

# Quality of Surface Waters of the United States 1963

## 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*

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*Prepared in cooperation with the States  
of Georgia, Illinois, Indiana, Kentucky,  
Michigan, Minnesota, New York,  
North Carolina, Ohio, Pennsylvania,  
Tennessee, West Virginia, Wisconsin,  
and with other agencies*



**UNITED STATES DEPARTMENT OF THE INTERIOR**

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## PREFACE

This report was prepared by the Geological Survey in co-operation with the States of Georgia, Illinois, Indiana, Kentucky, Michigan, Minnesota, New York, North Carolina, Ohio, Pennsylvania, Tennessee, West Virginia, Wisconsin, 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 under the supervision of the following:

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

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ILLUSTRATION

Figure 1. Map of the conterminous United States showing basins covered by the five water- supply papers on quality of surface water in 1963.....	Page 2
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# QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1963

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, 1962, to September 30, 1963. 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.

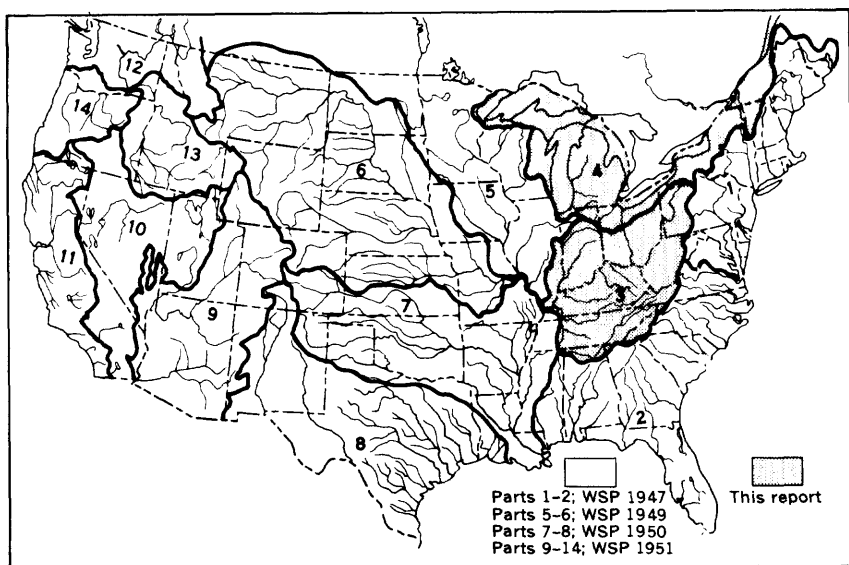


Figure 1.--Map of the conterminous United States showing basins covered by the five water-supply papers on quality of surface waters in 1963. The shaded portion represents the section of the country covered by this volume; the unshaded portion represents the section of the country covered by other water-supply 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, 1963, the Geological Survey maintained 167 stations on 106 streams for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 76 of these locations for chemical-quality studies. Samples were also collected less frequently at many other points. Water temperatures were measured daily at 133 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 31.

Quantities of suspended sediment are reported for 22 stations during the year ending September 30, 1963. 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 14 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 ( $\text{Al}^{+3}$ ).....	0.11119	Hydroxide ( $\text{OH}^{-1}$ )...	0.05880
Arsenic ( $\text{As}^{+2}$ ) .....	.02669	Iodide ( $\text{I}^{-1}$ ).....	.00788
Barium ( $\text{Ba}^{+2}$ ).....	.01456	Iron ( $\text{Fe}^{+3}$ ).....	.05372
Beryllium ( $\text{Be}^{+2}$ ) .....	.22192	Lead ( $\text{Pb}^{+2}$ ).....	.00965
Bicarbonate ( $\text{HCO}_3^{-1}$ )..	.01639	Lithium ( $\text{Li}^{+1}$ ).....	.14411
Bromide ( $\text{Br}^{-1}$ ).....	.01251	Magnesium ( $\text{Mg}^{+2}$ )..	.08226
Cadmium ( $\text{Cd}^{+2}$ ).....	.01779	Manganese ( $\text{Mn}^{+2}$ ) ..	.03640
Calcium ( $\text{Ca}^{+2}$ ).....	.04990	Nickel ( $\text{Ni}^{+2}$ ).....	.03406
Carbonate ( $\text{CO}_3^{-2}$ ) .....	.03333	Nitrate ( $\text{NO}_3^{-1}$ ) .....	.01613
Chloride ( $\text{Cl}^{-1}$ ).....	.02821	Phosphate ( $\text{PO}_4^{-3}$ )..	.03159
Chromium ( $\text{Cr}^{+6}$ ).....	.11539	Potassium ( $\text{K}^{+1}$ )....	.02557
Cobalt ( $\text{Co}^{+2}$ ).....	.03394	Sodium ( $\text{Na}^{+1}$ ).....	.04350
Copper ( $\text{Cu}^{+2}$ ).....	.03148	Strontium ( $\text{Sr}^{+2}$ )....	.02282
Fluoride ( $\text{F}^{-1}$ ).....	.05264	Sulfate ( $\text{SO}_4^{-2}$ ) .....	.02082
Hydrogen ( $\text{H}^{+1}$ ).....	.99209	Zinc ( $\text{Zn}^{+2}$ ) .....	.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  $180^{\circ}\text{C}$  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 ( $\text{SiO}_2$ )

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 ( $\text{HCO}_3$ , $\text{CO}_3$ , $\text{OH}^-$ )

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 ( $\text{SO}_4$ )

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-in-flow carrying appreciable quantities of chloride. Large quantities of chloride may affect the industrial use of water by increasing the corrosiveness of waters that contain large quantities of 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 that concentrations greater than 1.7 ppm also protect the teeth from cavities but cause an undesirable black stain (Durfor and Becker, 1964, p. 20). Public Health Service, 1962 (p. 8), states, "When fluoride is naturally present in drinking water, the concentration should not average more than the appropriate upper control limit (0.6 to 1.7 ppm). Presence of fluoride in average concentration greater than two times the optimum values shall constitute grounds for rejection of the supply." Concentration higher than the stated limits may cause mottled enamel in teeth, endemic cumulative fluorosis, and skeletal effects.

### Nitrate ( $\text{NO}_3$ )

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  $\text{NO}_3$ ) 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  $\text{NO}_3$ ) 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  $\text{NO}_3$ ) 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  $\text{NO}_3$ ) should be regarded as unsafe for infant feeding. U. S. Public Health Service (1962) sets 45 ppm as the upper limit.

### Phosphate ( $\text{PO}_4$ )

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 required 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:

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

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 are 15 and 3 ppm, respectively (Northeast Water Works Association, 1940). Wash water containing more than 8 ppm has been reported to impart 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 (Wyman, Robertson, and Page, 1962). Although the physiological implications of ABS to human beings is unknown, prolonged ingestion of this material by rats is believed to be nontoxic (Paynter, 1960). The U.S. Public Health Service (1962) recommends that ABS should not exceed 0.5 ppm in drinking and culinary waters.

### Temperature

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

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 results 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



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.

State reports containing more complete records of stream discharge may be obtained by writing to the responsible District Engineer, Surface Water Branch, U.S. Geological Survey. For the area covered in this volume, the States, drainage basins, and locations of the district engineers are listed below.

State	Drainage basin	Surface Water Branch district office
Georgia	Ohio River basin	Room 164 Peachtree-Seventh Bldg. Atlanta, Ga. 30323
Illinois		605 South Neil Street Champaign, Ill. 61820
Indiana		Room 516 611 North Fark Avenue Indianapolis, Ind. 46204
Kentucky		Room 310, Center Bldg. 522 West Jefferson St. Louisville, Ky. 40202

State	Drainage basin	Surface Water Branch district office
Michigan	St. Lawrence River basin	407 Capitol Savings and Loan Bldg. Lansing, Mich. 48933
Minnesota		1610 Post Office Bldg. St. Paul, Minn. 55101
New York		P. O. Box 948 Federal Bldg. Albany, N. Y. 12201
North Carolina		P. O. Box 2857 Federal Bldg. Raleigh, N. C. 27602
Ohio		1509 Hess Street Columbus, Ohio 43212
Pennsylvania	Ohio River basin	1224 Mulberry Street Harrisburg, Pa. 17104
Tennessee		823 Edney Bldg. Chattanooga, Tenn. 37402
West Virginia		3303 New Federal Office Bldg. 500 Quarrier St. East Charleston, W. Va. 25301
Wisconsin	St. Lawrence River	5001 University Avenue Madison, Wis. 53705

## 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, 1941-63

Year	WSP	Year	WSP	Year	WSP	Year	WSP
1941	942	1947	1102	1953	1290	1959	1642
1942	950	1948	1132	1954	1350	a 1960	1742
1943	970	1949	1162	1955	1400	a 1961	1882
1944	1022	1950	1186	1956	1450	1962	1942
1945	1030	1951	1197	1957	1520	1963	1948
1946	1050	1952	1250	1958	1571		

a To be published.

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

Many of the reports listed are available for consultation in the larger public and institutional libraries. Copies of Geological Survey publications still in print may be purchased at a nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402, who will, upon request, furnish lists giving prices.

## COOPERATION

The table on page 28 lists State and local agencies that co-operated in water-quality investigations in the drainage basins included in this volume, and the locations of quality-of-water district offices responsible for the data collected.

Many State and Federal agencies assisted in collecting records for these quality-of-water investigations. Financial assistance was provided by the Soil Conservation Service and Forestry Service of the United States Department of Agriculture for some water-quality investigations. The Atomic Energy Commission provided financial assistance through arrangements with Oak

State	Cooperating agency	Drainage basin	District office
Georgia	Department of Mines, Mining and Geology, Captain Garland Payton, director.	Ohio River	Room 244 Federal Bldg. Ocala, Fla. 32670
Illinois	Ohio River Valley Water Sanitation Com- mission, Dr. Edward J. Cleary, executive director and chief engineer.		2822 E. Main Street Columbus, Ohio 43209
Indiana	Ohio River Valley Water Sanitation Com- mission, Dr. Edward J. Cleary, executive director and chief engineer.		
Kentucky	University of Kentucky, Dr. John W. Oswald, president, through State Geological Survey, W. W. Hagan, director and State Geologist. Ohio River Valley Water Sanitation Com- mission, Dr. Edward J. Cleary, executive director and chief engineer.		
Michigan	Michigan State Water Resources Commis- sion, Loring F. Oeming, executive secretary.		
Minnesota	Minnesota Department of Conservation, Division of Waters, S. A. Frellsen, director.	St. Lawrence River	Cotner Terrace 235 North Cotner Blvd. Lincoln, Nebr. 68505

State	Cooperating agency	Drainage basin	District office
New York	New York Department of Commerce, Bureau of Industrial Development, Henry Gallien, director. New York State Conservation Department, Division of Water Resources, F. W. Montanari, assistant commissioner.	St. Lawrence River	P. O. Box 948 Room 348 Federal Bldg. Albany, N. Y. 12201
North Carolina	North Carolina Department of Water Resources, H. E. Brown, director.	Ohio River	P. O. Box 2857 Federal Bldg. Raleigh, N. C. 27602
Ohio	Department of Natural Resources, Fred E. Morr, director. Department of Health, Dr. Emmett W. Arnold, director. Miami Conservation District Max L. Mitchell, chief engineer. Ohio River Valley Water Sanitation Com- mission, Dr. Edward J. Cleary, executive director and chief engineer.	Ohio River St. Lawrence River	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.		Room 1302 U. S. Custom House 2nd and Chestnut Sts. Philadelphia, Pa. 19106

State	Cooperating agency	Drainage basin	District office
Tennessee	Tennessee Department of Conservation and Commerce, J. B. McBride, commissioner through Division of Water Resources, R. W. Robinson, director. Tennessee Valley Authority.	Ohio River	823 Edney Bldg. Chattanooga, Tenn. 37402
West Virginia	Ohio River Valley Water Sanitation Commission, Dr. Edward J. Cleary, executive director and chief engineer.		2822 E. Main Street Columbus, Ohio 43209
Wisconsin	Wisconsin Conservation Department, L. P. Voigt, director, through Wisconsin State Committee on Water Pollution, T. F. Wisniewski, director	St. Lawrence River	

Ridge National Laboratory for the operation of three thermograph stations in Tennessee. In addition to the cooperative programs, many stations were operated from funds appropriated directly to the Geological Survey.

## 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 supervision of district engineers, district chemists or district chief as follows: In Pennsylvania, N. H. Beamer; North Carolina, G. A. Billingsley; Minnesota, D. M. Culbertson; Tennessee, J. S. Cragwall, Jr.; Georgia, K. A. MacKichan; New York, F. H. Pauszek, and in Illinois, Indiana, Kentucky, Michigan, Ohio, West Virginia, and Wisconsin, G. W. Whetstone. Any additional information on file can be obtained by writing or visiting the responsible Survey district office.

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## CHEMICAL ANALYSES, WATER TEMPERATURES, AND SEDIMENT

## PART 3. OHIO RIVER BASIN

## OHIO RIVER MAIN STEM

## 3-126. ALLEGHENY RIVER AT WARREN, PA.

LOCATION --At bridge on U.S. Highway 6, Warren County, approximately 9.5 miles downstream from gaging station near Kinzua.  
DRAINAGE AREA --2,233 square miles.

RECORDS AVAILABLE --Chemical analyses: October 1948 to September 1951, October 1961 to September 1963.

Water temperatures: October 1948 to September 1951, October 1961 to September 1963.

EXTREMES, 1962-63 --Specific conductance: Maximum daily, 692 micromhos Sept. 17; minimum daily, 77 micromhos Mar. 28.

Water temperatures: Maximum, 78°F July 2, 27-29; minimum, freezing point on several days in December and January.

EXTREMES, 1961-62 --Dissolved solids (18°C): Maximum, 373 ppm Sept. 11-20, 1949; minimum, 100 ppm Apr. 11-20, 1949.

Water temperatures: Maximum, 78°F July 2, 27-29; minimum, freezing point on several days in December and January.

EXTREMES, 1961-62 --Dissolved solids (18°C): Maximum, 373 ppm Sept. 11-20, 1949; minimum, 100 ppm Apr. 11-20, 1949.

Specific conductance: Maximum daily, 1,110 micromhos Oct. 13, 1948; minimum daily, 43 micromhos Jan. 22, 1962.

Water temperatures: Maximum, 84°F July 13, 14, 1949; minimum, freezing point on many days during winter months.

REMARKS --Records of specific conductance of daily samples available in district office at Philadelphia, Pa. No discharge records available.

Chemical analyses, in parts per million, water year October 1962 to September 1963																					
Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Alum- inum (Al)	Iron (Fe)	Man- gese- sum (Mn)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Pot- as- sium (K)	Bicar- bonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Dissolved (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Total acid- ity as H <sup>+</sup>	Specific conduct- ance (micro- mhos at 25°C)	Col- or	
																Cal- cium- magne- sium	Non-carbon- ate				
Oct. 1-10, 1962		4.8		0.01	0.03	25	6.1	38	1.8	48	21	74	0.0	0.6	235	88	48		391	7.5	2
Nov. 1-10, 1962		2.8		.03	.01	18	3.4	22	1.1	39	16	42	.0	.1	156	59	27		263	7.0	7
Dec. 1-2, 4-5, 1962		6.4		.01	.01	20	2.4	24	1.8	44	16	44	.1	.1	185	64	28		279	7.4	5
Jan. 1-10, 1963		6.0		.02	.02	28	5.6	34	2.1	57	24	64	.2	.6	235	93	47		386	7.4	5
Feb. 1-10, 1963		6.5		.00	.00	23	5.4	27	3.0	48	17	58	.2	1.7	182	80	40		346	7.2	5
Mar. 1-5, 1963		11		.02	.02	28	8.3	35	.5	68	19	72	.1	2.0	231	104	49		389	6.9	5
Apr. 8-10, 1963		--		--	--	--	--	9.7	--	29	14	16	--	1.5	--	41	17		138	6.7	3
May 1-10, 1963		3.8		.00	.00	14	3.9	15	.5	40	13	28	.1	1.8	107	51	18		184	7.3	3
June 1-10, 1963		2.9		.00	.00	18	3.9	19	1.2	46	13	37	.1	1.3	119	61	24		231	7.0	3
July 1-10, 1963		5.8		.02	.02	30	6.3	41	1.0	58	14	82	.1	1.0	249	101	46		417	7.2	5
Aug. 1-10, 1963		4.4		.00	.00	25	7.0	38	2.8	64	18	120	.1	1.1	342	127	58		454	7.3	3
Sept. 1-10, 1963		4.4		.00	.00	39	7.2	59	2.8	64	18	120	.1	1.1	342	127	58		582	7.3	7

Chemical analyses, in parts per million, water year October 1962 to September 1963

OHIO RIVER MAIN STEM--Continued  
3-126. ALLEGHENY RIVER AT WARREN, PA.--Continued

Temperature °F of water, water year October 1962 to September 1963

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

## OHIO RIVER MAIN STEM--Continued

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 1963.

Water temperatures: October 1944 to June 1953, October 1956 to September 1963.

EXTREMES, 1962-63.--Specific conductance: Maximum daily, 441 micromhos Oct. 17; minimum daily, 103 micromhos Mar. 29, 31.

Water temperatures: Maximum, 78°F July 29, 31, and Aug. 1-4; minimum, 33°F on many days in January and February.

EXTREMES, 1943-47.--Dissolved solids (1944-47, 1956-59): Maximum, 304 ppm Oct. 11-20, 1946; minimum, 63 ppm Mar. 1-10, 1945.

Specific conductance: Maximum, 441 micromhos Oct. 17, 1946; minimum, 103 micromhos Mar. 29, 31, 1947.

Water temperatures: Maximum, 78°F July 29, 31, and Aug. 1-4; minimum, 33°F on many days in January and February.

Specific conductance: Maximum, 441 micromhos Oct. 17, 1946; minimum, 103 micromhos Mar. 29, 31, 1947.

Water temperatures: Maximum, 86°F July 31 and Aug. 4, 1957; minimum, freezing point on many days during winter months.

REMARKS.--Records of specific conductance of daily samples available in district office at Philadelphia, Pa.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>	Total acidity as H <sup>+</sup>	Specific conductance (micro-mhos at 25°C)	pH	Color
Oct. 1-10, 1962	4480	2.8		0.10	0.01	31	10	31	2.1	57	59	52	0.2	0.4	235	119	72	415	7.5	2
Nov. 1-5, 7-10	8910	4.6				19	6.8	12	1.0	38	39	22	.1	1.0	133	76	45	236	7.3	10
Dec. 1-10, ....	4940	3.4		.00	.00	21	4.9	12	1.0	41	35	21	.0	.7	127	73	39	228	7.1	5
Jan. 1-10, 1963	4730	4.1		.00	.00	25	6.3	14	1.0	50	41	26	.0	1.5	159	89	48	271	7.1	5
Feb. 1-3-10, ....	5950	9.0		.00	.00	23	7.5	12	2.8	38	49	23	.2	2.3	145	89	58	269	7.2	3
Mar. 1-10, ....	9920	7.8				24	6.3	15	1.3	40	52	23		.9	169	86	53	294	6.9	5
Apr. 1-10, ....	42370	5.6				11	3.2	4.2	.7	18	24	7.0		.4	76	41	26	128	6.7	7
May 1-10, ....	10590	3.0		.00	.00	16	4.4	8.5	.5	30	34	14	.1	.6	110	58	34	175	7.1	3
June 1-10, ....	7300	2.8		.00	.00	18	5.4	10	1.2	34	36	18	.1	.4	117	67	39	203	7.3	3
July 1-10, ....	2170	3.9		.00	.00	26	6.8	16	1.2	45	56	26	.2	.7	161	93	56	283	7.3	2
Aug. 1-10, ....	2250	5.6		.00	.00	29	7.5	21	2.2	46	63	36	.2	.8	198	104	66	342	6.9	3
Sept. 1-10, ....	1420	3.2	.05			34	8.8	27	1.8	54	74	42	.2	1.0	228	121	77	390	7.0	5

OHIO RIVER MAIN STEM--Continued  
3-365. ALLEGHENY RIVER AT KITTANNING, PA.--Continued

Temperature °F of water, water year October 1962 to September 1963

Month	Day																															Aver- age
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October .....	61	61	61	61	61	60	61	61	61	62	62	62	62	61	62	62	--	62	61	61	61	60	59	56	54	54	53	52	51	50	--	59
November .....	43	42	48	47	46	--	45	46	45	46	45	46	46	45	46	46	45	45	44	44	44	44	43	43	43	43	43	41	42	41	--	45
December .....	43	40	48	49	39	38	32	38	37	34	--	34	34	34	34	34	34	34	34	35	35	35	35	34	34	34	34	34	34	34	34	36
January .....	34	33	--	34	34	34	34	34	34	36	35	35	35	35	34	34	33	33	36	36	33	33	33	33	33	33	34	33	33	34	34	34
February .....	33	35	34	33	33	34	34	33	33	33	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	33	33	33	--	34
March .....	34	35	39	34	35	--	35	35	35	35	34	34	34	34	34	34	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	36
April .....	45	46	46	48	49	44	50	48	49	48	48	49	49	48	48	48	48	49	50	54	54	53	52	53	49	47	50	52	--	49	--	49
May .....	51	51	50	52	55	55	55	56	59	60	62	62	61	60	60	60	61	60	60	61	61	61	61	61	61	60	61	61	61	62	65	64
June .....	53	53	54	55	56	57	58	59	59	59	70	70	70	70	70	70	69	69	69	70	70	70	69	69	70	71	70	71	72	74	75	69
July .....	77	77	77	74	74	75	75	75	74	--	73	73	72	73	72	73	73	74	75	76	75	74	75	75	75	76	--	76	77	78	77	76
August .....	78	78	79	--	77	76	76	--	76	76	74	74	73	73	71	72	73	73	73	73	73	73	71	72	71	70	71	70	71	71	71	73
September .....	70	70	70	71	71	70	69	69	71	70	70	70	70	70	69	69	69	69	70	71	70	69	68	68	66	66	65	66	67	65	--	69



KISKIMINETAS RIVER BASIN--Continued  
 3-485. KISKIMINETAS RIVER AT LEECHBURG (VANDERGRIFF), PA.--Continued

Temperature °F of water, water year October 1962 to September 1963																																	
Month	Day																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Average	
October.....	56	60	58	58	59	58	62	63	64	62	--	62	60	63	65	--	66	59	60	60	59	62	56	62	62	62	62	62	62	62	62	57	
November.....	49	50	49	41	40	45	46	48	49	51	50	48	47	46	47	46	42	41	38	47	47	44	46	44	42	40	40	40	40	42	--	45	
December.....	43	39	40	42	41	41	37	36	36	33	32	34	32	--	--	34	33	34	37	36	37	37	38	33	37	36	34	33	35	33	33	36	
January.....	33	--	--	--	--	--	--	--	33	35	38	37	37	36	37	38	36	37	39	41	34	33	35	--	--	--	--	--	--	--	--	--	--
February.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	36	32	--	--	36	35	33	34	34	--	--	--	--	--
March.....	34	35	34	36	36	37	--	40	39	41	39	43	43	42	42	42	44	45	46	45	43	42	43	44	45	--	52	53	52	54	43	--	43
April.....	56	56	58	56	54	55	54	55	56	52	51	53	55	56	57	54	55	58	65	64	63	64	64	56	52	53	54	58	60	58	--	57	--
May.....	52	52	58	59	64	65	63	65	--	72	67	64	63	63	64	62	66	65	66	67	66	65	63	60	65	67	--	65	68	69	70	64	--
June.....	72	73	70	71	70	70	72	72	74	78	76	70	68	73	76	70	72	72	73	75	73	71	72	75	74	78	80	80	78	84	--	74	--
July.....	--	--	--	--	--	76	76	79	71	71	76	78	72	70	78	76	75	79	81	78	79	76	77	80	80	83	83	80	79	78	78	78	--
August.....	79	77	78	77	77	73	74	76	78	77	78	80	78	72	74	73	74	73	--	71	75	77	75	70	72	73	72	73	75	76	74	--	75
September.....	72	--	70	72	69	--	68	73	72	73	--	75	74	66	68	67	64	68	67	64	64	63	61	60	60	60	55	64	67	64	--	67	--



## OHIO RIVER MAIN STEM

3-496.55. ALLEGHENY RIVER AT OAKMONT, PA.

LOCATION.--At intake line to Ohio River Valley Water Sanitation Commission (ORGANCO) monitor at Oakmont filtration plant, Allegheny County, 0.5 mile upstream from Oakmont Road Bridge and 10.5 miles downstream from gaging station at Natrona.

DRAINAGE AREA.--220 square miles, approximately.

RECORDS AVAILABLE.--Chemical analyses: July to September 1963.

Water temperatures: July to September 1963.

REMARKS.--Values reported for acidity are potential free and determined to pH 7.0. Daily samples were collected at this station and records of specific conductance of daily samples are available in district office at Columbus, Ohio. Analyses were made on the maximum daily specific conductance for each week or 10-day period and on the maximum and minimum daily specific conductance for each month. Records of discharge are given for Allegheny River at Natrona.

## Chemical analyses, in parts per million, July to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (PO <sub>4</sub> )	Hardness as CaCO <sub>3</sub>		Specific conductance (microhmhos at 25°C)	Organics: Phenols or C <sub>15</sub> H <sub>12</sub> SO <sub>3</sub> (ABS)
																Calcium magnesium	Non-bicarbonate		
July 5, 1963 (maximum weekly).....	2990				0.36	--	--			--	131	--		--	0.05	--	--	376	0.1
July 9 (maximum weekly).....	2350				.92	--	--			--	165	--		--	.05	--	--	453	.1
July 20 (maximum weekly).....	2420				.11	--	--			--	148	--		--	.10	--	--	444	.1
July 25 (maximum weekly).....	3860				--	44	12			2	177	30		2.2	--	310	180	489	4.8
July 26 (maximum monthly).....	2390			0.00	.00	34	6.3			12	106	22		.9	--	200	111	336	6.1
Aug. 4 (maximum 8/1-10).....	3340			2.1	--	--	--			--	162	--		--	.08	--	--	485	5.5
Aug. 20 (maximum 8/11-20).....	2280			.96	--	--	--			--	156	--		--	.08	--	--	484	5.8
Aug. 22 (maximum monthly).....	2350			1.4	46	11				4	163	35		4.1	--	319	180	494	5.4
Aug. 26 (maximum monthly).....	3250			.18	39	11				12	138	32		2.6	--	273	143	441	5.9
Sept. 10 (maximum 9/1-10).....	1820			1.4	--	--	--			--	182	--		--	.08	--	--	549	5.1
Sept. 28 (maximum 9/21-30).....	1930			.05	--	--	--			--	168	--		--	.03	--	--	547	6.3
Sept. 29 (maximum monthly).....	2100			1.7	51	16				8	192	42		4.8	--	359	193	569	5.8
Sept. 1 (maximum monthly).....	1660			1.1	44	13				8	164	34		4.2	--	303	157	490	5.6

OHIO RIVER MAIN STEM--Continued  
 3-496.55. ALLEGHENY RIVER AT OAKMONT, PA.--Continued  
 Temperature (°F) of water, July to September 1963

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	
July.....	81	82	83	82	80	80	80	80	80	80	79	78	80	80	80	78	80	82	82	83	80	81	80	81	81	83	84	84	84	84	81	
August.....	84	84	84	82	80	80	81	81	80	80	82	80	80	80	79	79	78	78	78	77	78	73	77	77	76	78	79	79	79	79	79	
September.....	76	75	76	78	79	78	87	78	77	75	75	75	77	76	75	73	73	74	75	76	76	75	72	70	71	72	74	70	69	66	--	

## MONONGAHELA RIVER BASIN

## 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 above water plant; 272 square miles above gaging station.  
 RECORDS AVAILABLE --Water temperatures: January 1947 to September 1963.  
 EXTREMES, 1962-63. --Water temperatures: Maximum, 78°F July 1; minimum, 33°F on many days during winter months.  
 EXTREMES, 1947-63. --Water temperatures: Maximum, 92°F July 22, 1952; minimum, freezing point on many days during winter months.  
 REMARKS --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 1962 to September 1963																															Average	
Month	Day																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		31
October.....	54	55	56	58	57	57	56	58	56	56	58	58	59	58	62	63	62	59	58	56	55	53	52	48	46	42	40	44	42	44	45	54
November.....	43	42	40	40	40	39	40	42	44	44	44	44	45	43	42	41	43	45	44	43	42	43	43	40	40	39	35	34	36	35	36	41
December.....	36	35	36	38	38	36	35	33	33	33	33	33	33	33	33	33	34	35	37	36	35	35	35	35	35	37	37	34	33	35	35	41
January.....	33	33	33	33	33	34	33	33	34	34	32	38	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	34
February.....	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
March.....	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
April.....	54	56	58	56	50	52	51	52	50	48	46	47	46	48	50	51	54	57	60	60	58	60	58	50	50	53	54	56	54	53	53	53
May.....	49	49	52	57	60	64	65	65	67	70	67	60	58	58	60	62	60	59	60	60	58	58	58	59	60	62	65	66	66	68	70	61
June.....	70	69	69	62	59	62	64	63	65	66	66	63	63	65	66	65	67	68	69	68	68	69	68	70	72	72	73	74	74	74	74	67
July.....	78	76	72	71	68	69	70	72	71	70	70	70	70	68	70	72	73	73	75	74	69	71	71	73	72	73	74	75	75	76	76	72
August.....	76	76	75	75	75	74	70	71	71	74	72	73	74	74	73	72	71	71	70	70	69	69	70	68	69	72	71	72	71	70	72	71
September.....	67	69	72	72	69	69	68	66	67	66	66	67	69	66	64	65	68	68	67	66	64	63	63	63	63	61	61	62	58	58	58	66



## MONONGAHELA RIVER BASIN--Continued

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

Analyses based on maximum monthly and minimum monthly specific conductance, and minimum monthly pH--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> ) (Al)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Acidity (micro-mhos at 25°C)	pH	Color
																Calcium magnesium	Non-carbonate			
Nov. 3, 1962 (maximum conductance).....				--	--					0	220	11	0.1	1.0	334	206	206	--	512	4.6
Nov. 7 (minimum conductance).....				--	--					4	37	2.3	.0	1.5	69	35	32	--	106	5.4
Nov. 11 (minimum pH).....				1.1	0.26					--	--	--	--	--	--	--	--	0.2	209	4.2
Dec. 19 (maximum conductance).....				--	--					0	192	9.0	.0	1.6	302	141	141	--	498	3.6
Dec. 27 (minimum conductance).....				--	--					2	52	3.0	.0	2.1	110	49	48	--	147	5.0
Dec. 18 (minimum pH).....				4.4	.71					--	--	--	--	--	--	--	--	.6	497	3.6
Jan. 28, 1963 (maximum conductance).....				--	--					0	172	8.0	.0	.7	268	134	134	--	446	3.8
Jan. 17 (minimum conductance).....				--	--					4	45	5.0	.0	1.9	86	44	41	--	128	5.0
Jan. 11 (minimum pH).....				2.5	.36					--	--	--	--	--	--	--	--	.4	301	3.8
Feb. 3 (maximum conductance).....				--	--					0	182	6.0	.2	.8	272	146	146	--	459	4.0
Feb. 7 (minimum conductance).....				--	--					0	58	3.0	.1	1.4	102	53	53	--	160	4.5
Feb. 19 (minimum pH).....				3.0	.38					--	--	--	--	--	--	--	--	.4	314	3.9
Mar. 19 (maximum conductance).....				--	--					0	161	4.0	.3	.6	223	130	130	--	385	4.1

Mar. 17, 1963 (minimum conductance).....	--	--	0	57	2.0	.2	.6	103	58	58	--	189	4.5
Mar. 13 (minimum pH).....	4.3	.88	--	--	--	--	--	--	--	--	0.8	460	3.8
Apr. 27 (maximum conductance).....	--	--	0	508	5.0	.6	.5	746	376	376	--	1140	3.4
Apr. 2 (minimum conductance).....	--	--	0	104	2.0	.2	.5	150	79	79	--	280	4.1
Apr. 28 (minimum pH).....	9.6	2.3	--	--	--	--	--	--	--	--	1.3	1000	3.4
May 17 (maximum conductance).....	--	--	0	324	4.0	.4	.1	456	221	221	--	801	3.5
May 25 (minimum conductance).....	--	--	0	90	2.0	.4	.2	124	69	69	--	274	4.0
May 5 (minimum pH).....	5.6	1.5	--	--	--	--	--	--	--	--	1.5	792	3.4
June 30 (maximum conductance).....	--	--	0	185	3.0	.3	.9	290	146	146	--	510	3.7
June 9 (minimum conductance).....	--	--	2	58	4.0	.2	1.1	92	54	54	--	160	5.2
June 1 (minimum pH).....	3.1	.58	--	--	--	--	--	--	--	--	1.0	485	3.6

## MONONGAHELA RIVER BASIN--Continued

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

Temperature (°F) of water, October 1962 to June 1963																																	
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	.....	63	64	65	65	65	64	65	60	65	60	63	65	65	65	66	--	65	64	--	63	65	--	60	60	54	50	55	55	55	54	62	
November	.....	55	54	50	49	50	48	47	48	47	48	48	46	47	48	--	46	46	46	--	45	--	--	--	--	--	--	--	--	--	--	--	57
December	.....	--	43	42	40	44	42	39	39	38	38	36	35	34	33	34	33	34	35	34	34	35	35	36	37	35	36	37	--	--	--	37	
January	.....	--	--	35	34	35	35	35	34	37	40	39	38	37	37	37	37	38	37	38	34	33	37	32	32	33	33	33	33	33	33	35	
February	.....	32	33	33	33	33	33	34	35	35	34	35	34	35	34	34	33	33	35	34	32	33	36	34	36	33	34	--	--	--	34		
March	.....	34	34	36	40	40	40	39	40	40	41	42	45	43	43	47	46	48	49	44	43	43	45	45	46	46	47	50	48	43	43		
April	.....	--	55	53	52	52	54	54	--	51	52	50	50	49	49	48	54	51	55	51	53	50	--	48	47	47	47	--	48	50	--	51	
May	.....	46	45	44	44	45	47	--	44	48	51	48	47	47	48	46	43	50	44	47	--	63	61	58	60	61	62	63	64	64	54	52	
June	.....	65	68	66	65	69	65	65	67	67	68	65	65	67	67	65	67	66	69	70	68	68	62	70	72	73	74	75	75	78	--	68	







## 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 mouth.

DRAINAGE AREA.--1,411 square miles.

