	110	88		276	6.7	3
May 3, 1960....	78	2.6		.00	.00	21	6.3	4.0	1.5	21	63	3.0	.2	1.1	116	79	62		180	6.7	3
MONONGAHELA RIVER BASIN																					
3-835. YOUGHIOGHENY RIVER AT SUTERSVILLE, PA.																					
Oct. 3, 1959[b]..	950							--		0	103	4.5		1.5	173	78	78	0.1	247	4.4	3
Oct. 22[c].....	666	4.2	0.2	0.02	0.42	20	6.1	16	1.3	0	105	3.0	0.2	.6	160	75	75	.2	286	4.1	1
Oct. 22[d].....	666							a20		6	107	6.0		2.0	--	84	79	--	278	6.6	2
Oct. 22[e].....	666							a77		2	341	10		2.9	--	205	204	--	713	5.0	1

Nov. 12, 1959[d]	1,580							a7.8		4	58	2.0		3.6	104	53	50	--	158	5.5	1
Nov. 12[e]	1,580							--		0	313	10		3.2	--	175	175	0.5	733	3.6	5
Apr. 13, 1960[d]	3,830							a12		2	60	7.0		3.5	114	52	51	--	158	4.8	1
Apr. 13[e]	3,830							--		0	159	3.0		2.2	--	124	124	--	412	3.9	1
May 2[d]	1,140							--		0	122	2.5		2.2	--	98	98	.2	312	4.5	2
May 2[e]	1,140							a17		22	96	1.0		2.7	--	85	67	--	236	7.6	1
June 10[d]	1,260							a6.7		2	84	2.5		2.5	--	80	80	--	216	5.1	1
June 10[e]	1,260							--		0	476	7.0		3.1	--	290	290	--	1,110	3.3	11
June 25[f]	970							a14		10	84	4.5		2.5	161	74	66	--	224	6.4	4
Sept. 23[g]	1,330							a9.4		4	79	4.8		2.7	135	74	71	--	210	5.7	1

3-850. MONONGAHELA RIVER AT BRADDOCK, PA.

Oct. 28, 1959	7,050	--		--	--	--	--	--	--	0	223	9.0	--	1.4	366	140	140	0.7	529	4.0	4
Dec. 7	11,400	6.0		0.00	0.55	23	6.6	13	2.0	4	95	7.0	0.1	3.2	164	85	81		253	5.6	3
Feb. 8, 1960	14,200	8.3		.02	.81	36	9.9	15	4.2	10	136	11	.2	6.2	230	130	123		368	6.3	3
Apr. 18	6,300	7.2	0.2	.00	.55	26	8.5	14	2.5	1	121	5.0	.1	2.0	196	100	99		300	5.1	2
Sept. 12	13,700	--		--	--	--	--	a42	--	34	218	14	--	3.9	390	186	158		559	7.1	2

a Sodium, potassium calculated as sodium (Na).
b Left side and right side.
c Bridge below gage.
d Left side and center.
e Right side.
f Cross section composited.
g Center of stream.

MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN--Continued

STREAMS IN TENNESSEE RIVER BASIN IN NORTH CAROLINA AND GEORGIA

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

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
3-4410. DAVIDSON RIVER NEAR BREVARD, N. C.																		
Oct. 13, 1959.....	207	7.5	0.01	1.0	0.2	0.9	0.4	6	0.6	0.8	0.0	0.0	14	3	0	13	6.7	5
Apr. 11, 1960.....	216	7.4	.01	1.3	.3	1.2	.5	6	.2	1.8	.0	.9	a17	4	0	14	6.2	5
3-4447.5. SOUTH FORK MILLS RIVER NEAR PISGAH FOREST, N. C.																		
May 19, 1960.....	51.2	6.9	0.02			1.2	0.5	6	0.3	2.0	0.0	0.2		3	0	12	6.5	
3-4455.5. NORTH FORK MILLS RIVER NEAR MILLS RIVER, N. C.																		
May 20, 1960.....	49.1	15	0.01			2.6	0.7	15	0.3	2.2	0.0	0.3		8	0	28	7.2	
3-4460. MILLS RIVER NEAR MILLS RIVER, N. C.																		
Oct. 13, 1959.....	285	7.3	0.02	1.4	0.1	0.9	0.4	6	0.8	0.1	0.0	0.1	14	4	0	13	6.6	10
Apr. 11, 1960.....	350	6.7	.01	1.1	.8	1.1	.3	6	.4	1.0	.3	.6	a15	6	1	15	6.9	5
3-4472.3. CANE CREEK ABOVE FAIRVIEW, N. C.																		
May 17, 1960.....	26.6	13	0.03			4.0	1.5	14	0.3	2.9	0.0	0.4		6	0	26	7.2	
3-4482.1. HOMINY CREEK AT CANDLER, N. C.																		
May 18, 1960.....	31.2	15	0.05			3.5	1.6	21	2.4	2.2	0.0	1.2		16	0	54	6.6	
3-4484.1. SOUTH HOMINY CREEK AT CANDLER, N. C.																		
May 18, 1960.....	52.8	11	0.17			2.6	0.9	16	0.6	5.2	0.0	0.8		11	0	39	6.6	
3-4485. HOMINY CREEK AT CANDLER, N. C.																		
Oct. 9, 1959.....	210	12	0.00	3.2	1.6	2.1	1.6	17	2.5	1.5	0.0	0.9	33	14	0	44	6.7	7
May 4, 1960.....	115	12	.00	3.3	1.2	1.8	.9	16	2.0	1.5	.1	1.0	32	13	0	38	7.1	5
3-4489.1. SWANNANOA RIVER AT GROVESTONE AT SWANNANOA, N. C.																		
Jan. 13, 1960.....	40.6	8.7	0.04			1.7	0.7	10	0.5	2.1	0.0	0.6		7	0	24	6.2	
Apr. 12.....	71.8	8.4	.04			2.0	.7	11	1.7	4.1	.0	.4		10	1	31	6.3	

3-4500. BEETREE CREEK NEAR SWANNANOA, N. C.

Oct. 15, 1959.....	32.1	8.5	0.01	1.3	0.4	1.2	0.5	8	1.6	0.4	0.0	0.0	18	5	0	19	6.8	5
May 2, 1960.....	8.7	9.1	.00	1.4	.4	2.0	1.0	7	.3	3.2	.0	.9	a30	5	0	23	6.2	5

3-4510. SWANNANOA RIVER AT BILTMORE, N. C.

Oct. 15, 1959.....	418	10	0.03	3.2	1.2	6.0	1.3	20	4.4	3.9	0.0	1.0	41	13	0	57	6.6	10
Apr. 15, 1960.....	253	10	.01	2.6	1.0	4.8	1.0	10	7.2	3.0	.0	2.1	a38	11	2	50	6.2	5

3-4516.9. NEWFOUND CREEK NEAR ALEXANDER, N. C.

May 18, 1960.....	22.6	20	0.06			3.8	2.3	29	1.2	4.6	0.0	1.5		21	0	63	6.8	

3-4530. IVY RIVER NEAR MARSHALL, N. C.

Oct. 19, 1959.....	172	14	0.01	3.8	1.7	2.4	1.2	22	2.3	1.0	0.0	1.0	38	16	0	46	7.1	5
Apr. 11, 1960.....	285	14	.01	2.9	1.9	2.5	1.1	18	2.2	1.8	.0	2.5	a41	15	1	45	6.9	5

3-4540. BIG LAUREL CREEK NEAR STACKHOUSE, N. C.

Oct. 19, 1959.....	132	12	0.02	3.7	1.4	2.0	0.9	19	1.8	0.5	0.0	0.8	32	15	0	40	7.2	5
Apr. 11, 1960.....	257	12	.01	2.9	.8	1.9	.9	14	1.4	2.3	.0	2.0	a35	10	0	33	6.7	5

3-4555. WEST FORK PIGEON RIVER NEAR HAZELWOOD, N. C.

Oct. 8, 1959.....	972	3.6	0.04	0.9	0.6	0.3	0.3	5	1.3	0.5	0.0	0.5	10	5	1	14	5.7	17
May 3, 1960.....	68.0	6.5	.01	1.8	.3	.5	.2	7	1.4	.5	.0	.2	14	6	0	14	6.5	10

3-4560. WEST FORK PIGEON RIVER NEAR WAYNESVILLE, N. C.

Oct. 8, 1959.....	963	4.7	0.01	1.3	0.3	0.5	0.4	6	0.9	0.5	0.0	0.3	12	4	0	14	6.1	12
May 3, 1960.....	133	7.3	.00	1.6	.4	1.2	.6	7	.5	1.5	.0	1.7	18	6	0	19	6.7	10

a Dissolved solids (residue at 180°C).

MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN--Continued

STREAMS IN TENNESSEE RIVER BASIN IN NORTH CAROLINA AND GEORGIA--Continued

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

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
3-4575. ALLEN CREEK NEAR HAZELWOOD, N. C.																		
Oct. 13, 1959.....	48.5	8.1	0.00	1.3	0.6	0.8	0.4	8	0.9	0.2	0.0	0.3	17	6	0	16	6.9	5
Apr. 28, 1960.....	36.7	9.1	.00	1.8	.2	1.2	.7	9	.4	1.9	.0	.8	a22	5	0	20	6.3	7
3-4590. JONATHAN CREEK NEAR COVE CREEK, N. C.																		
Oct. 13, 1959.....	89.7	11	0.04	2.2	0.7	1.5	0.8	12	0.2	1.0	0.0	0.5	24	8	0	26	6.8	5
Apr. 28, 1960.....	134	11	.01	2.2	.2	2.6	1.5	8	.4	3.0	.0	4.2	a30	7	0	36	6.3	7
3-4640. CANE RIVER NEAR SIOUX, N. C.																		
Oct. 26, 1959.....	360	11	0.05	2.9	1.1	1.8	1.2	17	2.5	1.0	0.0	0.6	30	12	0	35	7.0	10
Apr. 18, 1960.....	326	11	.00	2.2	1.3	1.8	.9	13	1.1	2.4	.0	1.5	a30	11	0	32	6.6	7
3-4790. WATAUGA RIVER NEAR SUGAR GROVE, N. C.																		
Oct. 27, 1959.....	160	11	0.02	4.2	1.1	2.2	0.9	18	2.4	2.0	0.1	1.4	34	15	0	42	7.1	10
Apr. 19, 1960.....	170	13	.00	4.0	1.8	2.3	1.0	19	1.7	3.2	.0	3.3	a42	18	2	48	6.9	5
3-5000. LITTLE TENNESSEE RIVER NEAR PRENTISS, N. C.																		
Oct. 2, 1959.....	142	11	0.05	2.2	0.3	2.3	0.7	12	1.4	0.5	0.0	0.2	25	7	0	26	6.8	5
Apr. 20, 1960.....	499	8.9	.00	1.4	.5	.9	.3	9	.3	1.0	.1	.0	17	6	0	16	6.8	8
3-5005. CULLASAJA RIVER AT HIGHLANDS, N. C.																		
Oct. 2, 1959.....	24.4	5.4	0.04	1.0	0.3	1.3	0.4	7	1.4	0.8	0.0	0.3	14	4	0	15	6.6	10
Apr. 12, 1960.....	96.5	5.1	.01	.6	.2	1.0	.3	4	.3	1.0	.2	.9	12	2	0	11	6.3	5
3-5010. CULLASAJA RIVER AT CULLASAJA, N. C.																		
Oct. 2, 1959.....	74.5	9.2	0.02	2.2	0.3	1.2	0.5	12	0.3	0.5	0.0	0.3	21	7	0	21	6.5	5
Apr. 20, 1960.....	258	8.0	.01	1.3	.3	1.1	.5	7	.6	1.0	.1	.9	a19	4	0	15	7.2	5

3-5030. LITTLE TENNESSEE RIVER AT NEEDMORE, N. C.

Oct. 16, 1959.....	1,420	8.7	0.07	1.9	0.2	1.3	0.7	8	1.3	0.8	0.0	0.6	20	6	0	21	6.8	15
Apr. 14, 1960.....	1,610	8.7	.01	1.4	.3	1.5	.6	10	.3	1.6	.0	.6	a23	5	0	19	7.1	5

3-5040. NANTAHALA RIVER NEAR RAINBOW SPRINGS, N. C.

Oct. 12, 1959.....	219	6.9	0.03	1.6	0.1	0.7	0.3	8	0.8	0.2	0.1	0.0	15	4	0	13	6.8	20
Apr. 28, 1960.....	175	7.5	.00	1.3	.6	.4	.2	8	.7	1.0	.1	.0	16	6	0	14	6.8	10

3-5055. NANTAHALA RIVER AT NANTAHALA, N. C.

Oct. 16, 1959.....	602	7.1	0.03	1.9	0.2	0.9	0.4	9	0.7	0.2	0.0	0.1	16	6	0	17	6.7	5
Apr. 18, 1960.....	729	6.9	.00	1.5	.4	.9	.4	8	.3	1.3	.0	.7	a17	5	0	14	6.6	5

3-5080. TUCKASEGEE RIVER AT TUCKASEGEE, N. C.

Oct. 8, 1959.....	864	7.6	0.01	2.1	0.1	1.1	0.6	9	0.4	0.8	0.1	0.4	17	6	0	19	6.5	10
Apr. 29, 1960.....	754	6.5	.01	1.1	.3	.7	.2	7	1.2	1.0	.0	.0	14	4	0	13	6.6	10

3-5090. SCOTT CREEK ABOVE SYLVA, N. C.

Oct. 8, 1959.....	109	10	0.04	2.9	0.6	1.6	0.9	13	2.6	0.7	0.0	0.3	26	10	0	30	7.2	15
Apr. 29, 1960.....	125	10	.00	2.0	.9	1.2	.4	12	.7	.5	.0	.2	22	9	0	24	7.0	7

3-5120. OCONALUFTEE RIVER AT BIRDTOWN, N. C.

Oct. 19, 1959.....	377	7.9	0.03	1.3	0.4	1.2	0.5	8	0.4	0.2	0.0	0.2	16	5	0	15	6.9	5
Apr. 14, 1960.....	669	7.6	.00	1.3	.4	1.2	.5	6	.4	1.0	.0	1.0	16	5	0	13	7.0	5

3-5135. NOLAND CREEK NEAR BRYSON CITY, N. C.

Oct. 20, 1959.....	27.0	6.2	0.02	1.0	0.1	0.7	0.3	6	0.6	0.3	0.1	0.0	12	3	0	10	6.6	10
Apr. 27, 1960.....	36.3	6.0	.00	1.1	.4	.3	.2	5	.6	.5	.1	.1	11	4	0	10	6.5	10

3-5450. HIWASSEE RIVER AT PRESLEY, GA.

Oct. 12, 1959.....	188	8.4	0.02	1.2	0.1	1.0	0.5	7	0.5	0.7	0.1	0.0	16	4	0	14	6.6	10
May 10, 1960.....	131	8.1	.00	1.5	.6	.6	.2	7	1.8	1.0	.0	.0	17	6	1	14	6.6	8

a Dissolved solids (residue at 180°C).

MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN--Continued

STREAMS IN TENNESSEE RIVER BASIN IN NORTH CAROLINA AND GEORGIA--Continued

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

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (calculated)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
3-5470. HIWASSEE RIVER BELOW CHATUGE DAM, NEAR HAYESVILLE, N. C.																		
Oct. 12, 1959.....	19.0	6.9	0.04	1.8	0.3	1.3	0.9	9	1.2	0.8	0.1	0.6	18	6	0	20	6.5	20
Apr. 28, 1960.....	1,180	6.5	.01	1.8	.7	1.2	.7	9	.4	1.8	.0	1.1	a19	7	0	18	6.8	5
3-5483.3. BRASSTOWN CREEK AT BRASSTOWN, N. C.																		
May 19, 1960.....	86.7	21	0.07			3.4	0.9	24	0.4	2.0	0.0	0.4		13	0	38	7.2	
3-5485. HIWASSEE RIVER ABOVE MURPHY, N. C.																		
Oct. 1, 1959.....	218	9.3	0.01	2.6	0.8	1.2	0.8	14	0.5	0.5	0.0	0.3	23	10	0	25	6.6	5
Apr. 28, 1960.....	445	8.2	.01	1.4	1.2	1.4	.7	11	.4	1.3	.0	1.2	a24	8	0	21	6.7	5
3-5500. VALLEY RIVER AT TOMOTLA, N. C.																		
Oct. 1, 1959.....	52.6	8.2	0.06	8.5	1.0	1.5	0.8	32	2.2	0.8	0.1	0.4	40	25	0	60	7.1	10
May 10, 1960.....	173	7.3	.00	3.8	.8	.8	.2	15	1.1	.5	.0	.2	22	13	0	28	7.0	5
3-5505. NOTTELY RIVER NEAR BLAIRSVILLE, GA.																		
Oct. 13, 1959.....	175	9.4	0.02	1.6	0.4	1.3	0.5	10	0.6	0.7	0.1	0.1	20	6	0	19	7.0	10
Apr. 28, 1960.....	193	9.5	.00	1.8	.6	.8	.4	10	.6	1.0	.1	.2	20	7	0	18	6.9	7
3-5535. NOTTELY RIVER AT NOTTELY DAM NEAR IVYLOG, GA.																		
Oct. 13, 1959.....	1,230	10	0.01	2.2	0.4	1.6	1.0	10	1.4	1.3	0.1	0.9	24	7	0	31	6.7	10
Apr. 28, 1960.....	1,350	8.7	.05	1.2	.9	1.5	.8	8	.3	1.9	.0	.9	a21	7	0	22	6.9	5

a Dissolved solids (residue at 180°C).

STREAMS TRIBUTARY TO LAKE SUPERIOR

4-310. BLACK RIVER NEAR BESSEMER, MICH.

LOCATION.--Temperature recorder at gaging station, 450 feet downstream from bridge on county highway, 500 feet downstream from Powder Mill Creek, and 2.5 miles north of Bessemer, Gogebic County.
DRAINAGE AREA.--202 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1954 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 79°F July 12; minimum, freezing point on many days during winter months.
EXTREMES, 1954-60.--Water temperatures: Maximum, 83°F Aug. 2, 1957; minimum, freezing point on many days during winter months.
REMARKS.--Recorder inoperative May 16 to July 5. Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	52	54	54	54	54	49	48	49	42	41	42	43	43	42	42	42	41	42	44	44	41	40	38	38	39	40	40	45
Minimum	--	51	51	51	51	52	53	54	47	46	43	42	41	41	41	42	41	41	40	41	39	40	42	41	40	38	38	37	37	39	40	43
November																																
Maximum	40	39	37	37	37	35	34	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	--	33
Minimum	39	37	37	37	35	34	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	34	--	33
December																																
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	34	34	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	34	34	34	34	34	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	34	34	34	34	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	34	34	34	32
February																																
Maximum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	34	32	34	34	34	34	34	--	--	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	34	34	--	--	32
March																																
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	34	34	34	34	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	34	34	34	34	32
April																																
Maximum	32	32	32	32	33	32	33	33	34	35	34	35	37	36	36	36	36	37	40	40	45	45	45	45	42	40	39	40	40	40	--	37
Minimum	32	32	32	32	32	33	33	33	33	33	33	33	33	33	34	35	36	34	37	40	40	44	45	42	40	39	39	39	40	40	--	36
May																																
Maximum	40	41	41	41	42	42	42	40	40	39	40	42	44	46	50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	39	40	41	41	41	42	42	40	39	39	39	40	43	46	50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June																																
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July																																
Maximum	--	--	--	--	--	71	70	75	76	74	77	79	78	74	77	72	74	76	77	71	76	74	72	73	79	76	69	72	75	79	71	74
Minimum	--	--	--	--	--	69	64	67	69	71	69	70	67	62	65	69	69	69	70	67	67	70	69	70	70	67	66	66	72	71	67	68
August																																
Maximum	72	76	70	74	73	77	76	73	73	66	69	72	73	70	67	69	73	73	75	76	75	76	76	71	70	73	72	66	66	66	70	72
Minimum	70	71	71	70	69	71	73	69	66	62	66	68	70	66	63	64	67	71	72	74	72	72	71	69	69	69	66	66	64	64	66	68
September																																
Maximum	70	70	74	74	74	76	76	75	68	64	62	61	60	59	61	59	59	59	58	59	61	60	59	54	55	56	56	56	54	55	--	63
Minimum	70	70	70	73	72	73	75	69	64	61	61	60	59	59	59	58	58	57	56	57	59	59	54	54	54	55	55	54	55	51	--	61

STREAMS TRIBUTARY TO LAKE MICHIGAN

4-460. BLACK RIVER NEAR GARNET, MICH.