RECORDS AVAILABLE.--Water temperatures: October 1941 to September 1963.

EXTREMES, 1948-63.--Water temperatures: Maximum, 85° July 30, 1949, July 28, 1952, and Aug. 6, 1955; minimum, 33°F on several days during winter months.

REMARKS.--Records furnished by the West Penn Power Company.

Temperature °F of water, water year October 1962 to September 1963

Temperature at 2 o' clock, at 6 p.m., and at 10 p.m., 1892 to September, 1893																																		
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	68	68	69	68	--	64	64	63	63	64	--	--	65	64	64	63	63	--	--	62	60	60	59	58	--	--	59	58	58	--	--		
November.....	57	58	--	--	52	50	50	49	49	--	--	--	46	46	46	48	48	--	--	46	46	44	44	--	--	44	44	42	42	42	--	--		
December.....	--	--	42	42	43	41	40	--	--	40	40	38	37	37	--	--	36	36	36	36	--	--	35	--	--	35	34	34	--	--	34	--	--	
January.....	--	34	34	34	--	--	34	34	35	35	--	--	37	37	36	36	35	--	--	34	34	34	34	34	--	--	34	--	34	33	34	--	--	
February.....	34	--	--	34	34	34	34	--	--	34	33	33	33	33	--	--	34	34	34	--	--	--	--	--	--	--	35	34	34	34	--	--	--	
March.....	35	--	--	34	34	34	35	36	--	--	36	36	36	38	38	--	--	39	39	40	40	39	--	--	--	39	40	40	41	42	--	--	--	
April.....	50	51	54	51	51	58	53	54	54	53	--	--	53	54	55	55	55	--	--	56	56	56	56	56	55	--	--	56	56	--	--	--		
May.....	57	57	57	58	58	58	59	64	65	67	62	64	62	63	64	64	65	65	65	65	66	65	64	65	65	65	64	66	67	67	68	63	--	
June.....	71	71	71	71	71	72	73	--	--	68	70	70	67	70	--	--	74	76	79	79	--	--	79	79	--	--	77	78	79	--	80	--	--	
July.....	80	81	78	--	77	--	75	75	78	78	79	--	--	75	76	77	79	80	--	--	80	80	79	81	--	--	--	--	80	81	81	--	--	
August.....	80	80	--	--	79	79	78	78	76	--	--	77	77	77	76	77	78	--	--	77	78	78	78	--	--	--	76	77	77	77	76	--	--	
September.....	--	76	76	75	74	74	--	--	76	76	74	70	--	--	72	70	72	73	73	--	--	--	--	--	--	--	68	68	70	70	--	--	68	--

## MONONGAHELA RIVER BASIN--Continued

3-750. MONONGAHELA RIVER AT CHARLENOI, PA.

LOCATION.--At intake to Ohio River Valley Water Sanitation Commission (ORSANCO) monitor at Charleroi filtration plant, Washington County, 1 mile downstream from bridge on Interstate Highway 70-S, and 0.8 mile upstream from gaging station.

DRAINAGE AREA.--5,213 square miles (at gaging station).

RECORDS AVAILABLE.--Chemical analyses: July to September 1963.

Water temperatures: July to September 1963.

REMARKS.--Values reported for acidity are potential free and determined to pH 7.0. Daily samples were collected at this station and records of specific conductance of daily samples are available in the district office at Columbus, Ohio. Analyses were made on the maximum daily specific conductance for each week or 10-day period and on the maximum and minimum daily specific conductance for each month.

Chemical analyses, in parts per million, July to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphate (PO <sub>4</sub> )	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Coliforms or C <sub>6</sub> H <sub>5</sub> SO <sub>3</sub> OH (ABS)
																Calcium, magnesium	Non-carbonate			
July 6, 1963 (maximum weekly).....	3040				0.78	--	--			--	166	--	--	--	0.08	--	--	448	3.9	0.0
July 20 (maximum weekly).....	1320				.99	--	--			--	194	--	--	--	.04	--	--	.6	4.0	.1
July 28 (maximum monthly).....	1960				1.6	55	15		0	0	304	10		1.2	--	453	199	1.4	760	3.7
August 5 (maximum monthly).....	1280				--	22	6.1		0	0	108	2.0		.8	--	171	80	.2	292	4.2
Aug. 19 maximum 8/11-20).....	1600				2.1	--	--		--	--	341	--	--	--	.04	--	--	.8	788	3.8
Aug. 21 (maximum 8/21-31).....	3060				1.7	--	--		--	--	228	--	--	--	.07	--	--	.6	596	3.8
Aug. 6 (maximum monthly).....	3480				1.5	63	19		0	0	347	6.0		1.1	--	488	235	1.4	864	3.6
Aug. 27 (maximum monthly).....	1820				1.2	28	6.8		0	0	136	4.0		1.1	--	208	98	.4	383	4.1
Sept. 8 (maximum 9/1-10).....	3710				.72	--	--		--	--	192	--	--	--	.06	--	--	1.1	525	3.8
Sept. 12 (maximum 9/11-20).....	2670				.74	--	--		--	--	174	--	--	--	.41	--	--	.6	475	4.0
Sept. 18 (maximum monthly).....	780				1.1	50	16		0	0	282	8.0		2.0	--	406	191	.8	647	3.9
Sept. 7 (maximum monthly).....	4690				.52	23	6.6		0	0	120	4.0		.8	--	188	84	.6	354	3.9

MONONGAHELA RIVER BASIN--Continued  
 3-750. MONONGAHELA RIVER AT CHARLEROI, PA.--Continued  
 Temperature (°F) of water, July to September 1963

Temperature at 2.7 m. daily, May to September, 1900																																
Month	Day																															Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
July.....	78	78	78	76	76	77	77	75	75	74	74	75	76	75	75	76	77	78	78	78	78	78	78	78	78	79	79	80	80	80	79	77
August.....	1	80	79	80	79	78	79	79	79	79	77	77	78	77	75	75	74	74	74	74	74	74	74	74	74	74	73	73	74	75	75	70
September.....	74	73	74	75	--	--	--	--	--	71	71	75	75	74	69	72	71	71	70	70	70	68	68	66	65	65	65	65	65	64	--	75

MONONGAHELA RIVER BASIN--Continued

LOCATION.--Temperature recorder at gaging station, 0.7 mile upstream from bridge on State Highway 42 at Friendsville, Garrett County, and 1.5 miles upstream from Bear Creek.

DRAINAGE AREA. --295 square miles.

RECORDS AVAILABLE. --Water temperatures: October 1962 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 80°F July 28; minimum, freezing point on many days during winter months.  
REMARKS.--Records fair, probably because of friction in recorder.

REMARKS.--Records fair, probably because of friction in recorder.

[illegible]

MONONGAHELA RIVER BASIN--Continued  
3-825. YOUGHIOGHENY RIVER AT CONNELLSVILLE, PA.

LOCATION:--At gaging station at downstream side of Crawford Avenue Bridge in Conneltsville, Fayette County, 0.8 mile upstream from Mounts Creek.  
DRAINAGE AREA.--1,326 square miles.  
RECORDS AVAILABLE.--Chemical analyses: November 1962 to September 1963.

Chemical analyses, in parts per million, November 1962 to September 1963

Date collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Alum- inum (Al)	Iron (Fe)	Man- gan- ese (Mn)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Pot- tas- sium (K)	Bicar- bonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub> Cal- cium, magne- sium	Total acid- ity as H <sup>+</sup>	Specific conduct- ance (micro- mhos at 25°C)	Col- or pH
Nov. 1, 1962.....	3320	5.7			0.00	13	3.2	2.8	2.2	8	37	5.0	0.0	3.1	80	46	39	136	6.5
Dec. 5, 1962.....	2020	5.0		.00	.00	8.4	2.2	3.1	1.2	5	27	3.0	.0	2.4	65	30	26	101	5.9
Jan. 9, 1963.....	1700	4.8		.00	.00	8.8	2.4	3.0	1.0	6	26	5.0	.2	2.3	74	32	27	105	6.3
Feb. 13, 1963.....	2000	--		--	--	--	--	4.8	--	4	33	9.0	--	1.4	--	41	38	146	6.4
Apr. 24, 1963.....	2000	4.3		--	--	11	3.4	3.0	.6	3	39	2.5	--	.7	84	42	39	121	6.3
May 28, 1963.....	830	3.7		.00	.17	9.6	3.6	3.0	.5	6	34	3.0	.2	2.0	60	39	34	110	5.6
July 7, 1963.....	1800	3.8		.01	.04	9.6	2.4	2.5	1.5	5	30	1.5	.3	1.9	65	34	25	108	5.5
Aug. 7, 1963.....	820	3.8		.06	.03	9.6	2.4	2.5	2.5	7	30	1.5	.3	1.9	65	34	25	102	6.1
Sept. 12, 1963.....	900	4.1		.00	.03	9.2	1.9	2.5	2.2	10	23	2.0	.1	1.6	58	31	23	88	6.5

## OHIO RIVER MAIN STEM

3-860.6. OHIO RIVER AT SOUTH HEIGHTS, PA.

LOCATION --At intake line to Ohio River Valley Water Sanitation Commission (ORSANCO) monitor at the Duquesne Powerplant at South Heights, Allegheny County, 1.6 miles above Ambridge-Woodlawn Bridge.

DRAINAGE AREA --19,520 square miles, approximately.

RECORDS AVAILABLE --Chemical analyses: July to September 1963.

Water temperatures: July to September 1963.

REMARKS --Values reported for acidity are potential free and determined to pH 7.0. Daily samples are collected at this station and records of specific conductance of daily samples are available in district office at Columbus, Ohio. Analyses were made on the maximum daily specific conductance for each week or 10-day period and on the maximum and minimum daily specific conductance for each month. No discharge records available.

## Chemical analyses, in parts per million, July to September 1963

Date of collection	Mean Silica discharge (cis)	Alu- mi- num (Al)	Iron (Fe)	Man- ga- nese (Mn)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Po- tas- sium (K)	Bi- car- bon- ate (HCO <sub>3</sub> )	Car- bon- ate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Phos- phor- us (PO <sub>4</sub> )	Hardness as CaCO <sub>3</sub>		Specific conduct- ance (micro- mhos at 25°C)	Col- loids or C <sub>15</sub> sulfo OH (ABS)	Organics Phe- nols ben- zene C <sub>15</sub> sulfo OH (ABS)	
																Cal- cium, mag- ne- sium	Non- car- bon- ate				
July 4, 1963 (maximum weekly).....			--	--	--	--	--	--	--	--	148	--	--	--	0.16	--	--	0.1	424	5.8	0.1
July 13 (maximum weekly).....			--	--	--	--	--	--	--	--	146	--	--	--	.33	--	--	.0	418	5.7	.1
July 19 (maximum monthly).....			--	--	44	12	--	--	2	--	184	24	7.2	--	318	160	158	--	513	4.7	--
July 6 (minimum monthly).....			--	--	33	8.4	--	--	8	--	126	14	4.8	--	223	117	111	--	356	5.8	--
Aug. 10 (maximum 8/1-10).....			--	1.9	--	--	--	--	--	--	250	--	--	--	.13	--	--	.5	630	4.5	.1
Aug. 20 (maximum 8/11-20).....			--	2.2	--	--	--	--	--	--	254	--	--	--	.18	--	--	.4	665	4.2	.1
Aug. 21 (maximum monthly).....		0.87	2.1	59	--	16	--	--	0	--	262	22	4.9	--	422	213	213	.3	685	4.2	--
Aug. 1 (minimum monthly).....		3.9	1.5	42	--	11	--	--	12	--	171	24	5.6	--	296	150	140	.1	485	6.0	--
Sept. 14 (maximum 9/11-20).....		--	1.3	--	--	--	--	--	--	--	193	--	--	--	.17	--	--	.2	524	4.5	.1
Sept. 25 (maximum 9/21-30).....		--	1.4	--	--	--	--	--	--	--	295	--	--	--	.39	--	--	.0	590	5.3	.2
Sept. 1 (maximum monthly).....		--	--	10	80	16	--	--	80	--	233	30	12	--	480	266	200	.0	714	6.7	--
Sept. 11 (minimum monthly).....		--	--	1.0	38	11	--	--	0	--	169	17	5.2	--	287	140	140	.2	470	4.3	--

OHIO RIVER MAIN STEM--Continued  
 3--860.6. OHIO RIVER AT SOUTH HEIGHTS, PA.--Continued  
 Temperature (°F) of water, July to September 1963

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
July.....	80	82	83	81	77	79	79	76	75	75	76	78	78	77	76	78	79	79	81	80	80	79	80	81	82	83	83	83	82	80	79
August.....	81	82	83	83	81	79	81	80	81	81	77	79	78	74	75	78	78	76	75	75	76	77	79	78	75	76	76	80	80	78	78
September.....	77	79	76	78	76	76	77	--	77	77	74	78	76	75	74	75	75	75	74	75	74	71	72	71	70	72	70	71	70	--	74





## 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 June 1963 (discontinued).

Water temperatures: October 1943 to September 1944 (incomplete), October 1949 to September 1963.

EXTREMES, October 1962 to June 1963.--Dissolved solids: Maximum, 690 ppm Jan. 1-31; minimum, 380 ppm Feb. 1-28.

HARDNESS: Maximum, 302 ppm Jan. 1-31; minimum, 186 ppm Feb. 1-28.

Specific conductance: Maximum, 997 micromhos/cm, 24; minimum, 248 micromhos/cm, 28.

Specific conductance: Maximum, 997 micromhos/cm, 24; minimum, 248 micromhos/cm, 28.

EXTREMES, 1949-63.--Dissolved solids (1951-53, 1956-63): Maximum, 690 ppm Jan. 1-31, 1963; minimum, 145 ppm Feb. 11, 13, 15, 17, 1959.

HARDNESS (1951-53, 1956-63): Maximum, 328 ppm Jan. 1-10, 1953; minimum, 96 ppm Feb. 11, 13, 15, 17, 1959.

Specific conductance (1951-53, 1956-63): 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, 1960.

REMARKS.--Values reported for acidity are potential free and were determined to pH 7.0. Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. Water temperatures affected by cooling water return from steel mills.

Chemical analyses, in parts per million, October 1962 to June 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>	Acidity (H <sup>+</sup> )	Specific conductance (micro-mhos at 25°C)	Ammonia-nitrite as NH <sub>4</sub>	
Oct. 1-31, 1962.....	302								46	234	52	1.2	29	510	259	221	--	782	2.8
Nov. 1-30.....	339								69	232	34	1.0	19	310	264	208	--	970	5.0
Dec. 1-31.....	257								7	217	44	1.6	26	473	229	224	--	720	3.0
Jan. 1-31, 1963.....	310								18	298	114	1.1	24	690	302	287	--	1080	4.4
Feb. 1-28.....	296								22	161	53	1.0	19	380	186	168	--	606	1.0
Mar. 1-31.....	2486								4	200	38	.8	1.4	401	192	189	0.2	610	5.0
Apr. 1-11, 26-30.....	727								0	250	49	1.9	9.1	456	223	223	.2	752	8.4
May 1-31.....	471								1	250	49	1.2	16	456	226	215	.2	752	4.2
June 1-30.....	492								2	210	41	1.2	19	408	216	215	.1	655	2.4
Weighted average.....	631								12	216	47	1.0	11	442	216	206	--	688	4.3
Time-weighted average.....	--								20	225	55	1.0	19	477	234	218	--	749	3.4
Tons per day.	--								20	368	81	2.0	19	753	368	352	--	--	7.3

BEAVER RIVER BASIN--Continued  
 3-995. MAHONING RIVER AT LOWELLVILLE, OHIO--Continued  
 Analyses based on monthly extremes of specific conductance

Chemical analyses, in parts per million, October 1962 to June 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>	Specific conductance (micro-mhos at 25°C)	pH	Ammonia nitrogen as NH <sub>4</sub>	
Oct. 21, 1962. Maximum.....	251									108	233	54	1.6	0.2	542	263	174	868	7.2	0.5
Oct. 3, Minimum.....	313									10	214	38	3.8	22	433	212	204	673	6.3	2.0
Nov. 23, Maximum.....	240									118	230	54	1.1	.4	498	260	163	856	7.0	1.1
Nov. 13, Minimum.....	476									24	232	53	1.0	.39	516	260	240	758	6.9	.5
Dec. 31, Maximum.....	251									8	300	116	.0	.29	698	302	295	1060	5.4	--
Dec. 4, Minimum.....	255									2	208	40	1.7	.28	448	211	210	652	5.2	--
Jan. 24, 1963 Maximum.....	244									82	297	110	1.0	.2	678	302	235	1140	--	--
Jan. 3, Minimum.....	251									0	302	118	1.0	.32	712	302	302	1060	--	--
Feb. 3-4, Maximum.....	287									2	296	117	1.4	.27	680	300	298	1110	--	--
Feb. 22-24, Minimum.....	291									30	88	20	.7	6.8	200	122	98	330	--	--
Mar. 30, Maximum.....	1750									0	275	51	2.4	4.0	496	234	234	831	4.1	--
Mar. 4-5, Minimum.....	1525									34	86	20	.5	7.1	222	122	94	329	--	--
Apr. 11, Maximum.....	394									0	272	50	1.4	4.8	492	235	235	838	4.2	--
Apr. 26, Minimum.....	712									2	178	38	.8	12	360	183	182	572	4.7	--
May 17, Maximum.....	394									0	256	52	1.1	6.1	468	232	232	808	4.2	--
May 3, Minimum.....	688									4	187	43	.6	13	374	204	201	601	5.4	--
June 18, Maximum.....	394									0	282	42	.9	.5	482	248	248	790	4.5	--
June 13, Minimum.....	539									40	150	39	.7	17	342	194	161	556	7.0	--



## BEAVER RIVER BASIN--Continued

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

LOCATION--At intake line to Ohio River Valley Water Sanitation Commission (ORSANCO) monitor at Beaver Falls filtration plant at Eastvale, Beaver County, 0.5 miles downstream from bridge on State Route 568.  
 DRAINAGE AREA--3,106 square miles (at gaging station).

RECORDS AVAILABLE--Chemical analyses: July to September 1963.

Water temperatures: July to September 1963.

REMARKS--Values reported for acidity are potential free and determined to pH 7.0. Daily samples were collected at this station and records of specific conductance of daily samples are available in district office at Columbus, Ohio. Analyses were made on the maximum daily specific conductance for each 10-day period and on the maximum and minimum daily specific conductance for each month.

## Chemical analyses in parts per million, July to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Carbocatione (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphate as PO <sub>4</sub>	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific acidity (microhmohms at 25°C)	pH	Colloids or organic matter (ABS)	Organics (Phe-Alkyl benzoate, C <sub>10</sub> H <sub>8</sub> OH)
																		Calcium, magnesium	Non-bicarbonate				
July 10, 1963 (maximum 7/1-10).....	856				0.00	--	--	--	--	--	--	161	--	--	--	0.18	--	--	--	0.0	522	6.5	0.0
July 15 (maximum 7/11-20).....	1010				.00	--	--	--	--	--	--	160	--	--	--	.18	--	--	--	.0	534	7.1	.2
July 23 (maximum 7/21-30).....	1060				--	60	11	--	58	150	39	150	39	14	14	--	359	195	147	--	563	6.9	--
July 26 (minimum monthly).....	925				--	53	9.7	--	50	130	31	130	31	10	10	--	306	172	131	.0	485	6.7	--
Aug. 10 (maximum 8/1-10).....	813				.64	--	--	--	--	--	--	134	--	--	--	.25	--	--	--	.0	503	6.7	.1
Aug. 19 (maximum 8/17-20).....	913				.21	--	--	--	--	--	--	148	--	--	--	.24	--	--	--	.0	522	7.2	.2
Aug. 27 (maximum monthly).....	813				.36	56	13	--	44	162	33	162	33	9.0	9.0	--	330	183	157	.0	548	6.7	--
Aug. 7 (minimum monthly).....	867				.85	52	10	--	68	118	25	118	25	8.5	8.5	--	268	171	115	.0	459	6.8	--
Sept. 8 (maximum 9/1-10).....	918				.13	--	--	--	--	--	--	164	--	--	--	.58	--	--	--	.0	548	6.3	.2
Sept. 16 (maximum 9/11-20).....	1440				.18	--	--	--	--	--	--	160	--	--	--	.23	--	--	--	.0	556	6.7	.2
Sept. 23 (maximum monthly).....	666				.20	60	13	--	48	162	40	162	40	14	14	--	360	203	164	.0	576	6.4	--
Sept. 17 (minimum monthly).....	855				.17	56	10	--	68	126	32	126	32	11	11	--	312	181	125	.0	498	6.5	--

BEAVER RIVER BASIN--Continued  
3-1075. BEAVER RIVER AT BEAVER FALLS, PA.--Continued  
Temperature (°F) of water, July to September 1963

Month	Temperature (°F) of water, July to September, 1905																															Average
	Day																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
July.....	82	84	86	82	81	81	82	82	77	77	75	75	77	77	76	77	77	78	78	81	82	81	80	80	80	82	--	84	84	83	82	80
August.....	82	81	80	80	80	--	78	77	78	79	80	80	80	78	76	77	75	78	77	74	72	76	74	74	--	74	74	74	76	78	--	77
September....	--	76	75	75	75	76	73	75	75	74	75	--	73	73	70	--	70	71	71	71	71	71	70	70	68	67	66	70	67	67	--	72

## OHIO RIVER MAIN STEM

3-1096. OHIO RIVER AT EAST LIVERPOOL, OHIO

LOCATION --At intake line to Ohio River Valley Water Sanitation Commission (ORSANCO) monitor at East Liverpool filtration plant, Columbiana County, and 0.6 mile downstream from Little Beaver Creek.

DRAINAGE AREA --23,500 square miles, approximately.

RECORDS AVAILABLE --Chemical analyses: July to September 1963.

Water temperatures: July to September 1963.

REMARKS --Values reported for acidity are potential free and determined to pH 7.0. Daily samples were collected at this station and records of specific conductance of daily samples are available in district office at Columbus, Ohio. Analyses were made on the maximum daily specific conductance for each week or 10-day period and on the maximum and minimum specific conductance for each month. No discharge records available.

Chemical analyses, in parts per million, July to September 1963

QUALITY DATA, 1963, JULY TO SEPTEMBER, 1963																					
Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (residue at 180°C) PO <sub>4</sub>	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	Organics		
																Calcium, magnesium	Non-carbonate				
July 6, 1963 (maximum weekly).....											144				0.14			429	6.7	0.2	
July 9 (maximum weekly).....											156				.09			439	6.9	.1	
July 20 (maximum weekly).....											156				.10			454	6.5	.1	
July 23 (maximum monthly).....						47	12		6		182	26		9.2		338	167	162	512	5.4	--
July 1 (minimum monthly).....						36	8.6		12		122	20		6.1		231	126	116	378	6.1	--
Aug. 9 (maximum 8/1-10).....						0.64					182				.09				535	6.6	.1
Aug. 19 (maximum 8/11-20).....						1.6					232				.07				622	4.8	.1
Aug. 27 (maximum monthly).....						1.9	57	16	0		250	25		7.4		430	208	208	662	4.5	--
Aug. 5 (minimum monthly).....						.70	45	11	8		170	26		8.2		318	157	151	491	6.7	--
Sept. 11 (maximum 9/11-20).....						.62					197				.18				544	5.4	.1
Sept. 15 (maximum 9/21-30).....						.82					178				.12				531	6.0	.1
Sept. 8 (maximum monthly).....						1.2	55	13	4		224	28		7.6		389	191	188	601	4.9	--
Sept. 17 (minimum monthly).....						.67	45	10	4		176	23		8.0		316	153	150	490	5.2	--

OHIO RIVER MAIN STEM--Continued  
 3-1096. OHIO RIVER AT EAST LIVERPOOL, OHIO--Continued  
 Temperature (°F) of water, July to September 1963

Temperature (°F) at meteor. way to September, 1900																																
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	
July.....	82	82	--	--	83	79	80	82	80	79	79	79	78	78	77	78	79	79	79	79	82	82	--	--	81	77	82	81	--	83	80	
August.....	--	81	82	81	81	80	--	80	80	80	80	82	81	79	78	77	78	--	--	76	76	77	76	76	77	76	78	--	78	77	79	
September.....	77	77	78	78	78	78	76	77	78	78	79	--	76	76	75	75	76	76	75	75	74	--	74	--	--	68	72	72	72	70	--	75



## OHIO RIVER MAIN STEM--Continued

3-1107. OHIO RIVER AT NEW CUMBERLAND DAM, AT STRATTON, OHIO

LOCATION.--About 600 feet upstream from dam (mile 54.3), 0.2 mile upstream from Stratton, Jefferson County, and about 1.1 miles downstream from Goose Run. DRAINAGE AREA.--23,866 square miles.

RECORDS AVAILABLE.--Chemical analyses: January 1961 to June 1963 (discontinued).

Water temperature: January 1962 to June 1963 (discontinued).

EXTREMES, 1961-63.--Dissolved solids: Maximum, 403 ppm Oct. 1-31; minimum 146 ppm Apr. 1-30.

Hardness: Maximum, 190 ppm Oct. 1-31; minimum, 84 ppm Mar. 1-31.

Specific conductance: Maximum daily, 731 microhos Oct. 3; minimum daily, 166 microhos Mar. 31.

Water temperatures: Maximum, 77°F June 28; minimum, freezing point Dec. 27, Jan. 1-4.

EXTREMES, 1961-63.--Dissolved solids: Maximum, 422 ppm Sept. 1-30, 1962; minimum, 134 ppm Mar. 1-31, 1961.

Hardness: Maximum, 192 ppm Sept. 1-30, 1962; minimum, 80 ppm Mar. 1-31, 1961.

Specific conductance: Maximum daily, 731 microhos Oct. 3, 1962; minimum daily, 166 microhos Mar. 31, 1963.

Water temperatures: Maximum, 83°F Aug. 31, Sept. 4, 9, 13, 1961; minimum, freezing point on several days during January, February, and December 1962, and

minimum 32°F Aug. 1963.

REMARKS.--Values reported for acidity are potential free and determined to pH 7.0. Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. No discharge records available.

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> ) (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Acidity (microhos at 25°C)	Specific conductance (microhos at 25°C)	pH or Col.
															Calcium	Non-carbonate			
Oct. 1-31, 1962			0.16	1.4					5	222	30	0.4	7.5	403	190	186		599	
Nov. 1-30.....			.39	.67				16	105	105	18	.2	5.6	204	104	92		326	
Dec. 1-31.....			.44	.05				12	101	101	11	.1	5.0	204	104	92		326	
Jan. 1-31, 1963			1.6	.31				6	92	116	21	.2	5.4	228	118	113		352	
Feb. 1-28.....				.24															
Mar. 1-31.....			.66	.42				10	82	14	14	.0	3.2	153	84	76		249	
Apr. 1-30.....			.43	.06				14	81	11	11	.3	2.0	146	85	74		251	
May 1-31.....			.59	.36				9	121	16	13	.3	3.8	216	116	109		353	
June 1-28.....			.33	.09					9	110	14	.3	4.1	200	107	100		328	
Time-weighted average....			0.56	0.41					10	115	18	0.2	6.4	216	111	104		341	

Analyses based on maximum monthly, minimum monthly specific conductance, and minimum monthly pH

Oct. 3, 1962 (maximum conductance)....	--	--							0	286	34	0.6	12	488	238	238	--	731	4.9
Oct. 9 (minimum conductance)....	--	--							5	188	30	.4	7.2	346	166	162	--	525	6.2
Oct. 9 (minimum pH).....	0.22	2.1						--	--	--	--	--	--	--	--	--	0.1	629	4.8

Nov. 1, 1962 (maximum con- ductance)....	--	--	7	184	31	.3	6.7	342	166	161	--	534	6.6
Nov. 26 (minimum con- ductance)....	--	--	7	78	11	.0	3.4	144	82	76	--	229	6.2
Nov. 3 (mini- mum pH).....	.14	.61	--	--	--	--	--	--	--	--	.0	483	6.3
Dec. 25-26 (maximum con- ductance)....	--	--	6	129	24	.2	5.2	254	117	112	--	382	6.3
Dec. 1 (minimum con- ductance)....	--	--	8	79	12	.0	3.8	160	80	74	--	242	6.2
Dec. 24 (mini- mum pH).....	1.8	.86	--	--	--	--	--	--	--	--	.1	378	6.3
Jan. 3, 1963 (maximum con- ductance)....	--	--	0	142	18	.3	.4	238	100	100	--	370	2.1
Jan. 13 (maximum con- ductance)....	--	--	12	76	16	.0	4.5	172	87	77	--	286	6.4
Jan. 3 (mini- mum pH).....	.84	.09	--	--	--	--	--	--	--	--	1.2	370	2.1
Feb. 24 (maximum con- ductance)....	--	--	4	128	27	0.3	6.5	252	126	124	--	385	6.2
Feb. 18 (minimum con- ductance)....	--	--	8	97	20	.2	4.3	193	100	94	--	303	6.5
Feb. 9 (mini- mum pH).....	2.3	0.14	--	--	--	--	--	--	--	--	0.1	344	5.2
Mar. 4 (maximum con- ductance)....	--	--	8	137	30	.2	6.1	255	127	121	--	417	6.1
Mar. 31 (minimum con- ductance)....	--	--	10	52	8.0	.0	2.4	96	60	52	--	166	6.9
Mar. 5 (mini- mum pH).....	1.5	.27	--	--	--	--	--	--	--	--	.0	408	6.1

## OHIO RIVER MAIN STEM--Continued

3-1107. OHIO RIVER AT NEW CUMBERLAND DAM, AT STRATTON, OHIO--Continued

Analyses based on maximum monthly, minimum monthly specific conductance, and minimum monthly pH

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>			Specific conductance (micro-mhos at 25°C)	pH	Color
																Calcium	Non-carbonate	Acidity (H <sup>+</sup> )			
Apr. 22, 1963 (maximum conductance)....				--	--					20	112	14	0.4	3.7	195	116	100	--	330	6.6	
Apr. 1-2 (minimum conductance)....				--	--					11	50	5.0	.2	2.4	94	58	49	--	169	6.4	
Apr. 28 (minimum pH).....				0.94	0.29					--	--	--	--	--	--	--	--	0.0	284	6.3	
May 23 (maximum conductance)....				--	--					10	143	18	.4	4.0	242	132	124	--	422	6.5	
May 1 (minimum conductance)....				--	--					12	92	10	.3	2.9	174	95	85	--	278	6.4	
May 28 (minimum pH).....				.35	.64					--	--	--	--	--	--	--	--	.1	353	5.5	
June 5, (maximum conductance)....				--	--					6	144	20	0.4	5.2	268	134	129	--	409	6.0	
June 11 (minimum conductance)....				--	--					12	80	11	.3	3.6	138	85	75	--	249	6.3	
June 11 (minimum pH).....				0.20	0.51					--	--	--	--	--	--	--	--	0.2	328	5.5	

1938

OHIO RIVER MAIN STEM--Continued  
 3-1107. OHIO RIVER AT NEW CUMBERLAND DAM, AT STRATTON, OHIO--Continued

Temperature (°F) of water, October 1962 to June 1963  
 (Once-daily measurement, usually at 1000)

Month	Day																															Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October.....	67	67	68	68	66	65	67	66	66	62	66	67	62	68	69	68	68	66	67	67	68	66	66	65	64	62	61	58	59	58	--	65
November.....	58	56	59	55	53	53	52	53	52	53	52	52	52	51	50	50	50	50	50	49	50	51	49	48	48	47	46	46	45	46	--	51
December.....	45	46	45	45	45	44	44	43	43	42	42	40	38	36	40	39	37	37	37	36	38	38	38	38	37	38	32	33	35	35	35	39
January.....	32	32	32	35	35	35	37	36	36	38	39	37	39	39	38	38	38	38	37	36	36	36	36	34	35	35	34	34	35	35	35	36
February.....	34	37	37	38	38	38	38	38	36	36	35	35	35	32	35	32	35	35	35	34	34	32	32	30	30	35	35	35	35	35	35	35
March.....	33	37	37	38	38	38	38	38	38	38	39	40	41	42	42	42	44	44	43	44	41	42	40	40	42	44	43	46	47	47	48	41
April.....	52	51	53	53	53	53	54	53	53	52	51	52	52	51	52	52	53	54	55	56	59	59	58	57	56	55	55	55	54	56	--	54
May.....	55	55	56	57	59	60	60	61	63	65	68	66	66	66	66	67	67	67	66	66	68	67	67	67	67	67	67	68	68	69	69	64
June.....	72	71	74	72	72	73	72	73	76	75	74	73	72	71	71	71	71	71	72	72	72	74	74	75	75	76	76	77	--	--	--	73

## MUSKINGUM RIVER BASIN

3-1290. TUSCARAWAS RIVER AT NEWCOMERSTOWN, OHIO

LOCATION.--At gaging station at highway bridge, 0.8 mile south of Newcomerstown, Tuscarawas County, 2 miles upstream from Buckhorn Creek, and 4 miles downstream from Dunlin Creek.

DRAINAGE AREA.--2,436 square miles.

RECORDS AVAILABLE.--Chemical analyses: July 1946 to September 1948, October 1955 to September 1959, October 1960 to September 1963.

Chloride: July 1946 to May 1949, October 1957 to September 1963.

Hardness: October 1957 to September 1960.

Specific conductance: July 1946 to September 1948, October 1955 to September 1963.

Water temperatures: July 1946 to May 1949, October 1955 to September 1963.

EXTRMS, 1962-63.--Specific conductance: Maximum daily, 4,490 micromhos Oct. 5; minimum daily, 230 micromhos Mar. 6.

EXTRMS, 1962-63.--Temperature: Maximum daily, 83°F Aug. 22; minimum daily, 37°F Oct. 20.

EXTRMS, 1946-49, 1955-63.--Dissolved solids (1946-48, 1955-57): Maximum 3,787 ppm ppm Oct. 20, 1955; minimum, 250 ppm Apr. 4-13, 1957.

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, 230 micromhos Mar. 6, 1963.

Water temperatures: Maximum, 86°F Aug. 22, 1959; minimum, freezing point on many days during winter months.

REMARKS.--Samples for iron and manganese filtered clear when collected. Ohio Canal diverts water above station; part of diverted water goes into the Cuyahoga River basin. Flow regulated by 8 flood-control reservoirs.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Alu- mi- num (Al)	Iron (Fe)	Man- gan- ese (Mn)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Potas- sium (K)	Lith- ium (Li)	Bi-car- bon- ate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Phos- phor- us (PO <sub>4</sub> )	Hardness as CaCO <sub>3</sub>		Specific conduct- ance (micro- mhos at 25°C)	pH	Oxygen consumed		
																	Cal- cium, mag- nesium	Non-car- bon- ate			Col- or	Un- fil- tered	
Oct. 3, 1962.	487	9.6		0.51	0.18	384	35	347	9.5		76	252	1090	1.6	10	0.21	1100	1040	3900	6.7	5	3	
Nov. 1.....	881	6.2		.30	.49	171	18	131	6.1		100	169	379	.7	7.6		1070	501	1419	1660	7.4	5	1
Dec. 20.....	698	5.0		.70	.96	260	26	255	8.5		120	230	675	1.1	12		1720	756	2730	7.0	7	1	
Jan. 1-31, 1963.																							
Jan. 1-31, 1963.	997										94	180	355	.7	9.7	.11	1110	480	403	1920	7.5		
Jan. 1-31, 1963.	1500			.27	.63						96	180	500	1.0	12		1580	580	502	2120	7.5	1	
Feb. 1-22.....	800			.82	1.2																		
Feb. 19.....	800																						
Mar. 6-31.....	10810										44	92	190	.2	4.8	.12	572	255	219	869	7.1	1	2
Mar. 20.....	11700			.66	.90											.04						2	2
Apr. 1-30.....	3658										78	149	189	.7	6.6		732	340	276	1060	7.1		
Apr. 23.....	4840			.23	.69											.13						1	3
May 1-31.....	1301										102	186	285	.9	7.0		1030	453	369	1470	7.3		
May 22.....	1190			.30	1.0											.09						0	1
June 1-30.....	1634										80	168	320	.9	5.8			428	362	1470	6.8		
July 1-31.....	581			.22	.35						106	195	578	1.4	8.0	.10	1320	624	537	2460	7.0		
July 30.....	592			.81	1.0											.08						1	2
Aug. 1-18.....																							
Sept. 1-30.....	456										94	210	602	1.4	9.6			660	583	2340	6.8		
Sept. 1-30.....	308										100	226	910	1.8	10			844	762	3400	6.3		
Sept. 12.....	250			.13	.04											.00						3	4

## MUSKINGUM RIVER BASIN--Continued

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

Chemical analyses, in parts per million, January to September 1963

(Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Turbidity
														Calcium	Non-carbonate			
Jan. 31, 1963 (maximum conductance).....	500							118	204	660	1.2	14	1820	742	645	2660	7.7	--
Jan. 15 (minimum conductance).....	1800							62	139	102	.3	7.0	466	254	203	748	7.6	--
Jan. 13 (maximum turbidity).....	3000							--	--	--	--	--	--	--	--	--	--	450
Feb. 5 (maximum conductance).....	850							98	200	800	1.2	11	2340	846	765	3040	7.5	--
Feb. 11 (minimum conductance).....	1100							76	142	288	.8	9.5	952	381	319	1340	7.3	--
Feb. 16 (maximum turbidity).....	600							--	--	--	--	--	--	--	--	--	--	6
Mar. 21 (maximum conductance).....	10400							42	96	298	.2	4.0	828	354	319	1250	7.4	--
Mar. 15 (minimum conductance).....	11300							12	64	14	.0	4.7	146	76	66	220	6.9	--
Mar. 20 (maximum turbidity).....	11700							--	--	--	--	--	--	--	--	--	--	330
Apr. 18 (maximum conductance).....	1810							88	191	260	.7	7.0	940	430	358	1360	7.3	--
Apr. 1 (minimum conductance).....	9000							64	114	95	.4	4.9	418	226	174	660	7.2	--
Apr. 15 (maximum turbidity).....	5240							--	--	--	--	--	--	--	--	--	--	400
May 15 (maximum conductance).....	1060							104	194	380	.9	4.8	1280	518	433	1740	7.9	--
May 6 (minimum conductance).....	1700							92	167	182	.8	5.5	700	346	270	1080	7.4	--
May 18 (maximum turbidity).....	960							--	--	--	--	--	--	--	--	--	--	7
June 28 (maximum conductance).....	684							86	144	565	1.4	6.0	1520	639	568	2310	6.9	--
June 7 (minimum conductance).....	3670							60	116	118	.5	5.2	456	246	197	739	6.7	--

## MUSKINGUM RIVER BASIN--Continued

## 3-1290. TUSCARAWAS RIVER AT NEWCOMESTOWN, OHIO--Continued

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

(Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity--Continued)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Po- tas- sium (K)	Bicar- bonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub> Catchum, Non-carbon- slum ate	Specific conductance (micro-mhos at 25°C)	pH	Tur- bid- ity	
July 18, 1963 (maximum conductance).....	628							106	234	720	1.8	11	1820	770	683	2850	7.2	--
July 2 (minimum conductance).....	748							68	163	390	.9	7.2	1070	474	418	1750	6.9	--
Aug. 15 (maximum conductance).....	494							90	223	850	1.8	9.4	2030	836	762	3170	6.9	--
Aug. 8 (minimum conductance).....	480							118	206	360	1.4	7.0	1070	496	399	1750	7.1	--
Sept. 15 (maximum conductance).....	487							110	236	1220	2.6	17	3020	1030	940	4360	6.5	--
Sept. 4 (minimum conductance).....	310							110	216	640	1.2	7.8	1870	672	582	2630	6.4	--

MUSKINGUM RIVER BASIN--Continued  
3-1290. TUSCARAWAS RIVER AT NEWCOMERTOWN, OHIO--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Dissolved oxygen		Organics		Ammonia nitrogen as $\text{NH}_4$	Nitrite ( $\text{NO}_2$ )	Cyanide (CN)	Turbidity	Threshold odor
	Parts per million	Percent saturation	Phenols as $\text{C}_6\text{H}_5\text{OH}$	Alkyl benzene sulfonate (ABS)					
Oct. 3, 1962	5.7	58		0.3				7	M-2
Nov. 1	9.2	78		.1				10	M-4
Dec. 20	11.9	84		.3				10	0
Jan. 16, 1963	10.2	70		.0				10	C-8
Feb. 19	7.6	53		.2				10	0
Mar. 20	9.0	70		.0				60	M-2
Apr. 23	8.1	76		.0				55	0
May 22	11.6	120		.0				15	E-2
July 2	11.3	143		.1				15	0
July 30	9.4	115		.2				--	0
Sept. 12	10.0	116		.3				--	M-2



## QUALITY OF SURFACE WATERS, 1963

## MUSKINGUM RIVER BASIN--Continued

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

Chloride, in parts per million, and specific conductance, water year  
October 1962 to September 1963

Day	October		November		December		January	
	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)
1	975	3630	360	1660	570	2430	432	1940
2	1000	3700	420	1820	640	2620	510	2190
3	1050	3900	390	1730	790	3090	420	1900
4	1100	3900	400	1780	780	3090	460	2020
5	1220	4490	350	1630	660	2700	490	2080
6	625	2640	420	1800	720	2920	500	2170
7	550	2410	340	1600	680	2720	460	2030
8	650	2580	240	1280	680	2740	470	2080
9	1100	3940	270	1350	570	2470	500	2150
10	850	3290	270	1430	460	2070	420	1950
11	850	3230	344	1620	500	2160	340	1600
12	700	2720	430	1790	500	2170	220	1190
13	625	2600	120	876	440	2060	200	1100
14	575	2380	108	790	560	2380	178	963
15	650	2620	155	950	780	3020	102	748
16	825	3090	240	1180	740	2940	106	787
17	550	2320	230	1180	840	3170	141	916
18	650	2550	290	1400	720	2900	150	970
19	400	1810	290	1440	740	2920	240	1240
20	385	1720	300	1440	680	2700	230	1250
21	390	1740	340	1590	560	2350	260	1340
22	470	1980	460	1960	530	2210	260	1340
23	430	1880	420	1880	460	1980	320	1530
24	340	1590	386	1780	370	1720	340	1630
25	292	1440	440	1940	290	1440	340	1630
26	312	1510	460	1970	280	1370	290	1480
27	335	1580	520	2190	340	1580	360	1710
28	355	1630	520	2170	350	1640	470	2030
29	332	1580	500	2160	380	1740	530	2280
30	348	1620	530	2230	480	2050	540	2290
31	385	1720	--	--	400	1810	660	2660
Day	February		March		April		May	
	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)
1	640	2580	--	--	95	660	192	1100
2	620	2530	--	--	89	665	335	1500
3	640	2570	--	--	114	755	200	1130
4	660	2570	--	--	122	802	280	1360
5	800	3040	--	--	157	935	265	1330
6	600	2410	14	230	143	887	182	1080
7	550	2180	175	776	149	918	218	1180
8	380	1690	174	803	212	1120	210	1170
9	400	1730	227	953	198	1100	238	1280
10	400	1720	235	989	190	1090	255	1320
11	288	1340	198	881	210	1150	258	1360
12	280	1340	291	1180	255	1280	298	1480
13	360	1570	294	1190	225	1220	280	1440
14	370	1660	227	1010	240	1290	280	1440
15	380	1710	188	868	205	1150	380	1740
16	440	1940	222	968	232	1240	268	1410
17	540	2230	198	914	238	1260	252	1370
18	540	2230	190	894	260	1360	288	1500
19	580	2370	195	919	225	1240	375	1740
20	580	2370	112	649	85	664	335	1640
21	540	2250	298	1230	175	921	328	1630
22	600	2370	220	1000	182	940	318	1570
23	--	--	235	1030	265	1180	320	1570
24	--	--	170	883	150	866	305	1510
25	--	--	170	868	170	938	320	1580
26	--	--	135	779	225	1140	302	1530
27	--	--	112	688	240	1210	302	1540
28	--	--	140	786	210	1120	360	1720
29	--	--	125	735	200	1090	440	1960
30	--	--	145	637	210	1140	335	1690
31	--	--	92	629	--	--	335	1690

## MUSKINGUM RIVER BASIN--Continued

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

Chloride, in parts per million, and specific conductance, water year  
October 1962 to September 1963--Continued

Day	June		July		August		September	
	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)
1	355	1690	425	1880	680	2700	680	2770
2	525	2190	390	1750	420	1910	680	2770
3	520	2210	450	1930	590	2370	660	2690
4	400	1820	635	2500	660	2590	640	2630
5	185	1040	560	2340	580	2380	660	2710
6	135	819	520	2170	480	2160	710	2840
7	118	738	540	2250	460	2000	800	3100
8	182	970	560	2340	360	1750	800	3100
9	270	1260	580	2420	370	1820	800	3100
10	220	1170	580	2420	510	2170	840	3180
11	135	848	550	2340	540	2310	910	3390
12	180	1000	600	2420	540	2310	920	3450
13	130	856	680	2640	560	2350	900	3450
14	195	1070	680	2640	590	2420	1100	3980
15	185	1090	720	2740	850	3170	1220	4360
16	185	1090	720	2810	800	3090	1100	4020
17	290	1420	720	2790	760	2940	800	3180
18	300	1490	720	2850	800	3070	750	2930
19	345	1630	460	2130	--	--	950	3520
20	270	1430	570	2320	--	--	1050	3850
21	325	1600	480	2150	--	--	1000	3770
22	315	1580	550	2340	--	--	1100	3980
23	305	1530	620	2500	--	--	950	3520
24	410	1830	660	2620	--	--	760	3050
25	415	1820	620	2520	--	--	760	2980
26	485	2060	700	2740	640	2610	820	3160
27	490	2100	660	2640	640	2640	825	3530
28	565	2310	600	2420	560	2400	1080	3980
29	455	2020	460	2020	680	2700	1100	3980
30	358	1670	370	1820	760	2970	1080	4020
31	--	--	440	1980	700	2830	--	--

MUSKINGUM RIVER BASIN--Continued  
 3-1290. TUSCARAWAS RIVER AT NEWCOMERTOWN, OHIO--Continued  
 Temperature (°F) of water, water year October 1962 to September 1963  
 (Once-daily measurement at 1800)

Month	Day (Once-daily measurement at 1800)																															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	62	61	63	62	62	64	65	63	65	66	67	63	65	68	69	64	63	62	60	59	59	56	52	48	46	47	48	48	48	59	
November.....	47	47	47	47	47	47	45	47	46	47	47	47	47	47	47	47	48	48	45	44	46	43	42	42	42	40	40	41	40	--	46	
December.....	40	40	39	40	38	36	32	32	33	32	32	32	32	32	32	34	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	
January.....	32	32	32	32	32	33	32	32	32	32	32	32	32	32	32	32	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	
February.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	--	--	--	--	--	--	
March.....	--	--	--	--	--	33	33	34	35	34	36	35	38	38	38	38	43	41	41	45	43	44	42	44	45	45	47	49	50	49	41	
April.....	52	54	53	54	52	54	50	50	49	48	48	49	50	52	51	55	59	60	59	59	57	51	50	53	55	58	56	54	--	53	53	
May.....	55	57	59	62	61	64	65	67	71	70	63	63	60	--	65	68	64	66	67	67	68	63	63	65	64	67	65	69	68	70	71	65
June.....	73	72	69	68	69	72	74	76	78	72	67	67	69	70	70	71	72	73	70	69	70	72	75	77	78	80	74	76	79	--	72	
July.....	82	82	78	77	78	77	77	74	70	75	77	77	73	77	76	80	82	80	77	79	78	79	81	82	83	83	82	78	80	80	78	
August.....	81	80	78	80	79	79	77	80	77	78	76	77	75	73	72	73	74	75	--	--	--	--	--	--	--	--	74	75	74	76	70	76
September.....	78	73	74	73	71	71	70	72	72	74	75	74	71	69	69	71	71	72	72	70	69	68	65	64	65	67	67	62	63	--	70	

## MUSKINGUM RIVER BASIN--Continued

3-1390. KILLBUCK CREEK AT KILLBUCK, OHIO

LOCATION.--At gaging station at bridge on U.S. Highway 62 at Killbuck, Holmes County, 0.12 mile downstream from Black Creek.

DRAINAGE AREA.--466 square miles.

RECORDS AVAILABLE.--Chemical analyses: October 1957 to September 1958.

Water temperatures: October 1962 to September 1963.

Sediment concentrations: October 1962 to September 1963.

EXTRIMES 1962-63.--Water temperatures: Maximum 77° June 10; minimum freezing point on several days during December to March.

Sediment concentrations: Maximum daily, 2,170 ppm June 11; minimum daily, 1 ppm Dec. 14, 15, 17.

Sediment loads: Maximum daily, 3,150 tons June 11; minimum daily, 0.2 ton Dec. 14, 15, 17.

REMARKS.--Flow affected by ice Dec. 8-19, Jan. 4-8, 14-16, 20-31, Feb. 1-7, 10-18, 21-28, Mar. 1-7.

Temperature (°F) of water, water year October 1962 to September 1963																																		
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.....	45	43	--	--	--	--	--	--	--	--	--	66	57	56	60	61	58	58	58	54	56	50	52	47	43	40	38	45	47	43	38	--		
November.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
December.....	34	35	38	35	33	32	33	32	33	32	33	32	33	34	34	34	34	34	34	34	33	34	33	34	33	35	37	35	35	33	34	--	42	
January.....	37	36	38	33	35	37	41	36	37	35	35	35	32	33	32	33	32	33	32	32	32	32	32	33	34	33	32	33	33	33	33	34	--	
February.....	34	34	34	34	34	34	34	34	34	33	33	33	33	33	33	33	33	33	35	33	32	34	33	34	33	34	33	33	33	32	--	33	--	
March.....	33	32	33	33	33	35	34	35	34	36	38	35	35	37	43	43	43	43	43	40	37	36	37	43	50	51	46	47	51	55	52	40	--	
April.....	54	56	59	53	49	48	51	49	51	45	46	45	47	46	46	47	51	56	60	58	58	57	52	47	47	49	52	52	55	56	--	51	--	
May.....	46	49	56	55	60	58	57	60	65	66	59	59	59	60	58	59	60	61	61	61	58	53	54	55	56	58	61	63	63	60	58	--	63	
June.....	63	66	62	65	66	66	69	69	71	77	70	65	63	68	65	66	65	65	65	68	63	60	53	66	66	67	71	70	68	72	--	67	--	
July.....	73	74	70	66	67	68	71	66	62	66	65	72	66	67	65	65	68	73	72	72	74	74	73	74	73	76	76	74	74	72	--	70	--	
August.....	74	70	71	70	72	72	72	72	73	68	70	65	65	68	66	64	65	68	64	65	59	70	65	69	68	65	64	70	70	70	69	--	69	--
September.....	65	66	69	68	66	69	65	70	71	65	69	68	64	64	66	69	67	68	64	64	61	61	60	60	64	64	64	64	64	56	--	65	--	

## QUALITY OF SURFACE WATERS, 1963

## MUSKINGUM RIVER BASIN--Continued

## 3-1390. KILLBUCK CREEK AT KILLBUCK, OHIO--Continued

## Suspended sediment, water year October 1962 to September 1963

Suspended sediment, water year October 1962 to September 1963										
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..	62	--	E 8	50	14	1.9	63	8	1.4	
2..	50	--	E 4				60	7	1.1	
3..	61	--	E 10	49	17	2.2	58	13	2.0	
4..	136	--	E 50	48	17	2.2	58	6	.9	
5..	103	--	E 35	51	17	2.3	60	3	.5	
6..	75	83	17	52	13	1.8	84	9	2.0	
7..	62	67	11	52	11	1.5	94	25	6.3	
8..	70	63	12	52	16	2.2	80	3	.6	
9..	71	61	12	54	31	4.5	70	3	.6	
10..	67	60	11	393	210	A 220	65	6	1.0	
11..	60	61	9.9	636	109	187	60	4	.6	
12..	54	64	9.3	421	72	82	60	3	.5	
13..	51	66	9.1	275	71	53	60	2	.3	
14..	48	63	8.2	185	53	26	60	1	.2	
15..	46	64	7.9	139	38	14	65	1	.2	
16..	16	65	8.1	120	80	26	70	2	.4	
17..	53	70	10	168	43	20	75	1	.2	
18..	70	54	10	198	38	20	75	2	.4	
19..	59	32	5.1	175	19	9	80	6	1.3	
20..	54	56	8.2	156	29	12	97	10	2.6	
21..	50	58	7.8	138	27	10	110	10	3.0	
22..	47	27	3.4	123	28	9.3	116	10	3.1	
23..	46	24	3.0	105	7	2.0	118	9	2.9	
24..	47	16	2.0	91	3	.7	98	11	2.9	
25..	48	13	1.7	81	2	.4	105	10	2.8	
26..	51	14	1.9	76	2	.4	95	10	2.6	
27..	52	12	1.7	69	4	.7	85	11	2.5	
28..	51	9	1.2	67	3	.5	92	7	1.7	
29..	50	24	3.2	65	4	.7	92	6	1.5	
30..	50	14	1.9	64	8	1.4	116	8	2.5	
31..	51	9	1.2	--	--	--	112	8	2.4	
Total	1841	--	284.8	4203	--	715.6	2533	--	51.0	
JANUARY				FEBRUARY			MARCH			
1..	101	6	1.6	90	8	0.8	70	8	1.5	
2..	91	3	.7	60	7	1.1	80	10	2.2	
3..	87	2	.5				120	11	3.6	
4..	80	4	.9	80	5	1.1	500	30	40	
5..	80	3	.6	110	6	1.8	4300	176	2040	
6..	80	3	.6	150	11	4.4	3900	253	2660	
7..	80	4	.9	330	50	44	3500	153	1440	
8..	80	4	.9	311	14	12	2870	193	1500	
9..	81	4	.9	212	8	4.6	2610	190	1340	
10..	89	7	1.7	160	6	2.6	2300	161	1000	
11..	257	58	S 50	130	4	1.4	2080	157	882	
12..	447	53	64	110	5	1.5	1840	170	844	
13..	302	17	14	90	6	1.4	1930	163	849	
14..	220	8	4.8	80	11	2.4	1940	150	786	
15..	180	17	8.3	75	8	1.6	1800	122	593	
16..	160	7	3.0	70	7	1.3	1600	82	354	
17..	136	4	1.5	70	7	1.3	1520	95	390	
18..	116	5	1.6	80	6	1.3	1470	65	258	
19..	107	4	1.2	154	10	4.2	1440	116	451	
20..	95	3	.8	232	16	10	2090	468	2640	
21..	90	4	1.0	200	14	7.6	2000	204	1100	
22..	80	4	.9	160	8	3.4	1780	147	706	
23..	75	3	.6	120	6	1.9	1480	90	360	
24..	70	3	.6	100	8	2.2	1180	52	166	
25..	70	6	1.1	85	10	2.3	940	48	122	
26..	65	6	1.0	75	8	1.6	819	62	137	
27..	65	12	2.1	70	10	1.9	871	58	136	
28..	60	9	1.4	70	8	1.5	816	51	112	
29..	60	13	2.1	--	--	--	741	52	104	
30..	55	10	1.5	--	--	--	666	51	92	
31..	55	6	.9	--	--	--	602	53	86	
Total	3614	--	171.7	3509	--	121.9	49855	--	21195.3	

F Estimated.

S Computed by subdividing day.

A Computed from partly estimated-concentration graph.