LOCATION.--Temperature recorder at gaging station, 10 feet upstream from county bridge, 15 feet downstream from unnamed tributary entering from right, 3.5 miles upstream from Lake Michigan, and 4 miles southwest of Garnet, Mackinac County.
DRAINAGE AREA.--28 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: October 1951 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 63°F Sept. 7-9; minimum, 34°F Jan. 4-10, Apr. 13-15, 18.
EXTREMES, 1951-60.--Water temperatures: Maximum, 68°F July 21, 22, 1952; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	55	53	51	51	49	49	49	49	49	49	48	47	46	45	43	43	43	42	43	43	43	42	44	46	45	41	40	39	38	39	40	45
Minimum	53	51	51	49	49	49	49	49	49	48	47	46	45	43	43	43	43	42	42	43	42	42	42	44	41	40	39	38	38	38	39	44
November																																
Maximum	40	40	40	39	39	37	36	37	37	37	37	37	36	36	36	36	36	36	36	36	36	37	37	37	37	36	36	36	36	36	--	37
Minimum	40	40	39	39	37	36	36	36	37	37	37	36	36	36	36	36	36	36	36	36	36	36	37	37	36	36	36	36	36	36	--	37
December																																
Maximum	37	37	37	38	38	38	37	37	37	37	36	36	36	37	37	37	37	37	37	36	36	36	36	36	36	36	36	36	36	35	35	37
Minimum	36	37	37	37	38	37	37	37	37	36	36	36	36	36	37	37	37	37	36	36	36	36	36	36	36	36	36	36	35	35	35	36
January																																
Maximum	35	35	35	35	34	34	34	34	34	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	36	36	36	35
Minimum	35	35	35	34	34	34	34	34	34	34	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	36	36	35
February																																
Maximum	36	36	36	35	36	36	36	36	36	35	35	35	35	35	35	34	36	36	36	36	36	36	35	35	35	36	36	36	36	--	--	36
Minimum	35	35	35	33	35	35	35	35	35	35	35	35	35	35	35	35	36	36	36	36	36	35	35	35	35	35	36	36	35	--	--	35
March																																
Maximum	35	36	35	35	35	35	35	35	35	36	35	36	36	37	37	36	37	38	38	38	37	36	36	35	35	36	37	39	39	39	37	36
Minimum	35	35	35	35	35	35	35	35	35	35	35	35	35	35	36	36	36	37	37	36	35	35	35	35	35	35	36	37	38	37	36	36
April																																
Maximum	37	37	37	37	36	36	36	36	36	37	37	37	36	35	36	39	39	38	36	40	40	41	45	45	46	46	44	43	43	43	--	39
Minimum	36	37	37	36	36	35	36	36	36	35	37	36	36	34	34	35	35	34	35	36	40	40	41	41	44	44	42	42	43	43	--	38
May																																
Maximum	43	46	46	46	48	48	45	44	42	41	44	47	49	52	52	52	53	56	56	56	55	55	55	55	55	57	56	58	56	57	58	51
Minimum	40	42	45	46	46	45	44	43	41	40	39	43	46	48	50	51	53	52	55	55	55	54	53	53	52	55	55	55	55	55	55	49
June																																
Maximum	58	58	58	56	56	55	55	56	56	55	54	56	55	55	55	54	54	53	53	55	58	58	56	56	57	58	56	56	58	58	--	56
Minimum	55	56	56	54	54	52	52	52	52	53	52	52	52	53	53	51	50	52	52	52	54	56	54	54	54	55	55	57	56	55	--	54
July																																
Maximum	55	54	54	54	53	54	56	56	57	58	58	58	56	55	55	54	56	55	54	54	53	57	59	59	59	58	59	59	58	60	59	56
Minimum	51	53	53	51	51	51	51	53	53	54	54	54	54	51	51	53	52	53	51	50	51	53	55	55	55	57	56	55	56	57	56	53
August																																
Maximum	59	60	60	58	59	57	57	57	56	56	56	58	59	59	56	56	57	57	57	57	57	57	57	57	58	58	56	58	61	61	62	58
Minimum	57	59	56	55	55	55	56	56	58	58	58	56	56	56	58	58	58	55	55	55	57	55	55	55	53	55	52	53	58	60	61	55
September																																
Maximum	62	61	59	62	62	61	63	63	63	60	57	56	54	52	52	52	52	52	50	51	51	51	50	50	52	51	50	49	46	45	--	55
Minimum	61	59	58	58	60	60	61	63	60	56	56	54	52	52	52	49	49	49	50	49	50	50	50	50	51	49	49	46	45	43	--	53

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

4-585. EAST BRANCH ESCANABA RIVER AT GWINN, MICH.

LOCATION.--Temperature recorder at gaging station in county park at Gwinn, Marquette County, 1 mile upstream from mouth.
DRAINAGE AREA.--125 square miles.
RECORDS AVAILABLE.--Water temperatures: November 1954 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 70°F July 10-12; minimum, freezing point on many days during winter months.
EXTREMES, 1954-60.--Water temperatures: Maximum, 79°F July 4, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	54	52	51	51	51	51	53	52	50	48	47	46	44	43	41	42	42	42	41	41	41	40	41	41	39	38	38	38	38	38	37	44
Minimum	52	51	51	50	50	51	51	50	48	47	46	44	43	41	41	41	42	41	40	41	40	39	39	39	38	38	38	38	38	38	38	43
November																																
Maximum	37	37	37	37	37	34	34	34	34	34	34	34	34	34	34	34	34	33	33	33	33	33	33	33	33	33	32	32	32	32	--	34
Minimum	37	37	37	37	34	34	34	34	34	34	34	34	34	34	34	34	33	33	33	33	33	33	33	33	33	33	32	32	32	32	--	34
December																																
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
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	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
April																																
Maximum	32	32	32	32	33	33	33	33	33	33	33	34	34	35	35	34	35	35	36	40	43	44	44	43	42	41	41	43	45	45	--	37
Minimum	32	32	32	32	32	33	33	33	32	33	33	33	33	34	34	34	34	34	35	36	40	43	43	41	41	40	40	41	43	40	--	36
May																																
Maximum	40	43	44	43	46	46	42	36	35	38	42	45	47	50	54	54	56	57	58	59	59	60	60	60	58	60	60	60	61	60		51
Minimum	38	38	43	43	43	42	36	35	35	35	38	42	45	47	50	54	54	56	57	58	59	58	60	57	56	56	60	58	60	59	57	49
June																																
Maximum	62	61	59	60	60	58	58	60	61	61	60	60	62	63	63	62	55	58	59	61	62	63	63	61	63	64	66	67	67	67	--	62
Minimum	60	57	58	59	57	56	55	56	57	58	57	56	58	58	60	55	53	55	57	57	59	61	61	59	59	61	62	65	65	65	--	59
July																																
Maximum	65	63	62	61	62	62	63	67	69	70	70	70	69	64	65	65	66	66	65	64	63	63	64	66	66	68	68	68	66	66	66	66
Minimum	61	61	61	58	58	58	58	61	64	66	66	66	63	59	59	63	62	63	62	59	61	61	62	63	63	66	66	65	65	64	62	62
August																																
Maximum	65	67	67	66	67	68	68	67	66	63	67	66	68	66	64	64	65	68	69	68	68	67	65	63	63	66	65	64	62	62	65	66
Minimum	63	64	63	62	63	62	66	65	63	59	59	62	64	63	59	58	60	63	64	64	64	64	63	60	61	62	60	60	60	61	62	62
September																																
Maximum	65	63	64	65	66	67	68	67	63	60	58	56	54	53	54	53	52	52	51	54	56	56	55	54	56	55	55	54	52	51	--	56
Minimum	63	61	62	64	63	64	66	63	60	56	56	54	52	52	52	50	52	50	51	50	53	54	53	54	54	53	53	51	51	49	--	56

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

4-595. FORD RIVER NEAR HYDE, MICH.

LOCATION.--Temperature recorder at gaging station, 40 feet downstream from county highway bridge, 1.4 miles downstream from Tenmile Creek, and 1.5 miles north of Hyde, Delta County.
DRAINAGE AREA.--450 square miles.
RECORDS AVAILABLE.--Water temperatures: July 1956 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 76°F July 9-12; minimum, freezing point on many days during winter months.
EXTREMES, 1956-60.--Water temperatures: Maximum 86°F July 19, Aug. 2, 1957; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	57	55	55	54	54	54	56	56	55	51	51	46	45	45	45	48	47	45	45	45	42	43	46	46	42	40	39	37	36	37	39	47
Minimum	55	53	53	51	52	53	52	53	50	48	46	44	44	43	43	45	44	43	41	42	40	41	43	42	40	39	37	36	36	36	37	45
November																																
Maximum	39	39	38	38	37	34	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	33
Minimum	39	38	38	37	34	33	33	33	32	32	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	33
December																																
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
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
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
March																																
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
April																																
Maximum	32	32	32	32	32	32	32	32	32	32	32	32	32	34	34	39	39	38	39	42	47	49	49	49	46	46	43	46	46	45	--	38
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	36	34	37	39	42	46	47	46	44	43	43	43	45	41	--	37
May																																
Maximum	41	46	46	46	50	50	45	--	--	--	47	51	54	56	59	59	60	61	61	60	60	61	62	62	62	62	61	61	63	63	64	56
Minimum	38	41	44	43	46	45	41	--	--	--	44	47	49	52	54	56	56	57	59	59	59	58	59	58	58	59	60	60	60	60	58	52
June																																
Maximum	64	65	65	63	63	62	63	64	65	65	62	64	64	65	65	65	61	62	62	64	64	65	65	65	69	69	71	71	72	72	--	65
Minimum	61	62	62	61	60	60	58	59	60	62	60	59	62	62	64	58	56	59	59	60	62	62	63	61	62	65	65	68	68	67	--	62
July																																
Maximum	68	68	68	66	67	68	69	74	76	76	76	76	76	76	73	73	72	75	75	73	72	71	74	74	74	74	74	--	--	--	--	72
Minimum	64	66	65	63	63	64	65	68	73	73	73	73	69	65	68	72	70	70	71	68	68	69	68	69	70	73	70	--	--	--	--	69
August																																
Maximum	--	--	--	--	--	--	--	--	--	--	--	72	72	69	65	65	67	70	72	72	73	73	71	68	67	72	72	68	68	68	70	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	67	69	65	62	61	63	66	69	70	70	67	65	64	67	68	67	66	64	67	--	--
September																																
Maximum	70	67	68	69	69	72	74	74	68	65	65	62	60	59	60	60	60	60	57	60	60	--	--	--	--	--	--	--	--	--	--	--
Minimum	67	65	66	68	66	67	70	68	64	62	62	60	59	58	58	58	59	57	57	56	59	--	--	--	--	--	--	--	--	--	--	--

4-655. STURGEON RIVER NEAR FOSTER CITY, MICH.

LOCATION.--Temperature recorder at gaging station, 30 feet downstream from bridge on County Highway 569, 1.8 miles downstream from confluence of East and West Branches, and 4 miles south of Foster City, Dickinson County.
DRAINAGE AREA.--244 square miles.
RECORDS AVAILABLE.--Water temperatures: July 1956 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 78°F July 12; minimum, freezing point on many days during winter months.
EXTREMES, 1956-60.--Water temperatures: Maximum, 83°F July 19, 29, Aug. 2, 1957, July 30, 1959; minimum, freezing point on many days during winter months.
REMARKS.--Recorder stopped Aug. 10-14; range 63°F to 77°F. Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	57	55	55	54	55	55	56	55	55	51	51	47	46	45	45	47	46	46	46	45	43	42	45	45	42	39	38	37	36	38	39	47
Minimum	55	54	54	52	53	54	55	55	51	49	47	46	45	44	44	45	45	44	43	43	42	41	42	42	39	38	37	36	36	36	38	45
November																																
Maximum	40	39	38	38	36	34	33	34	34	34	34	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	--	34
Minimum	39	37	37	36	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	--	33
December																																
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
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	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
April																																
Maximum	32	32	32	32	32	32	32	32	32	32	32	34	33	36	38	41	41	38	41	44	50	52	52	49	46	46	46	48	48	47	--	39
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	38	38	36	38	41	44	48	49	46	44	44	44	44	47	46	--	37
May																																
Maximum	41	45	45	46	50	50	44	38	37	39	44	49	53	55	59	58	60	61	61	59	60	61	62	63	62	61	61	61	61	61	63	54
Minimum	38	41	44	43	46	44	38	37	37	37	39	43	47	50	53	56	55	56	58	58	58	57	58	58	57	59	59	60	59	60	56	50
June																																
Maximum	63	64	62	62	62	61	62	64	64	63	60	65	64	68	68	67	60	59	62	64	64	67	66	65	67	68	70	71	72	70	--	65
Minimum	61	60	60	60	59	58	56	58	60	60	59	57	60	60	63	56	54	57	58	59	62	62	62	60	61	63	66	66	68	66	--	60
July																																
Maximum	69	68	66	66	66	68	70	74	77	77	76	78	76	71	73	72	71	75	72	70	68	72	74	74	76	75	74	74	72	69	66	72
Minimum	64	66	64	62	61	62	63	66	70	71	70	70	66	62	64	69	68	67	67	64	65	66	66	68	69	71	69	68	68	66	63	66
August																																
Maximum	69	75	73	74	75	77	76	73	70	--	--	--	--	--	70	70	71	74	76	75	75	75	73	70	70	73	70	68	68	66	68	72
Minimum	65	68	69	63	68	70	72	69	67	--	--	--	--	--	62	62	63	66	69	70	69	69	69	63	65	67	65	64	64	63	65	67
September																																
Maximum	68	67	69	71	70	74	76	74	69	65	63	61	60	58	59	58	58	56	54	59	58	58	57	58	59	58	58	56	54	53	--	62
Minimum	66	65	66	58	67	69	72	69	65	61	61	58	56	56	56	54	56	52	53	53	56	57	55	56	56	54	55	54	53	51	--	59

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

4-1215. MUSKEGON RIVER AT EVART, MICH.

LOCATION.--Temperature recorder at gaging station, 500 feet downstream from bridge on U.S. Highway 10 at Evart, Osceola County, 0.4 mile upstream from Twin Creek, and at mile 123.9.
DRAINAGE AREA.--1,450 square miles.
RECORDS AVAILABLE.--Water temperatures: November 1956 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 75°F July 12, Sept. 8; minimum, freezing point on many days during November to March.
EXTREMES, 1956-60.--Water temperatures: Maximum, 80°F Aug. 24, 1959; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	60	58	59	59	58	56	55	56	56	51	51	47	47	46	45	47	47	47	46	46	45	43	48	49	49	47	45	45	46	46	43	50
Minimum	58	56	58	57	56	55	55	54	51	50	47	47	46	45	45	45	46	45	43	44	43	43	45	43	47	45	43	42	41	41	42	46
November																																
Maximum	43	43	42	41	41	41	40	39	38	37	38	38	36	35	34	33	33	33	33	33	33	33	34	35	35	35	35	35	36	36	--	36
Minimum	43	42	41	41	41	40	38	38	37	37	37	36	35	34	33	33	33	33	33	33	33	33	34	35	35	34	34	34	34	34	--	36
December																																
Maximum	33	32	34	34	34	34	34	33	32	32	32	33	33	33	34	34	34	34	33	32	32	32	32	32	32	34	34	33	33	34	34	33
Minimum	32	33	33	34	34	34	33	32	32	32	32	32	33	33	33	34	34	33	32	32	32	32	32	32	32	34	34	34	34	34	34	33
January																																
Maximum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	33	33	33	33	33	33	33	33	33	34	34	34
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	33	33	33	33	33	33	34	34	34	34	34
February																																
Maximum	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	32	32	33	33	--	--	34
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	--	--	34
March																																
Maximum	33	33	32	33	32	32	33	33	33	32	32	32	32	32	32	32	32	33	33	32	32	32	32	33	33	33	33	33	34	34	34	33
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	34	34	34	33	34
April																																
Maximum	33	33	33	33	33	33	33	34	35	36	36	38	42	46	47	49	49	49	46	47	50	53	57	59	59	58	53	53	54	51	--	44
Minimum	33	33	33	33	33	33	33	34	34	36	36	38	39	42	46	47	48	46	44	45	47	50	53	57	58	53	51	51	51	51	--	43
May																																
Maximum	51	51	54	56	59	59	59	56	52	49	47	50	53	53	56	57	57	59	60	63	64	64	61	60	60	60	60	61	64	63	64	57
Minimum	49	49	51	53	56	59	56	52	49	47	46	46	50	50	53	55	57	56	58	60	60	61	60	58	56	59	57	60	61	62	61	53
June																																
Maximum	64	65	66	66	67	65	63	64	64	65	67	67	66	63	62	63	63	61	64	63	64	65	64	62	62	63	67	69	70	70	--	65
Minimum	63	63	64	64	64	62	60	60	61	62	64	65	63	59	59	61	61	59	60	61	61	63	62	59	56	60	62	67	67	67	--	62
July																																
Maximum	70	69	70	67	66	67	69	71	72	73	74	75	74	72	72	72	73	72	71	70	70	70	73	74	74	73	71	70	73	72	69	71
Minimum	66	65	66	65	63	62	63	65	67	68	69	69	70	68	66	66	63	69	66	64	66	67	66	66	68	69	69	67	66	69	68	67
August																																
Maximum	68	69	69	69	70	71	69	70	67	65	67	69	70	69	67	69	68	71	72	71	71	71	70	70	68	68	70	71	71	71	72	69
Minimum	65	67	67	66	65	66	67	66	63	62	62	64	65	65	62	62	63	65	67	67	68	67	68	65	65	65	65	66	67	66	67	65
September																																
Maximum	71	71	70	70	71	71	74	75	73	69	66	64	62	61	59	60	62	62	60	62	62	62	61	64	64	63	62	60	60	60	--	65
Minimum	69	68	67	68	67	66	68	70	69	64	61	62	57	55	56	55	59	58	58	59	60	61	60	61	62	59	58	58	59	59	--	61

4-1235. MANISTEE RIVER NEAR GRAYLING, MICH.

LOCATION.--Temperature recorder at gaging station, 25 feet upstream from bridge on State Highway 72, 2.5 miles downstream from Goose Creek, and 6.5 miles northwest of Grayling, Crawford County.
DRAINAGE AREA.--159 square miles.
RECORDS AVAILABLE.--Water temperatures: May 1957 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 71°F July 9; minimum, freezing point on many days during November, and January to March.
EXTREMES, 1957-60.--Water temperatures: Maximum, 73°F June 22, July 20, Aug. 3, 1957; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	55	54	56	56	54	52	51	52	53	51	51	47	46	45	45	47	47	46	44	43	40	45	40	48	48	42	41	40	42	44	44	48
Minimum	52	50	54	53	52	51	51	51	49	47	45	43	45	44	44	45	46	44	40	42	40	40	45	48	42	41	39	39	40	42	44	45
November																																
Maximum	44	43	41	41	41	41	38	38	39	40	41	39	36	34	34	36	36	32	35	36	37	40	40	40	37	35	36	35	34	33	--	38
Minimum	42	39	38	40	40	38	37	37	38	39	39	35	34	33	32	32	32	32	32	35	36	37	40	37	35	34	35	33	34	34	--	36
December																																
Maximum	37	39	39	39	39	39	36	35	35	35	35	37	36	37	38	38	38	38	36	35	35	35	33	33	36	39	42	42	34	34	35	37
Minimum	35	37	37	37	37	36	34	34	34	33	34	35	33	35	37	37	37	36	33	34	34	33	33	33	33	36	35	34	33	32	34	35
January																																
Maximum	35	35	36	36	33	37	33	33	33	32	34	35	38	39	39	35	36	36	33	33	33	34	35	35	34	33	34	37	36	36	36	35
Minimum	33	33	35	33	33	33	33	33	33	33	33	34	35	38	35	33	34	34	32	33	32	33	34	34	33	32	32	34	37	36	36	34
February																																
Maximum	36	34	32	33	37	37	35	33	34	34	32	32	32	32	32	32	36	36	36	36	35	37	36	34	33	33	34	34	33	--	--	34
Minimum	34	32	32	32	33	35	32	32	33	32	32	32	32	32	32	32	32	35	34	33	34	33	32	32	32	32	33	34	32	--	--	33
March																																
Maximum	32	32	32	32	32	32	34	34	33	37	34	35	36	39	39	38	37	43	42	40	39	36	35	37	36	41	47	47	47	47	42	38
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	33	33	34	33	37	36	36	34	32	33	34	33	34	33	33	43	41	42	38	34
April																																
Maximum	44	45	45	44	42	41	41	42	41	45	44	49	49	50	53	53	52	44	47	50	51	57	59	60	59	51	49	52	52	50	--	49
Minimum	39	42	42	42	39	36	40	38	39	36	40	39	44	47	44	50	44	39	39	45	49	48	53	55	51	40	42	43	40	47	--	44
May																																
Maximum	50	52	52	57	57	56	54	49	45	44	48	55	54	55	59	61	59	61	60	60	62	61	56	57	60	62	63	62	61	60	60	57
Minimum	42	45	49	48	52	53	49	45	44	43	43	45	49	48	51	52	52	49	56	56	56	55	53	51	51	55	57	59	57	56	54	51
June																																
Maximum	63	65	63	64	64	62	62	64	64	64	63	64	63	59	61	61	60	59	58	61	61	60	59	58	63	64	66	66	67	67	--	62
Minimum	56	58	57	57	57	54	51	54	54	55	58	55	56	54	53	57	55	53	53	51	55	56	54	54	51	56	57	61	60	60	--	55
July																																
Maximum	65	65	66	62	63	63	66	69	71	70	68	70	69	66	66	65	67	67	63	62	62	62	67	66	68	66	67	67	70	66	64	66
Minimum	56	56	60	56	55	55	55	58	61	62	60	61	62	57	56	59	59	62	57	54	55	56	57	59	59	60	57	59	61	61	59	58
August																																
Maximum	65	66	67	68	63	65	64	64	63	62	64	67	66	65	61	63	65	67	66	66	64	66	65	62	61	63	63	67	67	66	67	65
Minimum	56	60	60	59	56	57	59	58	59	53	56	58	60	56	51	54	56	59	60	59	60	57	59	53	55	58	58	59	63	59	59	57
September																																
Maximum	66	65	64	64	64	67	70	69	68	62	59	58	56	54	54	56	55	54	52	56	55	55	54	59	59	57	55	54	52	49	--	59
Minimum	62	57	59	61	58	59	63	63	62	55	53	55	50	48	52	48	54	49	50	51	54	53	53	53	57	51	51	48	48	45	--	54

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

4-1245. EAST BRANCH PINE RIVER NEAR TUSTIN, MICH.

LOCATION.--Temperature recorder at gaging station, 75 feet downstream from highway bridge, 1.6 miles upstream from North Branch, 3.0 miles west of Tustin, Osceola County, and 5.5 miles northwest of Le Roy.
DRAINAGE AREA.--63 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: July 1952 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 63°F Aug. 24 to Sept. 2, Sept. 4-8; minimum, 33°F on many days during December to March.
EXTREMES, 1952-60.--Water temperatures: Maximum 73°F July 4, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	53	53	54	54	53	53	53	53	53	50	48	47	46	46	45	45	45	45	45	43	43	43	46	46	46	46	44	41	41	41	42	47
Minimum	53	52	52	53	53	53	53	53	50	48	47	46	46	45	45	45	45	45	42	42	42	42	43	46	46	44	41	41	41	41	41	46
November																																
Maximum	42	42	41	40	40	40	39	37	36	37	38	38	36	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	--	36
Minimum	42	41	40	40	40	39	37	36	36	36	37	36	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	--	36
December																																
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	33	34
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	33	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	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
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
March																																
Maximum	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34	34	34	34	34	38	36	35	34	34	34
Minimum	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34	34	34	34	34	34	35	34	34	34	34
April																																
Maximum	34	34	34	34	34	34	35	35	35	36	36	40	42	44	51	51	50	46	46	49	52	57	60	60	59	55	50	50	50	50	--	45
Minimum	34	34	34	34	34	34	34	35	35	35	36	36	38	42	44	50	46	41	40	46	49	51	56	59	55	50	47	48	50	50	--	43
May																																
Maximum	50	51	52	56	56	56	56	50	47	44	43	49	50	54	56	56	56	58	58	58	58	58	58	58	59	59	58	58	59	59	59	55
Minimum	45	47	51	52	54	56	50	47	44	43	42	43	48	50	52	53	54	51	58	58	58	58	58	54	55	58	57	57	58	58	57	52
June																																
Maximum	59	59	59	59	59	58	57	59	59	58	58	58	58	56	56	57	58	56	58	58	58	59	59	57	59	59	59	59	59	59	--	58
Minimum	58	58	58	58	58	56	53	54	54	55	58	58	56	54	54	56	55	53	54	55	55	58	56	57	54	57	56	59	59	59	--	56
July																																
Maximum	59	59	59	59	60	60	60	60	60	60	60	60	60	60	60	60	60	59	60	60	61	61	61	61	61	61	61	61	61	61	61	60
Minimum	59	58	58	56	56	55	55	56	58	59	59	59	59	58	57	57	58	59	58	56	58	61	58	59	60	60	61	61	61	61	59	58
August																																
Maximum	62	61	61	61	62	62	61	61	61	60	62	62	62	62	61	62	61	62	62	62	62	62	62	63	63	63	63	63	63	63	63	62
Minimum	59	61	61	60	60	61	61	61	60	60	58	60	60	60	58	58	59	60	60	60	61	60	62	60	61	62	60	62	61	61	61	60
September																																
Maximum	63	63	62	63	63	63	63	63	62	61	60	60	58	55	55	56	57	57	56	58	58	58	58	61	62	61	61	55	53	52	--	59
Minimum	61	61	61	61	61	61	61	61	61	59	56	58	55	53	54	54	56	56	56	56	58	58	58	58	61	57	55	53	52	50	--	57

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

4-1250. PINE RIVER NEAR LE ROY, MICH.

LOCATION.--Temperature recorder at gaging station, 15 feet downstream from highway bridge, 5.0 miles northwest of Le Roy, 5.1 miles downstream from East Branch, and 5.3 miles southwest of Tustin, Osceola County.
DRAINAGE AREA.--118 square miles.
RECORDS AVAILABLE.--Water temperatures: January 1953 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 63°F July 12, 13, 27-30; minimum, freezing point on many days during December to March.
EXTREMES, 1953-60.--Water temperatures: Maximum, 69°F July 22, 1953, Aug. 1, 2, 5, 6, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Recorder stopped Mar. 17-21; range 30° to 36°F. Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	51	51	52	52	52	51	51	52	52	49	48	46	45	44	44	45	45	45	44	44	43	44	47	48	48	45	43	41	41	42	43	47
Minimum	51	50	51	52	51	51	51	51	49	47	46	45	44	44	44	44	45	44	42	43	43	43	44	47	45	43	41	41	41	41	42	46
November																																
Maximum	43	43	41	40	41	41	40	38	37	39	39	39	37	36	35	35	35	35	35	35	35	36	36	36	36	35	35	35	35	35	--	37
Minimum	43	41	40	40	40	40	38	37	37	37	39	37	36	35	35	35	35	35	35	35	35	35	36	36	35	35	35	35	34	34	--	37
December																																
Maximum	36	36	36	36	36	36	36	35	35	35	35	35	35	36	37	37	37	37	37	35	35	35	35	34	34	34	34	34	33	32	32	35
Minimum	35	36	36	36	36	36	35	35	35	35	35	35	35	35	36	37	37	37	35	35	35	35	34	33	33	34	34	33	32	32	32	35
January																																
Maximum	32	33	33	33	32	32	32	32	32	33	33	33	33	33	34	34	33	33	34	34	34	34	34	34	34	33	34	34	34	35	35	33
Minimum	32	32	33	32	32	32	32	32	32	32	32	32	33	33	33	33	33	33	33	34	33	33	34	34	33	33	33	34	34	34	35	33
February																																
Maximum	35	35	33	33	35	35	35	34	34	34	32	33	33	33	33	35	35	35	34	34	34	34	34	35	34	34	34	33	33	--	--	34
Minimum	35	33	33	33	33	35	34	33	34	32	32	32	32	32	33	33	34	34	34	34	33	34	33	33	33	33	33	32	32	--	--	33
March																																
Maximum	32	33	33	33	33	33	34	33	33	34	34	34	33	34	34	34	34	34	34	34	34	34	33	34	33	37	39	38	38	34	35	34
Minimum	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	35	35	34	33	33	32
April																																
Maximum	33	33	33	33	33	33	35	35	36	37	37	40	42	43	47	48	48	45	44	47	50	53	57	57	57	53	49	49	47	48	--	43
Minimum	33	33	33	33	33	33	33	35	35	35	36	35	37	42	42	47	45	40	39	44	47	49	53	57	53	49	47	47	47	47	--	41
May																																
Maximum	48	49	51	54	55	55	53	49	46	44	43	47	48	52	54	54	54	56	56	61	61	61	58	56	57	57	56	57	60	60	59	54
Minimum	45	46	49	50	53	53	49	46	44	43	42	43	47	48	50	51	53	50	56	56	60	58	56	54	54	56	55	56	56	58	57	51
June																																
Maximum	59	61	61	61	61	60	56	57	58	58	59	59	58	55	55	56	57	56	58	57	58	58	58	58	58	58	61	61	61	61	--	58
Minimum	58	59	60	60	59	55	52	53	54	54	57	57	55	54	53	55	55	53	54	54	54	57	58	58	53	55	56	59	60	60	--	56
July																																
Maximum	61	60	61	60	59	58	59	61	61	62	62	63	63	62	60	60	61	61	59	59	59	59	61	61	61	62	63	63	63	63	60	61
Minimum	58	57	58	56	56	56	55	56	58	60	59	59	60	57	56	57	57	59	57	55	57	59	57	57	58	60	61	61	60	61	56	58
August																																
Maximum	58	60	61	61	59	59	62	60	59	56	57	59	59	59	57	57	57	58	59	59	59	60	60	59	58	58	58	60	60	60	60	59
Minimum	55	57	60	58	58	56	58	58	56	56	54	56	57	57	55	54	55	56	57	58	58	59	58	56	58	57	55	57	60	58	58	57
September																																
Maximum	60	60	59	59	59	59	61	61	61	58	55	53	53	51	51	51	53	53	52	54	54	54	54	56	56	56	54	53	51	51	--	55
Minimum	57	58	58	58	57	57	58	59	58	54	52	53	51	50	50	50	51	52	51	52	53	54	54	54	56	53	52	51	51	49	--	54

4-1255. PINE RIVER NEAR HOXEYVILLE, MICH.

LOCATION.--Temperature recorder at gaging station, 500 feet upstream from bridge on State Highway 37, 4.2 miles northwest of Hoxeyville, Wexford County, 8.0 miles east of Wellston, and 8 miles upstream from mouth.
DRAINAGE AREA.--251 square miles.
RECORDS AVAILABLE.--Water temperatures: July 1952 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 63°F July 29, 30; minimum, 33°F Feb. 9, 10.
EXTREMES, 1952-60.--Water temperatures: Maximum, 68°F Aug. 1, 1955; minimum, freezing point on several days during January 1955 and February 1958.
REMARKS.--Recorder stopped Jan. 10, 11; range 34°F to 37°F, June 2-6, pen not marking. Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	51	52	52	52	52	51	51	51	49	48	47	46	46	46	46	46	46	45	44	44	45	47	48	48	47	45	43	43	43	43	47
Minimum	51	51	51	52	52	51	51	51	49	48	47	46	46	46	46	46	46	45	44	44	44	44	45	47	47	45	43	43	43	43	43	47
November																																
Maximum	43	43	42	42	42	42	42	41	40	41	41	41	40	39	38	37	37	36	37	37	38	39	39	39	39	38	38	38	38	38	--	40
Minimum	43	42	42	42	42	42	41	40	40	40	41	40	39	38	37	37	36	36	36	37	37	38	39	39	38	38	38	38	38	38	--	39
December																																
Maximum	38	39	39	39	40	40	40	39	38	38	38	38	38	38	39	39	39	39	39	38	37	37	37	36	36	38	39	39	37	35	35	38
Minimum	38	38	39	39	39	40	38	38	38	38	38	38	38	38	38	39	39	39	38	37	37	37	36	35	35	36	36	37	35	35	34	37
January																																
Maximum	34	35	36	36	34	34	34	35	35	--	--	36	37	37	37	37	36	35	35	35	35	35	36	36	36	36	36	36	37	37	37	36
Minimum	34	34	35	34	34	34	34	34	34	--	--	35	36	37	37	36	35	35	35	35	35	35	35	36	36	35	35	36	37	37	37	35
February																																
Maximum	--	--	--	--	--	--	--	--	--	37	34	34	34	34	34	36	37	37	37	37	36	36	36	37	37	36	36	36	36	--	--	--
Minimum	--	--	--	--	--	--	--	--	33	33	34	34	34	34	34	36	37	37	36	36	36	36	36	36	36	36	36	36	35	--	--	--
March																																
Maximum	35	35	35	35	35	35	35	35	35	36	36	36	35	36	36	36	36	38	38	39	38	35	35	36	36	38	41	43	43	41	37	37
Minimum	34	34	35	34	34	35	35	35	35	35	35	35	34	35	35	36	36	36	38	38	35	34	35	35	35	36	38	41	40	37	36	36
April																																
Maximum	36	37	37	38	38	38	38	39	39	41	41	42	45	46	47	48	48	47	45	47	49	52	55	55	55	54	51	50	49	49	--	45
Minimum	36	36	37	37	38	38	38	38	39	39	41	41	42	45	46	47	47	45	43	45	47	49	52	55	54	51	50	48	49	49	--	44
May																																
Maximum	49	50	50	53	53	53	53	51	47	46	45	47	49	51	52	52	52	53	53	55	57	57	55	54	54	54	53	54	55	55	56	52
Minimum	48	48	49	50	53	53	51	47	46	45	45	45	47	49	51	51	52	51	53	53	55	55	54	52	52	53	53	53	53	54	53	51
June																																
Maximum	56	--	--	--	--	--	55	56	57	57	57	57	57	54	55	55	57	55	57	56	56	57	57	56	57	57	60	60	60	60	--	57
Minimum	54	--	--	--	--	--	52	53	54	55	56	56	54	53	53	55	54	54	54	54	54	56	55	55	54	55	56	59	59	58	--	55
July																																
Maximum	60	59	60	57	58	57	58	59	59	60	60	61	61	60	59	60	61	59	58	58	58	58	61	62	61	61	62	62	63	63	60	60
Minimum	58	57	58	57	55	54	54	55	56	58	57	59	58	57	56	56	57	58	56	55	56	57	56	58	59	60	59	61	60	60	57	57
August																																
Maximum	60	60	61	61	61	61	60	60	59	58	59	60	61	60	58	59	59	61	62	61	60	62	61	60	60	60	59	61	62	61	61	60
Minimum	57	59	59	60	58	58	59	59	57	57	57	57	58	57	55	56	57	57	58	59	59	59	59	58	58	58	57	58	60	58	59	58
September																																
Maximum	61	61	60	61	60	61	62	62	62	59	56	55	55	53	54	54	54	54	52	53	53	53	53	56	57	55	53	52	51	51	--	56
Minimum	60	59	59	59	58	58	59	60	59	56	55	55	53	52	52	53	54	52	52	52	53	53	53	53	55	53	52	51	51	50	--	55

4-1262. LITTLE MANISTEE RIVER NEAR FREESOIL, MICH.

LOCATION.--Temperature recorder at gaging station, 25 feet upstream from Sixmile Bridge, 5.8 miles north of Freesoil, Mason County, 7.4 miles upstream from mouth, and 9.0 miles southeast of Manistee.
DRAINAGE AREA.--200 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1956 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 67°F July 13, 29; minimum, 34°F Nov. 17-19, Feb. 10-15.
EXTREMES, 1956-60.--Water temperatures: Maximum, 72°F June 17, 18, 1957; minimum, freezing point Dec. 10-16, 1957.
REMARKS.--Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	53	52	54	54	53	52	53	54	54	50	49	46	45	45	45	47	47	46	45	45	44	45	48	49	49	47	44	43	43	44	44	48
Minimum	52	52	53	52	53	52	53	53	50	48	46	45	45	45	45	45	46	45	43	44	42	43	45	48	47	44	43	42	43	43	44	47
November																																
Maximum	44	44	42	42	42	42	41	40	40	41	41	41	39	37	37	36	36	34	35	36	37	39	39	40	40	39	38	38	38	38	--	39
Minimum	44	41	41	42	42	41	40	40	40	39	41	39	37	37	35	35	34	34	34	35	36	37	39	39	39	38	38	38	38	38	--	38
December																																
Maximum	38	39	39	40	40	40	40	38	37	37	39	38	38	38	40	40	40	39	39	37	37	37	36	36	37	40	42	42	40	38	38	39
Minimum	38	38	39	39	40	40	38	37	37	37	37	38	38	38	38	39	39	39	37	37	37	36	35	36	36	37	40	40	37	38	38	38
January																																
Maximum	35	37	37	37	35	35	35	35	35	36	36	36	33	29	29	30	37	35	36	36	36	36	36	37	37	36	38	38	39	39	39	37
Minimum	35	35	37	35	35	35	35	35	35	35	36	36	36	38	38	37	36	36	36	36	36	36	36	36	36	36	36	36	38	39	39	36
February																																
Maximum	39	39	35	35	38	38	38	37	37	37	34	34	35	35	35	37	38	38	38	38	37	38	38	38	38	36	37	37	37	--	--	37
Minimum	39	35	35	35	35	32	37	37	37	34	34	34	34	34	34	35	37	38	37	37	36	36	37	37	35	36	36	37	35	--	--	36
March																																
Maximum	36	36	36	35	35	36	36	37	36	38	37	37	36	38	38	38	37	41	41	40	39	37	37	36	36	40	45	47	48	47	41	39
Minimum	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	37	36	36	37	38	36	35	35	35	35	36	39	43	45	41	37	36
April																																
Maximum	39	41	41	41	41	39	39	40	41	42	43	42	51	53	56	56	55	47	48	50	55	58	62	61	58	55	53	52	51	50	--	49
Minimum	37	37	41	40	39	38	38	39	39	39	42	42	47	51	51	54	47	45	44	47	50	52	56	58	55	52	49	49	50	47	--	46
May																																
Maximum	51	55	55	58	57	57	55	51	47	46	48	52	55	57	59	58	58	60	59	62	62	61	59	59	60	58	56	56	59	59	61	56
Minimum	46	49	53	52	55	55	51	47	46	45	45	45	48	51	53	54	55	52	58	59	61	59	57	55	55	56	55	55	55	57	55	53
June																																
Maximum	60	62	61	60	62	60	59	60	60	60	60	61	59	56	56	57	60	57	61	58	59	59	58	57	60	60	63	62	63	63	--	60
Minimum	57	57	57	58	57	56	52	53	55	56	58	57	56	54	52	55	54	55	54	54	55	58	55	54	52	55	57	60	59	59	--	56
July																																
Maximum	63	61	63	61	61	62	63	65	65	64	64	66	67	64	63	64	65	63	63	63	63	63	65	65	66	65	66	66	67	66	65	64
Minimum	58	57	59	56	55	56	56	57	60	61	60	60	61	59	57	58	60	61	60	56	59	60	57	59	61	63	60	63	62	62	58	59
August																																
Maximum	64	63	65	64	64	65	64	63	61	60	62	63	64	63	60	61	61	64	65	64	63	64	63	63	62	63	62	64	64	63	65	63
Minimum	58	61	62	61	59	60	62	60	58	57	56	58	59	58	56	56	57	58	60	61	62	61	61	58	58	60	57	59	62	58	60	59
September																																
Maximum	64	62	63	64	63	64	65	64	63	60	58	57	55	54	55	55	56	56	53	56	55	55	55	59	59	57	55	54	52	51	--	58
Minimum	62	60	60	61	60	59	61	62	60	56	54	55	53	50	52	52	55	52	52	53	53	54	54	55	57	53	53	51	51	49	--	55

4-1280. STURGEON RIVER NEAR WOLVERINE, MICH.

LOCATION.--Temperature recorder at gaging station, 1.8 miles north of Wolverine, Cheboygan County, 2.8 miles downstream from West Branch, and 9 miles upstream from mouth.
DRAINAGE AREA.--170 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: October 1958 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 70°F July 12; minimum, freezing point on many days during February and March.
EXTREMES, 1958-60.--Water temperatures: Maximum, 73°F June 28, 1959; minimum, freezing point on many days during February and March 1960.
REMARKS.--Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	54	53	55	55	53	52	54	54	54	52	52	48	48	47	47	48	48	46	45	45	45	46	49	50	49	45	43	42	43	44	44	49
Minimum	53	51	53	51	52	51	52	51	50	50	48	47	47	46	46	47	46	44	42	44	44	43	46	49	45	43	41	41	42	43	44	47
November																																
Maximum	44	44	42	42	40	40	39	40	40	41	41	40	38	36	36	38	38	35	36	38	38	40	40	40	38	37	37	37	36	37	--	39
Minimum	44	41	41	39	39	39	39	39	39	40	40	38	36	36	35	35	35	35	35	36	38	38	40	38	37	36	36	35	36	36	--	38
December																																
Maximum	38	40	40	40	40	40	35	36	37	36	37	38	37	38	39	39	39	39	38	36	36	36	35	35	37	39	39	39	35	35	35	36
Minimum	37	38	39	38	40	38	36	36	36	36	36	37	36	36	38	38	39	38	36	36	35	35	35	35	35	37	37	33	33	35	34	37
January																																
Maximum	35	34	35	35	34	34	34	34	34	34	34	34	34	37	37	34	36	35	34	34	34	35	35	35	35	34	35	36	35	36	35	35
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	35	35	35	34	34
February																																
Maximum	35	34	33	33	33	34	34	34	34	34	33	33	32	33	33	32	34	34	35	35	35	35	34	33	33	33	33	34	33	--	--	34
Minimum	34	33	32	32	32	33	33	33	33	33	33	32	32	32	32	32	32	33	34	33	34	33	32	32	32	32	33	33	32	--	--	33
March																																
Maximum	33	33	32	32	33	33	33	33	33	33	33	33	33	33	33	33	34	35	37	37	35	35	34	34	34	36	40	39	41	39	36	35
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	34	34	34	33	33	33	33	33	33	35	37	37	36	35	33
April																																
Maximum	38	38	39	38	38	38	38	37	38	40	38	42	40	43	45	45	45	42	44	46	47	52	56	57	55	51	49	52	50	50	--	44
Minimum	35	37	37	36	36	36	34	37	36	34	36	37	37	37	37	37	42	39	36	37	42	45	44	49	52	50	46	45	43	47	48	--	40
May																																
Maximum	51	51	50	56	54	54	53	51	47	46	48	53	51	54	56	59	57	60	61	59	60	59	58	58	56	61	61	62	62	61	64	56
Minimum	45	45	48	47	51	52	51	47	46	44	44	45	47	48	49	50	53	50	54	56	56	56	55	52	52	52	56	57	57	58	55	51
June																																
Maximum	62	65	63	63	62	61	62	62	63	62	62	64	62	59	60	60	60	58	57	61	61	60	60	58	62	64	65	64	67	65	--	62
Minimum	56	58	58	56	57	54	53	53	52	55	58	55	55	55	55	57	55	54	55	52	55	56	55	55	53	56	56	61	60	60	--	56
July																																
Maximum	62	62	62	62	60	61	64	67	69	68	67	70	68	65	65	64	63	63	62	62	61	66	67	66	66	66	66	67	68	67	64	65
Minimum	55	56	59	56	56	54	54	58	61	61	61	61	62	58	57	60	60	59	58	56	56	58	58	59	60	62	60	60	61	62	60	59
August																																
Maximum	64	66	67	65	64	65	64	65	63	62	64	67	68	69	61	62	64	66	76	65	63	65	64	61	61	64	62	60	60	60	64	64
Minimum	58	61	61	58	56	53	60	60	57	55	56	59	62	59	54	54	56	59	60	60	59	58	60	54	55	58	56	60	61	57	58	58
September																																
Maximum	65	62	61	61	63	65	68	67	64	60	58	57	54	52	53	52	55	54	52	53	56	55	54	58	59	56	55	53	52	49	--	57
Minimum	61	57	58	60	57	58	62	63	60	55	53	54	49	48	51	47	52	50	51	51	52	53	53	53	56	51	51	48	49	47	--	54

STREAMS TRIBUTARY TO LAKE HURON--Continued

4-1290. PIGEON RIVER NEAR VANDERBILT, MICH.