## MUSKINGUM RIVER BASIN--Continued

3-1390. KILLBUCK CREEK AT KILLBUCK, OHIO--Continued

Suspended sediment, water year October 1962 to September 1963--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..	566	50	76	336	36	33	113	50	15
2..	555	44	66	311	35	29	100	53	14
3..	524	60	85	289	43	34	92	55	14
4..	682	128	236	269	50	36	94	57	14
5..	640	50	86	244	47	31	94	86	22
6..	602	39	63	225	34	21	345	1700 A	1600
7..	531	29	42	211	36	20	166	172	77
8..	471	32	41	197	40	21	127	167	57
9..	426	22	25	183	36	18	113	123	38
10..	382	17	18	175	39	18	151	213 S	101
11..	343	11	10	203	48	26	505	2170 S	3150
12..	313	10	8.4	194	27	14	289	300	234
13..	288	13	10	175	32	15	211	150	85
14..	264	18	13	167	31	14	161	138	60
15..	243	8	5.2	153	27	11	126	129	44
16..	224	4	2.4	142	22	8.4	106	83	24
17..	227	3	1.8	139	27	10	95	92	24
18..	296	23	18	140	34	13	86	76	18
19..	338	63 S	75	133	45	16	74	75	15
20..	966	242 S	618	135	30	11	68	70	13
21..	877	41	97	139	38	14	66	70	12
22..	710	61	117	130	32	11	62	52	8.7
23..	605	45	74	120	28	9.1	57	58	8.9
24..	513	32	44	111	26	7.8	54	59	8.6
25..	437	31	36	104	30	8.4	51	61	8.4
26..	382	47	48	99	26	6.9	48	51	6.6
27..	333	57	51	92	29	7.2	47	49	6.2
28..	296	42	34	106	30	8.6	46	48	6.0
29..	279	38	29	218	295	174	46	52	6.4
30..	343	43	40	166	73	33	46	62	7.7
31..	--	--	--	131	54	19	--	--	--
Total	13656	--	2069.8	5437	--	698.4	3639	--	5698.5
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..	50	66	8.9	54	132	19	30	42	3.4
2..	50	63	8.5	51	116	16	28	40	3.0
3..	45	52	6.3	49	127	17	28	56	4.2
4..	42	56	6.4	117	410 S	140	27	57	4.2
5..	39	52	5.5	65	76	13	28	47	3.6
6..	37	57	5.7	52	69	9.7	28	57	4.3
7..	35	61	5.8	50	76	10	28	55	4.2
8..	33	60	5.3	56	76	11	27	40	2.9
9..	32	54	4.7	54	84	12	26	40	2.8
10..	32	52	4.5	62	86	14	26	58	4.1
11..	32	38	3.3	60	61	9.9	26	41	2.9
12..	31	39	3.3	48	78	10	40	68	7.3
13..	30	56	4.5	44	82	9.7	38	47	4.8
14..	32	43	3.7	44	68	8.1	43	49	5.7
15..	37	46	4.6	44	61	7.2	43	69	8.0
16..	43	74	8.6	41	67	7.4	40	59	6.4
17..	128	516 S	209	40	53	5.7	32	56	4.8
18..	60	153	25	39	63	6.6	30	69	5.6
19..	44	83	9.9	38	52	5.3	28	58	4.4
20..	44	101	12	59	87	14	28	51	3.8
21..	43	87	10	58	39	6.1	29	49	3.8
22..	41	89	9.8	49	60	7.9	28	38	2.9
23..	41	93	10	43	86	10	27	30	2.2
24..	48	87	11	40	78	8.4	26	34	2.4
25..	46	99	12	38	44	4.5	26	38	2.7
26..	40	88	9.5	36	56	5.4	27	45	3.3
27..	35	72	6.8	33	61	5.4	27	43	3.1
28..	43	85	9.9	32	74	6.4	27	33	2.4
29..	48	82	11	31	46	3.8	26	30	2.1
30..	62	91	15	31	56	4.7	27	24	1.7
31..	61	78	13	32	48	4.1	--	--	--
Total	1384	--	463.5	1490	--	412.3	894	--	117.0

Total discharge for year (cfs-days).....92055

Total load for year (tons).....31999.8

S Computed by subdividing day.

A Computed from partly estimated-concentration graph.

## MUSKINGUM RIVER BASIN--Continued

3-1390. KILLBUCK CREEK AT KILLBUCK, OHIO--Continued

Particle-size analyses of suspended sediment, water year October 1962 to September 1963

(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)	Sam- pling point	Water tem- per- ature (°F)	Discharge (cfs)	Sediment concen- tration (ppm)	Sediment discharge (tons per day)	Suspended sediment												Method of analysis
							Percent finer than size indicated, in millimeters												
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000		
Mar. 5, 1963.....	1440			4620	200		59	71	80	83	87	90	95	100				SBWC	
Mar. 5.....	1440			4620	200		15	56	66	84	88	93	97	100				SEN	
Mar. 20.....	0800			2120	775		44	57	65	73	83	90	88	89	100			SBWC	
Mar. 28.....	0830			260	474		53	71	86	93	97	99	100	---				SBWC	
June 11.....	0830			657	3620		46	60	73	88	97	98	99	100				SBWC	
June 11.....	0830			657	3620		20	31	47	75	95	95	99	100				SEN	
July 17.....	1200			97	1040		58	72	86	95	97	98	100	---				SBWC	

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, and 4 miles north of Cambridge, Guernsey County.

DRAINAGE AREA.--160 square miles.

RECORDS AVAILABLE.--Chemical analyses: June 1959 to July 1963.

REMARKS.--Samples for iron and manganese filtered clear when collected. No discharge records available.

Chemical analyses, in parts per million, October 1962 to July 1963

Chemical analyses, in parts per million, October 1962 to July 1963																						
Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Total conductivity (micro mhos at 25°C)	pH	Coliform or million	Dissolved oxygen	
																Calcium-magnesium	Non-carbonate					
Oct. 3, 1962.	3.4		0.71	0.20	46	13	20	3.6	93	87	32	0.3	1.0	0.15	268	169	92	443	7.4	7	7.0	68
Nov. 2	6.4		.77	.00	63	17	23	4.1	107	139	36	.2	.6		356	227	140	564	7.8	7	8.4	66
Dec. 20	5.3		.34	.04	53	13	13	1.6	93	111	17	.2	.5		270	186	110	432	7.6	8	10.5	73
Feb. 19, 1963	6.2		.35	.27	35	11	9.1	2.6	70	72	14	.2	3.4		199	133	75	318	6.9	5	10.2	71
Mar. 21.....	6.1		.23	.00	14	3.6	3.0	2.1	23	33	4.0	.2	2.5		82	50	31	129	7.2	25	8.6	66
Apr. 22.....	6.7		.49	.34	29	7.8	5.9	1.7	58	63	8.0	.1	.6		154	105	57	253	7.3	5	8.9	84
May 23.....	6.7		.50	.28	37	9.9	11	2.1	88	66	16	.1	.7		198	133	61	332	7.4	5	8.8	81
July 2.....	7.5		.71	.38	35	9.2	17	2.8	92	51	30	.2	1.8		200	126	50	348	7.4	5	4.0	49
July 30.....	7.2		.54	1.1	25	7.8	10	2.2	82	27	16	.0	1.2		140	94	28	246	7.3	5	5.1	60

Chemical analyses, in parts per million, October 1962 to July 1963--Continued

Date of collection	Oxygen consumed		Alkyl benzene sulfonate (ABS)	Turbidity
	Filtered	Unfiltered		
Oct. 3, 1962	2	4	0.0	15
Nov. 2	1	2	0.0	4
Dec. 20	0	1	0.1	2
Feb. 19, 1963	--	--	--	7
Mar. 21	--	--	--	240
Apr. 22	--	--	--	60
May 23	--	--	--	15
July 2	--	--	--	75
July 30	--	--	--	--



## QUALITY OF SURFACE WATERS, 1963

## MUSKINGUM RIVER BASIN--Continued

## 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; 1961 to 1963 water years unpublished.

Sediment records: October 1952 to September 1963.

EXTREMES, 1962-63.--Sediment concentrations: Maximum daily, 874 ppm June 6; minimum daily, 3 ppm Jan. 26-29, Feb. 7-10.

Sediment loads: Maximum daily, 41,400 tons Mar. 5; minimum daily, 13 tons Jan. 29, Sept. 30.

EXTREMES, 1952-63.--Sediment concentrations: Maximum daily, 1,600 ppm Jan. 22, 1959; minimum daily, 1 ppm on several days during 1952, 1954, 1956, and 1960.

Sediment loads: Maximum daily, 160,000 tons Jan. 22, 1959; minimum daily, 3 tons on several days during 1952, 1954, 1956, and 1960.

REMARKS.--Flow regulated by 14 flood-control reservoirs. Flow affected by ice Jan. 24, 25.

## Suspended sediment, water year October 1962 to September 1963

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..	1250	18	61	1620	14	61	1500	8	32
2..	1110	18	54	1620	13	57	1400	7	26
3..	1030	17	47	1610	9	39	1380	5	19
4..	1290	15	52	1600	6	26	1340	5	18
5..	1520	14	57	1610	5	22	1340	6	22
6..	1370	13	48	1590	5	22	1480	6	24
7..	1310	13	46	1570	5	21	1660	7	31
8..	1270	12	41	1660	13	58	1740	7	33
9..	1360	12	44	1740	17	80	1770	7	33
10..	1340	11	40	3400	163	1770	1650	8	36
11..	1260	10	34	8320	324	7280	1490	8	32
12..	1180	10	32	9330	228	5740	1170	8	25
13..	1090	10	29	7850	163	1450	1200	7	23
14..	1020	10	28	5870	91	1440	1440	7	23
15..	962	11	28	4690	54	684	1340	7	25
16..	926	11	28	4120	43	478	1450	7	27
17..	1060	12	34	3770	42	428	1520	7	29
18..	1420	12	48	3970	39	418	1520	8	33
19..	1680	14	64	4170	33	372	1540	8	33
20..	1860	18	90	4020	13	141	1670	8	36
21..	1850	22	110	3650	6	59	1920	8	41
22..	1740	23	108	3200	7	60	2380	8	51
23..	1680	22	100	2820	7	53	2790	8	60
24..	1660	22	99	2510	7	47	2690	7	51
25..	1660	22	99	2230	7	42	2750	7	52
26..	1740	22	103	2020	8	44	2860	7	54
27..	1790	21	101	1880	8	41	2400	7	45
28..	1740	20	94	1780	8	38	2100	8	45
29..	1690	18	82	1710	9	42	2100	8	45
30..	1650	17	76	1600	9	39	2240	9	54
31..	1630	15	66	--	--	--	2440	10	66
Total	44138	--	1941	97530	--	23052	56070	--	1124

S Computed by subdividing day.

## MUSKINGUM RIVER BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1963--Continued

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	2310	11	69	1520	4	16	1550	9	38
2..	2270	10	61	1560	4	17	1900	9	46
3..	2070	10	56	1840	4	20	2780	26	195
4..	2000	9	49	2260	5	30	9700	251	10400
5..	1835	8	40	2780	4	30	53800	454	41400
6..	1800	8	39	3040	4	33	30900	420	35000
7..	1760	7	33	3530	3	28	25300	450	30700
8..	1720	7	32	4100	3	33	19800	274	14500
9..	1720	7	32	4200	3	34	26500	220	15700
10..	1850	7	35	3720	3	30	29300	162	12800
11..	2780	52	439	3220	4	35	28700	142	11000
12..	5950	144	2310	2870	5	39	28900	128	9990
13..	8210	112	2480	2710	6	44	29200	121	9540
14..	8360	66	1490	2570	6	42	28900	114	8740
15..	7430	61	1220	2270	5	31	29200	103	8120
16..	6380	35	603	1930	5	26	28800	93	7230
17..	5080	22	302	1680	5	23	29000	112	8770
18..	4260	17	196	1580	7	30	29400	89	7060
19..	3740	14	141	1740	26	122	28500	85	6540
20..	3580	12	116	2040	12	66	28400	440	33700
21..	3140	11	93	2510	8	54	27000	154	11200
22..	2510	10	68	2850	8	62	28600	100	7720
23..	2230	8	48	2450	8	53	29500	73	5810
24..	2000	6	32	2300	8	50	29300	60	4750
25..	1800	5	24	2140	8	46	29200	58	4570
26..	1730	3	14	1870	8	40	28500	58	4460
27..	1770	3	14	1620	8	35	28200	61	4640
28..	1740	3	14	1540	8	33	28300	63	4810
29..	1600	3	13	--	--	--	28100	68	5160
30..	1540	4	17	--	--	--	27700	66	5080
31..	1540	4	17	--	--	--	27200	67	4920
Total	96700	--	10097	68440	--	1102	782130	--	334689
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..	26800	65	4700	5560	32	480	2160	15	87
2..	26300	62	4400	6650	31	473	1890	14	71
3..	25400	63	4320	5170	27	377	1710	13	60
4..	24000	59	3820	4740	24	307	1680	13	59
5..	27600	62	3780	4330	23	269	5220	196	3910
6..	19600	70	3700	3970	23	246	11400	874	26900
7..	13300	103	3700	3700	23	300	11300	460	14000
8..	9590	85	2200	3480	23	216	11100	360	10800
9..	7850	65	1380	3240	22	192	10200	325	8950
10..	6910	46	858	3050	20	165	9500	275	7050
11..	6230	37	622	2870	18	139	10400	329	9240
12..	5640	30	458	2930	17	134	12200	243	8000
13..	5150	26	362	2820	15	114	11200	169	5110
14..	4490	24	291	2720	15	110	10100	110	3000
15..	4640	25	313	2620	15	106	9330	80	2020
16..	4130	23	256	2460	16	106	8840	63	1500
17..	4010	22	238	2360	16	102	8420	57	1300
18..	4150	19	213	2300	16	99	8120	47	1030
19..	4840	28	366	2270	16	98	7070	448	916
20..	10300	386	12800	2360	16	102	4420	36	430
21..	15100	340	13900	2450	17	112	3430	32	296
22..	14400	172	6690	2510	17	115	3000	31	251
23..	11700	110	3470	2460	17	113	2680	30	217
24..	9750	78	2050	2220	18	108	2340	30	190
25..	8290	62	1390	2020	18	98	2080	30	168
26..	6970	50	941	1870	18	91	1890	30	153
27..	6060	54	884	1780	18	86	1710	30	138
28..	5440	39	573	1760	17	81	1540	29	120
29..	5000	31	418	2290	17	105	2010	28	152
30..	5000	33	446	2700	17	124	2090	27	152
31..	--	--	--	2510	16	108	--	--	--
Total	323650	--	79529	93170	--	5276	179030	--	106270

S Computed by subdividing day.

## QUALITY OF SURFACE WATERS, 1963

## MUSKINGUM RIVER BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1963--Continued

[illegible]

## MUSKINGUM RIVER BASIN--Continued

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

Particle-size analyses of suspended sediment, water year October 1962 to September 1963  
(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 tem- per- ature (°F)	Discharge (cfs)	Sediment concentra- tion (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							Percent finer than size indicated, in millimeters											
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Mar. 5, 1963.....	1630			36000	387		50	60	77	85	94	96	98	100			SEWC	
Apr. 20.....	2000			14700	555		50	55	70	79	92	96	100				SEWC	
June 6.....	1100			12200	1940		50	65	81	93	98	99	100				SEWC	
June 6.....	1100			12200	1940		28	44	67	91	97	98	100				SEN	



April	Maximum	57	60	61	55	55	58	56	55	55	53	55	53	53	58	55	59	66	64	61	62	62	58	53	57	59	61	63	62	58	--	58	
	Minimum	52	54	57	54	51	51	52	53	52	51	50	50	51	50	52	53	58	61	57	57	58	53	51	50	53	55	56	58	54	--	53	
May	Maximum	57	60	63	66	65	68	70	73	72	68	60	60	69	67	71	70	70	71	70	68	66	68	68	68	68	70	68	70	68	67	70	67
	Minimum	51	52	56	58	61	60	60	61	64	66	60	55	57	60	62	63	62	63	62	63	61	59	56	59	60	62	63	64	62	61	60	
June	Maximum	73	74	72	68	72	77	76	78	79	79	76	72	72	74	74	74	75	77	76	76	74	75	76	78	80	80	81	81	79	80	--	76
	Minimum	64	67	66	66	67	70	68	72	72	72	71	64	64	66	66	66	66	67	68	70	64	64	66	66	69	71	72	74	71	72	--	68
July	Maximum	80	81	80	78	78	78	78	78	76	74	75	76	76	76	78	82	82	82	78	80	80	80	80	82	82	81	80	80	79	81	79	
	Minimum	74	75	73	69	59	70	72	72	68	67	67	68	70	71	69	72	74	76	76	73	71	72	73	74	75	76	76	76	72	74	72	
August	Maximum	82	80	80	80	76	79	81	81	80	79	79	79	77	75	77	76	76	72	77	77	78	78	76	76	76	76	78	76	76	78	78	
	Minimum	76	74	76	74	73	74	75	75	73	74	75	77	72	70	71	73	73	71	71	70	71	73	75	72	70	71	73	72	71	73	73	
September	Maximum	74	74	76	76	74	72	73	74	75	75	74	74	69	65	69	70	70	70	70	69	67	63	62	62	63	63	63	63	61	--	69	
	Minimum	68	69	72	74	70	68	68	70	71	70	69	69	66	63	65	65	65	65	68	66	62	58	58	58	59	61	61	56	--	65		

MUSKINGUM RIVER BASIN--Continued  
3-1475. LICKING RIVER BELOW DILLON DAM, NEAR DILLON FALLS, OHIO

LOCATION.--Temperature recorder at gaging station, 500 feet downstream from Dillon Dam, 2 miles northwest of Dillon Falls, Ohio. Contingent gaging station 1/2 miles upstream from mouth.  
DRAINAGE AREA--716 square miles.

RECORDS AVAILABLE.--Water temperatures: October 1961 to September 1963.

EXTREMES 1962-63.--Water temperatures: Maximum, 77°F Aug. 9-16; minimum, 34°F Feb. 28 to Mar. 2, Mar. 8-13.  
EXTREMES, 1961-63.--Water temperatures: Maximum, 78°F July 23-27, 1962; minimum, 34°F Feb. 28 to Mar. 2, Mar. 8-13, 1963.

Temperature (°F) of water, water year October 1962 to September 1963  
(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	62	62	62	62	62	62	62	62	63	63	64	64	64	64	64	64	65	65	64	64	64	64	63	62	60	59	56	54	54	53	52
	Minimum	62	62	61	61	62	62	62	62	62	63	63	64	64	64	64	64	64	64	64	64	64	64	63	62	60	59	56	54	53	52	61	
	Normal	62	62	62	62	62	62	62	62	62	62	62	63	64	64	64	64	64	64	64	64	64	64	63	62	60	59	56	54	53	52	61	
November	Maximum	52	52	51	50	50	50	50	49	48	48	48	48	48	48	48	48	48	48	48	48	48	48	47	46	46	46	45	44	44	44	--	48
	Minimum	52	51	50	50	50	50	49	48	48	48	48	48	48	48	48	47	47	47	47	48	48	47	46	46	46	46	44	44	44	--	48	
	Normal	52	51	50	50	50	50	49	48	48	48	48	48	48	48	48	48	47	47	47	47	47	47	46	46	46	46	44	44	44	--	48	
December	Maximum	44	44	43	43	43	42	40	40	39	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	37	37	37	38	38	38	39
	Minimum	44	43	43	43	43	42	40	39	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	37	37	37	37	38	38	39
	Normal	44	43	43	43	43	42	40	39	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	37	37	37	37	38	38	39
January	Maximum	38	38	38	38	38	38	38	38	38	38	38	38	37	37	37	37	38	38	37	37	38	38	38	38	38	38	38	38	38	38	38	38
	Minimum	38	38	38	38	38	38	38	38	38	38	38	38	37	37	37	37	37	37	37	37	37	37	37	37	38	38	38	38	38	38	38	38
	Normal	38	38	38	38	38	38	38	38	38	38	38	38	37	37	37	37	37	37	37	37	37	37	37	37	38	38	38	38	38	38	38	38
February	Maximum	38	38	38	38	37	37	37	37	37	37	37	37	37	36	36	36	36	36	36	36	36	36	36	36	35	35	35	35	35	35	--	36
	Minimum	38	38	38	38	37	37	37	37	37	37	37	37	37	36	36	36	36	36	36	36	36	36	36	36	35	35	35	35	35	35	--	36
	Normal	38	38	38	38	37	37	37	37	37	37	37	37	37	36	36	36	36	36	36	36	36	36	36	36	35	35	35	35	35	35	--	36
March	Maximum	34	35	35	35	35	35	35	36	34	34	34	35	36	36	37	38	38	40	40	40	40	42	43	43	44	45	45	46	46	49	39	36
	Minimum	34	34	35	35	35	35	35	36	34	34	34	34	35	36	36	37	38	40	40	40	40	42	43	43	44	45	45	46	46	49	39	
	Normal	34	34	35	35	35	35	35	36	34	34	34	34	34	35	36	36	37	38	40	40	40	42	43	43	44	45	45	46	46	49	39	
April	Maximum	50	51	52	52	52	53	54	53	53	53	53	53	53	53	53	53	53	53	53	54	55	56	57	56	56	55	54	54	54	--	56	
	Minimum	49	50	51	52	52	52	53	53	53	53	53	53	53	53	53	53	53	53	53	54	55	56	57	56	56	55	54	54	54	--	56	
	Normal	49	50	51	52	52	52	53	53	53	53	53	53	53	53	53	53	53	53	53	54	55	56	57	56	56	55	54	54	54	--	56	
May	Maximum	54	55	55	56	56	56	57	58	59	61	61	61	61	61	61	61	62	62	62	62	62	62	62	62	62	63	63	64	66	60	60	
	Minimum	54	54	55	55	56	56	57	58	59	61	61	61	61	61	61	61	61	61	61	62	62	62	62	62	62	62	63	63	64	66	60	
	Normal	54	54	55	55	56	56	57	58	59	61	61	61	61	61	61	61	61	61	61	62	62	62	62	62	62	62	63	63	64	66	60	
June	Maximum	66	66	66	66	66	67	68	69	69	71	71	71	71	71	71	71	71	71	71	71	71	71	71	72	72	72	72	72	72	72	--	70
	Minimum	66	66	66	66	66	67	68	69	69	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	72	72	72	72	72	72	--	70
	Normal	66	66	66	66	66	67	68	69	69	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	72	72	72	72	72	72	--	70
July	Maximum	72	72	72	72	72	72	72	72	72	72	72	72	73	73	73	73	74	74	74	74	75	75	75	75	75	75	75	75	75	75	75	73
	Minimum	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	73	74	74	74	74	75	75	75	75	75	75	75	75	75	73	
	Normal	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	73	74	74	74	74	75	75	75	75	75	75	75	75	75	73	
August	Maximum	76	76	76	76	76	76	76	77	77	77	77	77	77	77	77	77	77	76	75	74	74	74	74	74	73	73	71	71	71	72	75	75
	Minimum	75	76	76	76	76	76	75	76	77	77	77	77	77	77	77	77	76	75	74	73	73	73	73	73	71	71	71	71	71	72	75	
	Normal	75	76	76	76	76	75	76	77	77	77	77	77	77	77	77	77	76	75	74	73	73	73	73	73	71	71	71	71	71	72	75	
September	Maximum	72	72	72	72	73	73	73	73	73	73	73	73	72	71	71	71	71	71	71	71	71	71	71	71	70	69	68	67	66	66	--	71
	Minimum	72	72	72	72	73	73	73	73	73	73	73	73	72	71	71	71	71	71	71	71	71	71	71	71	70	69	68	67	66	66	--	71
	Normal	72	72	72	72	73	73	73	73	73	73	73	73	72	71	71	71	71	71	71	71	71	71	71	71	70	69	68	67	66	66	--	71

## MUSKINGUM RIVER BASIN--Continued

3-1500. MUSKINGUM RIVER AT MCCONNELLSVILLE, OHIO

LOCATION.--At bridge on State Highway 37 at McConnelleville, Morgan County, 0.5 mile upstream from gaging station and dam 7, and 3 miles downstream from Oil Spring Run.

DRAINAGE AREA.--7,411 square miles.

RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1951, October 1954 to September 1963.

Chloride and specific conductance: October 1950 to September 1963.

Water temperatures: October 1950 to September 1951, July 1954 to September 1963.

EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,940 micromhos Oct. 15; minimum daily, 216 micromhos Mar. 7.

TEMPERATURES, 1962-63.--Maximum, 86°F July 30 Aug. 2; minimum, freezing point on several days during February.

EXTREMES, 1950-51.--Specific conductance: Maximum daily, 1,940 micromhos Oct. 15; minimum daily, 216 micromhos Mar. 7.

Hardness (1950-51, 1954-60). 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, 216 micromhos Mar. 7, 1963.

Water temperatures: Maximum, 94°F Aug. 4, 1955; minimum, freezing point on many days during winter months.

REMARKS.--Samples for iron and manganese filtered clear when collected except as noted. Temperature recorder was not operating Oct. 1 to Feb. 3. Flow regulated by 15 flood-control reservoirs. Some regulation at low flow by powerplant above station.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> ) num (Al)	Alu- minium (Al)	Iron (Fe)	Man- gane- ses (Mn)	Cal- cium (Ca)	Mag- nesium (Mg)	Sodium (Na)	Po- tas- sium (K)	Li- th- ium (Li)	Bi- car- bon- ate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> ) (CO <sub>3</sub> )	Chloride (Cl)	Fluo- ride (F) (NO <sub>3</sub> )	Phos- phorus (residue at 180°C) (PO <sub>4</sub> )	Hardness as CaCO <sub>3</sub>		To- Specific acid- ity (micro- mhos at 25°C)	Col- or	Oxygen consumed			
																Cal- cium, mag- nesium	Non- car- bon- ate			Un- fil- tered	Fi- l- tered		
Oct. 3, 1962.	1280	4.5		0.04	0.35	153	22	122	7.1		113	192	322	0.7	3.5	0.23	472	380	1550	7.2	6	4	2
Nov. 1.....	1890	4.5		.11	.03	113	20	75	5.3		127	160	186	.6	3.8	--	655	364	1100	7.4	6	1	2
Dec. 19.....	1800	6.6		.71	1.6	112	21	75	5.0		135	164	184	.4	4.6	--	659	366	1110	7.4	22	1	2
Jan. 1-11, 24, 28-31, 1963	2630			--	--	--	--	--	--		119	139	130	.4	3.1	.08	592	308	901	7.7	--	--	--
Feb. 1-28....	3203			.31	.86	--	--	--	--		112	128	152	.4	5.7	--	600	306	933	7.6	--	1	--
Feb. 19.....	2360			.70	.64	--	--	--	--					--	.08	--	293	152	462	7.6	--	1	2
Mar. 1-31....	30660					--	--	--	--		52	71	75	.1	4.5	--	381	222	602	7.3	--	2	6
Mar. 20.....	37500			.72	.53	--	--	--	--		96	103	68	.4	3.6	--	518	300	847	7.5	--	1	3
Apr. 1-30....	12630			.52	.67	--	--	--	--		120	140	114	.5	2.1	--	--	--	--	--	--	--	--
Apr. 22.....	16800			--	--	--	--	--	--					--	--	.18	--	--	--	--	--	--	--
May 1-31....	3637			.25	.46	--	--	--	--					--	--	.10	--	--	--	--	--	1	2
May 22.....	2890			--	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--
June 1-21, 26-30, 1963	6640			--	--	--	--	--	--		86	68	85	.4	2.6	--	375	215	628	6.9	--	--	--
June 26.....	2110			.43	.07	--	--	--	--		108	155	224	.6	3.0	.14	692	366	1190	6.8	--	2	3
July 1-31....	1460			--	--	--	--	--	--					--	--	.10	--	--	--	--	--	2	2
July 23.....	3060			.10	.09	--	--	--	--					--	--	--	692	366	1170	6.8	--	--	--
Aug. 1-28....	1287			--	--	--	--	--	--		110	163	212	.6	2.6	--	942	440	1370	6.7	--	--	--
Sept. 9-30...	635			--	--	--	--	--	--		138	171	298	.7	1.8	--	--	--	--	--	--	--	--
Sept. 6.....	644			.17	.04	--	--	--	--					--	--	.24	--	--	--	--	--	2	2
Sept. 14.....	655	2.4		a.00	--	190	23	174	9.1		112	172	478	1.0	4.5	--	1360	569	2040	8.0	--	3	--

a In solution when analyzed.