LOCATION.--Temperature recorder at gaging station at Pigeon River Fisheries Experiment Station, 11.1 miles east of Vanderbilt, Otsego County.
DRAINAGE AREA.--63 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: October 1950 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 75°F July 9, 10; minimum, freezing point on many days during February and March.
EXTREMES, 1950-60.--Water temperatures: Maximum, 81°F Aug. 1, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Recorder stopped Feb. 14-22, range 33°F to 36°F. Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	56	56	56	56	54	53	53	52	52	52	51	49	47	46	45	47	47	46	45	44	45	45	46	47	47	44	42	40	41	42	43	48
Minimum	53	53	54	53	53	52	52	52	50	49	49	46	46	45	45	45	46	43	42	42	42	42	43	43	44	42	40	39	39	40	42	46
November																																
Maximum	45	43	40	39	39	37	38	38	38	39	39	38	37	36	37	36	35	36	35	36	37	38	38	38	37	36	36	36	35	35	--	38
Minimum	43	40	39	38	36	38	38	36	36	37	38	36	35	34	34	35	34	34	34	34	35	36	37	37	35	34	34	33	34	34	--	36
December																																
Maximum	36	37	38	40	38	38	38	36	36	37	37	36	37	36	36	37	38	37	36	35	34	34	34	34	34	35	37	37	35	34	34	36
Minimum	35	36	37	37	37	38	36	35	35	35	35	35	35	35	35	36	36	36	35	34	34	33	33	33	34	34	35	34	33	33	33	35
January																																
Maximum	32	33	34	34	33	33	33	33	33	33	33	33	34	35	35	34	35	34	34	34	34	34	35	35	34	34	34	35	36	37	37	34
Minimum	33	33	33	33	32	33	32	33	33	33	33	33	34	34	34	34	33	33	33	33	33	33	33	33	33	33	33	34	34	34	34	33
February																																
Maximum	36	36	36	34	34	34	35	34	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	32	33	33	33	34	--	--	34
Minimum	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	--	--	33
March																																
Maximum	32	33	32	32	32	32	33	34	33	34	34	34	33	35	37	32	33	37	37	37	36	37	35	34	36	37	36	37	40	37	36	33
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	32	32	32	32	32	32	32	32	34	35	33	33	32
April																																
Maximum	36	36	39	37	37	37	38	38	36	40	38	42	39	41	42	43	43	43	42	44	46	49	54	54	53	46	46	50	47	47	--	43
Minimum	33	35	36	36	34	34	35	35	34	34	35	36	37	37	37	42	37	34	36	41	44	46	48	50	48	44	43	42	45	40	--	39
May																																
Maximum	49	49	48	52	54	53	53	50	46	44	44	48	49	52	54	59	55	58	61	59	62	58	58	58	56	61	64	65	63	63	63	55
Minimum	45	46	46	46	50	51	50	46	44	42	41	44	47	47	47	50	53	52	55	57	58	57	55	55	54	53	56	58	59	57	56	51
June																																
Maximum	66	67	66	67	66	63	65	66	63	60	63	64	63	59	60	63	63	62	60	63	65	67	64	59	62	65	68	68	67	67	--	65
Minimum	60	62	61	61	61	58	57	57	57	53	60	58	53	56	57	59	59	58	57	56	58	59	58	56	55	58	61	62	65	63	--	59
July																																
Maximum	69	70	68	67	62	65	68	72	75	75	73	73	72	71	70	69	66	65	65	67	69	67	70	70	72	67	66	69	71	67	66	69
Minimum	61	61	64	62	60	59	59	62	65	65	69	66	64	62	61	62	63	62	61	60	59	60	60	62	62	65	63	65	67	65	61	64
August																																
Maximum	67	68	70	68	66	67	67	67	62	63	67	70	71	67	66	67	70	71	71	68	66	68	64	66	68	66	69	70	71	71	71	68
Minimum	61	62	63	62	60	61	62	61	59	58	60	62	64	61	59	58	59	61	63	63	63	62	60	58	58	62	60	62	64	64	63	61
September																																
Maximum	68	68	67	65	67	70	73	70	68	66	64	60	57	55	53	56	56	56	54	54	56	56	55	60	62	62	60	59	54	52	--	61
Minimum	64	61	62	62	61	62	64	66	62	60	58	56	52	52	51	49	54	52	53	53	53	54	54	54	58	56	55	53	51	46	--	56

STREAMS TRIBUTARY TO LAKE HURON--Continued

4-1355. AU SABLE RIVER AT GRAYLING, MICH.

LOCATION.--Temperature recorder at gaging station, 65 feet upstream from bridge on U.S. Highway 27 at Grayling, Crawford County, and 0.8 mile upstream from East Branch.
DRAINAGE AREA.--110 square miles.
RECORDS AVAILABLE.--Water temperatures: March 1953 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 76°F July 10, 11, Sept. 8, 9; minimum, freezing point on many days during November to March.
EXTREMES, 1953-60.--Water temperatures: Maximum, 80°F on several days during 1953 and 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	60	56	57	57	57	55	52	54	54	51	51	48	44	44	43	44	44	44	42	42	42	43	46	46	46	43	40	36	39	41	41	47
Minimum	56	52	55	54	55	52	50	50	50	49	45	44	42	42	43	42	44	42	40	40	40	40	42	46	43	40	38	37	37	36	41	45
November																																
Maximum	41	41	38	38	38	38	37	36	36	36	37	36	34	33	33	33	32	32	32	32	32	34	35	35	35	33	33	33	33	33	--	35
Minimum	41	39	36	38	38	37	36	34	35	36	36	34	33	33	33	33	32	32	32	32	32	32	34	35	33	33	32	32	33	32	--	34
December																																
Maximum	33	34	35	35	35	35	34	32	32	32	32	32	32	33	34	34	35	35	33	32	32	32	32	32	32	32	33	33	32	32	32	33
Minimum	32	32	34	35	35	34	32	32	32	32	32	32	32	32	33	33	34	33	32	32	32	32	32	32	32	32	32	32	32	32	32	33
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	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	33	33	33	32	34	35	37	37	37	33
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	33	32	32	32	34	34	37	37	33
April																																
Maximum	38	39	40	40	39	39	39	39	39	41	41	42	47	49	53	50	51	47	46	47	51	57	60	62	62	56	50	51	51	50	--	47
Minimum	35	36	38	39	37	38	37	37	36	36	38	38	44	47	46	49	47	43	40	43	47	49	54	57	56	50	46	46	48	49	--	44
May																																
Maximum	49	52	56	57	58	58	57	53	49	46	46	50	52	55	59	62	62	61	62	62	63	63	60	59	62	63	65	65	65	65	65	58
Minimum	45	46	50	56	55	57	53	49	46	44	44	47	49	51	52	55	57	54	56	59	60	59	57	54	55	58	60	62	62	61	58	54
June																																
Maximum	58	57	57	55	56	56	54	56	56	60	56	61	59	62	62	63	63	61	61	64	64	63	62	62	64	66	69	69	70	70	--	65
Minimum	61	62	61	61	61	60	58	58	61	61	59	60	61	58	56	60	58	57	57	57	60	60	60	58	55	60	63	66	66	66	--	60
July																																
Maximum	70	69	68	67	65	66	68	71	75	76	75	75	72	70	71	71	72	72	70	68	68	68	71	73	73	73	71	73	74	74	69	71
Minimum	64	63	65	62	60	61	62	64	67	70	70	70	70	67	65	67	66	68	66	63	62	62	63	65	60	68	65	65	67	69	64	65
August																																
Maximum	69	69	72	72	69	69	69	67	67	64	67	70	70	70	65	67	68	71	73	72	72	72	72	63	68	68	69	71	72	72	73	70
Minimum	64	66	67	66	64	64	64	63	62	59	61	63	65	63	59	60	62	65	68	67	67	67	67	63	63	64	64	66	69	67	68	64
September																																
Maximum	73	71	71	70	71	73	75	76	76	70	67	67	62	56	56	58	58	58	56	59	59	59	58	62	62	62	62	60	58	54	--	64
Minimum	70	66	66	63	66	66	70	72	70	64	63	62	56	52	54	52	57	55	54	54	57	58	57	57	61	58	57	55	54	49	--	60

4-1365. AU SABLE RIVER AT MIO, MICH.

LOCATION.--Temperature recorder at gaging station, 150 feet upstream from bridge on State Highway 33 at Mio, Oscoda County, 10 miles downstream from Big Creek, and 80 miles upstream from mouth.
DRAINAGE AREA.--1,100 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: July 1952 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 71°F July 15, 16; minimum, freezing point on many days during January to March.
EXTREMES, 1952-60.--Water temperatures: Maximum, 77°F Aug. 4, 1955; minimum, freezing point on many days during winter months 1953, 1956 and 1960.
REMARKS.--Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	60	58	60	57	56	56	54	52	52	51	51	48	48	47	46	46	46	45	45	45	44	44	44	46	47	47	46	44	42	42	41	49
Minimum	58	57	57	56	55	54	53	52	51	51	48	48	47	46	46	46	45	44	44	44	44	43	43	44	46	46	44	42	41	41	40	46
November																																
Maximum	42	42	42	42	41	40	40	39	38	37	37	37	37	36	36	36	34	34	34	34	34	34	35	35	36	36	36	35	34	34	--	37
Minimum	41	41	41	40	40	40	39	39	37	36	36	36	36	35	35	34	34	34	33	33	33	33	33	34	35	35	34	34	34	33	--	36
December																																
Maximum	34	34	35	36	37	37	36	36	35	34	34	34	34	36	36	36	37	37	38	37	37	35	35	34	34	34	35	34	35	35	34	35
Minimum	33	33	33	34	36	36	36	34	34	33	33	33	33	34	35	35	35	37	37	37	35	35	34	33	33	33	33	33	34	34	34	34
January																																
Maximum	34	34	34	33	33	34	33	33	33	33	33	33	32	32	32	32	33	33	32	33	33	32	32	32	33	32	33	32	32	33	34	33
Minimum	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	32
February																																
Maximum	34	34	34	34	33	32	32	32	34	33	33	33	33	33	32	32	32	32	32	32	33	33	33	33	33	33	33	33	33	--	--	33
Minimum	34	34	34	33	32	32	32	32	33	33	33	32	32	32	32	32	32	32	32	32	32	33	33	33	33	32	32	32	32	--	--	32
March																																
Maximum	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	35	35	36	36	37	37	36	37	37	36	35	37	39	40	35
Minimum	32	32	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34	34	35	35	36	36	35	35	35	34	34	35	36	39	34
April																																
Maximum	40	39	38	40	40	39	38	39	40	40	40	41	42	44	46	48	49	50	48	46	48	52	54	57	56	56	54	52	49	50	--	46
Minimum	39	38	38	38	38	38	38	38	39	39	40	40	41	42	44	46	48	48	46	46	46	48	51	53	55	54	51	49	49	49	--	44
May																																
Maximum	50	51	50	53	55	56	58	56	54	52	48	47	49	52	55	56	56	57	59	59	62	61	61	60	58	59	61	62	63	64	64	56
Minimum	50	50	50	50	52	54	56	54	52	48	46	46	47	49	51	52	55	55	57	57	59	60	60	57	57	57	59	61	61	62	62	54
June																																
Maximum	64	64	64	65	66	64	64	64	63	64	63	63	63	62	62	61	59	60	61	61	60	61	61	61	62	63	64	65	67	68	--	63
Minimum	60	61	62	61	62	62	61	61	60	60	60	60	61	60	60	59	59	57	58	58	58	59	59	59	58	58	58	61	63	64	--	60
July																																
Maximum	69	68	68	65	64	63	66	66	66	66	70	70	69	70	71	71	69	69	69	67	67	67	66	67	68	66	69	68	69	68	68	68
Minimum	65	65	65	64	62	62	61	62	63	64	65	67	67	68	67	68	66	66	67	65	65	65	64	64	64	65	66	66	65	66	65	65
August																																
Maximum	68	68	67	67	68	67	67	66	65	63	65	66	65	64	64	65	65	65	63	64	65	67	66	65	65	65	64	67	65	67	68	66
Minimum	65	66	65	65	65	65	64	65	63	62	62	62	62	63	62	62	62	62	61	63	62	64	63	62	61	61	61	62	63	63	64	63
September																																
Maximum	66	66	67	66	64	66	67	68	67	65	64	63	61	58	56	54	55	54	53	54	54	54	54	56	57	58	57	57	55	54	--	60
Minimum	64	64	64	64	63	61	63	63	64	62	62	61	58	56	54	52	53	52	52	53	54	53	54	54	55	54	55	54	54	53	--	58

STREAMS TRIBUTARY TO LAKE HURON--Continued

4-1380. EAST BRANCH AU GRES RIVER AT McIVOR, MICH.

LOCATION.--Temperature recorder at gaging station, 25 feet downstream from highway bridge at McIvor, Iosco County, 1.1 miles east of National City, and 9 miles southwest of Tawas City.
DRAINAGE AREA.--84 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: October 1951 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 69°F July 13; minimum, freezing point on many days during January to March.
EXTREMES, 1951-60.--Water temperatures: Maximum, 76°F Aug. 3, 1957; minimum, freezing point on many days during winter months.
REMARKS.--Recorder stopped Feb. 20-23; range 32°F to 34°F, pen not marking May 16 to June 13. Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	56	56	59	59	58	56	56	56	56	54	53	50	49	48	47	50	50	48	46	47	47	46	51	52	52	48	46	44	44	46	46	51
Minimum	55	54	56	57	56	56	56	56	54	52	50	48	48	47	47	47	48	46	43	44	45	43	46	51	48	46	44	43	43	44	46	49
November																																
Maximum	46	46	43	42	43	43	41	40	39	40	42	41	39	37	37	37	37	34	34	34	35	37	38	38	35	35	34	34	34	34	--	38
Minimum	45	43	41	42	42	41	40	39	39	39	40	39	37	37	34	34	34	34	34	34	34	35	37	35	35	34	34	34	34	34	--	37
December																																
Maximum	36	36	38	38	38	38	36	34	34	34	34	35	35	34	36	37	37	36	36	34	34	34	33	33	33	35	35	35	33	33	33	35
Minimum	34	36	36	38	38	36	34	34	34	34	34	34	34	34	34	36	36	36	34	34	34	33	33	33	33	33	35	35	33	33	33	34
January																																
Maximum	33	33	33	33	33	32	32	32	32	32	32	32	32	33	33	32	32	32	32	32	32	32	32	32	32	32	32	33	34	34	34	32
Minimum	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	32	32	32	33	33	33	32
February																																
Maximum	34	33	32	32	34	34	34	32	33	33	32	32	32	32	32	32	32	33	34	--	--	--	--	32	32	32	32	32	32	--	--	33
Minimum	33	32	32	32	32	34	33	32	32	32	32	32	32	32	32	32	32	32	33	--	--	--	--	32	32	32	32	32	32	--	--	32
March																																
Maximum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	35	35	35	35	33	33	34	42	42	40	40	37	34
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	33	33	33	34	40	39	37	35	33
April																																
Maximum	35	36	37	37	37	37	37	37	39	40	40	43	43	47	47	51	51	48	47	50	52	55	56	59	58	54	52	52	52	51	--	46
Minimum	35	35	35	36	36	36	36	36	36	36	39	39	42	42	45	47	48	45	43	46	50	50	54	56	54	50	49	48	49	51	--	43
May																																
Maximum	51	53	55	58	59	61	61	56	51	49	49	49	50	53	55	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	48	47	51	52	56	57	56	51	49	49	49	49	49	50	50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June																																
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	57	59	61	61	57	62	62	61	61	60	58	61	61	65	64	65	65	--	--
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	55	54	58	57	54	56	57	57	58	58	56	54	57	59	61	61	61	--	--
July																																
Maximum	63	63	64	62	59	59	62	65	67	67	67	68	69	66	63	65	65	65	63	63	62	64	66	66	66	66	64	66	68	67	64	65
Minimum	58	57	60	57	56	56	56	58	61	63	62	63	64	60	58	59	62	60	58	57	57	57	60	60	60	59	58	60	61	64	58	59
August																																
Maximum	63	66	66	65	62	63	63	62	62	61	61	64	65	64	61	61	62	65	65	65	64	64	64	64	60	60	62	63	65	65	64	66	63
Minimum	58	61	63	59	57	58	59	58	57	56	56	57	60	58	55	54	55	58	60	59	61	60	58	55	54	56	56	58	63	57	59	58
September																																
Maximum	66	64	62	60	61	59	67	68	67	62	58	59	55	53	53	53	54	54	55	56	56	57	58	58	57	57	56	56	53	51	--	58
Minimum	63	60	58	60	56	56	60	63	62	56	53	55	51	48	52	49	53	52	54	54	56	55	57	57	57	53	53	51	51	49	--	55

4-1390. HOUGHTON CREEK NEAR LUPTON, MICH.

LOCATION.--Temperature recorder at gaging station, 0.5 mile upstream from mouth, 3 miles downstream from Wilkins Creek, and 3 miles southwest of Lupton, Ogemaw County.
DRAINAGE AREA.--27 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: July 1950 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 63°F July 9, 10; minimum, freezing point on many days during December to April.
EXTREMES, 1950-60.--Water temperatures: Maximum, 69°F June 25, 1952; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	54	54	55	55	54	52	52	53	53	50	50	47	47	46	45	47	47	46	44	44	44	45	48	48	48	45	44	42	43	45	45	46
Minimum	52	52	54	53	52	52	52	52	49	48	46	45	46	45	45	45	46	44	41	42	42	41	45	48	45	44	42	41	42	43	43	46
November																																
Maximum	45	44	41	41	43	43	41	40	40	40	41	40	38	38	36	38	38	35	37	37	38	39	40	40	37	36	37	37	35	37	--	39
Minimum	44	41	40	41	41	41	39	39	39	39	40	38	37	36	33	36	33	33	35	35	37	38	39	37	35	34	36	34	34	35	--	37
December																																
Maximum	38	39	39	39	39	39	37	36	36	36	37	38	37	37	38	39	39	38	37	35	35	35	35	35	37	38	39	38	33	34	35	37
Minimum	37	39	39	39	39	37	35	35	36	35	36	37	35	35	37	38	38	37	35	34	35	33	34	35	35	37	38	32	32	33	34	36
January																																
Maximum	34	36	37	37	38	38	35	35	34	36	36	36	36	37	37	35	35	36	34	35	35	35	36	36	35	34	36	38	36	37	37	36
Minimum	33	34	36	33	33	32	32	34	33	34	33	34	36	36	35	34	34	34	34	34	32	34	35	35	34	34	34	36	37	36	35	34
February																																
Maximum	36	34	35	35	38	38	37	36	36	36	32	33	33	33	34	37	38	38	37	36	36	36	35	35	35	35	35	35	35	--	--	35
Minimum	34	32	32	32	34	37	35	34	35	32	32	32	32	32	32	34	37	36	35	34	33	34	32	32	32	33	34	32	32	--	--	33
March																																
Maximum	34	34	34	33	34	34	36	36	35	36	35	36	38	39	38	38	38	39	39	38	37	37	35	36	35	39	43	40	39	37	36	37
Minimum	32	32	32	32	32	32	35	32	32	33	32	32	32	35	33	34	34	37	34	36	33	33	32	34	32	36	36	37	36	36	35	33
April																																
Maximum	36	36	37	35	36	36	37	37	39	39	38	42	40	44	46	49	49	42	45	48	50	53	55	55	55	49	48	49	49	49	--	44
Minimum	32	35	34	33	34	33	36	35	35	34	35	35	36	40	40	45	42	39	38	43	46	45	49	51	49	45	44	43	45	47	--	40
May																																
Maximum	48	49	51	55	55	54	54	50	46	45	45	48	48	52	54	56	56	50	57	56	59	58	54	54	56	57	59	59	57	57	59	54
Minimum	44	43	47	47	50	52	50	46	45	44	44	45	46	47	47	50	51	49	52	54	54	54	52	50	50	53	54	55	53	54	53	50
June																																
Maximum	58	58	59	59	60	58	57	57	57	57	57	59	59	56	56	54	56	54	58	57	57	57	56	55	58	58	61	61	62	62	--	58
Minimum	53	55	55	55	55	52	51	51	51	51	55	54	52	52	52	54	54	51	53	53	53	54	53	53	51	53	54	56	57	57	--	53
July																																
Maximum	59	59	60	58	57	57	58	61	63	63	61	61	61	60	59	60	60	59	58	58	58	59	61	60	60	60	62	62	62	62	59	60
Minimum	54	53	55	53	53	53	53	55	57	58	57	58	59	55	53	55	57	56	55	54	54	54	56	56	55	57	58	57	57	58	54	55
August																																
Maximum	58	60	60	59	58	58	58	58	58	57	57	57	59	59	56	56	57	58	59	59	59	59	59	56	56	57	57	58	58	57	59	58
Minimum	54	56	58	55	54	54	55	56	54	53	53	54	58	54	52	52	53	55	56	55	56	56	55	52	52	53	53	54	57	53	54	54
September																																
Maximum	60	57	57	56	56	57	59	59	59	57	55	53	51	50	50	52	52	52	51	54	54	53	53	53	53	52	53	53	50	49	--	54
Minimum	56	54	54	56	53	52	55	57	57	51	50	51	48	46	50	47	52	50	51	51	53	52	53	53	52	49	50	49	49	47	--	52

STREAMS TRIBUTARY TO LAKE HURON--Continued

4-1395. RIFLE RIVER AT "THE RANCH" NEAR LUPTON, MICH.

LOCATION.--Temperature recorder at gaging station, 0.2 mile downstream from Houghton Creek, and 3 miles southwest of Lupton, Ogemaw County.
DRAINAGE AREA.--54 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: July 1950 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 68°F July 9, 29; minimum, freezing point on several days during January and February.
EXTREMES, 1950-60.--Water temperatures: Maximum, 72°F June 25, 26, 1952, July 5, 6, 9, Aug. 1, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	55	57	58	57	56	54	55	55	55	53	53	49	49	48	47	49	49	47	45	46	45	46	49	50	50	46	45	44	44	47	47	50
Minimum	53	52	56	55	54	54	54	54	51	50	48	47	48	47	47	47	47	45	42	44	44	42	46	49	46	45	43	43	43	44	47	48
November																																
Maximum	47	46	43	43	45	45	42	41	41	41	42	41	39	39	37	39	39	36	38	37	38	39	40	40	37	36	37	37	36	37	--	40
Minimum	46	43	42	43	43	42	41	41	40	41	41	39	38	37	35	37	35	35	36	36	37	38	39	37	36	35	36	35	35	36	--	38
December																																
Maximum	38	39	40	39	39	39	38	37	37	37	37	38	37	37	38	39	39	38	38	36	35	35	35	35	37	38	38	38	34	35	35	37
Minimum	37	38	39	38	39	38	36	36	36	36	36	37	36	35	37	38	38	38	36	35	35	34	34	35	35	37	38	33	33	34	34	36
January																																
Maximum	34	35	36	35	32	32	33	34	35	35	34	34	35	35	34	34	34	34	33	34	34	34	34	34	34	33	34	35	37	37	36	34
Minimum	34	34	35	32	32	32	32	33	32	33	33	33	34	34	34	33	33	33	32	33	32	32	33	33	32	32	32	34	35	35	35	33
February																																
Maximum	35	34	35	34	34	36	36	34	36	35	32	33	32	33	33	35	36	36	36	36	34	36	34	34	34	34	35	34	35	--	--	35
Minimum	34	32	33	32	34	36	34	34	34	32	32	32	32	32	32	33	35	35	34	33	33	33	32	32	32	32	33	32	33	--	--	33
March																																
Maximum	34	33	34	34	34	34	36	35	34	37	35	36	37	39	38	36	37	38	37	37	36	36	35	37	35	39	43	41	40	38	34	36
Minimum	33	33	33	33	33	33	33	33	33	33	33	33	33	35	34	33	34	36	34	35	33	33	33	33	34	34	36	38	37	34	33	34
April																																
Maximum	36	36	37	36	36	36	37	37	38	41	39	43	41	45	43	48	48	44	44	47	49	52	53	53	53	50	49	50	51	50	--	44
Minimum	34	35	35	35	35	34	36	36	36	36	37	37	38	41	41	45	44	40	39	42	45	45	48	50	49	47	46	45	47	49	--	41
May																																
Maximum	40	50	51	55	55	55	56	51	48	47	47	51	50	54	56	60	58	61	60	60	62	61	58	58	61	62	64	63	63	61	64	56
Minimum	45	45	48	48	51	53	51	48	46	47	46	47	48	49	50	52	53	51	55	57	58	57	56	54	54	57	58	60	57	58	57	52
June																																
Maximum	62	63	63	65	65	60	62	62	62	62	61	64	60	56	60	59	59	57	62	61	61	60	58	57	63	63	66	64	67	67	--	62
Minimum	56	58	57	57	58	54	52	53	52	53	53	56	55	54	54	56	56	53	55	54	55	56	56	55	53	55	56	61	59	59	--	55
July																																
Maximum	64	65	65	60	60	60	64	66	68	67	66	67	67	65	65	65	65	63	63	64	60	64	67	66	66	63	66	67	68	66	63	65
Minimum	56	55	59	55	54	54	55	57	57	60	59	60	61	58	55	57	60	60	58	56	56	57	58	58	58	59	60	60	60	62	56	58
August																																
Maximum	63	60	60	62	62	62	62	63	61	62	62	64	64	62	60	60	62	64	63	63	61	65	63	61	60	60	62	64	64	63	64	62
Minimum	56	59	61	58	56	56	57	58	56	55	55	56	58	57	54	53	54	57	59	58	59	59	58	54	54	55	55	57	60	56	56	57
September																																
Maximum	64	63	60	60	62	63	66	66	64	60	58	57	54	53	53	54	55	55	54	57	56	56	57	57	57	56	57	59	53	54	--	58
Minimum	60	57	56	58	58	56	59	60	60	54	52	53	50	48	52	49	54	52	53	54	55	55	56	55	55	51	52	50	51	49	--	54

4-1400. PRIOR CREEK NEAR SELKIRK, MICH.

LOCATION.--Temperature recorder at gaging station, 0.2 mile upstream from mouth, 0.5 mile downstream from Ammond Creek, and 0.5 miles north of Selkirk, Ogemaw County.
DRAINAGE AREA.--19 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: October 1950 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 66°F July 9, 10, 12, 13, 29; minimum, freezing point on many days during January to March.
EXTREMES, 1950-60.--Water temperatures: Maximum, 76°F Aug. 1, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	57	58	60	60	57	56	55	56	56	52	52	48	48	47	46	49	49	47	44	45	45	44	49	50	50	46	45	42	43	45	47	50
Minimum	56	55	58	56	56	55	55	55	52	50	48	47	47	46	46	46	47	44	41	43	43	41	44	49	46	45	42	42	42	43	45	48
November																																
Maximum	47	46	42	42	44	44	42	41	40	40	41	41	38	36	35	35	35	35	35	35	35	36	36	36	35	35	35	35	34	34	--	38
Minimum	46	42	41	42	42	42	41	40	40	40	40	38	36	35	35	35	35	35	35	35	35	35	36	35	35	35	35	34	34	34	--	37
December																																
Maximum	34	35	36	36	36	36	35	34	34	34	34	34	34	33	34	34	34	34	34	34	34	34	34	34	34	34	34	34	33	33	33	34
Minimum	34	34	35	36	36	35	34	34	34	34	34	34	33	33	33	34	34	34	34	34	34	34	34	34	34	34	34	33	33	33	33	34
January																																
Maximum	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	32	32	32	32	32
Minimum	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	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	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	33	33	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	33	33	32
April																																
Maximum	33	33	33	33	33	33	33	33	34	37	37	40	42	49	50	51	52	47	48	50	51	54	58	58	58	52	50	50	50	50	--	44
Minimum	33	33	33	33	33	33	33	33	33	34	34	34	37	42	43	48	47	42	40	45	48	48	52	54	52	48	47	45	47	50	--	41
May																																
Maximum	50	50	52	55	55	56	56	53	49	47	46	49	49	53	56	59	58	61	60	60	62	62	58	56	59	59	61	61	60	60	61	56
Minimum	46	45	49	50	53	55	53	49	47	46	45	46	48	49	49	52	54	51	55	57	58	58	56	53	54	56	57	57	58	57	57	52
June																																
Maximum	61	61	61	61	62	60	57	57	57	57	59	60	60	56	57	59	59	57	59	59	58	58	58	57	59	59	63	64	65	64	--	59
Minimum	57	59	59	59	59	56	54	53	53	54	57	58	56	54	54	57	57	54	55	54	55	57	57	56	54	55	57	62	62	60	--	56
July																																
Maximum	61	61	62	59	58	58	60	61	66	66	65	66	66	63	61	63	64	63	61	60	59	63	64	64	64	63	64	64	66	65	61	63
Minimum	57	58	59	56	54	54	55	57	60	62	61	62	63	59	55	57	62	60	58	56	55	56	59	58	58	61	61	60	61	61	56	58
August																																
Maximum	61	63	64	62	60	61	61	61	60	59	60	62	64	62	58	58	60	63	63	63	63	63	63	59	58	59	60	63	63	61	63	61
Minimum	56	60	62	58	56	56	59	59	57	56	56	57	60	58	56	53	54	58	61	59	61	60	59	55	54	56	55	57	61	56	58	58
September																																
Maximum	63	62	60	61	60	61	66	66	66	60	56	55	53	50	50	52	54	54	52	55	56	56	56	56	56	56	55	55	52	49	--	57
Minimum	61	58	56	59	56	55	61	63	60	54	51	53	49	47	50	48	52	52	52	52	55	55	56	56	56	51	52	50	49	47	--	54

STREAMS TRIBUTARY TO LAKE HURON--Continued

4-1405. RIFLE RIVER AT SELKIRK, MICH.

LOCATION.--Temperature recorder at gaging station at highway bridge at Selkirk, Ogemaw County, 1.5 miles downstream from Prior Creek.
DRAINAGE AREA.--110 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1950 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 69°F July 9, 10, 12, 13; minimum, freezing point on many days during November to February.
EXTREMES, 1950-60.--Water temperatures: Maximum, 78°F Aug. 1, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	56	56	59	59	57	55	55	56	56	53	53	48	48	48	47	49	49	48	46	46	45	46	50	50	50	47	45	43	44	45	45	50
Minimum	54	54	56	56	55	55	55	55	52	50	48	47	48	46	46	47	48	46	42	44	44	42	46	50	47	45	43	42	43	44	45	48
November																																
Maximum	45	45	41	41	43	43	40	39	39	39	40	39	37	36	36	36	36	33	34	34	36	37	37	37	35	34	34	33	32	33	--	37
Minimum	44	41	40	41	41	40	39	38	38	38	39	36	36	36	34	34	33	33	33	34	34	36	37	35	34	34	33	32	32	32	--	36
December																																
Maximum	35	35	36	36	35	35	35	33	33	33	34	34	34	35	36	36	35	35	33	33	33	33	33	33	34	35	36	36	32	32	33	34
Minimum	33	35	35	35	35	35	33	33	33	32	33	33	33	34	34	35	35	34	33	33	33	33	33	33	33	34	35	32	32	32	32	33
January																																
Maximum	32	33	34	34	32	32	32	32	32	32	32	32	34	34	34	33	34	34	33	33	33	33	33	33	33	32	33	35	36	35	35	33
Minimum	32	32	33	32	32	32	32	32	32	32	32	32	32	34	33	32	33	32	32	32	32	32	33	33	32	32	32	33	35	34	34	32
February																																
Maximum	35	33	32	32	35	35	35	34	34	34	32	32	32	32	32	32	34	35	35	35	34	35	34	32	32	33	34	33	33	--	--	33
Minimum	33	32	32	32	32	35	34	32	33	32	32	32	32	32	32	32	32	34	34	33	32	32	32	32	32	32	32	32	32	--	--	32
March																																
Maximum	33	33	33	33	33	33	33	33	33	33	33	33	33	36	37	36	35	39	37	37	36	37	36	37	35	39	42	42	39	39	36	36
Minimum	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	35	34	35	34	33	34	34	34	34	36	39	38	36	35	34
April																																
Maximum	36	36	36	36	37	38	38	38	40	41	40	43	43	47	48	51	51	46	46	49	50	53	57	57	56	51	50	50	50	50	--	45
Minimum	35	35	35	35	35	36	37	36	37	36	38	37	39	42	43	48	46	42	40	44	47	47	51	53	51	47	46	45	47	49	--	42
May																																
Maximum	49	51	53	57	57	57	57	52	48	46	46	49	49	53	56	59	58	60	60	60	62	61	58	57	60	61	63	63	63	61	63	56
Minimum	45	45	49	49	53	55	52	48	46	45	45	45	47	49	50	52	53	51	56	57	57	58	55	53	54	57	58	60	58	58	57	52
June																																
Maximum	62	63	64	65	65	62	61	63	62	63	62	65	62	57	58	59	59	56	62	61	60	60	60	58	61	63	67	66	67	66	--	62
Minimum	57	60	59	59	60	56	53	54	54	54	59	58	57	54	53	57	56	53	55	55	56	57	57	56	53	56	58	63	61	61	--	57
July																																
Maximum	65	64	66	62	60	61	63	66	69	69	68	69	69	66	65	66	66	65	64	64	62	64	68	68	68	66	64	66	68	67	63	66
Minimum	58	57	60	57	55	55	55	58	61	63	62	62	63	59	57	59	62	62	59	58	58	58	60	60	60	61	60	61	61	63	57	59
August																																
Maximum	63	64	66	64	64	64	62	62	61	62	63	65	66	64	60	61	63	65	65	65	64	65	64	62	61	61	62	64	64	63	65	63
Minimum	57	60	61	59	56	57	59	58	57	56	57	58	60	58	55	55	56	59	62	60	62	60	60	55	55	57	57	58	62	57	59	58
September																																
Maximum	64	63	61	60	61	62	67	67	66	62	57	56	54	52	52	53	54	54	53	55	55	55	56	56	56	55	55	54	52	50	--	57
Minimum	61	58	57	59	56	56	61	63	62	55	53	54	50	47	50	48	53	51	52	52	55	54	54	55	54	51	51	50	49	48	--	54

STREAMS TRIBUTARY TO LAKE HURON--Continued

4-1415. WEST BRANCH RIFLE RIVER NEAR SELKIRK, MICH.

LOCATION.--Temperature recorder at gaging station, 0.5 mile downstream from Campbell Creek, 3.5 miles upstream from mouth, 4 miles southwest of Selkirk, Ogemaw County, and 6.5 miles southeast of town of West Branch.
DRAINAGE AREA.--52 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: May 1952 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 73°F July 12, 13, 29, 30, Sept. 8, 9; minimum, freezing point on many days during November to March.
EXTREMES, 1952-60.--Water temperatures: Maximum, 79°F June 28, 1959; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for the water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	58	58	60	60	58	56	55	56	56	52	52	50	47	46	46	48	48	46	44	45	44	45	49	50	50	47	45	43	44	46	47	50
Minimum	56	55	57	56	56	55	55	55	52	49	48	46	46	45	45	46	46	44	40	42	42	40	45	49	46	44	43	42	42	43	46	48
November																																
Maximum	47	45	42	42	45	45	41	40	39	39	41	39	36	35	34	35	35	33	33	32	34	36	37	37	34	33	34	34	33	34	--	37
Minimum	45	42	40	41	42	41	39	39	39	39	39	36	35	34	33	34	33	33	32	32	32	34	36	34	33	33	33	33	33	33	--	36
December																																
Maximum	35	36	36	36	36	36	35	33	33	33	33	34	34	34	35	35	35	34	34	32	32	32	32	32	32	34	34	34	34	32	32	34
Minimum	34	35	36	35	36	35	33	33	33	32	32	33	33	33	34	34	34	34	32	32	32	32	32	32	32	32	34	32	32	32	32	33
January																																
Maximum	32	32	33	33	32	32	32	32	32	32	32	32	32	32	33	33	33	33	32	32	32	32	32	32	32	32	34	33	33	33	34	32
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	32	32	32	32	32	32	32	32	32	32	32	33	34	33	32
February																																
Maximum	34	33	32	32	32	34	34	33	34	33	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	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	32
March																																
Maximum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	35	35	34	34	33	33	35	41	39	36	35	35	33
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	33	33	34	36	35	35	35	33
April																																
Maximum	34	34	35	34	35	35	36	35	38	39	38	44	44	49	49	54	53	47	51	51	54	57	61	62	61	54	53	53	54	53	--	47
Minimum	33	34	34	34	34	33	35	34	35	35	36	36	39	44	45	49	47	41	41	46	49	50	54	57	54	48	47	47	46	51	--	42
May																																
Maximum	51	54	57	61	61	60	59	54	48	47	48	50	50	55	59	63	61	60	62	61	63	62	60	60	61	64	66	65	63	63	64	58
Minimum	47	47	50	51	55	58	54	48	47	45	45	45	48	49	50	54	55	52	58	60	60	60	57	55	55	56	60	62	60	61	59	54
June																																
Maximum	64	66	66	67	67	65	63	64	64	65	66	67	66	62	60	63	63	59	63	64	64	64	64	61	63	66	69	69	71	70	--	65
Minimum	61	63	62	62	63	60	57	56	56	57	61	62	60	58	56	59	59	56	58	59	58	60	60	59	55	58	61	60	67	65	--	60
July																																
Maximum	68	68	68	66	64	64	68	69	71	72	72	72	73	69	67	69	70	69	68	67	65	68	70	70	71	70	69	72	73	73	69	69
Minimum	63	61	64	61	59	59	59	61	64	65	66	67	69	64	61	62	66	65	63	61	61	62	63	63	64	65	64	66	66	69	64	63
August																																
Maximum	68	70	71	70	67	69	69	66	66	64	66	68	69	68	64	64	66	69	70	70	69	70	70	65	65	66	66	69	70	68	70	68
Minimum	62	65	68	64	62	63	64	64	62	60	61	62	64	63	60	58	59	63	66	65	66	66	65	60	59	60	61	63	68	63	64	63
September																																
Maximum	70	69	67	67	66	68	71	73	72	67	63	61	58	56	56	57	59	59	57	59	60	60	60	61	61	63	59	59	58	54	--	62
Minimum	67	65	62	65	62	61	66	69	67	60	57	58	54	54	54	52	56	55	55	57	59	58	59	60	60	55	55	54	52	51	--	58

STREAMS TRIBUTARY TO LAKE ERIE

4-1935. MAUMEE RIVER AT WATERVILLE, OHIO.

LOCATION.--Temperature recorder at gaging station at bridge on State Highway 64, at Waterville, Lucas County, 3 miles downstream from Tontogany Creek.
DRAINAGE AREA.--6,314 square miles.
RECORDS AVAILABLE.--Chemical analyses: March 1950 to February 1952.
Water temperatures: March 1950 to September 1960.
Sediment records: April 1950 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 86°F Aug. 31; minimum, freezing point on many days during February and March.
Sediment concentrations: Maximum daily, 750 ppm Jan. 14; minimum daily, 2 ppm Mar. 19, 21-22.
Sediment loads: Maximum daily, 83,200 tons Jan. 14; minimum daily, 3 tons Sept. 11, 17, 30.
EXTREMES, 1950-60.--Water temperatures: Maximum, 92°F Aug. 25, 1959; minimum, freezing point on many days during winter months.
Sediment concentrations: Maximum daily, 2,240 ppm Mar. 26, 1954; minimum daily, 1 ppm on many days during 1953, 1955 and 1956.
Sediment loads: Maximum daily, 208,000 tons Feb. 12, 1959; minimum daily, less than 0.5 ton on several days during October to December 1953, September 1955.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	72	72	72	72	72	72	72	71	70	67	66	65	61	60	60	60	60	59	57	57	56	57	58	58	57	56	54	52	51	51	52	62
Minimum	69	68	70	71	71	72	71	70	67	65	65	61	60	60	59	59	59	57	56	56	55	55	56	57	56	54	52	51	50	51	51	60
November																																
Maximum	53	53	51	51	52	52	49	48	47	46	46	46	44	43	43	42	41	40	38	37	37	37	39	38	39	38	38	37	37	36	--	43
Minimum	52	51	49	50	51	49	48	47	46	46	46	44	43	42	42	41	40	38	37	37	37	37	37	38	36	36	37	37	36	36	--	42
December																																
Maximum	36	36	36	36	36	36	36	36	36	36	36	37	38	39	39	39	39	39	39	39	38	38	36	35	34	35	37	38	40	40	40	37
Minimum	36	36	36	36	36	36	36	36	36	35	35	36	37	38	39	39	39	39	37	38	38	36	35	34	34	34	35	37	38	40	40	37
January																																
Maximum	40	40	39	38	36	35	34	34	34	34	34	34	33	40	40	40	40	40	38	37	36	35	34	34	33	33	33	33	33	33	33	36
Minimum	40	39	38	36	35	34	34	34	34	34	34	34	34	38	40	40	40	38	37	36	35	34	34	33	33	33	33	33	33	33	33	35
February																																
Maximum	33	33	33	33	33	33	33	33	34	34	34	34	34	34	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	33
Minimum	33	33	33	33	33	33	33	33	33	34	34	34	34	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	33
March																																
Maximum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	34	34	35	35	35	35	35	36	39	40	42	34
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	33	33	34	35	35	35	35	35	36	39	40	33
April																																
Maximum	45	46	46	46	46	46	46	46	45	44	47	50	52	53	55	57	57	56	57	57	58	61	63	64	64	63	63	62	61	--	53	
Minimum	43	45	45	44	46	45	45	46	45	44	44	44	47	50	52	53	55	55	55	56	57	56	58	61	63	63	62	62	61	60	--	52
May																																
Maximum	60	58	60	62	64	64	64	61	59	54	53	53	52	53	57	61	61	63	65	68	69	69	67	67	67	67	67	67	68	66	69	62
Minimum	57	57	58	60	62	64	61	58	54	53	53	52	52	52	53	57	61	61	63	65	68	67	65	66	67	65	66	67	67	68	67	61
June																																
Maximum	69	69	71	73	73	73	73	72	72	73	74	74	73	70	70	68	68	68	69	69	--	--	--	72	73	75	77	77	77	77	--	72
Minimum	69	69	69	71	73	72	72	71	71	71	73	73	70	70	68	67	68	66	67	68	--	--	--	71	70	73	75	77	76	76	--	71
July																																
Maximum	76	76	76	75	74	74	76	76	76	78	79	82	81	77	78	79	80	80	80	79	82	82	83	84	85	80	82	82	83	82	81	79
Minimum	74	74	75	73	72	72	73	74	75	76	77	77	76	74	74	75	76	77	78	76	75	77	78	77	76	77	76	76	77	76	74	75
August																																
Maximum	83	82	78	78	80	77	77	81	79	79	78	82	80	80	76	77	80	81	80	80	76	78	81	77	80	80	81	81	81	83	86	80
Minimum	73	74	75	73	73	75	73	73	73	73	70	71	71	71	72	69	69	71	72	72	72	72	71	70	69	71	74	73	74	74	72	72
September																																
Maximum	85	81	80	81	77	82	83	85	80	72	73	72	67	69	67	71	70	69	68	67	69	71	73	75	75	74	71	70	72	67	--	74
Minimum	75	73	70	72	72	69	70	72	72	66	63	63	63	59	63	61	63	63	64	64	65	69	66	67	67	67	67	67	64	62	--	67

STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-1935. MAUMEE RIVER AT WATERVILLE, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960

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	340	28	26	590	20	32	1390	20	75
2	360	21	19	373	10	10	1460	19	75
3	351	16 B	15	362	7	7	1580	16	68
4	407	21	23	1080	14 S	47	1830	20	99
5	443	27	32	5630	44	669	2560	19	131
6	590	41	65	5820	71	1120	4130	28	312
7	1770	50	239	6210	73	1220	5240	24	340
8	1460	55	217	5590	77	1160	4580	19	235
9	1800	60	292	3720	55	552	4500	14	170
10	1500	48	194	3160	31	264	3090	10	83
11	2750	49	361	2590	28	196	3360	16	145
12	3580	51	493	2020	19	104	10000	43 S	1350
13	4810	71	922	1500	19	77	23700	285 S	19400
14	4770	76	979	4970	26 S	402	28200	587	44700
15	3760	69	700	12500	74	2500	25800	447	31100
16	2790	51	384	15100	181	7380	18100	310	15100
17	1770	33	158	13600	249	9140	13800	204	7600
18	1620	34	149	10400	181	5080	10100	130	3540
19	1050	38	108	7610	116	2380	7000	95	1800
20	910	35	86	6920	80	1490	4920	70	903
21	653	34	60	5980	59	953	4240	61	698
22	628	31	52	4730	43	549	3470	45	422
23	653	30 B	55	3470	34	318	2760	38	283
24	628	32	54	2620	39	276	2500	50 B	340
25	666	25	45	2400	33	214	2250	39	237
26	757	22	45	1750	31	146	1860	30	151
27	705	25	48	1720	24	111	2600	28	196
28	731	23	45	2190	25	148	6960	37	695
29	666	24	43	2340	25	158	13100	92	3250
30	666	23	41	1370	21	78	15200	208	8540
31	590	22	35	---	---	---	15200	189	7760
Total	44134	---	5985	138315	---	36781	245480	---	149825
	JANUARY			FEBRUARY			MARCH		
1	12200	132	4350	7080	20	382	1370	14	52
2	9200	86	2140	7000	29	548	1050	12	34
3	9410	82	2080	6000	33	535	1180	10 B	30
4	11200	91	2750	5280	24	342	990	11 B	30
5	11300	137	4180	4090	29	320	1020	10	28
6	8660	120	2800	11300	69 S	2530	1090	7	21
7	5900	90	1430	20500	163	9020	1280	12	41
8	4460	69	831	24000	307	19900	1400	14 B	55
9	3580	68	657	19300	292	15200	1410	7	27
10	2850	63	485	24000	260	16800	1390	7	26
11	2370	50	320	44100	377	44900	1180	7	22
12	5170	109 S	2510	44800	541	65400	942	3	8
13	31000	521 S	41000	36200	430	42000	826	4	9
14	41100	750	83200	25400	324	22200	826	5	11
15	41400	589	65800	18600	214	10700	868	5	12
16	39900	395	42600	13500	167	6090	1010	5	14
17	34600	296	27600	10100	134	3650	1240	4	13
18	27000	225	16400	7700	114	2370	1280	3	10
19	21400	163	9420	5980	88	1420	1010	2	5
20	16400	139	6150	3980	70 B	750	1260	3	10
21	13000	108	3790	3680	69	686	1200	2	6
22	8700	78	1830	3020	53	432	2140	2	12
23	5860	68	1080	3230	46	401	2370	7	45
24	5000	57	770	2690	39	283	2280	11	68
25	4800	46	596	2620	22	156	3360	10	91
26	3760	40	406	2340	23	145	2590	10	70
27	3500	32	302	2160	22	128	2440	13	86
28	5320	29	416	2110	19	108	7610	31 S	721
29	6130	36	596	1800	14	68	18800	136 S	7710
30	7200	46	894	---	---	---	28900	328	25600
31	9790	23	608	---	---	---	30100	345	28000
Total	412160	---	327991	362560	---	267464	124412	---	62867