## MUSKINGUM RIVER BASIN--Continued

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

Chemical analyses in parts per million, January to September 1963

(Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Turbidity
														Calcium	Non-magnesium			
Jan. 9, 1963 (maximum conductance),..	2120							122	144	170	0.6	6.6	644	343	243	1040	7.6	--
Jan. 24 (minimum conductance),.....	2450							100	135	90	.3	7.0	454	270	188	746	7.6	--
Feb. 27 (maximum conductance),.....	2100							116	138	215	.4	6.8	736	352	257	1130	7.5	--
Feb. 20 (minimum conductance),.....	2800							108	122	104	.4	6.0	458	258	169	751	7.8	--
Feb. 3 (maximum turbidity),.....	2730							--	--	--	--	--	--	--	--	--	--	20
Mar. 1 (maximum conductance),.....	2560							118	132	188	.4	5.3	704	329	232	1080	7.9	--
Mar. 7 (minimum conductance),.....	29700							18	58	11	.1	4.9	136	74	59	216	7.0	--
Mar. 4 (maximum turbidity),.....	17400							--	--	--	--	--	--	--	--	--	--	1400
Apr. 19 (maximum conductance),.....	5420							118	128	120	.5	5.6	500	303	206	826	7.7	--
Apr. 1 (minimum conductance),.....	31700							70	71	34	.3	5.0	230	150	92	385	7.3	--
Apr. 14 (maximum turbidity),.....	5510							--	--	--	--	--	--	--	--	--	--	150
May 28 (maximum conductance),.....	2150							134	160	148	.6	.6	594	354	244	984	7.3	--
May 3 (minimum conductance),.....	6260							100	118	84	.4	2.4	420	248	166	670	7.9	--
June 5 (maximum conductance),.....	4620							122	156	183	.7	3.8	680	364	264	1090	6.7	--
June 9 (minimum conductance),.....	10400							40	64	46	.4	3.5	232	124	91	371	6.4	--

July 16, 1963 (maximum conductance)....	1030	130	139	280	.7	2.9	794	408	301	1380	6.9
July 1 (minimum conductance).....	2190	108	130	146	.4	2.4	492	296	207	901	6.8
Aug. 27 (maximum conductance).....	895	116	169	320	.7	3.6	930	462	367	1570	7.2
Aug. 12 (minimum conductance).....	1270	106	148	139	.6	2.6	520	300	213	996	7.0
Sept. 30 (maximum conductance).....	563	140	180	395	.7	1.6	1070	520	405	1800	7.0
Sept. 13-14 (minimum conductance).....	715	130	165	265	.6	2.4	812	388	281	1360	6.7

MUSKINGUM RIVER BASIN--Continued  
3-1500. MUSKINGUM RIVER AT McCONNELLSVILLE, OHIO--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued						
Date of collection	Dissolved oxygen		Organics		Nitrite (NO <sub>2</sub> )	Cyanide (CN)
	Parts per million	Percent satu- ration	Phenols as C <sub>6</sub> H <sub>5</sub> OH	Alkyl benzene sulfonate (ABS)		
Oct. 3, 1962.....	6.8	71		0.2		8
Nov. 1.....	8.8	78		.1		5
Dec. 18.....	8.7	60		.2		Ds-4
Jan. 16, 1963.....	9.2	54		.0		E-4
Feb. 18.....	7.8	73		.1		0
Mar. 20.....	7.4	59		.0		270
Apr. 22.....	8.7	86		.0		110
May 22.....	8.8	98		.1		10
June 26.....	6.2	76		.1		M-8
July 23.....	4.0	49		.1		--
Sept. 6.....	5.2	61		.1		0
						C-32
						--

## MUSKINGUM RIVER AT McCONNELSVILLE, OHIO--Continued

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

Chloride, in parts per million, and specific conductance, water year  
October 1962 to September 1963

Day	October		November		December		January	
	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)
1	338	1630	180	1100	144	968	116	870
2	312	1560	175	1100	--	--	115	874
3	308	1550	180	1120	--	--	120	876
4	310	1540	195	1160	158	1020	135	921
5	385	1770	198	1150	170	1060	125	881
6	405	1870	210	1180	165	1040	155	1000
7	348	1650	210	1190	185	1110	140	945
8	402	1850	205	1180	100	789	130	903
9	418	1880	218	1200	100	777	170	1040
10	370	1730	210	1160	265	1340	150	992
11	300	1490	155	1040	195	1150	150	963
12	290	1450	92	733	--	--	--	--
13	382	1740	95	708	225	1270	--	--
14	388	1740	110	761	222	1240	--	--
15	442	1940	170	917	222	1240	--	--
16	360	1700	84	688	245	1300	--	--
17	272	1430	62	625	235	1290	--	--
18	240	1330	58	622	185	1150	--	--
19	318	1550	72	678	170	1090	--	--
20	358	1690	77	688	170	1090	--	--
21	360	1690	78	680	190	1170	--	--
22	288	1480	106	777	200	1160	--	--
23	268	1410	79	689	230	1290	--	--
24	390	1800	80	684	202	1180	90	746
25	340	1660	80	684	200	1160	--	--
26	270	1390	115	801	200	1170	--	--
27	252	1310	130	866	172	1070	--	--
28	210	1180	145	931	172	1070	100	821
29	--	--	150	945	160	1020	105	825
30	225	1230	135	910	140	953	105	838
31	210	1190	--	--	112	871	120	894
Day	February		March		April		May	
	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)	Chlo- ride (Cl)	Specific conduct- ance (micro- mhos at 25°C)
1	122	896	188	1080	34	385	87	696
2	125	903	135	901	35	405	86	692
3	130	926	80	654	33	411	84	670
4	180	1080	26	330	37	436	120	800
5	180	1080	24	324	43	461	120	804
6	180	1070	32	310	48	500	121	814
7	175	1050	11	216	50	497	120	814
8	165	960	10	223	55	529	119	820
9	170	963	76	436	53	537	118	818
10	--	--	76	440	66	588	96	764
11	120	775	86	470	83	657	104	779
12	130	842	67	420	78	667	95	763
13	130	848	76	440	80	667	100	796
14	--	--	104	542	88	692	106	809
15	130	838	84	490	80	679	112	828
16	100	759	68	434	101	750	106	818
17	105	756	66	454	96	747	120	865
18	145	930	66	438	99	768	118	859
19	115	828	72	462	100	826	117	859
20	104	751	64	451	89	742	121	882
21	115	825	54	422	61	554	103	824
22	122	870	80	501	63	546	105	826
23	145	935	76	510	51	496	104	845
24	175	1030	78	511	76	577	128	898
25	200	1100	70	495	79	594	146	960
26	188	1080	60	471	54	534	146	960
27	215	1130	53	454	75	625	144	955
28	185	1060	40	406	90	674	148	984
29	--	--	40	402	76	618	146	968
30	--	--	44	406	99	710	146	970
31	--	--	39	399	--	--	144	957

## QUALITY OF SURFACE WATERS, 1963

## MUSKINGUM RIVER BASIN--Continued

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

Chloride, in parts per million, and specific conductance, water year  
October 1962 to September 1963--Continued

Day	June		July		August		September	
	Chloride (Cl)	Specific conductance (micro-mhos at 25°C)	Chloride (Cl)	Specific conductance (micro-mhos at 25°C)	Chloride (Cl)	Specific conductance (micro-mhos at 25°C)	Chloride (Cl)	Specific conductance (micro-mhos at 25°C)
1	112	850	146	901	235	1280	--	--
2	112	852	164	997	262	1380	--	--
3	120	850	192	1080	262	1380	--	--
4	166	1030	200	1140	260	1350	--	--
5	183	1090	198	1130	252	1350	--	--
6	156	981	242	1280	252	1350	--	--
7	44	399	244	1280	200	1180	--	--
8	44	372	178	1060	185	1130	--	--
9	46	371	178	1050	230	1240	265	1380
10	62	440	203	1140	230	1240	265	1380
11	62	442	184	1070	150	989	262	1380
12	40	411	202	1140	139	926	265	1380
13	40	411	208	1150	150	968	255	1360
14	36	384	207	1150	175	1070	255	1360
15	34	384	246	1270	185	1110	278	1410
16	46	422	280	1380	180	1100	275	1410
17	46	436	270	1370	172	1080	290	1450
18	34	412	252	1310	148	1020	285	1450
19	34	426	255	1320	148	1010	280	1450
20	42	465	252	1320	142	1010	270	1430
21	56	545	248	1300	142	1010	320	1560
22	--	--	262	1350	165	1080	298	1510
23	--	--	250	1360	202	1190	295	1500
24	--	--	242	1330	202	1210	320	1560
25	--	--	228	1250	220	1260	268	1420
26	112	789	178	1110	275	1410	348	1630
27	109	796	150	953	320	1570	345	1640
28	124	844	165	1020	315	1550	370	1710
29	124	840	198	1140	--	--	365	1700
30	126	842	210	1200	--	--	395	1800
31	--	--	238	1280	--	--	--	--



## MUSKINGUM RIVER BASIN--Continued

3-1503. MUSKINGUM RIVER NEAR BEVERLY, OHIO

LOCATION.--At intake line to Ohio River Valley Water Sanitation Commission (ORSANCO) monitor at Ohio Power Company water intake near Beverly, Washington County, 1 mile downstream from Meigs Creek, and 1.1 miles upstream from Olive Green Creek.

DRAINAGE AREA.--7,600 square miles, approximately.

RECORDS AVAILABLE: Chemical analyses: July 10 to September 1963.

REMARKS.--Daily samples were collected at this station and records of specific conductance of daily samples are available in district office at Columbus, Ohio.

Analyses were made on the maximum daily specific conductance for each 10-day period and on the maximum and minimum daily specific conductance for each month. Records of discharge are given for Muskingum River at McConnelsville.

Chemical analyses, in parts per million, July to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Alu- mi- num (Al)	Iron (Fe)	Man- ga- nese (Mn)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Po- tas- sium (K)	Bi-car- bon- ate (HCO <sub>3</sub> )	Car- bon- ate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Phos- phate (PO <sub>4</sub> ) at 180°C	Hardness as CaCO <sub>3</sub>		To-Specif- ic acid- ity (micro- ph as mhos at H <sup>+</sup> 25°C)	Organics Phe-Alkyl ben- zene as C <sub>6</sub> H <sub>5</sub> sulfo- nate OH (ABS)
																	Cal- cium, car- mag- nesium	Non- carbon- ate		
July 10, 1963 (maximum)	1050					--	--			--	--	--	216		--	0.10	--	--	1180 7.0	0.1
7/1-10).....						--	--			--	--	--	252		--	.14	--	--	1300 6.9	.1
July 20 (maximum)	2070					--	--			--	--	--	245		2.0	--	850	435 378	1370 6.7	--
7/11-20).....						133	25		70		242				2.2	--	489	292 192	835 7.3	--
July 27 (maximum monthly).....	1230					89	17		122		127									--
July 1 (minimum monthly).....	2190																			--
Aug. 14 (maximum)	1160					--	--		--	--	--	248		--	.18	--	--	--	1300 7.3	.1
8/1-20).....						--	--		--	--	--	--	212		--	.12	--	--	1220 6.9	.1
Aug. 30 (maximum)	1150					--	--		--	--	--	--	260		2.9	--	814	418 326	1350 6.9	--
Aug. 7 (maximum monthly).....	1860					131	22		112		178				2.6	--	549	309 225	931 7.0	--
Aug. 17 (minimum monthly).....	1030					89	21		102		154		139							--
Sept. 11(maximum)	598					--	--		--	--	--	288		--	.15	--	--	--	1460 7.2	.1
9/11-20).....						--	--		--	--	--	--	285		--	.10	--	--	1470 7.1	.1
Sept. 3 (maximum)	552					--	--		--	--	--	--	325		2.8	--	996	459 357	1570 6.8	--
Sept. 21-30).....	859					146	23		124		178									--
Sept. 3 (maximum monthly).....						119	22		124		172		246		2.8	--	822	388 286	1310 6.9	--
Sept. 2 (minimum monthly).....	847																			--

MUSKINGUM RIVER BASIN--Continued  
 3-1503. MUSKINGUM RIVER NEAR BEVERLY, OHIO--Continued  
 Temperature (°F) of water, July to September 1963

Temperature (7 a.m. to 4 p.m.)																																Aver- age
Month		Day																														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
July.....	--	81	82	--	--	82	81	--	80	82	81	81	83	--	--	80	80	82	84	83	80	--	80	78	82	82	84	85	--	85	84	83
August.....	85	84	--	--	--	85	83	84	84	83	--	85	85	84	81	80	84	--	84	85	82	81	81	82	--	84	86	86	88	83	--	84
September.....	--	85	86	86	83	84	87	--	88	88	90	92	86	83	--	83	83	84	82	87	87	--	87	85	85	85	85	85	--	83	--	86



## 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 (at gage).

RECORDS AVAILABLE.--October 1946 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 78°F on several days in July; minimum, freezing point on several days in December, January, and February.

EXTREMES, 1946-63.--Water temperatures: Maximum, 86°F on several days in August 1947, July and August 1955; minimum, freezing point on many days during winter months.

REMARKS.--Temperature records furnished by West Virginia Water Service Company.

Temperature °F of water, water year October 1962 to September 1963

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

## HOCKING RIVER BASIN

3-1595. HOCKING RIVER AT ATHENS, OHIO

LOCATION.--At gaging station at Mill Street Bridge at Athens, Athens County, 3.5 miles downstream from Margaret Creek.

DRAINAGE AREA.--944 square miles.

RECORDS AVAILABLE.--Chemical analyses: October 1954 to September 1963.

Sediment records: October 1954 to September 1963.

Sediment records: October 1956 to September 1963.

EXTREMES: 1962-63.--Dissolved solids: Maximum, 1.080 ppm Oct. 7; minimum, 283 ppm Mar. 1-31.

Hardness: Maximum, 581 ppm Oct. 7; minimum, 174 ppm Mar. 1-31.

Specific conductance: Maximum daily, 1.710 micromhos Oct. 7; minimum daily, 263 micromhos Mar. 20.

Water temperatures: Maximum, 78°F July 28; minimum, freezing point on many days during December to March.

Sediment concentrations: Maximum daily, 1.300 ppm Mar. 4; minimum daily, 1 ppm Oct. 23-27.

Sediment loads: Maximum daily, 44,000 tons Mar. 3; minimum daily, less than 0.5 ton Oct. 1-3, 24-27.

Eutrophication: Maximum, 13.26 ppm Oct. 1957; minimum, 8.00 ppm Jan. 22-24, 1959.

Hardness: Maximum, 702 ppm Oct. 1957; minimum, 80 ppm Jan. 22-24, 1959.

Specific conductance: Maximum daily, 2.080 micromhos Aug. 11, 1962; minimum daily, 192 micromhos Jan. 22, 1959.

Water temperatures: Maximum, 84°F Aug. 7, 1955; minimum, freezing point on many days during winter months.

Sediment concentrations (1956-63): Maximum daily, 1.320 ppm July 8, 1958; minimum daily, 1 ppm on many days each year.

Sediment loads (1956-63): Maximum daily, 44,000 tons Mar. 5, 1963; minimum daily, less than 0.5 ton on many days each year.

REMARKS.--Samples for iron and manganese were filtered clear when collected except as footnoted. Records of specific conductance of daily samples available in district office at Columbus, Ohio. Some regulation of flow by Tom Jenkins Reservoir and mill above station. Flow affected by ice Dec. 10-15, 31, Jan. 1-3, 5, 17-22, 25-29, Feb. 13-17, 24-27.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Alum-inum (Al)	Iron (Fe)	Man-ga-nese (Mn)	Cal-cium (Ca)	Mag-nesium (Mg)	Sodium (Na)	Potas-sium (K)	Bicar-bonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo-ride (F)	Ni-trate (NO <sub>3</sub> )	Hardness			Specific conductance (micro-mhos at 25°C)	Col- or
															Cal-cium	Non-carbon-ate	Total acid-ity as H <sup>+</sup>		
Oct. 7, 1962..	136	9.6		a.0.01	2.8	142	55	124	5.8	24	390	292	0.1	4.1	1080	581	562	1710	6.8
Nov. 1-30.....	619	9.0		a.00	2.3	83	35	56	3.6	34	279	112	.2	3.1	647	351	323	950	6.8
Dec. 1-19.....	268	9.2		a.01	3.3	90	36	61	3.1	52	284	122	.2	2.8	672	373	330	1020	6.8
Dec. 20-21,																			
25-31.....	972	7.5		a.00	.14	60	20	36	1.9	42	170	73	.1	2.7	404	232	197	652	7.1
Jan. 1-31, 1963	872									64	182	68	.1	4.8	468	286	213	709	7.2
Feb. 1-28.....	643									62	174	68	.2	3.8	410	253	202	663	7.0
Mar. 1-31.....	5975									40	134	30	.2	3.4	283	174	141	445	6.9
Apr. 1-30.....	1111									44	203	43	.2	4.4	439	255	219	648	6.8
May 1-31.....	525									46	228	55	.2	1.7	477	280	242	716	6.9
June 1-30.....	243									64	285	71	.2	1.2	598	349	296	892	6.7
July 1-31.....	179									58	324	77	.0	1.6	660	376	328	973	7.0
Aug. 1-31.....	104									40	381	80	.3	1.8	716	416	383	1070	6.4
Sept. 1-30.....	71.4									18	466	86	.3	2.2	684	466	411	1280	6.3
Weighted average.....	b 927									44	174	48	0.2	3.2	382	226	189	586	6.9
Time-weighted average.....										47	267	73	0.2	2.6	562	320	282	843	6.7
Tons per day..										119	469	128	0.5	8.6	1030	--	--	--	--

a In solution when analyzed.

b Mean discharge for 365 days; mean discharge for 332 days of chemical analyses, 996 cfs.

## HOCKING RIVER BASIN--Continued

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

### Analyses of additional samples

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Alumina (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Carbocatione (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus as P <sub>2</sub> O <sub>5</sub> at 180°C	Hardness as CaCO <sub>3</sub>		Total conductivity as H <sup>+</sup> at 25°C	Specific conductance in micro-mhos at 25°C	Color	Oxygen consumed	
																		Calcium, magnesium, residue	Non-carbonate residue					
Oct. 3, 1962	88	9.7	—	0.22	3.2	109	35	76	3.8	—	32	—	423	91	0.2	5.0	0.07	803	420	394	1140	6.7	—	1
Nov. 1, 1962	149	8.2	—	0.39	3.2	114	46	101	4.3	—	73	—	397	181	2.2	3.0	—	903	474	448	1350	6.9	—	1
Nov. 19, 1962	325	8.2	—	2.7	2.8	85	30	56	2.9	—	73	—	215	132	2.2	1.0	—	573	336	276	938	7.1	—	1
Jan. 16, 1963	1040	—	—	1.5	1.5	70	—	—	—	—	—	—	—	—	—	—	.05	—	—	—	—	—	1	
Feb. 12, 1963	1020	—	—	1.9	1.4	—	—	—	—	—	—	—	—	—	—	—	.04	—	—	—	—	—	1	
Mar. 20, 1963	10200	—	—	.88	.57	—	—	—	—	—	—	—	—	—	—	—	.04	—	—	—	—	—	1	
Mar. 22, 1963	1500	—	—	.26	.26	—	—	—	—	—	—	—	—	—	—	—	.03	—	—	—	—	—	4	
May 22, 1963	590	—	—	.05	.19	—	—	—	—	—	—	—	—	—	—	—	.21	—	—	—	—	—	0	
July 2, 1963	124	—	—	.28	.23	—	—	—	—	—	—	—	—	—	—	—	.07	—	—	—	—	—	1	
July 23, 1963	872	—	—	.25	2.8	—	—	—	—	—	—	—	—	—	—	—	.24	—	—	—	—	—	1	
Sept. 6, 1963	82	—	—	.13	1.4	—	—	—	—	—	—	—	—	—	—	—	.10	—	—	—	—	—	3	
		—	—			—	—	—	—	—	—	—	—	—	—	—							1	

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Dissolved oxygen		Organics		Ammonia nitrogen as $\text{NH}_4$	Nitrite ( $\text{NO}_2$ )	Cyanide (CN)	Turbidity	Threshold odor
	Parts per million	Percent saturation	Phenols as $\text{C}_6\text{H}_5\text{OH}$	Alkyl benzene sulfonate (ABS)					
Oct. 3, 1962.....	7.9	79		0.2				0.8	0
Nov. 1.....	10.4	86		1.1				3	0
Dec. 1.....	10.4	74		2.2				7	E-2
Jan. 1, 1963.....	10.8	83		0				25	C-8
Feb. 1.....	12.1	80		0				30	M-2
Feb. 12.....	11.7	80		0				110	0
Mar. 20.....	8.6	70		0					
Apr. 22.....	8.8	85		0				60	M-4
May 1.....	8.6	89		0				19	E-2
July 2.....	11.2	78		1.1				--	M-2
Aug. 2.....	6.4	62		1.1				--	M-1
July 23.....	5.4	62		1.1				--	0
Sept. 6.....	6.4	71		1.1				--	0

Chemical analyses in parts per million, January to September 1963  
(Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Turbidity
														Calcium	Non-magnesium			
Jan. 28, 1963 (maximum conductance).....	280							84	233	85	0.2	5.5	576	338	269	875	7.6	--
Jan. 13 (minimum conductance).....	4190							42	80	26	.2	6.8	210	130	96	348	7.4	--
Feb. 2 (maximum conductance).....	287							86	240	88	.2	4.4	554	334	263	879	7.1	--
Feb. 9 (minimum conductance).....	998							46	127	53	.2	2.8	304	196	159	520	7.5	--
Feb. 3 (maximum turbidity).....	680							--	--	--	--	--	--	--	--	--	--	90
Mar. 1 (maximum conductance).....	719							72	220	81	.2	3.6	506	304	245	805	6.9	--
Mar. 20 (minimum conductance).....	10200							24	74	16	.1	2.1	158	97	78	263	6.8	--
Mar. 2 (maximum turbidity).....	3380							--	--	--	--	--	--	--	--	--	--	240
Apr. 17 (maximum conductance).....	476							50	275	52	.1	2.0	566	328	287	801	7.2	--
Apr. 24 (minimum conductance).....	3780							44	95	22	.1	2.2	220	138	102	362	7.3	--
May 28 (maximum conductance).....	330							56	248	80	.2	1.9	556	328	282	832	7.2	--
May 13 (minimum conductance).....	660							40	169	40	.1	2.2	352	210	177	566	7.0	--
June 27 (maximum conductance).....	112							94	324	95	.3	1.4	700	408	331	1050	7.6	--
June 9 (minimum conductance).....	498							6	292	42	.3	1.9	504	299	284	599	5.7	--

## HOCKING RIVER BASIN--Continued

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

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

(Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity--Continued)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Turbidity
														Calcium	Non-carbonate sum			
July 1, 1963 (maximum conductance). <sup>a</sup>	150							0	539	55	.5	1.0	874	447	447	1340	3.6	--
July 24 (minimum conductance). <sup>b</sup> ....	804							4	128	17	.0	1.4	232	129	126	384	5.2	--
Aug. 16 (maximum conductance).....	128							0	556	85	.5	2.8	912	484	484	1300	4.1	--
Aug. 20 (minimum conductance).....	96							40	342	76	.3	2.6	668	392	359	968	6.8	--
Sept. 25 (maximum conductance).....	50							54	458	120	.3	3.3	904	528	484	1330	6.5	--
Sept. 4 (minimum conductance).....	88							104	341	85	.2	2.9	734	420	335	1070	7.0	--

<sup>a</sup> Includes 1.1 ppm potential free acidity (H<sup>+</sup>), determined to pH 7.0.<sup>b</sup> Includes 0.1 ppm potential free acidity (H<sup>+</sup>), determined to pH 7.0.



## QUALITY OF SURFACE WATERS, 1963

## HOCKING RIVER BASIN--Continued

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

## Suspended sediment, water year October 1962 to September 1963

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..	85	2	7	149	3	1	228	13	8
2..	83	2	7	132	3	1	213	11	6
3..	88	2	7	124	4	1	210	10	6
4..	172	3	1	118	4	1	207	8	4
5..	225	3	2	136	5	2	210	7	4
6..	168	3	1	156	5	2	273	8	6
7..	136	3	1	170	6	3	313	11	9
8..	206	3	2	165	6	3	302	13	11
9..	151	3	1	204	14	S 11	295	15	12
10..	130	3	1	2800	542	S 4840	280	14	10
11..	122	3	1	3730	389	3920	270	14	10
12..	106	3	1	1870	124	S 693	260	14	10
13..	105	3	1	812	26	57	250	13	9
14..	101	3	1	573	18	28	250	12	8
15..	94	4	1	435	15	18	250	12	8
16..	92	5	1	367	14	14	263	11	8
17..	105	5	1	367	10	10	380	11	11
18..	106	5	1	612	13	21	317	11	9
19..	112	5	2	944	40	102	325	12	10
20..	108	4	1	842	48	109	790	37	79
21..	101	4	1	650	34	60	1350	111	404
22..	95	3	1	662	16	28	1700	105	482
23..	94	2	1	520	6	8	1400	83	314
24..	88	2	7	384	5	5	1100	61	181
25..	90	1	7	325	6	5	788	37	79
26..	92	1	7	302	8	6	770	21	44
27..	95	1	7	273	8	6	622	14	24
28..	99	2	1	253	9	6	562	12	18
29..	108	2	1	243	9	6	963	--	E 210
30..	126	3	1	240	12	8	1600	--	E 260
31..	185	3	1	--	--	--	1300	--	E 100
Total	3668	--	29	18558	--	9975	18041	--	2354
	JANUARY			FEBRUARY			MARCH		
1..	850	20	46	243	19	12	710	115	S 447
2..	650	16	28	287	21	16	609	609	5560
3..	490	15	20	680	--	E 85	3760	396	4020
4..	431	15	17	1030	--	E 160	5300	1300	A 19000
5..	400	14	15	758	25	51	20200	800	B 44000
6..	371	13	13	794	25	A 55	26600	360	B 26000
7..	358	12	12	1050	75	A 210	20900	260	B 15000
8..	349	11	10	1320	--	E 260	10700	183	5290
9..	349	10	9	998	33	89	4540	261	3200
10..	393	10	11	740	22	44	3860	227	2360
11..	2000	464	S 3690	908	26	64	3920	200	2120
12..	5150	686	9590	1020	36	99	4220	209	2360
13..	4190	335	3790	794	35	75	3980	178	1910
14..	1980	252	1350	644	29	50	2860	162	1250
15..	1340	--	E 500	550	24	36	2140	142	820
16..	1040	--	E 180	420	22	25	2140	150	867
17..	800	--	E 75	360	20	19	6700	594	10700
18..	750	17	34	371	20	20	7910	365	7800
19..	650	13	23	515	19	26	8490	425	S 10600
20..	600	13	21	770	19	40	10200	283	7790
21..	550	13	19	764	19	39	8810	300	7140
22..	460	14	17	590	19	30	6500	171	3000
23..	435	15	18	510	18	25	3060	283	2340
24..	398	15	16	430	17	20	2710	167	1220
25..	360	15	14	430	17	20	2010	105	570
26..	330	16	14	400	17	18	1610	92	400
27..	300	16	13	320	16	14	1870	96	485
28..	280	17	13	298	14	11	1840	96	477
29..	270	17	12	--	--	--	1540	75	312
30..	260	18	13	--	--	--	1340	68	246
31..	250	18	12	--	--	--	1420	73	280
Total	27034	--	19595	17994	--	1613	185229	--	187564

E Estimated.

S Computed by subdividing day.

T Less than 0.5 ton.

A Computed from partly estimated-concentration graph.

B Computed from estimated-concentration graph.

## HOCKING RIVER BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1963--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..	1450	76	298	1020	46	127	274	10	7
2..	1270	63	216	888	37	89	254	10	7
3..	1100	49	146	764	36	74	241	9	6
4..	1010	47	128	698	36	68	250	8	5
5..	918	47	116	630	34	58	284	7	5
6..	828	44	98	590	33	52	452	25	A 30
7..	780	42	88	543	27	40	556	--	E 40
8..	725	37	72	507	17	23	498	17	23
9..	708	34	65	480	11	14	498	14	19
10..	681	29	53	452	10	12	412	13	14
11..	615	23	38	420	12	14	344	10	9
12..	570	17	26	393	14	15	278	7	5
13..	543	17	25	432	16	19	241	7	4
14..	525	17	24	912	55	S 145	216	7	4
15..	502	16	22	660	34	60	201	7	4
16..	480	14	18	512	23	32	184	7	3
17..	476	13	17	464	19	24	176	7	3
18..	543	16	23	480	17	22	163	7	3
19..	747	53	107	464	15	19	153	7	3
20..	1500	154	S 787	452	14	17	145	7	3
21..	2100	246	S 1450	670	24	43	148	7	3
22..	1590	74	S 318	590	16	25	145	7	3
23..	2720	369	S 3210	464	15	19	137	7	3
24..	3780	393	S 3520	404	15	16	128	7	3
25..	1970	248	1320	372	14	14	118	8	2
26..	1380	78	291	351	13	12	116	9	3
27..	1090	49	144	326	12	10	112	10	3
28..	930	43	108	330	11	10	153	--	E 7
29..	840	44	100	372	9	9	260	--	E 25
30..	960	42	109	334	10	9	162	26	11
31..	--	--	--	295	10	8	--	--	--
Total	33331	--	12937	16269	--	1099	7299	--	260
	JULY			AUGUST			SEPTEMBER		
1..	150	23	9	106	9	2	104	6	2
2..	124	22	7	100	10	3	98	6	2
3..	114	18	6	88	10	2	88	7	2
4..	106	16	4	92	9	2	88	9	2
5..	108	14	4	84	10	2	90	10	2
6..	100	14	4	74	9	2	82	10	2
7..	96	14	4	84	8	2	69	9	2
8..	94	12	3	130	7	2	67	9	2
9..	86	10	2	158	7	3	65	8	1
10..	84	8	2	130	7	2	64	7	1
11..	69	8	1	139	6	2	62	6	1
12..	74	8	2	124	5	2	64	7	1
13..	74	8	2	112	4	1	80	8	2
14..	88	9	2	162	4	2	116	10	3
15..	104	11	3	155	3	1	122	11	4
16..	102	9	2	128	3	1	104	12	3
17..	96	9	2	104	3	1	84	13	3
18..	86	8	2	94	3	1	69	13	2
19..	80	8	2	88	4	1	64	13	2
20..	108	8	2	96	4	1	60	11	2
21..	426	--	E 75	102	4	1	58	11	2
22..	390	27	S 28	104	4	1	54	11	2
23..	872	49	S 137	98	5	1	53	10	1
24..	804	45	98	86	5	1	52	10	1
25..	344	23	21	82	5	1	50	8	1
26..	170	18	8	80	6	1	48	7	1
27..	137	16	6	74	6	1	48	7	1
28..	122	16	5	73	5	1	48	6	1
29..	116	15	5	69	4	1	46	7	1
30..	114	13	4	86	4	1	45	6	1
31..	106	10	3	118	4	1	--	--	--
Total	5544	--	455	3220	--	46	2142	--	53
Total discharge for year (cfs-days).....								338329	
Total load for year (tons).....								235980	

E Estimated.

S Computed by subdividing day

A Computed from partly estimated-concentration graph.



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

Particle-size analyses of suspended sediment, water year October 1962 to September 1963  
(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)	Sam- pling point	Water tem- per- ature (°F)	Discharge (cfs)	Sediment concen- tration (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	
Jan. 11, 1963.....	1600			2670	650		47	58	72	84	93	97	98	99	100		SBWC
Mar. 4.....	1700			7140	1840		42	54	65	78	91	97	99	100	100		SBWC
Mar. 4.....	1700			7140	1840		20	30	44	62	86	94	99	100	100		SEN

## OHIO RIVER MAIN STEM

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

LOCATION --about 650 feet upstream from lock and dam 22, at Ravenswood, Jackson County, 450 feet downstream from Sandy Creek, and about 1.5 miles downstream from Turkey Run.

DRAINAGE AREA --39,840 square miles.

RECORDS AVAILABLE.--Chemical analyses: October 1954 to June 1963 (discontinued).

Water temperatures: October 1954 to June 1963 (discontinued).

EXTREMES, October 1962 to June 1963.--Dissolved solids: Maximum, 496 ppm Oct. 1-23; minimum, 128 ppm Mar. 1-5, 8-31.

Hardness: Maximum, 240 ppm Oct. 1-23; minimum, 72 ppm Mar. 1-5, 8-31.

Specific conductance: Maximum daily, 863 micromhos Oct. 2; minimum daily, 108 micromhos Mar. 5.

EXTREMES, 1954-63.--Dissolved solids: Maximum, 496 ppm Oct. 1-23; minimum, 128 ppm Mar. 1-5, 8-31.

Hardness: Maximum, 240 ppm Oct. 1-23; minimum, 72 ppm Mar. 1-5, 8-31.

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 available in district office at Columbus, Ohio. No discharge records available.

Chemical analyses, in parts per million, October 1962 to June 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 1-23, 1962.....								18	237	76	0.6	7.0	486	240	225	794		
Nov. 16-30 a.....								50	81	21	.2	2.4	23	113	72	367		
Dec. 1-31.....								30	93	33	.2	4.3	223	119	94	378		
Jan. 1-9, 13-15, 1963								32	96	28	.2	6.0	232	126	100	380		
Feb. 1-28.....								36	99	32	.2	4.9	246	128	98	406		
Mar. 1-5, 8-31.....								34	81	15	.0	2.2	128	72	56	209		
Apr. 1-30.....								34	127	27	.1	3.2	181	110	82	320		
May 1-30.....								32	102	26	.1	2.9	209	124	98	373		
June 1-30.....																		
Time-weighted average.....								31	107	32	0.2	3.9	240	130	104	402		

a Sample for Nov. 28 contained 28 ppm alkyl benzene sulfonate (ABS).

Analyses based on monthly extremes of specific conductance

Oct. 2, 1962 (maximum).....								16	251	90	0.7	7.2	540	144	131	863	7.4	
Oct. 9 (minimum).....								34	224	62	.7	7.6	459	233	205	755	7.0	
Nov. 17 (maximum)....								92	100	26	1.0	.4	330	113	38	471	7.0	
Nov. 30 (minimum)....								20	82	24	.1	3.2	178	94	78	298	7.8	
Dec. 18-20 (maximum)...								32	106	44	.3	5.8	259	140	114	442	6.6	
Dec. 22 (minimum)....								28	56	22	.2	3.5	151	80	57	261	6.9	

OHIO RIVER MAIN STEM--Continued  
 3-1596. OHIO RIVER AT LOCK AND DAM 22, AT RAVENSWOOD, W. VA.--Continued  
 Analyses based on monthly extremes of specific conductance--Continued

Chemical analyses, in parts per million, October 1962 to June 1963--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180° C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25° C)	pH	Color
														Calcium	Non-carbonate			
Jan. 9, 1963 (maximum).....								37	101	31	.3	7.2	246	137	107	408	6.8	
Jan. 14 (minimum)...								32	78	25	.2	5.0	190	83	109	324	6.8	
Feb. 10-11 (maximum)								52	114	44	.2	5.5	292	148	106	499	7.0	
Feb. 1-3 (minimum)...								27	83	22	.2	4.5	189	104	82	314	6.8	
Mar. 28 (maximum)...								20	69	21	.0	2.5	143	87	70	248	6.7	
Mar. 5 (minimum)....								18	27	7.0	.0	2.6	94	37	22	108	6.6	
Apr. 18 (maximum)...								38	89	32	.2	4.6	213	124	93	359	--	
Apr. 1 (minimum)....								20	56	17	.2	3.2	115	72	56	214	--	
May 30 (maximum)....								30	148	30	.2	3.5	302	162	137	481	6.9	
May 1 (minimum)....								34	101	26	.4	2.8	247	131	103	368	7.3	
June 1 (maximum)....								28	108	26	.2	3.5	223	128	105	378	7.0	
June 15 (minimum)...								38	97	24	.1	2.6	210	129	98	360	7.1	

OHIO RIVER MAIN STEM--Continued  
 3-1586. OHIO RIVER AT LOCK AND DAM 22, AT RAVENSWOOD, W. VA.--Continued  
 Temperature (°F) of water, October 1962 to June 1963  
 (Once-daily measurement at 0600)

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

## KANAWHA RIVER BASIN

## 3-1765. NEW RIVER AT GLENLYN, VA.

LOCATION:--At the Glenlyn steam electric plant of the Appalachian Electric Power Company, 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 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 77°F July 1, 2, 20, 29, and Aug. 25; minimum, freezing point on several days in December, January, and February.

EXTREMES, 1951-63.--Water temperatures: Maximum, 84°F June 28, 1952; minimum, freezing point on many days during winter months.

Temperature °F of water, water year October 1962 to September 1963

Month	Day																												Aver- age			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		29	30	31
October.....	60	61	62	63	63	63	65	65	65	65	63	64	65	66	67	66	66	65	63	60	59	58	54	53	52	51	46	45	50	52	54	49
November.....	59	60	61	62	63	64	64	64	64	63	63	63	63	63	63	63	63	63	62	61	60	59	58	57	56	55	54	53	52	51	50	47
December.....	44	43	42	44	44	42	40	40	40	37	34	33	32	33	32	33	34	37	40	37	38	37	37	37	37	37	40	40	40	37	34	38
January.....	32	32	34	36	37	38	38	39	38	38	40	43	45	37	34	34	35	37	39	40	40	35	35	32	32	32	33	33	33	33	36	
February.....	33	40	34	34	34	39	36	39	38	37	39	38	35	35	33	33	32	34	37	37	40	34	32	35	36	39	34	40	--	--	36	
March.....	37	38	36	39	35	45	40	40	40	40	42	40	41	43	42	43	43	47	47	45	43	40	40	43	47	50	47	48	50	51	52	43
April.....	52	55	56	57	52	50	52	54	53	50	48	49	50	49	49	51	55	57	60	61	62	64	--	53	--	56	57	58	56	--	54	
May.....	53	52	53	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	
June.....	63	65	68	66	66	66	71	72	74	75	75	72	74	69	70	69	68	69	70	72	73	71	70	70	73	73	75	75	75	76	--	71
July.....	77	77	76	72	70	71	71	70	71	70	68	68	68	69	69	69	70	75	76	77	75	74	73	73	73	74	75	75	77	76	75	73
August.....	75	74	75	76	75	74	75	75	74	75	74	73	75	71	69	70	71	73	74	74	74	73	74	74	77	73	65	69	70	71	71	73
September.....	71	70	71	72	74	72	72	72	72	73	72	72	73	70	66	66	69	67	67	68	71	71	66	64	63	63	65	65	63	63	--	69

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

LOCATION.--Temperature recorder at Bluestone Dam stilling basin, 1,000 feet above gaging station, 0.9 mile upstream from mouth of Greenbrier River, and 2.2 miles upstream from Hinton, Summers County.  
DRAINAGE AREA.--4,604 square miles.  
RECORDS AVAILABLE.--Water temperatures: May 1953 to September 1963.  
EXTREMES, 1962-63.--Water temperatures: Maximum, 80° F on several days in July and August; minimum, freezing point on several days in January, and February. Maximum, 85° F Aug. 26, 1959; minimum, freezing point on several days in 1958 and 1961-63.  
EXTREMES, 1953-63.--Water temperatures: Maximum, 85° F Aug. 26, 1959; minimum, freezing point on several days in 1958 and 1961-63.

Temperature °F of water, water year October 1962 to September 1963  
(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	64	63	63	64	65	66	65	66	67	67	66	67	67	67	67	67	66	66	66	66	66	65	65	64	62	60	58	56	55	53	63	
	Minimum	63	63	63	63	63	64	65	65	65	65	65	66	66	66	66	66	66	66	66	66	66	65	64	64	62	60	58	54	52	51	51	62	
November	Maximum	51	51	51	51	51	51	50	50	50	50	50	50	50	49	48	48	48	48	49	49	49	49	48	48	47	46	45	44	44	--	49	48	
	Minimum	51	51	51	51	51	50	50	49	48	50	50	50	50	49	48	48	48	48	49	49	49	48	47	46	46	45	44	44	--	48	48		
December	Maximum	45	45	45	45	45	44	44	41	40	39	38	37	35	34	33	33	33	33	36	36	36	36	36	36	38	37	36	36	39	37	39	38	
	Minimum	44	45	45	44	44	41	40	39	39	38	37	35	34	33	33	32	32	33	35	36	36	38	37	36	35	33	33	32	32	35	35		
January	Maximum	34	32	32	33	34	35	36	36	38	39	39	41	43	43	40	37	35	35	36	38	39	40	38	37	35	33	33	33	32	32	36	36	
	Minimum	32	32	32	32	33	34	35	36	36	38	39	41	40	37	34	34	35	36	38	39	40	38	37	35	33	33	33	32	32	35	35		
February	Maximum	32	32	32	33	34	34	35	36	37	37	37	36	36	36	36	36	36	34	34	34	34	34	34	34	34	34	34	34	36	--	35	35	
	Minimum	32	32	32	32	33	33	34	35	36	37	37	36	36	36	36	35	34	33	33	33	33	33	33	33	33	33	33	33	33	--	34	34	
March	Maximum	36	36	38	39	40	41	42	42	42	41	41	41	41	41	41	42	43	43	44	44	44	44	44	44	44	45	45	45	49	51	53	43	
	Minimum	35	35	36	37	38	39	40	41	42	41	41	41	40	40	41	42	42	43	44	44	44	44	44	44	44	45	44	45	49	51	51	42	
April	Maximum	55	57	59	59	58	58	56	56	55	55	55	54	54	53	53	54	55	56	56	56	56	56	56	56	56	56	56	56	56	56	56	58	57
	Minimum	53	55	57	58	58	58	56	55	55	55	54	53	53	52	52	53	54	55	55	55	55	56	56	56	56	56	56	56	56	56	57	57	
May	Maximum	61	60	59	59	59	59	64	66	67	69	69	68	68	67	67	67	67	66	66	66	66	66	66	66	66	66	65	65	65	65	67	65	65
	Minimum	60	58	57	58	58	59	59	64	65	66	66	66	66	67	67	67	67	66	65	65	65	65	65	65	65	65	64	64	64	64	64	64	
June	Maximum	68	68	69	70	70	71	74	75	76	75	76	76	74	74	74	74	74	74	74	74	74	74	74	74	74	75	76	77	78	79	--	74	74
	Minimum	67	68	68	69	70	70	71	73	74	74	74	74	74	74	74	74	74	74	74	74	73	73	73	74	74	75	76	77	77	78	--	73	73
July	Maximum	79	79	80	79	79	79	78	78	76	75	74	74	74	74	74	75	76	78	78	78	77	77	77	77	78	78	80	80	79	79	77	77	
	Minimum	78	78	78	78	78	76	75	74	74	74	74	74	74	74	74	74	75	76	76	76	76	76	76	76	76	77	78	78	78	78	76	76	
August	Maximum	79	79	80	80	80	80	79	79	79	79	78	78	77	76	77	76	75	75	75	75	75	75	75	75	75	76	76	76	76	76	76	77	77
	Minimum	78	78	80	79	79	79	79	78	78	78	78	77	76	75	75	75	75	75	75	75	75	75	75	75	76	76	76	76	76	76	75	77	77
September	Maximum	75	76	76	75	74	74	74	74	74	74	74	74	73	73	73	72	72	71	71	71	71	71	71	70	70	69	68	68	--	73	--	73	
	Minimum	75	75	75	74	74	74	74	74	74	74	74	74	73	73	72	72	71	71	71	71	71	71	70	70	69	69	68	67	--	72	--	72	

## KANAWHA RIVER BASIN--Continued

## 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.--37,068 square miles (at discontinued gaging station).

PERIOD OF RECORD.--October 1962 to September 1963.

EXTREMES 1962-63.--Water temperatures: Maximum, 82°F July 18, 20, and Aug. 1, 3; minimum, freezing point on many days during winter months.

EXTREMES 1946-63.--Water temperatures: Maximum, 82°F July 24, 1952, July 2, 1959; minimum, freezing point on several days during winter months.

Month	Temperature °F of water, water year October 1962 to September 1963																															Aver- age
	Day																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October.....	56	56	57	56	57	56	57	60	58	57	58	59	60	59	58	56	56	56	54	52	49	46	41	38	33	35	35	36	38	52		
November.....	37	37	36	38	38	39	37	38	42	43	43	41	40	39	38	40	44	44	43	43	44	44	42	40	40	35	33	35	37	34	--	39
December.....	34	35	34	35	36	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	32	32	32	32	32	33
January.....	32	32	32	32	32	32	32	32	32	32	32	34	34	33	32	32	32	32	33	32	32	32	32	32	32	32	32	32	32	32	32	32
February.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
March.....	32	33	34	33	34	34	33	33	33	33	38	38	38	42	40	40	40	40	40	40	38	36	37	40	42	42	43	44	48	48	48	39
April.....	48	48	49	50	50	50	50	50	50	48	48	48	48	48	46	48	50	52	52	58	58	63	56	50	52	50	52	50	50	--	51	
May.....	48	46	48	53	55	58	58	59	62	63	67	62	61	55	58	58	58	58	58	58	57	58	55	57	57	58	58	58	59	59	57	66
June.....	60	65	65	60	58	60	65	66	65	66	67	65	64	65	65	66	63	68	68	70	69	68	66	68	69	70	70	70	70	--	--	66
July.....	77	74	75	76	74	70	70	70	72	72	71	70	69	70	67	70	72	78	76	78	72	72	74	72	72	72	74	74	74	77	73	73
August.....	78	77	78	76	75	74	75	74	76	75	69	67	68	68	63	63	65	68	67	70	71	73	73	72	72	71	72	72	71	71	--	71
September.....	66	65	68	70	70	67	65	66	65	64	65	65	65	65	60	60	60	63	60	63	67	65	59	58	58	58	56	58	56	58	--	63





## KANAWHA RIVER BASIN--Continued

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

LOCATION.--At Appalachian Electric Power Company, Cabin Creek steam electric cooling water intakes, at Cabin Creek, Kanawha

DRAINAGE AREA.--8,661 square miles.

RECORDS AVAILABLE.--Water temperatures: October 1950 to September 1963.

EXTREMES, 1950-63.--Water temperatures: Maximum, 92°F on several days in August 1955 and 1959; minimum, freezing point Feb. 10,

1951 and Feb. 14-16, 1958.

REMARKS.--Temperature records furnished by the Appalachian Electric Power Company.

Temperature °F of water, water year October 1962 to September 1963

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	68	61	65	68	--	--	68	69	70	71	71	--	--	72	74	72	71	71	--	--	69	69	67	65	62	--	--	58	58	59	--
November.....	55	54	--	--	--	--	--	53	51	52	--	50	50	48	48	49	--	--	49	49	48	--	48	--	--	--	--	--	44	--	44	--
December.....	--	--	--	45	45	43	44	43	--	--	39	38	36	34	35	--	--	35	35	35	36	37	--	38	--	37	37	30	--	--	36	--
January.....	--	33	33	--	--	--	--	35	36	37	38	39	42	--	40	39	37	37	36	--	--	37	37	36	34	35	--	--	33	33	34	34
February.....	34	--	--	33	34	35	36	37	37	--	37	36	36	35	34	--	--	35	35	35	34	34	34	--	--	35	35	38	36	--	--	--
March.....	35	--	--	--	40	41	42	41	--	--	38	42	43	44	44	--	--	48	48	47	47	41	--	--	--	48	49	49	49	--	--	--
April.....	54	58	60	60	--	--	--	57	58	58	57	56	--	--	56	56	57	57	59	--	--	64	66	64	63	63	--	--	64	64	--	--
May.....	62	60	--	--	--	--	64	66	67	68	69	--	--	69	70	71	70	70	--	--	67	67	66	65	--	--	66	68	67	68	68	--
June.....	--	--	--	71	71	68	67	69	71	--	73	75	75	75	76	--	--	77	77	77	77	76	77	77	78	80	80	81	--	--	--	--
July.....	82	83	--	--	--	--	--	80	81	79	79	79	--	--	80	80	81	82	82	--	--	82	83	83	81	82	--	--	83	83	83	--
August.....	84	84	80	--	--	--	82	80	80	--	--	82	83	82	82	82	--	--	82	81	81	80	82	--	--	83	83	82	82	81	--	--
September.....	--	--	--	81	82	81	81	--	--	--	80	81	81	82	81	--	--	80	79	80	79	79	--	--	78	77	76	77	--	--	76	--







## KANAWHA RIVER BASIN--Continued

3-1970. ELK RIVER AT QUEEN SHOALS, W. VA.

LOCATION.--Temperature recorder at gaging station, 50 feet upstream from Queen Shoals Creek, 100 feet downstream from highway bridge at Queen Shoals, Kanawha County, and 4 miles upstream from Big Sandy Creek.  
 DRAINAGE AREA.--1,145 square miles (including that of Queen Shoals Creek).  
 RECORDS AVAILABLE.--Water temperatures: November 1960 to September 1963.  
 EXTREMES, 1960-63.--Water temperatures: Maximum, 84°F July 2, 3, 1963; minimum, freezing point on several days during January and February 1963.

Temperature, °F of water, water year October 1962 to September 1963  
 (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	63	63	64	64	64	64	64	64	64	64	64	65	66	67	67	67	67	66	65	64	63	62	60	58	56	52	50	50	50	52	62		
Maximum	63	63	64	64	64	64	64	64	64	64	64	64	64	65	66	67	66	65	64	63	62	60	58	56	52	50	50	50	50	50	61		
Minimum	63	63	64	64	64	64	64	64	64	64	64	64	64	64	65	66	67	66	65	64	63	62	60	58	56	52	50	50	50	50	62		
November	53	53	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	61		
Maximum	53	53	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	61		
Minimum	52	53	53	52	51	50	50	50	50	50	50	50	50	50	49	48	48	48	48	48	48	48	46	46	46	45	44	43	43	--	49		
December	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	48	
Maximum	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	48	
Minimum	42	41	41	41	40	39	38	37	36	35	35	35	35	35	34	34	34	33	33	33	36	37	38	38	37	37	37	37	37	37	37	37	
January	36	36	34	34	33	33	33	34	34	35	36	38	38	38	36	34	34	34	34	34	34	33	33	33	33	33	33	33	33	33	33	34	
Maximum	34	34	33	33	33	33	33	34	34	35	36	38	38	38	36	34	34	34	34	34	34	33	33	33	33	33	33	33	33	33	33	34	
Minimum	34	34	33	33	33	33	33	34	34	35	36	38	38	38	36	34	34	34	34	34	34	33	33	33	33	33	33	33	33	33	33	34	
February	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	
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	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	32	32	32	32	33	
March	33	33	34	36	39	40	41	41	41	42	42	42	44	44	42	45	45	46	46	46	45	43	45	46	46	47	48	49	50	52	43	43	
Maximum	33	33	34	36	39	40	41	41	41	42	42	42	44	44	42	45	45	46	46	46	45	43	45	46	46	47	48	49	50	52	43	43	
Minimum	33	33	34	34	36	40	41	41	41	41	41	42	42	42	42	42	45	45	46	45	43	43	45	44	44	44	47	48	49	50	42	42	
April	52	54	57	57	57	56	55	55	55	54	54	54	54	54	54	54	54	56	58	63	64	64	64	62	61	60	60	61	61	--	58	58	
Maximum	52	54	57	57	57	56	55	55	55	54	54	54	54	54	54	54	54	56	58	63	64	64	64	62	61	60	60	61	61	--	57	57	
Minimum	52	52	55	57	56	55	55	55	54	54	54	54	54	54	54	54	54	56	58	63	64	62	61	60	60	60	60	61	--	--	57	57	
May	61	60	60	61	61	65	66	67	69	71	71	70	69	68	68	69	69	69	69	69	68	68	67	67	67	67	67	68	69	71	67	67	
Maximum	61	60	60	61	61	65	66	67	69	71	71	70	69	68	68	69	69	69	69	69	68	68	67	67	67	67	67	68	69	71	67	67	
Minimum	60	60	60	61	63	65	66	67	69	70	69	68	68	68	68	69	69	69	69	68	68	67	67	67	67	67	67	68	69	71	66	66	
June	72	73	73	70	61	63	66	67	67	66	66	67	68	68	68	69	70	71	72	72	73	74	76	78	79	81	81	82	--	71	70	70	
Maximum	71	72	73	70	61	63	66	67	67	66	66	67	68	68	68	69	70	71	72	72	73	74	76	78	79	81	81	82	--	70	70	71	
Minimum	71	72	73	70	61	63	66	67	67	66	66	67	68	68	68	69	70	71	72	72	73	74	76	78	79	81	81	82	--	70	70	71	
July	81	84	84	83	80	78	77	76	76	75	76	76	76	76	77	78	80	82	82	82	80	79	77	76	76	78	78	78	79	79	79	79	79
Maximum	82	83	83	80	78	77	76	76	75	75	76	76	76	76	77	78	80	82	82	80	79	77	76	76	76	78	78	78	79	79	79	79	79
Minimum	82	83	83	80	78	77	76	76	75	75	76	76	76	76	77	78	80	82	82	80	79	77	76	76	76	78	78	78	79	79	79	79	79
August	80	81	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82
Maximum	79	80	81	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82
Minimum	78	78	78	78	78	77	76	76	76	76	76	76	76	75	74	72	72	72	72	72	71	70	69	68	67	66	66	66	66	66	66	66	66
September	77	77	77	78	78	77	76	76	76	76	76	76	76	75	74	72	72	72	72	72	71	70	69	68	67	66	66	66	66	66	66	66	66
Maximum	77	77	77	78	78	77	76	76	76	76	76	76	76	75	74	72	72	72	72	72	71	70	69	68	67	66	66	66	66	66	66	66	66
Minimum	77	77	77	78	78	77	76	76	76	76	76	76	76	75	74	72	72	72	72	72	71	70	69	68	67	66	66	66	66	66	66	66	66

## KANAWHA RIVER BASIN--Continued

3--1960. KANAWHA RIVER AT CHARLESTON, W. VA.

LOCATION.--Temperature recorder at gaging station at old lock 6, 1 mile upstream from Davis Creek, 1.5 miles downstream from Twomile Creek, 2 miles downstream from Patrick Street Bridge at Charleston, Kanawha County, and 3.5 miles downstream from Elk River.

DRAINAGE AREA.--10,419 square miles.

RECORDS AVAILABLE.--Water temperatures: March 1953 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 91°F Aug. 3; minimum, 34°F Dec. 15, 16.

EXTREMES, 1953-63.--Water temperatures: Maximum, 95°F Aug. 25, 26, 1959; minimum, 34°F on several days in 1961-63. Thermograph was not in operation from Jan. 24 to June 30; temperature readings during this period are from once-daily readings at the thermograph station. The thermograph is located 1.2 miles above the stream-gaging station. The upper pump-house is located 1.2 miles above the stream-gaging station.

Temperature °F of water, water year October 1962 to September 1963

(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	70	70	71	69	69	69	67	67	68	71	70	74	75	75	75	73	71	71	72	72	69	68	64	62	64	64	65	59	69	--	
	Minimum	67	67	68	69	69	69	67	67	67	66	68	69	70	74	74	73	72	70	70	70	69	66	63	60	60	60	60	60	59	55	67	--	
	Mean	67.5	67.5	69	69.5	70.5	69	68.5	68.5	67.5	67.5	68.5	70.5	70.5	74	74.5	74.5	74	71.5	70.5	70.5	70.5	69.5	66.5	63.5	60.5	60.5	60.5	60.5	59.5	57	63	68	
November	Maximum	56	55	54	54	53	52	51	51	51	50	50	50	50	50	50	51	51	51	51	50	50	49	48	48	48	48	48	47	46	48	51	--	
	Minimum	55	54	54	53	52	51	51	51	51	50	50	50	50	50	50	50	50	50	50	50	49	48	48	48	48	48	47	46	48	51	--		
	Mean	55.5	54.5	54	53.5	52.5	51.5	51.5	51.5	51.5	50.5	50.5	50.5	50.5	50.5	50.5	50.5	50.5	50.5	50.5	50.5	49.5	48.5	48.5	48.5	48.5	48.5	47.5	46.5	48	50.5	50.5	50.5	
December	Maximum	48	48	49	49	47	45	46	45	44	42	41	40	36	38	40	39	38	39	38	39	39	39	39	39	39	39	39	41	41	39	42	--	
	Minimum	45	46	45	45	44	44	45	44	44	40	38	36	34	34	35	35	36	36	38	38	38	38	38	38	38	38	39	39	39	41	39	40	
	Mean	46.5	46.5	47	47	45.5	44.5	45.5	44.5	44.5	41	39	37	34	34	35	35.5	35.5	37	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	39	40	40	40	40	40	
January	Maximum	38	37	37	37	37	38	39	40	41	42	43	42	41	40	39	39	39	39	39	39	41	41	--	--	--	--	--	--	--	--	--	--	
	Minimum	36	36	35	35	35	35	36	38	40	41	41	40	39	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	37	
	Mean	37	36.5	36	36	36	36.5	37.5	38.5	39.5	40.5	41	40.5	39.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	39.5	39.5	39.5	39.5	39.5	39.5	39.5	39.5	39.5	39.5	39.5	39	
February	Maximum	38	37	38	38	43	43	42	41	41	41	41	41	41	42	44	50	48	47	46	43	43	43	43	48	48	50	51	50	52	45	--		
	Minimum	35	35	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	35	
	Mean	36.5	36	37	37	39.5	39.5	39.5	38.5	38.5	38.5	38.5	38.5	38.5	39	40	48	48	47.5	46.5	43.5	43.5	43.5	43.5	48	48.5	49.5	50.5	51	50.5	45.5	35.5		
March	Maximum	55	55	56	59	58	57	58	59	57	57	58	57	57	58	57	58	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	60	
	Minimum	61	63	62	62	62	63	66	66	68	70	69	66	69	72	70	69	71	70	69	67	64	69	66	67	67	70	68	70	70	70	70	67	
	Mean	58	59	59	60.5	60	59.5	60.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	
April	Maximum	69	72	72	72	72	69	71	70	74	74	71	73	72	75	73	74	73	73	73	75	75	77	78	79	80	80	80	80	80	80	80	74	
	Minimum	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	
	Mean	74.5	76	76	76	76	74.5	75.5	77	77	77	75.5	76.5	76.5	77.5	76.5	76.5	76	76	76	77.5	77.5	78.5	79.5	80	80	80	80	80	80	80	80	77	
May	Maximum	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	
	Minimum	82	85	83	83	82	82	83	84	83	81	82	81	82	83	84	86	84	86	84	86	84	86	84	86	84	86	84	86	84	85	83	83	
	Mean	81	82.5	83	83	82	82.5	83.5	83.5	82	82.5	81.5	81.5	81.5	82.5	84	85	85	85	85	85	85	85	85	85	85	85	85	85	85	84.5	84	83	
June	Maximum	90	90	88	87	85	87	86	87	86	84	87	88	86	88	88	89	88	89	88	85	84	84	86	87	87	86	87	86	89	86	86	86	
	Minimum	82	85	83	83	82	82	83	84	83	81	82	81	82	83	84	86	84	86	84	86	84	86	87	87	86	87	86	89	86	86	86	86	
	Mean	86	87.5	85.5	85	86.5	86.5	86.5	86.5	86.5	85.5	86.5	87.5	87.5	88.5	89	89	89	89	89	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	88	87.5	87.5	87.5	87.5	
July	Maximum	85	84	86	83	82	78	76	78	80	80	83	83	80	80	81	82	81	81	80	81	84	83	82	84	83	82	84	83	82	84	83	82	83
	Minimum	90	90	88	87	85	87	86	87	86	84	87	88	86	88	88	89	88	89	88	85	84	84	86	87	87	86	89	86	86	86	86	86	
	Mean	87.5	87.5	87.5	85	86	87.5	86.5	86.5	86.5	85.5	87.5	88.5	87.5	88.5	88.5	89	88.5	89	88.5	86.5	86.5	86.5	87.5	87.5	87.5	87.5	88	87.5	87.5	87.5	87.5	87.5	
August	Maximum	80	89	91	89	87	83	78	81	86	86	86	86	85	85	85	84	86	88	87	87	87	87	87	86	87	86	89	86	86	82	83	83	
	Minimum	85	84	86	83	82	78	76	76	78	80	80	83	83	80	80	81	82	81	81	80	81	84	83	82	84	83	85	84	83	82	83	83	
	Mean	82.5	91.5	89.5	86	84.5	80.5	79.5	79.5	82.5	83	83	84	84	82.5	82.5	82.5	83.5	84.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	
September	Maximum	86	85	87	85	86	85	86	85	86	86	87	88	84	82	83	82	84	83	83	82	81	79	79	79	79	80	78	78	78	74	74	74	74
	Minimum	84	81	82	83	82	82	81	84	83	82	82	81	79	81	79	80	80	79	79	80	78	76	76	76	76	74	75	74	74	74	74	74	74
	Mean	85	83	84.5	84	83.5	83.5	83.5	83.5	83.5	82.5	82.5	82.5	82.5	81.5	81.5	81.5	81.5	81.5	81.5	81.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5



Feb. 1-28, 1963	25	32	20	.1	6.5	--	109	61	40	199	--	--	.00
Feb. 1 (maximum monthly).....	45	41	38	.1	.6	--	140	84	47	300	6.3	--	--
Feb. 6 (minimum monthly).....	18	25	10	.1	5.0	--	80	42	27	132	6.3	--	--
Mar. 1-31.....	22	29	6.5	.1	5.1	--	84	46	28	140	--	0.1	.00
Mar. 2 (maximum monthly).....	32	37	26	.1	6.5	--	140	76	50	232	7.4	--	--
Mar. 7 (minimum monthly).....	12	19	3.0	.0	3.1	--	55	30	20	90	7.1	--	--
Apr. 1-30.....	36	42	30	.1	8.5	--	155	84	54	278	--	.0	.00
Apr. 24 (maximum monthly).....	42	46	50	.1	8.6	--	204	108	74	367	6.9	--	--
Apr. 1 (minimum monthly).....	36	22	11	.0	5.1	--	90	58	28	151	6.8	--	--
May 1-31.....	34	38	34	.2	7.7	--	153	82	54	280	--	.0	.00
May 16 (maximum monthly).....	62	39	52	.1	.3	--	172	100	49	361	6.8	--	--
May 22 (minimum monthly).....	32	25	17	.1	4.0	--	86	55	29	173	6.8	--	--
June 1-30.....	24	37	30	.2	7.7	--	132	73	54	252	--	.1	.00
June 27 (maximum monthly).....	26	59	54	.1	3.8	--	224	111	90	396	6.7	--	--
June 8 (minimum monthly).....	18	20	14	.2	4.4	--	74	42	27	137	6.6	--	--
July 22 (maximum monthly).....	80	60	80	--	.1	--	245	124	58	506	6.7	--	--
July 10 (minimum monthly).....	40	46	38	--	8.6	--	178	92	59	322	6.5	--	--
July 2 (maximum monthly).....	--	58	--	--	--	--	--	--	--	454	6.1	0.0	--
July 20 (maximum monthly).....	--	61	--	--	--	--	--	--	--	486	5.8	.1	--
July 7/11-20)	--	--	--	--	0.18	--	--	--	--	--	--	--	--
num 7/11-20)	--	--	--	--	--	--	--	--	--	--	--	--	--



## KANAWHA RIVER BASIN--Continued

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

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Silica alum (SiO <sub>2</sub> ) (Al)	Iron (Fe)	Mang- nese (Mn)	Cal- cium (Ca)	Mag- nium (Mg)	Sodium (Na)	Pot- as- ium (K)	Lith- ium (Li)	Bi- car- bon- ate (HCO <sub>3</sub> )	Car- bor- ate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Phos- phate (PO <sub>4</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>	To-Specific conduct- ance (micro- hm at 25°C)	Col- or pH	Alkyl Am- monia sul- fo-gen (NO <sub>2</sub> ) (NH <sub>4</sub> )	
Aug. 29, 1963 (maximum monthly)....				51	7.3				20		65	116	--	0.4	--	378	157	141	631	5.5	--
Aug. 10 (mini- um monthly).				18	3.7				32		30	20	--	5.0	--	118	60	34	198	6.2	--
Aug. 6 (maximum monthly).				--	--				--		48	--	--	--	0.20	--	--	--	424	6.4	0.1
Aug. 8/1-10)....				--	--				--		53	--	--	--	.16	--	--	--	388	6.3	.1
Aug. 28 (maxi- um monthly).				--	--				--				--	--	--	--	--	--	716	6.6	--
Sept. 17 (maxi- um monthly).				50	8.0				84		73	133	--	.2	--	398	158	89	559	6.3	--
Sept. 4 (mini- um monthly).				41	7.3				64		75	86	--	.1	--	297	132	80	638	6.5	--
Sept. 10 (maxi- um monthly).				--	--				--		78	--	--	--	.32	--	--	--	703	6.4	.1
Sept. 23 (maxi- um monthly).				--	--				--		67	--	--	--	.34	--	--	--	703	6.4	.2

## KANAWHA RIVER BASIN--Continued

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

Temperature (°F) of water, water year October 1962 to September 1963  
(Once-daily measurement at approximately 0600)

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

## OHIO RIVER MAIN STEM

3-2022. OHIO RIVER NEAR HUNTINGTON, W. VA.