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

STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-1935. MAUMEE RIVER AT WATERVILLE, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960--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	25100	258	17500	1910	58	299	8530	80	1840
2	20600	188	10400	1620	41	179	8610	84	1950
3	16600	143	6410	1940	38	199	6680	84	1520
4	13900	119	4470	1670	31	140	4020	57	619
5	11600	100	3130	1460	28	110	3360	49	444
6	9540	88	2270	1070	49	142	4690	58	734
7	7980	70	1510	1180	28	89	5040	59	803
8	5280	59	841	868	30	70	3470	51	478
9	4850	54	707	1150	29	90	2140	46	266
10	4130	49	546	1860	39	196	1670	39	176
11	2920	80	631	2340	38	240	1410	29	110
12	2990	53	428	2250	33	200	1300	27	95
13	2280	39	240	2310	28	175	3180	34 S	317
14	2340	44	278	2720	28	206	11100	105 S	3390
15	1990	43	231	2560	33	228	20100	267	14500
16	2190	42	248	2050	47	260	21500	367	21300
17	3230	34	296	1580	49	209	16400	288	12800
18	8090	67 S	1580	942	46	117	12900	212	7380
19	13200	121	4310	1150	34	106	10700	154	4450
20	11600	120 B	3800	1390	27	101	8570	119	2750
21	10300	185	5140	1650	39	174	7860	166	2460
22	9160	214	5290	2220	34	204	6680	101	1820
23	7820	177	3740	3540	29	277	6020	102	1660
24	6170	130	2160	3500	30	284	5820	108	1700
25	4460	99	1190	3090	29	242	4350	95	1120
26	3470	84	787	2790	30	226	3360	79	717
27	2720	80	588	2690	23	167	2790	61	460
28	2190	69	408	3580	34	329	2470	43	287
29	1770	63	301	7900	55	1170	2220	38	228
30	1880	66	335	9290	68	1700	1600	44	190
31	--	--	--	8190	78	1720			
Total	220350	--	79765	82460	--	9849	198540	--	86564

Day	JULY			AUGUST			SEPTEMBER		
1	1480	45	180	350	41	39	285	10	8
2	1670	34	153	285	40	31	218	11	6
3	2110	56	319	478	56	72	247	10	7
4	2790	62	467	351	35	33	407	11	12
5	2400	57	369	479	43	56	247	13	9
6	2530	54	369	744	53	106	228	9	6
7	2530	51	348	1010	49	134	276	7	5
8	2890	50	390	528	30	43	247	11 B	7
9	2760	46	343	407	24	26	296	16	13
10	1990	51	274	329	30 B	25	168	11	5
11	1330	39	140	384	20	21	123	8	3
12	1090	42	124	407	11	12	190	8	4
13	990	45	120	296	11	9	238	9	6
14	974	49	129	296	18	14	138	10	4
15	1160	54	169	285	11	8	116	13	4
16	1260	50	170	238	10	6	153	10	4
17	1220	53	174	266	11	8	168	7	3
18	1200	72	233	340	12	11	183	10	5
19	812	46	101	318	11	9	175	10	5
20	840	74	168	318	16	14	256	11	8
21	679	51	93	329	21	19	175	12	6
22	731	41	81	384	48	50	389	18	19
23	679	45	82	329	42	37	443	10	12
24	491	35	46	373	29	29	318	9	8
25	491	35	46	351	25	24	285	10	8
26	503	44	60	329	20	18	266	5	4
27	503	48	65	351	13	12	552	13	19
28	640	51	88	296	15	12	578	19	30
29	679	49	90	318	19	16	373	10	10
30	653	49	86	218	15	9	238	5	3
31	419	48	54	218	10 B	6	--	--	--
Total	40494	--	11605	11605	--	909	7976	--	243

Total discharge for year (cfs-days)..... 1,888,486
Total load for year (tons)..... 1,033,774

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

STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-1935, *MAUMEE RIVER AT WATERVILLE, OHIO*--Continued

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

Date of collection	Time (24 hour)	Water temperature (°F)	Sampling point	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	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. 14, 1959.....	1245			28500	601		81	83	88	95	98	99	100					SBWC
Jan. 14, 1960.....	1245			41400	837		75	82	88	94	97	98	99	100				SBWC
Jan. 14.....	1245			41400	837		62	73	85	95	98	99	100					SBN
Mar. 30.....	0745			28600	316		53	66	82	88	95	97	100					SBWC
June 16.....	1305			21500	368		61	73	84	90	92	96	100					SBWC
June 16.....	1305			21500	368		58	79	85	90	93	98	100					SBN

STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-1990. HURON RIVER AT MILAN, OHIO

LOCATION.--Temperature recorder at gaging station, 500 feet downstream from bridge on U.S. Highway 250, 0.2 mile northwest of Milan, Erie County, and 2 miles downstream from confluence of East and West Branches.
DRAINAGE AREA.--363 square miles.
RECORDS AVAILABLE.--Chemical analyses: March 1950 to February 1952.
Water temperatures: March to August 1950, July 1953 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 86°F July 29; minimum, freezing point on many days during November to March.
EXTREMES, 1953-60.--Water temperatures: Maximum, 91°F July 27, Aug. 4, 1955; minimum, freezing point on many days during winter months.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	70	71	71	72	72	68	65	64	61	61	58	51	51	54	56	56	52	50	52	54	54	57	57	55	49	48	46	44	47	49	58
Minimum	65	64	64	70	69	68	65	62	61	55	58	51	49	49	50	51	52	47	46	48	51	50	54	55	49	48	46	43	40	42	47	54
November																																
Maximum	49	49	44	49	56	56	45	43	41	44	43	42	42	45	42	42	42	34	33	33	35	37	43	43	41	35	34	34	33	33	--	41
Minimum	49	44	40	42	49	45	42	40	38	40	42	39	39	42	41	40	34	33	33	33	33	33	37	41	35	33	33	33	32	32	--	38
December																																
Maximum	34	34	34	35	37	37	36	34	34	33	37	40	40	38	37	38	39	39	38	35	33	33	34	33	32	37	40	43	43	38	35	36
Minimum	32	33	33	33	35	36	34	33	32	32	33	37	38	36	36	37	38	38	35	33	33	33	33	32	32	32	37	40	38	33	34	33
January																																
Maximum	34	34	34	34	33	34	34	32	32	34	34	37	40	40	40	38	36	35	35	34	34	35	33	33	33	33	33	33	34	33	33	33
Minimum	32	32	34	33	33	32	32	32	32	32	34	34	37	40	37	36	35	35	34	34	34	33	33	33	33	33	33	33	33	33	33	34
February																																
Maximum	36	36	35	34	36	36	36	36	36	39	39	37	35	34	35	33	33	33	33	33	32	32	33	33	33	35	35	34	36	--	--	35
Minimum	35	34	34	34	34	36	35	36	36	37	35	34	34	33	33	33	32	33	33	32	32	32	32	32	32	32	32	33	33	--	--	34
March																																
Maximum	36	35	33	33	32	32	32	32	32	32	32	32	32	32	32	32	33	32	32	32	32	32	33	33	33	32	34	33	41	40	40	34
Minimum	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	32	32	32	33	41	44	33
April																																
Maximum	45	46	47	47	45	42	44	46	43	44	43	56	61	61	61	66	63	57	56	60	58	68	71	75	75	68	65	62	58	59	--	56
Minimum	43	42	46	45	42	39	39	41	39	38	39	42	47	54	55	56	56	50	46	48	55	52	58	62	64	58	55	55	51	55	--	49
May																																
Maximum	57	63	69	72	73	70	67	58	55	50	49	48	51	57	67	70	72	68	71	79	75	71	67	71	70	70	70	73	71	68	69	66
Minimum	51	50	54	58	62	64	56	54	50	48	47	46	47	49	52	59	62	61	60	66	69	64	61	62	60	61	66	64	64	63	61	58
June																																
Maximum	75	76	76	82	78	74	75	74	74	76	76	74	63	68	67	74	72	65	72	74	76	73	72	72	77	79	81	79	81	76	--	74
Minimum	62	65	63	67	70	65	64	62	62	62	60	64	63	64	54	65	64	61	62	64	64	66	68	68	63	65	67	72	72	71	--	65
July																																
Maximum	74	76	74	71	73	75	77	80	81	80	83	82	80	69	76	76	78	81	78	77	79	83	85	83	82	80	79	83	86	82	80	79
Minimum	69	66	68	64	62	64	66	66	69	73	70	70	68	66	62	65	68	70	72	68	65	69	75	72	70	73	70	71	72	65	70	68
August																																
Maximum	80	81	80	75	79	77	79	82	79	78	79	75	75	78	75	73	76	80	78	77	75	72	72	74	75	77	76	81	80	76	80	77
Minimum	67	70	74	72	71	69	67	73	73	73	69	67	67	71	69	67	67	68	71	70	69	66	66	68	65	66	72	71	75	73	69	70
September																																
Maximum	81	80	76	78	78	75	78	81	79	76	69	69	67	65	65	68	68	67	66	67	68	70	73	74	74	72	71	70	66	66	--	72
Minimum	71	73	67	69	73	65	67	72	73	66	62	61	63	57	60	60	63	62	62	64	64	64	66	68	67	67	68	66	60	60	--	65

4-2080. CUYAHOGA RIVER AT INDEPENDENCE, OHIO

LOCATION.--Temperature recorder at gaging station on Rockside Road, 1 mile northeast of Independence, Cuyahoga County, and 3 miles downstream from Tinkers Creek.
DRAINAGE AREA.--709 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1948 to September 1949.
Water temperatures: October 1948 to September 1949, October 1952 to September 1958, August 1959 to September 1960.
Sediment records: October 1950 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 80°F July 28-30; minimum, freezing point Feb. 15.
Sediment concentrations: Maximum daily, 4,800 ppm Aug. 21; minimum daily, 7 ppm Oct. 21-22, Mar. 18.
Sediment loads: Maximum daily, 34,500 tons Mar. 30; minimum daily, 2 tons Sept. 28
EXTREMES, 1948-49, 1950-60.--Water temperatures (1948-49, 1952-60): Maximum, 88°F Aug. 18, 1949; minimum, freezing point on many days during winter months.
Sediment concentrations (1950-60): Maximum daily, 4,800 ppm Aug. 21, 1960; minimum daily, 1 ppm Sept. 4, 10, 1955.
Sediment loads: Maximum daily, 34,500 tons Mar. 30, 1960; minimum daily, less than 0.5 ton on several days during August to September 1954 and September 1955.
REMARKS.--Records of water discharge for water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(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	68	68	68	68	66	66	65	63	63	58	58	57	57	57	57	56	55	56	56	58	59	59	55	53	51	50	51	54	60
Minimum	66	67	66	67	68	68	66	66	65	63	62	58	58	57	56	56	57	55	54	53	55	55	56	56	55	53	51	50	49	50	51	58
November																																
Maximum	54	53	50	53	56	56	51	50	48	48	48	48	48	49	47	46	46	44	41	41	42	42	45	46	46	44	41	41	40	38	--	47
Minimum	53	50	49	50	53	51	50	48	47	47	48	47	47	47	46	45	44	41	41	41	41	42	42	45	44	41	41	40	38	38	--	45
December																																
Maximum	39	39	40	40	41	42	41	38	38	38	39	41	41	39	38	39	40	40	40	40	40	38	38	38	39	40	42	44	44	42	41	40
Minimum	38	39	39	40	40	41	38	38	38	38	38	39	39	38	38	38	39	40	40	39	38	38	38	38	38	39	40	42	42	41	40	39
January																																
Maximum	40	39	38	38	36	36	38	38	38	40	40	39	41	41	41	40	38	38	38	38	36	35	36	36	36	37	37	37	36	36	37	38
Minimum	39	38	38	36	36	36	36	38	38	38	39	38	38	41	40	38	38	38	38	36	35	35	35	36	35	35	37	37	37	37	37	37
February																																
Maximum	37	37	36	37	38	38	38	36	38	39	39	38	35	35	33	34	35	35	35	35	34	34	36	37	37	37	37	36	36	--	--	36
Minimum	36	36	35	35	36	38	36	36	36	37	38	35	35	33	32	33	34	35	35	34	34	34	34	36	36	36	36	36	35	--	--	35
March																																
Maximum	36	37	37	35	35	36	36	36	36	38	38	38	38	38	38	37	37	38	40	38	38	37	38	38	38	38	40	38	38	41	42	38
Minimum	34	36	35	34	35	35	35	34	35	35	36	36	36	37	35	37	36	37	37	37	36	36	37	38	36	38	38	35	35	38	41	36
April																																
Maximum	41	41	44	44	44	43	43	44	44	43	43	50	52	55	55	58	58	58	53	54	56	61	63	67	70	67	63	63	61	61	--	53
Minimum	40	40	41	44	43	42	42	43	43	42	41	43	48	52	54	55	56	51	49	52	54	56	60	62	66	63	60	60	58	60	--	51
May																																
Maximum	61	58	63	65	67	67	67	62	54	52	50	50	53	53	58	60	63	63	66	69	70	69	64	64	65	65	66	67	66	66	63	62
Minimum	57	55	57	61	63	65	62	54	52	50	50	50	50	53	53	58	60	62	61	66	69	64	61	61	62	63	65	62	64	62	61	59
June																																
Maximum	66	67	71	74	74	73	70	69	70	71	72	72	68	69	69	72	72	70	70	70	71	71	73	73	73	74	74	74	77	77	--	72
Minimum	63	66	66	69	72	70	67	65	66	67	69	68	66	66	65	67	70	68	67	69	69	69	71	72	70	70	70	73	73	74	--	69
July																																
Maximum	75	74	74	71	72	72	73	74	76	75	75	76	76	72	73	74	74	76	76	74	75	77	79	79	79	78	78	80	80	80	77	76
Minimum	70	70	71	68	69	69	69	70	71	73	71	72	72	70	69	70	72	72	72	72	71	72	75	75	74	75	74	76	76	76	74	72
August																																
Maximum	76	76	76	74	76	75	74	75	76	76	75	74	74	76	74	72	73	76	76	74	71	70	73	73	73	73	74	76	76	75	76	74
Minimum	71	73	72	73	74	73	72	72	74	74	73	71	71	72	71	70	69	72	72	71	69	68	69	71	69	69	72	72	74	73	74	72
September																																
Maximum	77	77	75	73	75	74	73	74	74	72	69	66	65	62	64	68	68	67	66	65	66	68	69	71	71	70	71	70	68	67	--	70
Minimum	74	74	70	70	73	70	70	71	72	69	66	64	61	59	62	64	67	65	65	65	65	66	68	68	68	68	69	68	65	64	--	67

STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-2080. CUYAHOGA RIVER AT INDEPENDENCE, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960
(Where no concentration 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	4620	743	S 11400	1200	--	260	1100	15	44
2	1760	9	43	1090	56	165	1150	10	31
3	1360	11	A 40	953	106	273	1150	11	34
4	1100	12	36	1200	150	B 490	1090	11	32
5	1020	16	A 45	2230	--	1900	1070	14	40
6	2050	--	3500	1540	65	S 290	1670	--	500
7	3600	--	9000	1180	32	102	1900	--	340
8	1440	144	560	1020	29	80	1420	14	54
9	1510	--	180	926	24	60	1190	23	74
10	1330	23	82	836	20	45	1070	27	78
11	1250	19	64	773	28	58	1210	38	S 134
12	1120	74	224	901	48	117	4530	260	A 3600
13	940	30	76	1120	--	470	6800	340	A 6200
14	858	13	30	1720	--	1200	4080	153	1680
15	724	12	23	1700	180	S 900	3060	95	B 750
16	621	19	32	1280	56	194	2700	48	350
17	537	20	29	1180	38	121	2280	34	209
18	481	23	30	1030	38	106	1840	56	278
19	418	17	19	930	24	60	1500	74	300
20	390	12	13	858	27	62	1220	59	194
21	362	7	7	814	39	86	1070	41	118
22	335	7	6	755	24	49	922	23	57
23	311	24	20	732	52	103	778	17	36
24	860	--	480	814	69	152	688	20	37
25	858	110	A 250	872	53	125	649	24	42
26	1200	--	360	791	29	62	661	18	32
27	1280	--	240	1220	--	420	710	32	61
28	1080	42	122	1580	65	A 280	980	--	340
29	890	37	89	1380	28	104	1640	--	650
30	746	30	60	1200	23	74	1460	72	284
31	890	--	180	--	--	--	1180	27	86
Total	35941	--	27240	33825	--	8408	52768	--	16665

	JANUARY			FEBRUARY			MARCH		
1	998	20	54	1080	23	67	597	17	27
2	935	24	60	980	24	64	529	22	31
3	1810	--	900	827	30	67	553	21	31
4	1580	54	230	732	43	85	517	28	39
5	1200	52	168	778	51	107	493	38	50
6	962	33	86	1340	--	280	505	25	34
7	989	20	53	1450	52	204	533	20	29
8	940	19	48	1230	40	133	537	20	29
9	818	13	29	1540	108	449	497	19	25
10	746	9	18	3670	320	A 3200	517	23	32
11	750	9	18	4130	310	A 3700	509	25	34
12	1720	950	A 8600	2850	60	462	497	33	44
13	3580	--	13000	2260	43	262	461	35	44
14	2310	116	723	1920	37	192	505	22	30
15	2390	--	600	1590	46	197	477	13	17
16	2160	30	175	1400	31	117	517	24	34
17	1860	25	126	1280	15	52	505	14	19
18	1740	113	531	1200	28	91	545	7	10
19	1820	75	368	1060	33	94	549	9	13
20	1480	31	124	912	46	113	661	9	16
21	1210	32	104	778	65	136	649	10	18
22	1050	25	71	800	30	65	641	9	16
23	966	23	60	786	26	55	621	11	18
24	868	19	44	C 732	--	70	633	13	22
25	822	19	42	C 746	--	70	637	11	19
26	778	18	38	C 786	--	70	653	12	21
27	764	24	50	C 701	--	70	760	47	S 128
28	1590	110	A 470	641	19	33	3230	902	S 8480
29	1660	95	A 430	637	15	26	5030	1000	A 15000
30	1390	27	101	--	--	--	6720	1900	34500
31	1180	18	57	--	--	--	6430	254	4410
Total	43066	--	27378	38836	--	10601	36508	--	63220

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

STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-2080. CUYAHOGA RIVER AT INDEPENDENCE, OHIO--Continued

Suspended sediment, water year October 1959 to September 1960--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	5010	42	568	1090	260 S	800	1480	105	420
2	4390	34	403	742	42	84	994	53	142
3	4210	65 A	900	746	33	66	782	35	74
4	6060	96 S	1800	541	30	44	629	34	58
5	3410	23	212	386	17	18	593	31	50
6	2570	24	166	345	15	14	517	21	29
7	2230	27	162	341	16	15	453	21	26
8	2020	25	136	1290	210 S	884	400	22	24
9	1700	39	179	1430	167	645	358	24	23
10	1500	37	150	2610	440	3100	311	20	17
11	1420	26	100	2720	273	2000	282	22	17
12	1290	20	70	2000	131	707	582	183 S	619
13	1160	23	72	1580	77	328	782	465 S	1020
14	1080	19	55	1460	91	359	1010	273 S	862
15	984	16 A	40	1330	59	212	2120	856 S	5230
16	1340	--	550	1100	36	107	1070	122	352
17	1750	--	1000	1060	34	97	904	68	166
18	1210	31	101	948	29	74	976	122	321
19	1020	26	72	822	25	55	876	54	128
20	930	48	120	746	23	46	773	50	104
21	886	49	117	641	19	33	688	37	69
22	836	37	84	796	--	410	601	27	44
23	755	25 A	50	1430	310 A	1200	577	31	48
24	683	25 A	45	1290	98	341	477	19	24
25	641	20	35	976	39	103	386	15	16
26	822	--	250	804	31	67	355	13	12
27	971	170 S	473	755	91	186	304	8	6
28	719	33	64	1020	252 S	777	348	422 S	534
29	619	20	33	953	330 S	924	348	188 S	194
30	601	20	32	904	118 S	452	295	34	27
31	--	--	--	2580	739 S	5710	--	--	--
Total	52811	--	8039	35436	--	19858	20251	--	10656

Day	JULY			AUGUST			SEPTEMBER		
1	434	131 S	200	247	25	17	212	25	14
2	412	44 S	58	215	18	10	173	15	7
3	595	220 A	400	864	750 A	2000	149	13 A	5
4	521	176 S	266	534	274 S	432	132	16	6
5	352	36	34	445	190 A	230	132	16	6
6	311	33	28	324	88	77	127	13	4
7	285	30	23	438	--	450	132	13	5
8	256	15	10	1090	--	3300	132	13	5
9	247	15	10	737	145	288	151	29	12
10	204	13	7	597	62	100	143	10	4
11	180	12	6	394	58	62	126	10	3
12	190	14	7	282	27	20	116	26	8
13	245	55 S	55	220	20	12	324	--	500
14	773	--	500	218	34 S	24	198	100 S	59
15	453	45	55	617	266 S	459	235	20	13
16	318	25	21	355	51	49	238	12	8
17	250	18	12	247	28	19	188	15	8
18	215	24	14	215	19	11	142	13	5
19	282	23	18	169	16	7	124	11	4
20	298	34	27	241	657 S	937	138	18	7
21	218	42	25	940	4800 A	13000	132	19	7
22	196	29	15	1500	--	15000	130	15	5
23	193	14	7	899	385	934	126	11	4
24	164	13	6	637	89	153	162	24	10
25	134	14	5	390	42	44	111	16	5
26	160	14	6	288	25	19	98	18	5
27	408	--	130	232	24	15	110	14	4
28	314	34	29	209	21	12	111	8	2
29	244	21	14	186	45 S	30	107	15	4
30	238	26	17	220	--	65	111	23	7
31	232	65	41	385	--	150	--	--	--
Total	9322	--	2046	14335	--	37926	4510	--	736

Total discharge for year (cfs-days)..... 377,609
Total load for year (tons)..... 232,773

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

STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-2080. CUYAHOGA RIVER AT INDEPENDENCE, OHIO--Continued

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

Date of collection	Time (24 hour)	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. 13, 1959.....	1100			7410	343		50	62	74	93	99	100	--	--				SBWC
Mar. 29, 1960.....	1600			4660	880		37	48	63	86	97	99	100	--				SBWC
May 31.....	0615			3570	1160		39	56	63	75	86	91	95	100				SBWC
May 31.....	0615			3570	1160		13	24	56	69	86	89	94	100				SBN
June 15.....	1220			2280	955		41	51	65	81	94	97	98	100				SBWC
June 15.....	1220			2280	955		8	20	43	75	92	95	96	100				SBN
June 28.....	1835			545	1790		34	47	61	89	92	98	100	--				SBWC

STREAMS TRIBUTARY TO LAKE ONTARIO

4-2305. OATKA CREEK AT GARBUTT, N.Y.

LOCATION.--At highway bridge, 40 feet upstream from gaging station at Garbutt, Genesee County, 2 miles southwest of Scottsville and 3.5 miles upstream from mouth.
DRAINAGE AREA.--208 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1959 to September 1960.
Water temperatures: October 1959 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 1,050 ppm Oct. 1-8; minimum, 220 ppm Apr. 1-6.
Hardness: Maximum, 734 ppm Oct. 1-8; minimum, 154 ppm Mar. 30-31.
Specific conductance: Maximum daily, 1,440 micromhos Oct. 5; minimum daily, 424 micromhos Dec. 15.
Water temperatures: Maximum, 68°F June 28; minimum, 35°F on several days during December, January, February and March.
REMARKS.--Records of specific conductance and pH of daily samples available in district office at Albany, N.Y. Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Oxygen consumed: Filtered	Oxygen consumed: Unfiltered
Oct. 1-8, 1959...	45	12	0.13	241	32	19	2.7	223	520	32	0.4	2.5	1050	734	551	1340	7.1	3	--	--
Oct. 9-10.....	83	--	.11	--	--	24	--	168	196	28	--	4.3	--	332	194	730	7.1	--	--	--
Oct. 11.....	41	--	.10	--	--	14	--	185	298	24	--	2.9	--	468	316	920	7.2	--	--	--
Oct. 12-20.....	26	10	.12	227	30	19	2.4	218	490	32	.4	2.3	984	691	512	1280	7.3	3	2	3
Oct. 21-31.....	33	8.2	.07	241	32	18	2.4	232	518	32	.4	2.0	1010	734	544	1310	7.2	3	--	--
Nov. 1-2.....	49	--	.08	--	--	5.1	--	242	430	30	--	2.3	--	680	481	1210	7.4	4	--	--
Nov. 3-15.....	68	9.6	.07	160	23	18	2.7	210	310	30	.3	2.5	702	494	322	969	7.6	4	2	4
Nov. 16-30.....	83	17	.08	140	21	19	2.4	200	262	30	.4	2.6	642	436	272	890	7.8	5	2	4
Dec. 1-12.....	181	3.9	.04	111	16	17	2.0	168	188	34	.2	3.5	462	343	205	740	7.5	3	3	11
Dec. 13-19.....	671	7.0	.05	75	12	12	2.2	136	115	24	.2	5.3	344	237	125	521	7.7	5	4	16
Dec. 20-25.....	204	9.4	.08	117	21	14	1.9	184	208	30	.2	6.2	563	379	228	794	7.7	2	3	7
Dec. 26.....	190	--	.05	--	--	17	--	159	115	32	--	5.4	--	264	134	584	7.6	3	--	--
Dec. 27.....	232	--	.11	--	--	12	--	206	213	31	--	4.5	--	412	243	822	7.5	5	--	--
Dec. 28-31.....	575	--	.10	--	--	14	--	150	118	30	--	4.4	--	262	139	575	7.6	7	--	--
Jan. 1-10, 1960..	322	11	.07	104	17	14	2.0	182	155	25	.2	7.8	469	330	181	703	7.3	6	3	4
Jan. 11-13.....	237	--	.07	--	--	14	--	204	208	32	--	6.3	--	402	235	803	7.4	5	--	--

STREAMS TRIBUTARY TO LAKE ONTARIO--Continued

4-2305. OATKA CREEK AT GARBUTT, N.Y.--Continued

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color	Oxygen consumed	
														Calcium, magnesium	Noncarbonate				Filtered	Unfiltered
Jan. 14-20, 1960.	563	8.9	0.07	80	16	12	2.0	157	125	23	0.2	5.9	358	266	137	565	7.5	6	--	--
Jan. 21-31.....	225	8.8	.06	116	19	15	1.9	196	195	26	.3	6.7	513	368	207	764	7.4	4	--	--
Feb. 1-10.....	284	12	.07	102	21	15	2.0	194	170	30	.2	6.2	516	341	182	751	7.6	5	--	--
Feb. 11-14.....	1155	--	.07	--	--	12	--	134	86	20	--	7.1	--	208	98	463	7.8	7	--	--
Feb. 15-29.....	320	9.5	.05	96	21	14	2.2	191	148	26	.2	7.7	471	326	169	710	7.5	5	3	3
Mar. 1-28.....	198	6.2	.07	120	18	15	1.9	202	192	29	.2	6.8	534	374	208	768	7.9	2	3	3
Mar. 29.....	808	--	.10	--	--	9.0	--	171	87	28	--	8.4	--	258	118	551	7.4	7	--	--
Mar. 30-31.....	4695	--	.14	--	--	6.9	--	116	46	14	--	8.3	--	154	59	340	7.4	12	--	--
Apr. 1-6.....	2042	6.2	.08	51	9.4	6.0	1.7	116	57	12	.2	7.4	220	166	71	352	7.4	11	3	6
Apr. 7-21.....	537	9.3	.04	88	15	8.8	1.7	177	115	18	.2	7.1	389	281	136	586	7.7	4	3	4
Apr. 22-30.....	259	9.4	.12	117	20	13	2.0	210	185	22	.3	5.9	524	374	202	745	7.7	4	3	4
May 1-23.....	202	8.0	.08	128	21	16	2.0	219	215	24	.5	5.8	574	406	226	808	7.7	8	3	5
May 24-27.....	404	--	.10	--	--	8.0	--	198	112	20	--	2.5	--	292	130	595	7.7	17	--	--
May 28-31.....	187	--	.08	--	--	5.8	--	223	207	21	--	4.4	--	419	236	800	7.7	11	--	--
June 1-15.....	148	12	.05	147	24	15	2.1	220	265	28	.2	3.6	640	466	286	896	7.6	6	3	4
June 16-19.....	264	--	.31	--	--	19	--	194	185	25	--	2.9	--	348	189	656	7.5	12	--	--
June 20-30.....	98	10	.06	160	26	16	2.1	226	298	30	.2	2.8	666	507	322	944	7.6	5	--	--
July 1-31.....	52	11	.08	205	31	15	2.2	243	414	30	.3	4.9	845	640	441	1140	7.6	3	2	2
Aug. 1-31.....	42	12	.09	223	28	20	2.6	236	430	26	.4	4.9	908	672	478	1180	7.6	2	1	3
Sept. 1-20.....	31	9.9	.08	228	32	18	2.4	227	482	30	.4	4.9	998	701	515	1240	7.7	2	--	--
Sept. 21-30.....	28	7.8	.06	232	32	19	2.4	230	501	30	.4	4.3	1030	711	522	1280	7.7	2	2	2
Weighted average	--	8.6	0.08	105	17	12	2.0	169	151	22	0.2	6.3	466	307	168	630	7.5	7	--	--
Time-weighted average.....	246.91	9.7	0.07	156	23	15	2.2	206	280	27	0.3	5.0	676	471	302	903	7.6	4	--	--
Tons per day....	--	4.8	0.05	58	9.7	7.9	1.1	113	101	15	0.1	4.2	259	--	--	--	--	--	--	--

STREAMS TRIBUTARY TO LAKE ONTARIO--Continued

4-2305. OATKA CREEK AT GARBUTT, N.Y.--Continued

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

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

STREAMS TRIBUTARY TO LAKE ONTARIO--Continued

4-2320. GENESEE RIVER AT DRIVING PARK AVENUE, ROCHESTER, N.Y.

LOCATION.--On right bank at Rochester, Monroe County at plant 5 of Rochester Gas and Electric Corp., 40 feet upstream from gaging station, and 60 feet upstream from Driving Park Bridge.
DRAINAGE AREA.--2,467 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1954 to September 1955.
Water temperatures: October 1954 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 78°F Aug. 10; minimum, freezing point Jan. 6.
EXTREMES, 1954-60.--Water temperatures: Maximum, 83°F Aug. 4-6, 1955; minimum, freezing point Mar. 1955, December 1956, and January 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

Temperature (°F) of water, water year October 1959 to September 1960
(Twice-daily measurement at approximately 10 a.m. and 4 p.m.)

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

STREAMS TRIBUTARY TO LAKE ONTARIO--Continued

4-2375. SENECA RIVER AT LOCK 24, BALDWINSVILLE, N.Y.

LOCATION.--At lock 24 at Baldwinsville, Onondaga County and 350 feet upstream from gaging station.
DRAINAGE AREA.--3,130 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1957 to September 1958.
Water temperatures: October 1957 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 76°F July 29, 31, Aug. 8, Sept. 2; minimum, freezing point Jan. 9-14.
EXTREMES, 1957-60.--Water temperatures: Maximum, 80°F July 30, 31, Aug. 1, 1958; minimum, freezing point on many days during winter months.
REMARKS.--Record of discharge for water year 1959 to September 1960 given in WSP 1703.

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

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

STREAMS TRIBUTARY TO LAKE ONTARIO--Continued

4-2560. INDEPENDENCE RIVER AT DONNATTSBURG, N.Y.

LOCATION.--At gaging station at downstream side of highway bridge at Donnattsburg, Lewis County, 1.2 miles downstream from Chase Lake Outlet, 4.2 miles northeast of Glenfield, and 5 miles upstream from mouth.
DRAINAGE AREA.--91.7 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1959 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 72°F July 11, 19; minimum, freezing point on several days during February and March.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
Jan. 20, 1960.....	165	9.0	0.27	2.6	1.2	0.9	0.6	5	6.5	0.5	0.2	1.5	34	12	8	33	5.6	21
Mar. 28.....	70	9.8	.35	2.9	1.4	1.0	.8	8	5.9	1.3	.1	1.6	34	13	7	32	6.6	28
May 16.....	233	3.5	.36	3.2	.0	1.9	.9	3	8.2	.6	.1	.6	a21	8	6	25	5.7	50
June 20.....	129	4.5	.75	3.0	.8	1.0	.4	7	5.7	.8	.1	1.2	25	11	6	25	5.9	76
Sept. 7.....	30	8.8	.95	8.0	.4	1.4	.6	19	8.0	.5	.2	.9	42	22	6	47	6.5	49

a Calculated from determined constituents.

4-2560. INDEPENDENCE RIVER AT DONNATTSBURG, N.Y.--Continued

Temperature (°F) of water, water year October 1959 to September 1960
(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	64	63	61	62	62	60	59	59	61	61	58	56	52	50	49	50	49	49	45	44	44	43	48	54	54	53	50	47	44	43	44	53
Minimum	63	60	59	61	60	59	59	59	59	58	56	52	50	47	47	48	49	45	41	42	42	41	43	48	53	50	47	44	42	41	42	51
November																																
Maximum	44	44	42	42	47	49	48	43	41	40	40	41	40	45	45	41	41	39	37	37	36	37	38	41	41	38	37	36	37	38	--	41
Minimum	44	42	40	40	42	47	43	41	40	39	39	40	39	39	41	39	39	36	36	36	36	36	36	38	38	36	36	35	35	35	--	39
December																																
Maximum	35	36	36	36	37	38	38	37	36	35	34	34	34	34	35	34	34	34	34	34	34	34	35	34	34	33	33	33	33	33	33	35
Minimum	35	35	36	36	36	37	37	35	34	34	34	34	33	33	33	34	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34
January																																
Maximum	33	34	34	33	33	33	33	34	33	33	33	33	33	33	33	33	34	33	33	33	33	33	33	33	34	33	33	33	33	34	34	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	33	33	34	34	34	33	33	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34	--	--	33
Minimum	33	33	33	33	33	33	33	33	33	33	32	32	33	33	33	33	33	32	32	33	32	32	33	33	33	33	33	33	33	--	--	33
March																																
Maximum	34	34	33	33	33	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34	34	34	33	34	34	33	33	34	33	33	33
Minimum	33	33	33	33	33	33	32	33	33	33	33	32	33	32	32	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
April																																
Maximum	33	33	33	33	33	34	35	35	35	37	39	39	40	40	40	42	46	47	41	42	47	49	48	52	52	50	46	48	52	51	--	42
Minimum	33	33	33	33	33	33	33	34	35	34	36	37	36	39	39	38	41	40	38	40	42	47	46	47	50	46	46	45	46	49	--	39
May																																
Maximum	50	49	52	56	57	59	59	59	58	58	55	54	53	53	52	52	55	58	60	60	62	62	61	57	57	60	61	63	63	64	63	57
Minimum	47	44	48	51	53	55	56	56	57	54	53	52	53	52	51	51	51	55	57	58	58	60	57	57	56	57	58	61	61	60	61	55
June																																
Maximum	61	64	66	66	67	66	64	64	64	66	65	65	66	66	62	62	67	66	63	63	64	66	66	66	66	66	68	69	69	69	--	65
Minimum	59	59	62	63	66	64	61	60	59	60	62	63	59	62	60	61	62	63	59	61	58	61	62	64	62	61	63	65	66	66	--	62
July																																
Maximum	69	70	70	66	63	63	65	65	68	69	72	70	70	70	70	70	70	70	72	71	69	69	71	71	70	70	70	69	71	71	68	69
Minimum	65	66	66	62	61	59	60	62	63	65	66	66	69	68	63	64	66	65	68	67	64	65	67	66	66	67	67	64	65	68	63	65
August																																
Maximum	67	67	68	68	68	67	69	67	66	66	67	66	66	68	67	65	67	68	68	66	66	66	66	64	63	65	67	67	69	70	69	67
Minimum	61	63	64	63	62	60	61	66	61	62	62	61	62	64	62	58	61	62	63	63	62	64	63	59	58	59	63	62	64	67	63	62
September																																
Maximum	67	67	65	63	63	63	66	68	69	69	65	62	59	61	61	61	61	59	59	63	62	63	63	64	64	63	63	62	62	60	--	63
Minimum	64	62	59	61	60	58	60	64	66	64	62	59	58	58	59	59	58	58	56	59	62	59	61	61	62	60	61	59	60	59	--	60

STREAMS TRIBUTARY TO LAKE ONTARIO--Continued

4-2571.5. BEAVER RIVER AT MOSHIER FALLS, N.Y.

LOCATION.--At the Niagara-Mohawk Moshier Falls Power Station which is at the confluence of Beaver River and Sunday Creek near Number Four, Lewis County.
DRAINAGE AREA.--184 square miles.
RECORDS AVAILABLE.--Water temperatures: October 1955 to September 1960.
EXTREMES, 1959-60.--Water temperatures: Maximum, 70°F July 30, Aug. 19-23; minimum, 34°F on many days during December, January, February, March and April.
EXTREMES, 1955-60.--Water temperatures: Maximum, 71°F Aug. 4, 1956; minimum, 34°F on many days during winter months.
REMARKS.--Measurements made by plant employees five feet below water surface in tailrace of the Moshier Falls hydroelectric station.

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

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

4-2608. ST. LAWRENCE RIVER AT ALEXANDRIA BAY, N.Y.

LOCATION.--Off pier behind post office at river-stage gage, Jefferson County.
DRAINAGE AREA.--296,500 square miles, approximately.
RECORDS AVAILABLE.--Water temperatures: October 1955 to September 1960.
EXTREMES, 1955-60.--Water temperatures: Maximum, 69°F Aug. 13-16.
EXTREMES, 1955-60.--Water temperatures: Maximum, 75°F Aug. 30, 31, Sept. 1, 2, 6, 8-10, 1959; minimum, freezing point on many days during winter months.
REMARKS.--River frozen Jan. 9 to Mar. 31.

Temperature (°F) of water, water year October 1959 to September 1960
(Twice-daily measurements at 8 a.m. and 4 p.m.)

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

STREAMS TRIBUTARY TO ST. LAWRENCE RIVER--Continued

4-2680. RAQUETTE RIVER AT RAYMONDVILLE, N.Y.

LOCATION.--At old highway bridge, Raymondville, St. Lawrence County, 250 feet downstream from gaging station, 0.3 mile downstream from Trout Brook, 0.4 mile downstream from powerplant of Niagara Mohawk Power Corp., 18 miles upstream from mouth.
DRAINAGE AREA.--1,131 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1959 to September 1960.
Water temperatures: October 1959 to September 1960.
EXTREMES, 1959-60.--Dissolved solids: Maximum, 173 ppm June 1-5; minimum, 41 ppm Aug. 18-31.
Hardness: Maximum, 173 ppm Nov. 11; minimum, 21 ppm Aug. 18-31.
Specific conductance: Maximum daily, 332 micromhos Nov. 11; minimum daily, 49 micromhos Aug. 29.
Water temperatures: Maximum, 79°F July 13, 28, Aug. 10, 14, 18; minimum, freezing point on many days during November, December, January, February, March and April.
REMARKS.--Records of specific conductance and pH of daily samples available in district office at Albany, N.Y. Records of discharge for water year October 1959 to September 1960 given in WSP 1707.

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Oxygen consumed: Filtered	Oxygen consumed: Unfiltered
Oct. 1-7, 1959...	1464	13	0.43	18	6.4	3.4	1.0	78	10	2.0	0.2	0.8	112	72	8	157	6.1	45	8	11
Oct. 8-10.....	2060	--	.27	--	--	2.1	--	120	12	.6	--	.9	--	108	14	224	6.6	65	--	--
Oct. 11-16.....	1498	11	.38	19	7.1	2.8	1.0	80	11	2.2	.2	.8	113	77	11	164	6.4	55	--	--
Oct. 17.....	1420	--	.36	--	--	.7	--	175	12	2.0	--	.7	--	158	15	314	6.8	55	--	--
Oct. 18-20.....	1387	--	.50	--	--	1.2	--	56	10	3.0	--	.8	--	58	14	127	6.5	45	--	--
Oct. 21-24.....	1530	--	.48	--	--	.9	--	60	10	1.5	--	1.0	--	60	11	131	6.4	35	--	--
Oct. 25-31.....	1801	9.6	.32	25	9.6	2.4	1.4	108	12	2.6	.2	.9	136	102	14	213	6.7	52	--	--
Nov. 1-10.....	2494	12	.18	24	9.5	3.6	1.5	108	10	2.6	.3	1.0	134	99	11	203	7.1	45	9	13
Nov. 11.....	3540	--	.17	--	--	1.6	--	188	16	2.0	--	3.6	--	173	19	332	7.3	23	--	--
Nov. 12-19.....	3886	15	.22	16	6.8	3.2	1.1	77	9.8	1.7	.2	1.2	106	68	5	153	7.0	38	8	13
Nov. 20-30.....	2985	9.5	.19	15	5.5	2.4	1.0	62	8.6	1.5	.2	1.1	89	60	9	133	7.1	37	8	11
Dec. 1-5.....	2954	7.5	.07	21	8.1	2.4	.7	90	13	1.7	.2	1.1	89	60	9	133	7.1	37	8	11

Dec. 6-7, 1959...	3720	--	.09	--	--	.5	--	26	10	1.9	--	.4	--	34	13	77	6.8	32	--	--
Dec. 8-9.....	4160	--	.08	--	--	1.8	--	105	14	2.7	--	.9	--	101	15	208	7.4	45	--	--
Dec. 10-16.....	3989	7.0	.08	19	7.1	2.6	.6	82	12	1.6	.2	.7	107	77	10	166	7.1	28	7	16
Dec. 17-19.....	3780	--	.09	--	--	1.4	--	112	15	2.0	--	.5	--	108	16	220	7.4	28	--	--
Dec. 20-21.....	2970	--	.06	--	--	.5	--	58	12	1.1	--	.8	--	61	14	128	7.3	32	--	--
Dec. 22-27.....	2700	7.7	.15	9.0	2.9	2.1	.5	30	8.8	1.3	.2	1.1	52	35	10	77	7.4	22	6	14
Dec. 28.....	2500	--	.11	--	--	1.8	--	101	13	.8	--	2.1	--	95	12	198	7.0	15	--	--
Dec. 29-31.....	2467	--	.16	--	--	1.4	--	32	9.5	1.6	--	.5	--	36	10	83	7.1	30	--	--
Jan. 1, 1960.....	2400	--	.28	--	--	1.6	--	132	18	1.0	--	.7	--	125	17	249	6.8	19	--	--
Jan. 2-4.....	2383	--	.35	--	--	.7	--	32	11	1.2	--	.6	--	38	12	87	6.3	24	--	--
Jan. 5.....	2350	--	.24	--	--	.5	--	60	13	1.0	--	1.0	--	64	15	136	6.2	30	--	--
Jan. 6.....	2300	--	.26	--	--	.8	--	131	16	1.6	--	2.2	--	118	11	230	6.5	24	--	--
Jan. 7-31.....	2274	9.7	.20	7.7	2.3	2.2	.6	24	12	1.2	.2	.6	58	29	9	71	6.3	25	8	8
Feb 1-10.....	2215	9.4	.19	8.8	3.8	1.8	.6	32	11	2.7	.2	.6	62	38	12	81	7.0	25	--	--
Feb. 11-29.....	2461	8.3	.18	15	6.0	1.7	1.1	60	11	2.3	.2	.7	86	62	13	128	6.9	30	8	9
Mar. 1-20.....	2270	7.9	.36	13	4.6	1.7	.7	52	8.7	.5	.1	1.1	78	52	9	110	7.2	28	8	10
Mar. 21-29.....	1828	8.9	.47	18	7.1	2.2	.8	79	9.4	.8	.1	1.0	102	74	10	152	7.5	33	8	10
Mar. 30-31.....	2040	--	.36	--	--	2.8	--	109	11	2.1	--	1.4	--	99	10	201	7.6	28	--	--
Apr. 1.....	4030	--	.42			.5	--	105	7.6	.6		2.6	--	96	10	195	7.0	18	--	--
Apr. 2-17.....	5440	5.2	.15	16	6.7	1.5	1.0	73	7.2	.3	.1	1.1	87	68	8	140	7.2	28	7	9
Apr. 18-30.....	4968	4.0	.13	25	10	2.5	1.2	117	9.2	.2	.2	.7	129	104	8	209	7.3	42	9	12
May 1-8.....	5618	6.9	.16	33	13	3.6	1.3	159	9.0	.2	.3	.9	164	136	6	266	7.4	38	9	12
May 9-11.....	4370	--	.21	--	--	1.4	--	47	7.4	.3	--	.4	--	44	6	101	7.0	28	--	--
May 12-26.....	3507	8.5	.19	33	13	4.0	1.0	162	7.6	.3	.3	1.4	154	136	3	273	7.3	55	10	16