LOCATION.--At intake line to Ohio River Valley Water Sanitation Commission (ORSANCO) monitor at the Huntington filtration plant at 40th Street and River Road, Cabell County, 0.5 mile upstream from Guyandotte River, and 6.7 miles upstream from gaging station.

DRAINAGE AREA.--54,200 square miles, approximately.

RECORDS AVAILABLE.--Chemical analyses: July to September 1963.

TEMPERATURES.--Water temperature: July to September 1963.

REMARKS.--Records of specific conductance of daily samples are available in district office at Columbus, Ohio.

Analyses were made on the maximum daily specific conductance for each week or 10-day period and on the maximum and minimum daily specific conductance for each month. Records of discharge are given for Ohio River at Huntington.

## Chemical analyses, in parts per million, July to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (residue at 180°C) PO <sub>4</sub>	Hardness as CaCO <sub>3</sub>	To-Specific acid-ance pH (micro-mhos at 25°C)	Colloids or C <sub>2</sub> H <sub>4</sub> sulfonate OH (ABS)	Organics
July 6, 1963 (maximum weekly).....	15500					--	--			--	91	--		--	0.14	--	377	7.4	0.0
July 12 (maximum monthly).....	14000					50	11			36	118	70		7.2	--	340	170	141	--
July 1 (minimum monthly).....	19700					35	7.6			38	81	33		3.8	--	212	119	88	--
Aug. 15 (maximum weekly).....	11500					--	--			--	121	--		--	.09	--	523	6.5	.1
Aug. 29 (maximum monthly).....	9670					53	11			40	145	66		5.2	--	355	177	144	--
Aug. 21 (minimum monthly).....	7700					31	6.1			32	76	32		4.8	--	201	103	76	--
Sept. 10 (maximum 9/1-10).....	11400					--	--			--	148	--		--	.11	--	646	6.0	.1
Sept. 10 (maximum 9/11-20).....	9650					--	--			--	173	--		--	.08	--	685	6.1	.1
Sept. 29 (maximum monthly).....	7420					63	14			24	186	86		8.0	--	440	215	195	--
Sept. 7 (minimum monthly).....	11400					51	10			36	136	68		5.7	--	344	168	139	--





## BIG SANDY RIVER BASIN--Continued

3-2125. LEVISA FORK AT PAINTSVILLE, KY.

LOCATION.--At bridge on State Highway 40 at Paintsville, Johnson County, 200 feet downstream from Paint Creek, and 700 feet upstream from Paint Creek, on gravel bottom.

DRAINAGE AREA.--2,143 square miles.

RECORDS AVAILABLE.--Chemical analyses: October 1949 to March 1953, November 1960 to September 1961.

Water temperatures: October 1949 to March 1953, November 1960 to September 1963.

Sediment records: October 1952 to March 1963, 89°F July 27; minimum, freezing point on several days during December and March.

EXTREMES, 1962-63.--Water temperatures: Maximum, 89°F July 27; minimum, freezing point on several days during December and March.

Sediment concentrations: Maximum daily, 3,360 ppm Mar. 12; minimum daily, 1 ton on several days during April and May.

EXTREMES, 1949-53, 1960-63.--Water temperatures: Maximum, 89°F July 27, 1953; minimum, freezing point on several days during December and March.

Sediment concentrations: Maximum daily, 3,360 ppm Mar. 12, 1963; minimum daily, 1 ton on several days during April and May 1963.

Sediment loads (1952-53, 1960-63): Maximum daily, 402,000 tons Mar. 13, 1963; minimum daily, 1 ton on many days during 1952 and 1963.

REMARKS.--No temperature record Dec. 27 to Feb. 4. Flow slightly regulated by Dewey Reservoir. Flow affected by ice Dec. 12-17, Jan. 24, 25.

Temperature (°F) of water, water year October 1962 to September 1963																																	
Month			Day																												Average		
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28			29
October.....	70	74	74	74	75	75	75	75	74	74	76	75	75	75	75	74	74	73	74	73	72	72	72	70	70	66	62	66	65	64	62	74	
November.....	62	60	56	58	57	54	50	48	46	44	44	43	42	42	43	43	44	42	41	42	42	43	40	40	40	49	40	42	40	--	46		
December.....	--	--	42	42	44	38	36	35	34	32	32	34	32	34	34	34	36	36	37	40	42	44	43	43	--	--	--	--	--	--	38		
January.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
February.....	--	--	--	--	44	40	--	40	39	41	37	39	35	33	37	35	35	32	35	45	38	41	38	35	38	38	40	40	--	--	--	--	
March.....	--	--	40	50	49	49	44	48	--	48	50	48	51	54	40	--	52	58	51	45	45	52	--	--	56	55	60	--	61	65	--	50	
April.....	66	70	62	60	60	60	61	60	58	57	64	58	55	57	59	67	68	68	68	69	73	65	61	65	68	66	65	65	60	--	64		
May.....	65	66	65	69	70	71	73	72	75	79	88	70	74	71	76	75	75	70	72	70	65	70	65	72	70	71	74	72	70	71	74	79	
June.....	72	75	73	72	78	80	79	80	85	86	83	78	80	81	80	79	78	80	--	78	70	74	--	79	80	83	83	79	84	85	--	79	
July.....	85	85	82	83	75	77	78	76	75	79	80	78	80	--	83	84	86	84	80	81	80	81	82	85	86	89	84	81	82	85	82	85	
August.....	83	82	85	82	82	80	82	84	80	79	78	76	75	75	80	78	75	75	75	80	80	80	81	72	78	80	81	79	76	74	79	74	
September.....	78	78	75	78	78	76	79	75	78	77	78	78	--	75	75	76	74	76	75	77	70	70	71	71	78	69	68	70	65	68	68	--	74

## QUALITY OF SURFACE WATERS, 1963

## BIG SANDY RIVER BASIN--Continued

## 3-2125. LEVISA FORK AT PAINTSVILLE, KY.--Continued

Suspended sediment, water year October 1962 to September 1963  
(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..	196	22	12	458	--	240	1020	37	104
2..	170	16	7	2010	--	1300	874	13	31
3..	155	13	5	2300	--	300	742	10	20
4..	147	18	7	2200	16	95	655	5	9
5..	133	22	8	2080	11	62	635	12	20
6..	122	19	6	641	--	220	826	9	20
7..	117	22	7	316	--	95	1320	8	28
8..	167	17	8	284	27	21	1720	26	121
9..	184	27	13	330	29	26	1630	20	88
10..	161	17	7	2270	--	1500	1560	26	110
11..	138	20	7	9910	616	16500	1460	30	118
12..	120	6	2	8250	546	13100	1050	25	71
13..	115	8	2	3140	225	1910	860	13	30
14..	117	6	2	1830	180	869	700	6	11
15..	181	4	2	1250	160	540	800	10	22
16..	147	9	4	952	155	398	900	10	24
17..	128	8	3	766	188	389	1000	9	24
18..	144	13	5	784	175	370	1070	6	17
19..	193	15	8	1480	156	623	1180	14	45
20..	167	20	9	1870	124	626	1300	8	28
21..	147	36	14	1740	31	146	4750	909	S 15800
22..	128	45	16	3600	325	3610	8820	650	B 16000
23..	125	43	14	6970	1060	20000	9430	295	7510
24..	120	13	4	6640	800	14000	6790	397	7280
25..	270	16	12	3550	410	3930	3780	93	949
26..	280	8	6	2350	167	1060	3350	46	416
27..	260	6	4	1940	39	204	4110	81	899
28..	210	5	3	1580	45	192	5660	--	2200
29..	180	7	3	1340	23	83	5530	--	1500
30..	160	6	2	1170	17	54	6150	--	5500
31..	150	5	2	--	--	--	9250	--	9500
Total	5032	--	204	74001	--	82483	68922	--	68493
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..	7090		2600	2540	--	210	3350	123	1110
2..	4520		1000	2880	--	500	4380	200	2360
3..	3040		470	8150	--	23000	6750	382	6960
4..	3560		260	13300	--	18000	6890	260	4840
5..	2110		170	10200	293	8070	7930	421	S 9760
6..	1820		150	5470	195	2880	18800	2720	S 138000
7..	1640		150	4260	114	1310	30100	2060	167000
8..	1510		140	3480	92	864	27900	725	S 57600
9..	1440		120	2850	74	569	12000	360	11700
10..	1350		120	2340	60	379	6970	320	6020
11..	1340		120	2580	61	425	9010	743	18100
12..	2650		700	4920	107	1420	29800	3360	S 289000
13..	5930		4300	5530	145	2160	51000	2920	402000
14..	6910		3200	4690	106	1340	51900	971	136000
15..	5360		1600	3650	45	443	28700	600	46500
16..	3900		840	2840	50	383	11600	650	20400
17..	3030		500	2700	23	168	13700	1980	S 61800
18..	2620		450	2540	33	226	28800	2170	169000
19..	2440		330	2790	76	572	28700	490	S 39800
20..	2260		270	3660	210	2080	16500	330	14700
21..	2290		260	6190	320	5350	9090	340	8340
22..	2570		290	8340	374	8620	6880	240	4460
23..	2370		240	5740	245	3800	2690	207	3180
24..	2100		160	4480	95	1150	7100	217	4160
25..	2050		170	3950	62	661	6500	221	3940
26..	2210		180	3400	58	532	6260	213	3600
27..	3100		800	3420	60	554	6050	200	3270
28..	3230		490	3310	63	563	4950	150	2000
29..	2340		170	--	--	--	2410	71	462
30..	1970		130	--	--	--	2040	70	386
31..	2120		150	--	--	--	1810	56	274
Total	89870		20000	130200	--	86029	453660	--	1636722

S Computed by subdividing day.

B Computed from estimated-concentration graph.

## BIG SANDY RIVER BASIN--Continued

3-2125. LEVISA FORK AT PAINTSVILLE, KY.--Continued

Suspended sediment, water year October 1962 to September 1963--Continued  
(Where no concentrations are reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	1670	52	234	448	2	2	2560	280	1940
2..	1560	40	168	555	1	1	2000	97	524
3..	1460	35	138	505	1	2	1500	51	206
4..	1340	30	108	496	1	1	1250	33	111
5..	1250	20	68	452	1	1	1100	35	104
6..	1160	16	50	420	1	1	970	25	65
7..	1090	16	47	406	2	2	900	30	73
8..	1060	15	43	382	2	2	2000	26	140
9..	1070	15	43	368	3	3	1600	164	378
10..	1020	12	33	350	1	1	1200	177	573
11..	958	15	39	333	2	2	780	175	368
12..	886	10	24	314	2	2	620	80	134
13..	800	8	17	317	10	8	500	35	47
14..	760	7	14	371	6	6	450	25	30
15..	712	6	12	354	3	3	420	23	26
16..	660	5	9	354	2	2	410	20	22
17..	630	5	8	350	--	13	400	14	15
18..	585	2	3	820	220	490	390	16	17
19..	565	3	4	940	68	172	440	20	24
20..	575	2	3	946	27	69	420	184	991
21..	540	5	7	706	15	28	680	426	782
22..	527	6	8	579	4	6	500	366	494
23..	555	5	7	496	4	5	365	148	154
24..	565	1	2	432	4	5	330	86	77
25..	519	1	1	403	7	8	300	54	44
26..	500	1	1	368	8	8	285	27	41
27..	456	2	2	357	9	9	250	25	17
28..	417	6	7	2000	1260	13500	225	21	15
29..	406	3	3	3600	1240	15000	244	19	10
30..	417	2	2	2810	281	2600	231	12	7
31..	--	--	--	4270	674	7770	--	--	--
Total	24713	--	1105	25583	--	39722	23340	--	7407
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..	307	15	12	266	26	19	122	23	8
2..	537	44	89	700	72	136	105	15	4
3..	890	90	216	736	252	501	98	23	6
4..	537	145	210	420	242	274	119	28	9
5..	371	153	153	288	127	99	452	104	223
6..	282	388	295	228	65	40	1290	504	1760
7..	244	280	184	192	54	28	690	388	723
8..	311	124	104	183	55	27	409	260	287
9..	575	117	162	225	45	27	295	137	109
10..	399	276	297	317	150	128	241	72	47
11..	307	137	114	500	140	189	201	52	28
12..	285	70	54	409	350	386	169	85	39
13..	228	42	26	343	354	328	204	100	59
14..	201	41	22	279	302	227	204	118	65
15..	186	32	16	244	352	232	228	74	46
16..	177	27	13	301	163	132	216	47	27
17..	169	26	12	320	85	73	175	37	17
18..	153	20	8	247	63	42	146	32	13
19..	143	20	8	210	65	37	122	29	10
20..	146	25	10	201	75	41	108	23	7
21..	172	24	11	169	65	30	98	20	5
22..	190	22	11	157	45	19	88	23	5
23..	200	25	14	141	28	11	76	22	4
24..	220	23	14	177	28	13	70	24	4
25..	250	19	13	219	25	15	65	20	4
26..	219	16	9	198	20	11	61	20	3
27..	183	15	7	163	19	8	57	16	2
28..	160	21	9	141	18	7	53	17	2
29..	146	17	7	149	21	8	53	16	2
30..	143	20	8	169	22	10	52	16	2
31..	163	19	8	149	27	11	--	--	--
Total	8494	--	2136	8441	--	2658	6267	--	3516

Total discharge for year (cfs-days).....938523

Total load for year (tons).....1950475

S Computed by subdividing day.

A Computed from partly estimated-concentration graph.



## BIG SANDY RIVER BASIN--Continued

3-2125. LEVISA FORK AT PAINTSVILLE, KY.--Continued

Particle-size analyses of suspended sediment, water year October 1962 to September 1963

(Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; D, decantation; N<sub>1</sub>, in native water;P, pipet; S, sieve; V, visual accumulation tube; W<sub>1</sub>, in distilled water)

Date of collection	Time (24 hour)	Sam- pling point	Water tem- per- ature (°F)	Discharge (cfs)	Sediment concen- tration (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. 12, 1962.....	1200			8470	554		41	56	75	92	98	99	100	---	---	---	---	SBWC
Mar. 12, 1963.....	1100			30500	3110		34	49	65	80	94	98	99	100	---	---	---	SBWC
Mar. 13.....	1000			50600	3190		34	50	68	82	92	96	98	100	---	---	---	SBWC
Mar. 14.....	1230			53100	833		49	62	72	81	87	90	93	97	100	---	---	SEN
Mar. 14.....	1230			53100	833		35	49	67	79	85	89	93	96	100	---	---	SBWC
July 6.....	1800			265	512		82	93	95	96	97	98	100	---	---	---	---	SBWC
July 6.....	1800			265	512		83	95	97	98	98	98	100	---	---	---	---	SBWC
Aug. 12.....	1800			388	428		84	98	99	99	99	100	---	---	---	---	---	SBWC



## BIG SANDY RIVER BASIN--Continued

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

LOCATION.--At the Catlettsburg, Kenova, and Corrado Water Company intake at Catlettsburg, Boyd County, 300 feet upstream from bridge on U.S. Highway 60, 13 miles upstream from Catlettsburg, 13 miles upstream from Corrado, and 19 miles upstream from mouth.

DRAINAGE AREA.--4,281 square miles, approximately.

RECORDS AVAILABLE.--Chemical analyses: October 1956 to June 1963 (discontinued).

EXTREMES, October 1956 to June 1963 (discontinued).

Water temperatures: Maximum, 82° F. Oct. 1-31; minimum, 56° F. Mar. 1, 5-30.

Hardness: Maximum, 182 ppm Oct. 1-31; minimum, 56 ppm Mar. 1, 5-30.

Specific conductance: Maximum daily, 769 micromhos Oct. 4; minimum daily, 111 micromhos Mar. 13.

Water temperatures: Minimum, freezing point on several days during December to February.

EXTREMES, 1956 to 1963 (discontinued).

Water temperatures: Maximum, 82° F. Oct. 1-31; minimum, 56° F. Mar. 1, 5-30.

Hardness: Maximum, 182 ppm Oct. 1-31; minimum, 56 ppm Mar. 1, 5-30.

Specific conductance: Maximum daily, 876 micromhos Sept. 10, 1957; minimum daily, 86 micromhos Feb. 28, 1962.

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.

Chemical analyses, in parts per million, October 1962 to June 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Phosphate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 1-31, 1962.....								92	164	50	0.2	3.0	415	182	107	667		
Nov. 1-30.....								40	71	19	.1	2.5	176	88	55	305		
Dec. 1-22, 24-31....								46	68	23	.2	2.8	179	89	52	304		
Jan. 1-5, 7-25, 30-31, 1963.....								42	60	13	.1	2.4	153	77	42	252		
Feb. 1-28.....								32	51	12	.1	1.9	134	63	37	212		
Mar. 1, 5-30.....								24	50	8.0	.1	2.0	101	56	36	175		
Apr. 1-30.....								76	116	25	.0	1.5	280	139	77	461		
May 1-18, 20-29, 31.								82	120	36	.3	1.5	312	144	77	503		
June 3-6, 10-30.....								58	73	23	.4	2.3	202	96	49	344		
Time-weighted average.....								55	88	24	0.2	2.2	222	106	60	365		

Analyses based on monthly extremes of specific conductance

Oct. 4, 1962 (maximum).....								48	195	83	0.6	5.6	475	220	181	769	7.4	
Oct. 11 (minimum)....								104	143	38	.1	1.6	366	162	77	597	7.4	
Nov. 1 (maximum)....								64	181	54	.4	4.9	414	190	138	672	7.2	
Nov. 14 (minimum)....								22	43	10	.0	3.2	106	58	40	187	7.1	
Dec. 8 (maximum)....								76	83	23	.0	2.2	244	109	47	369	7.8	
Dec. 24 (minimum)....								20	36	7.0	.0	2.4	91	46	30	151	7.2	

Jan. 11, 1963 (maximum).....	63	75	22	.2	3.4	200	108	56	344	7.6
Jan. 2 (minimum)....	22	37	7.0	.2	2.1	88	47	29	149	7.0
Feb. 2 (maximum)....	54	76	20	.0	2.5	199	94	50	316	6.9
Feb. 6 (minimum)....	16	32	6.0	.0	2.1	86	39	26	126	7.0
Mar. 30 (maximum)...	34	73	13	.1	2.9	138	80	52	254	7.5
Mar. 13 (minimum)...	14	30	5.5	.0	2.6	81	33	22	111	7.0
Apr. 30 (maximum)...	94	128	39	.1	2.0	350	153	76	560	7.3
Apr. 1 (minimum)....	54	91	12	.0	2.1	208	109	65	338	7.0
May 16 (maximum)....	96	134	66	.2	.4	395	172	94	640	7.0
May 31 (minimum)....	28	50	13	.2	.7	123	65	42	198	7.1
June 21 (maximum)...	82	104	30	.3	2.5	273	124	57	441	7.2
June 3 (minimum)....	36	54	12	.3	1.8	134	68	38	215	7.6

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

Temperature (°F) of water, October 1962 to June 1963  
(Once-daily measurement at 0800)

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	68	67	66	64	67	70	67	64	68	69	70	71	70	69	63	64	64	65	65	65	60	61	58	57	56	55	58	56				
November .....	54	53	48	50	51	50	50	50	50	50	46	57	46	49	50	48	48	48	46	46	46	47	46	45	43	44	44	44		48			
December .....	42	41	40	42	43	41	41	36	34	32	33	32	33	33	34	34	33	34	35	34	38	38	38	39	36	37	37	37	36		36		
January .....	--	34	33	--	--	--	35	35	35	38	45	42	40	38	38	35	35	35	33	33	34	34	39	30	32	--	--	--	35	34			
February .....	35	35	33	32	35	34	36	35	35	36	37	35	37	35	33	32	32	35	33	33	32	32	32	32	32	32	32	34	--	34			
March .....	35	--	--	--	42	39	38	42	40	41	42	42	45	43	41	42	42	43	43	43	42	42	41	41	43	44	45	45	47	--	42		
April .....	50	53	51	53	53	51	49	48	47	45	42	45	45	46	46	45	48	48	52	53	53	54	54	54	53	52	52	52	53		50		
May .....	48	49	48	49	51	53	54	57	59	58	54	54	55	55	55	55	54	--	50	53	50	50	50	50	50	53	52	51	54	--	48		
June .....	--	--	53	54	54	53	--	--	60	62	55	58	62	60	57	54	55	54	54	50	48	50	52	51	53	56	57	57	--	--	55		

## 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 Whitesoak Creek, and 6.5 miles west of Greenup, Greenup County.

DRAINAGE AREA --242 square miles.

RECORDS AVAILABLE --Water temperatures: October 1956 to September 1963.

Sediment concentrations: October 1956 to September 1963.

EXTREMES, 1962-63 --Water temperatures: Maximum, 81°F July 17, 19; minimum 33°F Jan. 26, 29, Feb. 26.

Sediment concentrations: Maximum daily, 1,000 ppm Mar. 5; minimum daily, 1 ppm Feb. 18, 19, 25.

Sediment loads: Maximum daily, 10,200 tons Mar. 5; minimum daily, less than 0.05 ton Oct. 3, 4, 14-29.

EXTREMES, 1956-63 --Water temperatures: Maximum, 83°F July 16, 23, 31, 1957, Sept. 11, 1961; minimum, freezing point on many days during winter months.

Sediment concentrations: Maximum daily, 1,500 ppm May 27, 1960; minimum daily, 1 ppm on many days during 1956 to 1963.

Sediment loads: Maximum daily, 31,600 tons Feb. 28, 1962; minimum daily, less than 0.06 ton on many days during 1957 to 1962.

REMARKS --Occasional regulation of low flow caused by withdrawal of water by gas transmission plant above gage. Flow affected by ice Dec. 11-16.

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

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 .....	52	61	63	65	64	--	--	66	66	70	72	73	71	69	64	63	65	65	61	56	54	49	49	50	--	51	47	47	62	--	--	46
November .....	47	45	46	42	46	43	46	46	47	44	46	45	49	51	46	49	49	48	48	--	46	--	--	46	--	--	48	45	45	--	--	46
December .....	44	45	42	43	40	38	38	37	--	34	--	--	--	--	34	--	--	37	--	--	35	40	38	36	--	38	38	38	38	36	--	--
January .....	36	37	37	--	--	--	40	--	42	40	44	--	--	39	36	36	--	38	37	--	--	36	--	--	--	33	--	33	34	34	--	--
February .....	34	34	--	--	34	38	38	37	35	--	35	--	34	--	34	35	37	36	38	35	--	34	--	36	33	--	25	33	--	26	--	--
March .....	37	39	42	42	45	42	44	44	46	44	48	48	49	48	45	51	48	51	48	44	45	48	50	51	52	54	55	--	56	47	--	
April .....	58	62	63	59	57	56	58	56	58	56	--	56	55	54	56	55	60	64	65	--	67	--	--	--	--	65	61	61	--	--	59	--
May .....	--	60	63	64	65	68	68	70	74	70	64	63	63	67	64	67	--	64	--	66	65	65	64	65	62	66	78	66	69	71	65	--
June .....	--	--	58	70	71	74	71	72	80	79	76	71	75	--	--	71	75	76	78	72	74	--	75	74	--	78	--	76	77	--	--	76
July .....	79	79	78	78	78	72	73	77	73	73	75	77	74	75	--	80	81	78	81	79	79	78	77	78	77	80	79	79	77	--	76	77
August .....	78	78	79	78	78	75	--	78	78	77	76	75	--	73	72	73	78	70	70	70	70	71	72	71	74	76	75	74	--	73	74	--
September .....	74	72	73	71	72	71	70	75	71	75	--	75	--	70	70	71	70	73	70	--	70	65	63	66	69	68	67	68	67	--	70	70

## TYGARTS CREEK BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1963

Day	OCTOBER			NOVEMBER			DECEMBER		
	Suspended sediment			Suspended sediment			Suspended sediment		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	6.3	12	0.2	51	3	0.4	60	7	1.1
2..	4.5	5	.1	40	3	.3	55	6	.9
3..	4.5	3	T	32	5	.4	50	5	.7
4..	4.5	3	T	27	3	.2	46	4	.5
5..	6.8	3	.1	27	2	.1	45	5	.6
6..	9.0	3	.1	28	3	.2	59	7	1.1
7..	10	3	.1	30	3	.2	68	8	1.5
8..	11	3	.1	32	4	.3	68	5	.9
9..	17	8	.4	130	28	26	64	4	.7
10..	14	4	.2	1810	570	3270	60	4	.6
11..	11	2	.1	1320	322	1480	55	4	.6
12..	7.6	4	.1	384	92	95	50	4	.5
13..	6.3	3	.1	212	44	25	47	3	.4
14..	5.0	3	T	147	28	11	45	3	.4
15..	3.9	3	T	111	21	6.3	42	2	.2
16..	3.0	2	T	89	17	4.1	40	2	.2
17..	2.4	4	T	428	65	75	40	2	.2
18..	2.1	4	T	913	110	270	46	4	.7
19..	1.8	3	T	1040	106	298	57	6	.9
20..	1.5	3	T	424	35	40	74	10	2.0
21..	1.8	2	T	260	32	22	1200	226	S 1250
22..	2.1	3	T	311	20	17	4080	363	4000
23..	2.1	4	T	304	15	12	1700	113	S 620
24..	2.4	4	T	212	12	6.9	592	33	53
25..	3.0	6	T	160	10	4.3	368	16	16
26..	2.7	4	T	129	9	3.1	294	8	6.4
27..	3.0	4	T	107	7	2.0	248	10	6.7
28..	3.0	3	T	91	6	1.5	210	9	5.1
29..	5.1	3	T	77	5	1.0	595	60	S 181
30..	4.6	2	.2	68	5	.9	1450	152	595
31..	4.4	3	.4	--	--	--	650	49	66
Total	247.4	--	2.7	8994	--	5673.2	12458	--	6833.4
Day	JANUARY			FEBRUARY			MARCH		
	Suspended sediment			Suspended sediment			Suspended sediment		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	342	14	13	70	7	1.3	468	45	S 116
2..	260	10	7.0	200	--	E 25	1800	310	1510
3..	210	8	4.5	1200	--	E 900	932	105	S 279
4..	160	7	3.0	800	80	A 170	732	186	S 477
5..	131	5	1.8	400	32	34	3760	1000	10200
6..	123	5	1.7	290	16	12	3390	256	S 2530
7..	115	4	1.2	250	10	6.8	1200	102	330
8..	107	3	.9	220	5	3.0	719	48	93
9..	99	3	.8	200	5	2.7	480	31	40
10..	89	4	1.0	200	4	2.2	380	23	24
11..	532	66	S 134	263	3	2.1	938	131	S 617
12..	995	--	E 200	400	3	3.2	5040	650	A 8800
13..	745	--	E 75	300	4	3.2	3940	292	S 3660
14..	368	22	22	250	6	4.0	762	100	206
15..	245	11	7.3	200	7	3.8	484	41	54
16..	185	8	4.0	135	9	3.3	1230	273	S 1930
17..	160	11	4.8	129	4	1.4	4940	525	S 6630
18..	139	9	3.4	133	1	.4	2530	172	S 1380
19..	129	11	3.8	165	1	.4	2080	531	S 4390
20..	110	10	3.0	287	5	3.9	3340	396	S 3780
21..	100	10	2.7	529	22	31	1140	114	351
22..	95	8	2.0	400	28	30	709	46	88
23..	90	8	1.9	318	15	13	500	27	36
24..	85	8	1.8	310	4	3.3	400	22	24
25..	80	8	1.7	297	1	.8	328	17	15
26..	80	8	1.7	266	2	1.4	290	17	13
27..	75	8	1.6	220	2	1.2	287	17	13
28..	70	8	1.5	200	2	1.1	257	14	9.7
29..	70	8	1.5	--	--	--	225	12	7.3
30..	70	8	1.5	--	--	--	202	12	6.5
31..	70	7	1.3	--	--	--	457	30	A 35
Total	6129	--	511.4	8632	--	1264.5	43940	--	47644.5

E Estimated.