STREAMS TRIBUTARY TO ST. LAWRENCE RIVER--Continued

4-2680. RAQUETTE RIVER AT RAYMONDVILLE, N.Y.--Continued

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

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Oxygen consumed: Filtered	Oxygen consumed: Unfiltered
May 27-29, 1960..	2557	--	0.18	--	--	0.9	--	100	6.5	0.2	--	0.9	--	88	6	178	7.2	50	--	--
May 30-31.....	1955	--	.19	--	--	.5	--	160	6.5	.3	--	.6	--	138	7	262	7.3	55	--	--
June 1-5.....	2574	9.6	.17	36	10	3.5	0.8	160	6.8	1.2	0.2	1.6	173	131	0	269	7.2	69	--	--
June 6-18.....	1745	6.6	.22	17	4.6	3.0	.6	69	7.6	1.8	.2	1.5	92	62	5	137	6.8	40	9	14
June 19-22.....	1675	--	.19	--	--	1.2	--	38	8.4	1.5	--	1.1		40	9	88	6.9	35	--	--
June 23-27.....	1600	8.8	.23	15	3.8	2.8	.7	54	10	2.5	.1	1.1	83	53	9	118	6.8	36	--	--
June 28-30.....	1700	--	.20	--	--	2.1	--	32	8.8	2.5	--	1.0	--	35	9	81	6.6	39	--	--
July 1-31.....	1360	8.6	.21	9.1	2.2	2.3	.6	26	12	1.8	.2	.7	57	32	10	72	6.7	29	8	11
Aug. 1-17.....	1145	8.7	.20	6.8	1.4	3.1	.8	24	6.0	2.3	.2	1.8	54	23	4	68	6.5	25	6	7
Aug. 18-31.....	950	3.4	.22	6.6	1.1	1.4	.6	20	5.6	1.1	.2	.8	41	21	5	53	6.8	25	--	--
Sept. 1-20.....	992	4.1	.25	6.3	1.8	1.5	.5	21	7.2	.2	.1	.9	47	23	6	61	6.7	20	--	--
Sept. 21-30.....	980	3.7	.33	7.2	1.8	1.4	.5	22	8.0	.5	.1	1.0	51	26	8	64	6.6	23	9	12
Weighted average	--	7.9	0.20	18	6.6	2.3	0.9	77	9.5	1.2	0.2	1.0	97	71	9	150	6.8	35	--	--
Time-weighted average ...	2425	7.9	0.22	15	5.2	2.2	0.8	64	9.5	1.3	0.2	1.0	86	61	9	130	6.7	33	--	--
Tons per day....	--	51	1.30	115	43	15	5.9	505	62	7.8	1.2	6.4	633	--	--	--	--	227	--	--

STREAMS TRIBUTARY TO ST. LAWRENCE RIVER--Continued

4-2680. RAQUETTE RIVER AT RAYMONDVILLE, N.Y.--Continued

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

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	76	60	60	73	63	63	57	60	59	60	55	54	52	49	48	49	50	48	46	48	43	42	45	50	52	50	--	45	42	45	42	53
November	42	42	40	42	42	50	45	40	40	40	42	42	42	45	43	39	39	39	--	36	40	36	36	35	38	40	39	34	32	32	--	40
December	34	36	31	35	38	40	44	31	33	33	--	31	33	33	31	34	31	35	33	31	33	32	31	31	32	33	32	32	31	34	31	33
January	32	32	32	32	32	36	32	32	32	32	32	33	37	35	34	32	32	33	34	32	35	34	32	34	40	34	32	33	32	35	32	33
February	39	33	35	33	33	39	38	38	35	32	36	38	35	32	32	32	35	36	32	35	32	32	37	39	32	37	37	32	33	--	--	35
March	31	33	36	34	31	36	31	31	35	33	31	32	34	35	35	32	35	39	37	35	31	34	31	31	31	34	35	36	35	33	31	33
April	32	34	35	31	35	31	33	36	32	35	36	31	31	40	45	45	49	44	46	46	47	48	49	50	49	50	49	51	50	51	--	41
May	51	53	50	51	53	52	50	51	60	51	61	50	56	58	56	58	59	60	64	60	61	63	60	62	65	69	70	73	76	62	60	59
June	59	61	65	76	70	65	60	69	73	72	70	71	69	70	72	73	70	71	60	61	65	67	69	73	74	75	70	73	69	70	--	69
July	71	72	70	60	63	66	70	73	74	75	70	76	79	70	71	73	70	73	74	75	73	71	70	74	70	71	78	79	76	75	72	72
August	73	77	76	76	76	76	70	71	72	79	77	70	73	79	77	76	75	79	78	73	74	75	73	70	71	72	73	74	76	65	65	74
September	64	66	68	69	69	68	70	--	69	70	71	65	68	67	68	69	70	67	62	63	64	65	66	72	68	69	70	60	63	62	--	67

MISCELLANEOUS ANALYSES OF STREAMS IN ST. LAWRENCE RIVER BASIN

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

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
STREAMS TRIBUTARY TO LAKE SUPERIOR																							
4-165. ST. LOUIS RIVER NEAR AURORA, MINN.																							
July 27, 1960	160	7.5				12	5.4	4.2	1.0	47	0	16	2.9	0.3	0.6		104	52	13	0.3	117	6.6	95
Aug. 10.....	116	8.6		0.61	0.00	11	6.5	4.7	1.0	53	0	13	2.9	.3	1.0		112	54	11	.3	122	6.9	110
Sept. 29.....	34	--				19	5.7	4.7	--	76	0	13	3.8	--	--		113	71	9	.2	163	7.0	28
4-170. EMBARRASS RIVER AT EMBARRASS, MINN.																							
July 25, 1960	21	10		--		11	3.3	2.0	0.8	41	0	13	0.0	0.2	1.7		99	41	7	0.1	84	6.4	140
Aug. 9.....	14	11		0.94	0.00	12	3.4	2.1	1.9	48	0	13	.0	.2	1.7		102	44	5	.1	89	6.9	168
Sept. 23.....	2.7	13		1.1		22	1.7	2.9	1.0	74	0	3.8	.0	.1	.8		99	62	1	.2	130	6.9	41
4-180. EMBARRASS RIVER NEAR MCKINLEY, MINN.																							
July 27, 1960	75	4.9		--		14	4.6	3.1	1.2	48	0	17	0.0	0.3	1.3		99	54	15	0.2	121	6.7	86
Aug. 10.....	75	6.2		0.24	0.00	16	6.8	3.5	1.2	66	0	20	.1	.3	.6		117	68	14	.2	147	7.1	68
Sept. 29.....	32	8.3		.15		22	6.6	3.9	1.6	80	0	22	2.0	.2	.7		121	82	16	.2	180	7.2	38
4-187.7. ELBOW CREEK NEAR IRON JUNCTION, MINN.																							
July 6, 1960.	2.8	6.4				24	13	8.1	2.4	95	0	41	4.2	0.3	3.0	0.05	168	112	34	0.3	261	6.8	35
Aug. 10.....		11		0.17	0.02	22	11	7.2	1.8	89	0	35	3.0	.4	2.6	.11	166	100	27	.3	231	7.6	57
4-189. EAST TWO RIVER NEAR IRON JUNCTION, MINN.																							
July 6, 1960.	13	3.0				28	12	10	2.0	100	0	44	12	0.3	0.9		180	120	38	0.4	285	7.0	31
Aug. 10.....		7.7		0.06	0.00	33	14	15	2.9	122	0	49	17	.3	2.4		224	142	42	.5	342	7.2	45

4-190. WEST TWO RIVER NEAR IRON JUNCTION, MINN.

July 6, 1960.	6.4	4.8		--	--	21	8.4	5.3	1.4	100	0	13	1.5	0.2	0.4		128	87	5	0.2	188	7.0	43
Aug. 10.....	19	7.1		0.21	0.00	18	9.5	5.2	1.2	92	0	11	2.0	.2	.3		126	84	9	.2	180	7.1	55
Sept. 24.....	13	9.1		.75	.03	26	9.5	5.9	1.8	120	0	15	3.5	.2	.4		142	104	6	.3	221	7.2	29

4-200. SWAN RIVER NEAR TOIVOLA, MINN.

July 27, 1960	90	10		--	--	25	10	7.4	2.0	106	0	23	6.2	0.3	3.7		168	105	18	0.3	236	6.9	60
Aug. 11.....	117	11		0.20	0.00	23	12	6.9	1.6	104	0	26	5.0	.4	2.9		168	105	20	.3	228	7.0	85
Sept. 28.....	46	11		.18	.00	41	17	11	2.8	179	0	36	12	.3	3.3		229	172	25	.4	374	7.5	13

4-240. ST. LOUIS RIVER AT SCANLON, MINN.

July 28, 1960	1210	7.2		--		24	6.3	8.2	1.0	81	0	22	8.7	0.3	0.4		178	86	20	0.4	198	6.6	140
Aug. 8.....	1230	7.4		0.32	0.00	24	6.1	8.1	1.4	74	0	18	11	.3	.4		180	85	24	.4	201	6.4	110
Sept. 30.....	800	8.3		.46		33	2.8	13	2.0	104	0	18	15	.1	.9		193	94	9	.6	235	6.6	140

MISCELLANEOUS ANALYSES OF STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

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

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
STREAMS TRIBUTARY TO LAKE ONTARIO																		
BLACK RIVER AT GLENFIELD, N.Y.																		
Mar. 28, 1960		7.8	0.17	11	0.7	2.4	0.6	34	8.7	0.7	0.1	1.3	55	31	3	84	6.9	6
May 16		4.8	.19	8.4	1.0	3.0	1.3	24	9.2	.1	.5	.6	58	25	6	59	6.9	40
June 20		5.4	.22	6.1	2.2	2.7	.5	26	6.3	1.1	.3	.7	51	24	3	63	6.6	29
BLACK RIVER AT CARTHAGE, N.Y.																		
May 16, 1960		4.5	0.24	10	0.5	2.4	1.0	25	9.4	1.0	0.1	1.0	60	27	7	65	6.6	30
June 20		5.2	.39	9.6	.8	1.6	.4	28	5.7	1.0	.2	1.2	50	28	5	66	6.8	32
Sept. 7		6.6	.37	9.4	.8	3.8	.6	30	8.4	1.4	.2	1.1	51	27	3	75	6.4	18
4-2587. DEER RIVER AT DEER RIVER, N.Y.																		
Mar. 28, 1960	124	3.9	0.07	28	2.6	1.9	1.0	80	12	2.8	0.1	2.3	98	81	15	161	7.4	14
May 16	234	1.2	.12	18	1.6	2.1	1.1	52	11	1.1	.1	.4	75	52	9	103	7.2	40
June 20	106	2.4	.06	19	3.0	1.3	.6	70	5.3	1.0	.1	.8	84	60	3	131	7.0	47
July 18	17	1.4	.09	31	3.5	2.1	1.0	107	6.6	1.0	.2	.8	110	92	5	192	7.2	14
Sept. 7	4.5	11	.07	31	4.6	3.2	1.2	116	3.6	2.5	.1	1.0	121	97	2	210	7.6	5
4-2605. BLACK RIVER AT WATERTOWN, N.Y.																		
Mar. 28, 1960	1,690	6.9	0.37	13	1.0	2.8	0.8	34	12	2.2	0.2	0.7	77	37	9	99	7.0	17
May 16	5,330	4.2	.23	14	.9	3.0	1.3	36	11	.6	.2	.6	71	39	9	90	6.6	25
June 20	2,810	4.8	.32	17	1.0	2.3	.8	36	19	1.2	.2	.5	71	47	17	89	6.6	34
ST. LAWRENCE RIVER BASIN																		
INDIAN RIVER AT THERESA, N.Y.																		
Jan. 20, 1960		7.3	0.27	18	4.0	1.9	1.0	64	11	0.5	0.1	1.4	88	62	9	134	7.4	23
Mar. 28		7.0	.31	21	4.9	1.8	1.1	79	8.9	2.3	.1	1.3	97	73	8	157	7.3	21
May 16		3.8	.27	20	3.7	3.5	1.2	63	12	.2	.1	.7	85	65	14	132	7.0	30

INDIAN RIVER AT THERESA, N.Y.--Continued

June 20, 1960.....		4.4	0.18	18	4.4	2.0	0.6	71	7.3	1.3	0.1	1.1	91	63	5	140	6.8	40
Sept. 7.....		3.1	2.5	24	5.2	3.1	1.0	93	8.4	2.8	.2	2.2	107	82	6	182	6.7	28

OSWEGATCHIE RIVER AT WEGATCHIE, N.Y.

Jan. 20, 1960.....		6.9	0.19	8.7	2.2	1.8	0.7	25	12	0.4	0.2	1.4	55	31	10	82	6.6	26
Mar. 28.....		7.1	.37	12	2.9	2.4	.9	37	13	3.0	.2	1.8	69	42	12	98	6.8	20
May 16.....		4.8	.28	11	1.9	2.9	1.1	27	14	1.0	.2	.9	65	36	14	81	6.8	30
June 20.....		5.0	.44	9.5	2.1	1.7	.6	27	11	1.0	.2	1.3	53	32	10	76	6.9	40

4-2630. OSWEGATCHIE RIVER AT HEUVELTON, N.Y.

Mar. 29, 1960.....	1,100	7.5	0.44	13	3.6	2.2	1.5	45	13	2.6	0.3	1.8	77	48	11	111	6.7	27
May 16.....	2,100	4.5	.25	15	3.9	3.8	1.8	49	13	.3	.4	1.5	78	54	14	116	7.0	30

OSWEGATCHIE RIVER AT OGDENSBURG, N.Y.

Jan. 20, 1960.....		6.5	0.18	15	3.6	2.1	1.1	49	13	0.7	0.2	1.2	79	53	13	121	6.6	33
Mar. 28.....		7.1	.40	16	3.9	2.2	1.6	56	13	2.2	.2	1.5	83	56	10	124	7.0	29
May 16.....		3.7	.24	16	3.9	3.2	1.5	51	13	.5	.3	1.0	87	56	14	119	6.9	30
June 20.....		3.9	.28	13	3.2	2.7	.7	48	9.6	.9	.2	1.2	69	46	6	108	7.1	32

4-2650. GRASS RIVER AT PYRITES, N.Y.

Mar. 28, 1960.....	360	9.2	0.23	7.2	2.0	1.3	0.7	26	9.8	0.3	0.2	1.4	53	26	5	68	7.0	18
May 16.....	1,060	4.6	.28	5.6	1.5	1.7	1.1	15	7.2	.0	.1	1.0	a30	20	8	46	6.7	60
June 20.....	439	20	.44	3.8	1.8	2.8	.5	18	5.4	.6	.4	1.2	a46	17	2	48	6.7	70

a Calculated from determined constituents.

MISCELLANEOUS ANALYSES OF STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

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

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
ST. LAWRENCE RIVER BASIN--Continued																		
GRASS RIVER AT BUCK'S BRIDGE, N.Y.																		
Jan. 21, 1960		9.0	0.24	11	3.6	1.6	0.6	36	12	0.9	0.2	1.8	65	43	13	97	6.7	23
Mar. 28		8.8	.24	15	4.7	1.9	1.0	51	14	2.5	.2	1.7	79	57	15	120	7.1	20
May 16		4.5	.37	11	2.8	2.5	1.1	32	12	.5	.2	1.0	a52	39	13	66	6.8	60
June 20		5.9	.42	9.0	3.2	1.6	.6	30	12	.9	.2	1.0	62	36	11	82	6.7	56
July 19, 1960		4.3	.52	10	3.8	2.3	1.0	41	12	.7	.2	.2	66	41	7	96	7.5	39
GRASS RIVER AT CHAMBERLAIN CORNERS, N.Y.																		
Jan. 21, 1960		8.9	0.28	12	3.8	1.4	0.7	39	14	0.3	0.2	1.5	69	46	14	104	6.6	23
Mar. 29		8.9	.38	16	6.1	2.3	1.0	65	15	2.5	.2	1.7	94	65	12	141	7.0	25
May 17		4.3	.35	13	3.7	2.5	1.2	43	16	.5	.2	.9	72	48	13	100	6.9	60
June 20		5.4	.50	11	3.5	1.6	.5	38	12	.9	.2	1.1	60	42	11	95	7.0	40
4-2675. RAQUETTE RIVER AT SOUTH COLTON, N.Y.																		
Mar. 29, 1960	2,910	6.8	0.47	4.9	0.8	0.8	0.6	10	7.8	1.4	0.1	1.5	38	16	8	38	6.2	21
May 17	2,980	4.5	.14	4.0	.5	1.7	.7	5	11	.5	.4	.9	24	12	8	31	6.0	25
June 20	101	4.3	.21	4.4	.6	.8	.4	7	8.0	.5	.0	1.1	28	14	8	32	6.2	20
RAQUETTE RIVER AT NORWOOD, N.Y.																		
Mar. 29, 1960		6.9	0.40	5.6	1.4	1.1	0.7	16	8.2	2.0	0.2	1.3	46	20	7	55	6.3	20
May 17		4.6	.21	5.6	1.0	1.9	1.2	12	7.4	.5	.3	1.0	a29	18	8	43	6.6	36
June 20		4.1	.28	5.8	.8	.9	.4	12	7.8	1.0	.3	1.1	32	18	8	40	6.3	28
4-2687. ST. REGIS RIVER AT ST. REGIS FALLS, N.Y.																		
Mar. 29, 1960	280	9.5	0.32	5.6	1.8	1.1	0.6	20	6.3	1.4	0.1	1.8	49	22	5	53	6.7	18
May 17, 1960	800	5.7	0.33	6.2	0.4	2.3	0.7	12	7.8	0.5	0.1	1.0	52	17	7	83	6.4	60

ST. REGIS RIVER AT BUCKSTON, N.Y.

Jan. 21, 1960.....		9.0	0.17	7.2	2.2	1.3	0.5	24	7.0	0.3	0.1	1.3	47	27	8	63	7.1	27
Mar. 29.....		8.6	.20	7.2	2.3	1.2	.6	26	8.2	1.1	.1	1.9	52	28	6	66	6.8	20
May 17.....		5.2	.28	6.1	1.0	3.4	.9	15	10	1.0	.4	1.0	46	19	7	75	6.5	55
June 21.....		5.7	.26	8.2	2.0	1.3	.4	28	6.2	1.0	.1	.9	47	29	6	62	7.1	43
Sept. 8.....		4.7	.12	9.2	2.4	1.6	.5	36	5.6	.8	.1	.8	49	33	4	73	6.8	16

4-2690. ST. REGIS RIVER AT BRASHER CENTER, N.Y.

Mar. 29, 1960.....	900	8.2	0.23	11	3.8	1.3	0.7	42	8.8	1.5	0.1	2.1	66	43	9	93	7.6	19
May 17.....	2,000	5.3	.33	8.0	1.8	1.9	.8	23	10	.4	.1	1.0	56	28	9	60	6.8	60
July 19.....	213	4.4	.15	12	3.2	1.2	.7	44	8.0	.8	.1	.2	56	43	7	88	7.1	19

DEER RIVER AT DICKINSON CENTER, N.Y.

Mar. 29, 1960.....		9.5	0.25	6.9	2.0	2.4	0.6	22	8.4	1.2	0.1	2.3	53	25	7	62	7.1	24
May 17.....		5.5	.32	6.8	.9	3.5	.8	16	11	1.0	.1	1.0	a39	21	8	47	6.7	65
June 20.....		6.5	.57	7.0	2.6	1.6	.6	27	7.5	1.1	.1	.9	56	28	6	66	6.5	65
Sept. 8.....		4.6	.30	12	3.6	1.7	.5	46	7.0	.9	.1	1.1	61	45	8	92	7.0	24

DEER RIVER AT LAWRENCEVILLE, N.Y.

May 17, 1960.....		5.4	0.24	7.4	1.3	2.1	0.7	20	9.8	1.0	0.1	1.0	a39	24	8	54	6.7	60
June 21.....		6.3	.50	8.5	2.5	1.4	.3	32	7.3	.8	.1	1.0	52	32	6	71	7.1	56
July 17.....		3.8	.28	11	2.6	1.5	.6	40	6.0	1.0	.3	0.5	54	38	5	84	6.9	24
Sept. 8.....		3.1	.18	11	4.0	2.0	.5	48	6.5	1.2	.1	1.1	59	44	5	97	7.0	19

a Calculated from determined constituents.

MISCELLANEOUS ANALYSES OF STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

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

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
														Calcium, magnesium	Noncarbonate			
ST. LAWRENCE RIVER BASIN--Continued																		
DEER RIVER AT BRASHER IRON WORKS, N.Y.																		
Mar. 29, 1960	250	7.9	0.26	19	5.8	1.9	1.1	72	13	2.6	0.2	2.3	104	72	13	153	7.1	25
May 17	396	5.2	.18	18	4.6	2.1	.7	63	12	.1	.0	.7	100	64	13	126	7.2	50
June 21	88	5.0	.32	15	5.0	2.2	.7	64	9.0	.6	.1	.7	81	58	6	124	7.4	40

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