S Computed by subdividing day.

T Less than 0.05 ton.

A Computed from partly estimated-concentration graph.

## TYGARTS CREEK BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1962--Continued

Day	APRIL			MAY			JUNE		
	Suspended sediment			Suspended sediment			Suspended sediment		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	748	75	8 150	119	2	0.6	63	10	1.7
2..	488	22	29 133	133	3	1.1	52	10	1.4
3..	364	14	14 105	3	3	.8	45	10	1.2
4..	308	6	5.0 91	2	2	.5	40	11	1.2
5..	275	5	3.7 79	2	2	.4	38	10	1.0
6..	236	3	1.9 81	4	4	.9	36	9	.9
7..	215	2	1.2 93	3	3	.8	36	6	.6
8..	192	2	1.0 85	4	4	.9	34	8	.7
9..	182	2	1.0 69	7	7	1.3	31	9	.8
10..	168	2	.9 62	6	6	1.0	27	14	1.0
11..	149	2	.8 62	6	6	1.0	28	12	.9
12..	133	2	.7 60	8	8	1.3	25	7	.5
13..	125	2	.7 131	16	16	9.8	22	6	.4
14..	115	2	.6 620	--	E	270	20	5	.3
15..	109	2	.6 269	35	35	25	19	6	.3
16..	101	2	.5 175	20	20	9.4	17	7	.5
17..	97	2	.5 373	--	E	100	16	7	.3
18..	95	5	1.3 2530	370	370	2530	15	4	.2
19..	91	4	1.0 723	--	E	290	14	6	.2
20..	85	3	.7 342	54	54	50	13	7	.2
21..	79	3	.6 230	30	30	19	13	8	.3
22..	79	3	.6 170	26	26	12	12	12	.4
23..	75	3	.6 131	19	19	6.7	11	12	.4
24..	74	2	.4 105	17	17	4.8	9	7	.2
25..	70	2	.4 87	15	15	3.5	10	6	.2
26..	64	2	.3 79	12	12	2.6	8.6	10	.2
27..	60	2	.3 72	12	12	2.3	8.1	7	.2
28..	56	2	.3 75	12	12	2.4	10	6	.2
29..	50	2	.3 109	12	12	3.5	10	9	.2
30..	66	2	.4 117	12	12	1.8	24	22	1.4
31..	--	--	-- 87	11	11	2.6	--	--	--
Total	4949	--	219.3	7464	--	3358.0	706.7	--	17.8
Day	JULY			AUGUST			SEPTEMBER		
	Suspended sediment			Suspended sediment			Suspended sediment		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	87	--	E 12	99	322	86	63	30	5.1
2..	60	--	E 4	56	431	65	39	29	3.0
3..	63	17	2.9 43	43	260	30	30	29	2.3
4..	35	6	.6 34	130	12	664	950	A 1700	
5..	28	7	.5 30	100	8.1	324	698	611	
6..	23	10	.6 27	87	6.3	145	490	192	
7..	20	10	.5 32	80	6.9	89	641	154	
8..	18	10	.5 34	57	5.2	58	408	64	
9..	16	8	.3 31	43	3.6	43	209	24	
10..	14	8	.3 158	95	A 40	32	162	14	
11..	14	8	.3 91	52	13	30	115	9.3	
12..	14	10	.4 51	38	5.2	36	--	E 9	
13..	13	11	.4 44	53	6.3	56	104	16	
14..	13	6	.2 51	101	14.8	79	82	17	
15..	12	5	.2 39	78	8.2	55	46	6.8	
16..	12	3	.1 56	91	14	42	48	5.4	
17..	11	4	.1 32	94	8.1	33	42	3.7	
18..	10	4	.1 26	83	5.8	27	26	1.9	
19..	10	3	.1 28	42	3.2	24	23	1.5	
20..	11	5	.1 102	56	15	21	25	1.4	
21..	13	4	.1 123	67	A 20	19	20	1.0	
22..	19	9	.5 95	63	16	17	17	.8	
23..	24	10	.6 59	58	9.2	16	17	.7	
24..	55	14	2.1 42	54	6.1	16	33	1.4	
25..	113	163	S 41	32	4.6	15	22	.9	
26..	51	40	S 6.2	28	34	2.6	14	.6	
27..	33	7	.5 24	29	1.9	12	16	.5	
28..	26	5	.4 21	26	1.5	10	12	.3	
29..	25	5	.3 20	24	1.3	10	14	.4	
30..	402	--	E 240	114	--	25	11	.4	
31..	230	154	96 107	48	14	--	--	--	
Total	1475	--	412.0	1729	--	457.5	2030	--	2848.4
Total discharge for year (cfs-days).....98754.1									
Total load for year (tons).....69242.7									

E Estimated.

S Computed by subdividing day.

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 1962 to September 1963

(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	Sampling Time (24 hour)	Water- tem- per- ature (°F)	Discharge (cfs)	Sediment concentra- tion (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. 10, 1962.....	1635		2450	801		45	58	72	83	93	97	100	--				SBWC
Mar. 5, 1963.....	1630		4260	632		46	59	70	81	90	97	98	100				SBWC
Mar. 19.....	1815		3220	1560		41	54	67	81	92	96	99	100				SBWC
Mar. 19.....	1815		3220	1560		28	42	58	75	90	96	98	100				SBN

## SCIOTO RIVER BASIN

33-2268, OLENTANGY RIVER NEAR WORTHINGTON, OHIO

LOCATION.--Temperature recorder at gaging station, 30 feet downstream from Wilson 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 1963.

**EXTREMES, 1962-63, --Water temperatures:** Maximum, 87°F July 1, 18; minimum, 33°F Dec. 10.

EXTREMES: 1955-63. --Water temperatures: Maximum, 88°F July 7, 1962; minimum, freezing point on many days during winter months. 1955-63. --

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

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

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

## SCIOTO RIVER BASIN--Continued

3-2290. ALUM CREEK AT COLUMBUS, OHIO

LOCATION.--At Livingston Avenue Bridge, 0.2 mile upstream from gage at Columbus, Franklin County, and 6 miles upstream from mouth.

DRAINAGE AREA.--190 square miles.

RECORDS AVAILABLE.--Sediment records: October 1960 to September 1963.

EXTREMES, 1962-63.--Sediment concentrations: Maximum daily, 650 ppm Mar. 4; minimum daily, 2 ppm on several days during January and February.

Sediment loads: Maximum daily, 11,800 tons Mar. 5; minimum daily, 0.1 ton on many days.

EXTREMES, 1960-63.--Sediment concentrations: Maximum daily, 700 ppm June 8, 1961; minimum daily, 2 ppm on several days during 1960 to 1963.

Sediment loads: Maximum daily, 11,800 tons Mar. 5, 1963; minimum daily, less than 0.05 ton on Oct. 28, Dec. 14, 1960.

REMARKS.--Flow affected by ice Dec. 23, 24, Dec. 30 to Jan. 1, 14-17, Jan. 21 to Feb. 28.

Suspended sediment, water year October 1962 to September 1963

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..	9.0	37	0.9	12	9	0.3	23	6	0.4
2..	12	43	1.4	11	8	.2	23	7	.4
3..	75	95	19	10	7	.2	21	8	.4
4..	48	73	9.5	14	9	.3	21	8	.4
5..	30	61	4.9	30	13	1.0	23	9	.6
6..	27	46	3.4	17	13	.6	30	9	.7
7..	17	31	1.4	13	13	.4	36	10	1.0
8..	21	16	.9	14	13	.5	29	10	.8
9..	46	17	2.1	49	19	2.5	26	10	.7
10..	43	15	1.7	420	278	315	26	10	.7
11..	24	15	1.0	500	201	271	27	10	.7
12..	16	15	.6	200	83	45	27	9	.6
13..	12	14	.4	105	54	15	23	9	.6
14..	9.0	14	.3	71	44	8.4	21	10	.6
15..	7.8	14	.3	51	40	5.5	21	10	.6
16..	11	14	.4	60	45	7.3	21	10	.6
17..	18	14	.7	200	--	40	24	10	.6
18..	9.6	16	.4	200	E	65	28	11	.8
19..	7.8	16	.3	152	50	20	33	12	1.1
20..	7.8	16	.3	100	29	7.8	51	13	1.8
21..	12	16	.5	78	22	4.6	83	17	3.8
22..	11	12	.4	61	17	2.8	103	21	5.8
23..	10	13	.4	51	14	1.9	90	17	4.1
24..	9.6	18	.5	42	12	1.4	80	12	2.6
25..	14	14	.5	37	9	.9	58	8	1.2
26..	16	8	.3	31	8	.7	51	6	.8
27..	12	6	.2	29	10	.8	42	6	.7
28..	10	6	.2	26	7	.5	39	6	.6
29..	9.6	10	.2	25	8	.5	92	7	1.7
30..	10	9	.2	19	7	.4	130	7	2.4
31..	10	9	.2	--	--	--	110	7	2.1
Total	575.2	--	53.5	2628	--	820.5	1412	--	39.9

E Estimated.

A Computed from partly estimated-concentration graph.

## SCIOTO RIVER BASIN--Continued

3-2290. ALUM CREEK AT COLUMBUS, OHIO--Continued

Suspended sediment, water year October 1962 to September 1963--Continued

Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	80	8	1.7	20	2	0.1	67	--	E 6
2..	61	7	1.2	24	23	1.5	89	--	E 6
3..	47	6	.8	60	37	6.0	177	--	E 50
4..	39	5	.5	60	33	5.3	2500	650	S 6720
5..	37	4	.4	60	29	4.7	11600	426	S 11800
6..	37	4	.4	70	25	4.7	4650	235	2950
7..	37	4	.4	90	22	5.3	1500	144	583
8..	37	4	.4	110	19	5.6	498	75	102
9..	38	4	.4	85	17	3.9	448	56	68
10..	56	7	1.1	70	14	2.6	620	--	E 140
11..	524	344	S 646	50	12	1.6	421	72	82
12..	662	268	479	40	9	1.0	430	38	S 48
13..	412	100	111	34	6	.6	745	163	328
14..	230	51	32	28	4	.3	511	47	65
15..	190	36	18	24	2	.1	277	36	27
16..	160	28	12	22	3	.2	384	56	S 99
17..	90	23	5.6	20	4	.2	1980	470	2510
18..	69	23	4.3	24	6	.4	769	145	S 327
19..	56	17	2.6	34	6	.6	1020	291	S 1140
20..	58	11	1.7	46	5	.6	2110	500	S 3080
21..	50	6	.8	60	5	.8	630	106	180
22..	46	4	.5	56	5	.8	320	55	48
23..	38	4	.4	48	5	.6	230	39	24
24..	36	3	.3	38	5	.5	185	28	14
25..	34	3	.3	32	5	.4	157	20	8.5
26..	30	3	.2	28	5	.4	174	28	13
27..	26	2	.1	26	5	.4	466	57	72
28..	24	2	.1	24	5	.3	372	49	49
29..	20	2	.1	--	--	--	200	33	18
30..	18	2	.1	--	--	--	155	26	11
31..	18	2	.1	--	--	--	118	23	7.3
Total	3260	--	1322.5	1283	--	49.5	33803	--	30575.8
	APRIL			MAY			JUNE		
1..	108	19	5.5	112	40	12	38	46	4.7
2..	102	17	4.7	89	32	7.7	30	26	2.1
3..	96	15	3.9	71	21	4.0	23	13	.8
4..	116	41	13	59	17	2.7	25	13	.9
5..	149	36	14	51	17	2.3	25	15	1.0
6..	108	14	4.1	50	18	2.4	22	17	1.0
7..	89	13	3.1	44	22	2.6	40	51	S 6.5
8..	75	13	2.6	39	21	2.2	31	34	2.8
9..	70	9	1.7	38	20	2.0	30	14	1.1
10..	66	8	1.4	38	17	1.7	26	12	.8
11..	59	10	1.6	35	15	1.4	31	14	1.2
12..	53	10	1.4	35	14	1.3	25	14	.9
13..	50	10	1.4	56	34	S 6.7	38	19	1.9
14..	46	10	1.2	39	24	2.5	31	22	1.8
15..	43	10	1.2	48	17	2.2	22	16	1.0
16..	42	10	1.1	39	12	1.3	17	13	.6
17..	55	33	S 5.4	38	14	1.4	16	13	.6
18..	47	20	2.5	34	12	1.1	15	13	.5
19..	102	74	S 32	30	11	.9	14	13	.5
20..	594	500	A 800	40	28	S 3.2	13	13	.4
21..	255	135	93	32	21	1.8	17	16	.7
22..	139	48	18	30	19	1.5	14	17	.6
23..	267	410	A 300	25	17	1.1	12	18	.6
24..	125	43	14	22	15	.9	10	19	.5
25..	96	22	5.7	20	14	.8	8	18	.4
26..	80	19	4.1	18	14	.7	7	18	.3
27..	66	17	3.0	17	13	.6	6.3	15	.2
28..	59	14	2.2	26	14	1.0	6.3	14	.2
29..	76	17	3.5	158	79	S 38	5.9	14	.2
30..	106	38	11	82	83	18	29	--	E 3
31..	--	--	--	51	66	9.1	--	--	--
Total	3339	--	1356.3	1466	--	135.1	627.5	--	37.8

E Estimated.

S Computed by subdividing day.

A Computed from partly estimated-concentration graph.

## SCIOTO RIVER BASIN--Continued

3-2290. ALUM CREEK AT COLUMBUS, OHIO--Continued

Suspended sediment, water year October 1962 to September 1963--Continued

Day	JULY				AUGUST				SEPTEMBER			
	Mean discharge (cfs)	Suspended sediment		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		Mean concentration (ppm)	Tons per day
1..	18	20	A 1	30	13	1.0		2.3	27		0.2	
2..	26	--	E 2	20	12			2.1	22		.1	
3..	12	14	.4	15	11	.4		2.5	22		.1	
4..	12	13	.4	12	11	.4		2.1	15		.1	
5..	16	13	.6	9.9	13	.3		2.0	14		.1	
6..	12	13	.4	8.7	13	.3		2.0	27		.1	
7..	9.3	16	.4	22	17	S 1.2		2.0	18		.1	
8..	6.8	24	.4	15	13	.5		2.3	16		.1	
9..	7.4	22	.4	20	35	A 2		2.3	16		.1	
10..	5.9	20	.3	18	40	A 2		2.5	17		.1	
11..	4.5	15	.2	6.3	14	.2		2.9	13		.1	
12..	4.3	12	.2	7.1	14	.2		25	--	E 7		
13..	4.3	12	.1	24	20	S 1.4		5.0	26		.4	
14..	20	19	S 1.2	8.7	13	.3		3.1	17		.1	
15..	8.7	10	.2	6.8	14	.2		2.5	16		.1	
16..	7.4	9	.2	5.4	14	.2		3.8	17		.2	
17..	5.4	9	.1	4.5	13	.2		4.3	19		.2	
18..	3.8	9	.1	4.5	13	.2		3.5	20		.2	
19..	5.0	9	.1	20	57	S 6.1		2.9	23		.2	
20..	42	--	E 4	64	55	S 13		2.1	22		.1	
21..	44	--	E 5	14	17	.6		2.1	21		.1	
22..	62	35	A 6	4.3	15	.2		2.0	21		.1	
23..	34	18	1.6	3.3	15	.1		2.0	17		.1	
24..	21	18	1.0	2.9	15	.1		2.7	15		.1	
25..	15	18	.7	2.9	16	.1		3.1	15		.1	
26..	9.9	17	.4	2.9	15	.1		2.9	15		.1	
27..	8.0	17	.4	3.3	17	.2		2.7	15		.1	
28..	6.8	18	.3	3.1	15	.1		2.7	15		.1	
29..	9.2	26	.7	37	--	E 9		2.7	15		.1	
30..	11	19	.6	4.3	49	.6		2.5	15		.1	
31..	26	15	1.0	2.5	36	.2		--	--		--	
Total	477.7	--	30.4	402.4	--	42.0		102.6	--		10.7	
Total discharge for year (cfs-days).....											49376.4	
Total load for year (tons).....											34474	

E Estimated.

S Computed by subdividing day.

A Computed from partly estimated-concentration graph.

## SCIOTO RIVER BASIN--Continued

3-2290. ALUM CREEK AT COLUMBUS, OHIO--Continued

Particle-size analyses of suspended sediment, water Year October 1962 to September 1963

(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)	Sam- pling point	Water tem- per- ature (°F)	Discharge (cfs)	Sediment concentra- tion (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. 10, 1962.....	1710		--	--	439		57	70	80	91	97	99	100	--				SBWC
Jan. 11, 1963.....	1500		775	5570	633		31	62	74	85	97	99	100	--				SBWC
Mar. 4.....	1845		5570	5570	1220		39	49	63	75	86	93	97	100				SBWC
Apr. 23.....	0840		292	292	441		62	76	88	95	97	99	100	--				SBWC



## SCIOTO RIVER BASIN--Continued

3-2345. SCIOTO RIVER AT HIGBY, OHIO

LOCATION.--At gaging station at highway bridge, 0.8 mile downstream from Walnut Creek, and 1.2 miles north of Higby, Ross County. DRAINAGE AREA.-- 5,129 square miles.

RECORDS AVAILABLE.--Water temperatures: October 1953 to September 1963.

Sediment records: October 1953 to September 1963. Maximum daily, 149 ppm Mar. 5; minimum daily, 4 ppm Apr. 16, Sept. 3.

Sediment concentrations: Maximum daily, 1,940 ppm Mar. 5; minimum daily, 4 ppm Apr. 16, Sept. 3.

Sediment loads: Maximum daily, 352,000 tons Mar. 5; minimum daily, 5 tons Sept. 3.

EXTREMES, 1953-63.--Water temperatures: Maximum, 89°F July 1, 1962; 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 and 1956.

Sediment loads: Maximum daily, 550,000 tons Jan. 23, 1959; minimum daily, 1 ton on several days during 1955 and 1956.

REMARKS.--Flow slightly regulated by O'Shaughnessy, Griggs, Delaware, Hoover, and Rocky Fork Reservoirs. Flow affected by ice Jan. 23.

Temperature (°F) of water, water year October 1962 to September 1963  
(Once-daily measurement between 1400 and 1800)

Month	Day																															Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October.....	56	66	69	--	69	69	71	72	74	76	76	73	71	71	73	68	65	65	65	63	60	58	59	59	53	49	49	52	53	50	54	
November.....	52	50	50	48	49	48	46	53	52	48	49	50	48	44	44	55	51	51	48	46	45	43	46	46	41	--	48	49	46	51	--	
December.....	45	46	48	44	38	38	38	34	32	32	32	32	32	32	32	35	41	42	35	37	35	35	32	34	34	34	36	40	37	32	37	
January.....	34	35	36	37	37	37	38	40	42	45	40	36	32	32	32	35	35	38	39	35	32	36	32	32	32	32	32	32	33	34	35	
February.....	37	38	34	35	44	43	35	34	34	35	34	32	34	32	32	37	39	42	43	32	33	32	32	32	32	32	32	36	36	--	30	
March.....	38	33	30	39	42	--	39	40	39	38	38	44	45	44	42	42	50	46	42	45	40	40	46	47	53	50	48	54	58	54	43	44
April.....	64	68	65	--	59	60	58	55	53	54	56	56	56	55	54	56	64	68	66	67	69	61	51	53	53	60	65	69	62	54	--	60
May.....	56	60	66	66	69	69	71	69	69	68	62	63	64	64	68	70	69	70	72	70	68	66	65	--	65	70	66	69	72	71	70	67
June.....	76	71	72	--	76	75	82	--	81	81	80	75	--	71	75	76	76	80	75	80	77	80	81	--	81	--	79	79	80	84	--	76
July.....	83	80	80	81	83	81	79	79	76	79	80	81	80	80	81	82	85	85	85	80	80	81	83	84	85	86	88	84	83	83	84	82
August.....	83	84	86	84	84	80	81	81	79	80	81	80	78	75	75	76	72	73	78	78	78	78	78	78	74	74	77	76	78	77	76	76
September.....	75	76	77	76	75	--	78	75	78	83	78	83	72	72	75	76	75	75	78	--	69	68	69	70	69	70	65	65	60	--	73	



## QUALITY OF SURFACE WATERS, 1963

## SCIOTO RIVER BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1963

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..	586	15	24	586	23	36	1080	30	87
2..	554	13	19	578	19	30	1040	23	64
3..	578	10	16	574	18	28	1010	15	41
4..	705	14	27	570	13	20	1000	17	46
5..	888	19	46	591	13	21	994	24	64
6..	725	16	31	604	7	11	1030	23	64
7..	658	10	18	632	11	19	1110	21	63
8..	618	9	15	609	14	23	1120	18	54
9..	604	12	20	621	22	37	1040	16	45
10..	609	14	23	2700	432	3680	994	16	43
11..	632	14	24	4190	556	6290	940	22	56
12..	668	10	18	3690	204	2030	853	21	48
13..	637	8	14	3200	133	1150	811	19	50
14..	604	8	13	2520	68	463	846	38	87
15..	574	8	12	1970	46	245	839	30	68
16..	562	10	15	1750	33	156	853	37	85
17..	586	15	24	2010	59	320	860	30	70
18..	591	17	27	2840	102	782	884	22	52
19..	591	18	29	3630	135	1320	924	20	50
20..	566	17	26	3980	101	976	1100	26	77
21..	558	17	26	3230	70	610	1460	37	146
22..	542	18	26	2880	63	490	1970	66	351
23..	542	18	26	2480	52	348	1940	42	220
24..	539	12	17	2060	23	128	1710	26	120
25..	546	12	18	1720	26	121	1560	15	63
26..	550	13	19	1560	23	97	1580	9	38
27..	558	17	26	1470	23	91	1460	9	35
28..	574	18	28	1380	26	97	1300	16	56
29..	582	17	27	1260	26	88	1730	52	292
30..	574	18	28	1150	28	87	2280	73	449
31..	595	25	40	--	--	--	2100	33	187
Total	18696	--	722	56635	--	19794	38418	--	3163
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..	1860	34	171	1060	31	89	2600	117	1860
2..	1680	27	122	1150	24	74	9940	508	13600
3..	1570	28	119	2660	85	663	8340	342	7700
4..	1520	31	127	2820	82	624	18000	494	31200
5..	1300	33	116	2360	35	223	67200	1940	352000
6..	1200	23	74	2290	35	216	101000	901	246000
7..	1180	20	64	3080	56	466	93600	540	136000
8..	1150	24	74	3470	50	468	62400	358	60300
9..	1130	28	85	3070	34	282	39400	235	25000
10..	1130	28	85	2960	28	224	28800	232	18000
11..	2590	159	1350	3160	34	290	23400	182	11500
12..	9700	599	15700	3070	43	356	21500	152	8820
13..	9780	238	6630	2290	34	210	19400	135	7070
14..	6530	129	2270	1900	27	138	18200	116	5700
15..	4530	66	807	1460	25	98	17600	101	4800
16..	3740	44	444	1270	24	82	17300	362	18300
17..	3080	46	382	1260	22	75	33700	1480	135000
18..	2770	36	269	1210	23	75	31800	628	53900
19..	2410	34	221	1260	27	92	36300	571	56000
20..	2240	35	212	1520	42	172	44700	687	82900
21..	1850	25	125	1820	33	162	37200	442	44400
22..	1470	26	95	1640	19	84	31600	215	18300
23..	1200	27	87	1580	32	136	20200	194	10600
24..	1040	25	70	1750	25	118	13500	187	6820
25..	1340	31	112	1720	20	93	12900	157	5470
26..	1300	33	116	1510	18	73	12400	97	3250
27..	1210	30	98	1380	16	60	11800	110	3500
28..	1100	22	65	1200	17	55	11900	97	3120
29..	1100	23	68	--	--	--	11800	102	3250
30..	1130	23	70	--	--	--	8710	98	2300
31..	1080	21	61	--	--	--	7490	81	1640
Total	74910	--	30289	55920	--	5698	874680	--	1378300

S Computed by subdividing day.

## SCIOTO RIVER BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1963--Continued

Day	APRIL			MAY			JUNE		
	Suspended sediment			Suspended sediment			Suspended sediment		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	6710	57	1030	3390	34	311	2100	21	119
2..	5790	63	985	3210	30	260	1870	15	76
3..	4910	51	676	2980	16	129	1660	10	45
4..	4370	37	436	2740	7	52	1520	16	66
5..	4090	27	298	2530	12	82	1370	38	140
6..	3820	29	299	2340	7	44	2440	212	1580
7..	3690	30	299	2210	16	95	2340	166	1050
8..	3370	27	246	2100	28	159	1850	85	424
9..	3070	16	133	1950	27	142	1880	36	183
10..	2810	13	99	1870	27	136	1610	33	143
11..	2620	12	85	1820	32	157	1490	38	153
12..	2430	18	118	1980	25	134	1430	39	150
13..	2340	12	76	2100	16	91	1560	56	236
14..	2240	10	60	2510	25	169	1480	93	372
15..	2160	6	35	2530	17	116	1210	54	176
16..	2050	4	22	2260	11	67	1110	28	84
17..	2050	5	28	2090	12	68	985	26	69
18..	2050	8	44	2100	11	62	900	25	61
19..	2260	8	49	2090	15	85	860	23	53
20..	3030	174	1610	2070	18	101	821	22	49
21..	6110	244	4160	2140	16	92	794	19	41
22..	6140	181	3000	1950	17	90	794	19	41
23..	10400	787	24400	1760	11	52	758	20	41
24..	12100	612	20000	1580	9	38	713	28	54
25..	7970	165	3550	1460	13	51	686	36	67
26..	5640	116	1770	1370	13	48	650	30	53
27..	4390	53	628	1300	14	49	650	17	30
28..	3710	24	240	1370	20	74	634	8	14
29..	3300	18	160	1600	18	78	626	12	20
30..	3250	24	211	1710	19	88	618	12	20
31..	--	--	--	2460	17	113	--	--	--
Total	129070	--	64747	65570	--	3233	37409	--	5610
	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	610	12	20	549	24	36	602	7	11
2..	695	15	28	528	19	27	535	5	7
3..	840	19	43	514	10	14	507	4	5
4..	996	19	51	514	14	19	494	10	13
5..	860	24	56	500	16	22	482	16	21
6..	722	23	45	494	17	23	476	16	20
7..	686	18	33	521	17	24	482	12	16
8..	642	11	19	528	20	28	476	13	17
9..	618	9	15	594	23	37	470	12	15
10..	602	12	20	570	28	43	464	10	12
11..	578	14	22	556	27	40	452	12	15
12..	542	12	18	594	12	19	458	12	15
13..	535	9	13	556	13	20	514	12	17
14..	549	9	13	542	11	16	642	15	26
15..	542	10	15	650	19	33	642	11	19
16..	626	12	20	570	29	45	556	6	9
17..	602	14	23	514	16	22	500	7	9
18..	563	14	21	488	8	10	470	8	10
19..	542	12	18	494	23	31	464	9	11
20..	594	14	22	514	36	50	452	6	7
21..	704	21	40	722	22	43	446	6	7
22..	860	21	49	985	14	37	430	9	10
23..	785	12	25	704	14	27	420	6	7
24..	722	11	21	626	14	24	410	6	7
25..	650	13	23	594	13	21	395	10	11
26..	618	7	12	594	17	27	390	9	9
27..	594	9	14	578	14	22	395	9	10
28..	556	17	26	563	14	21	390	9	9
29..	542	25	36	556	17	26	376	7	7
30..	528	15	21	563	14	21	363	6	6
31..	535	13	19	686	18	33	--	--	--
Total	20038	--	801	17961	--	861	14153	--	358
Total discharge for year (cfs-days).....							1403460		
Total load for year (tons).....							1513576		

S Computed by subdividing day.

## SCIOTO RIVER BASIN--Continued

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

Particle-size analysis of suspended sediment, water year October 1962 to September 1963  
 (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)	Sam- pling point	Water tem- per- ature (°F)	Discharge (cfs)	Sediment concentration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							Percent finer than size indicated, in millimeters											
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Mar. 5, 1963.....	1000			60500	2600		51	63	78	88	96	97	98	100			SBWC	
Mar. 5.....	1000			60500	2600		37	52	71	86	95	96	98	100			SBW	
Mar. 5.....	1400			60600	2820		50	64	76	88	97	99	100	--			SBWC	

## SCIOTO RIVER BASIN--Continued

## 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 1966 to September 1963.

EXTREMES.--Temperature: Maximum, 86° F; minimum, 30° F.

EXTREMES, 1962-63.--Dissolved solids: Maximum, 475 ppm Sept. 1-30; minimum, 240 ppm Mar. 1-5, 13-19, 25-31.

Hardness: Maximum, 314 ppm Sept. 1-30; minimum, 170 ppm Mar. 1-5, 13-19, 25-31.

Specific conductance: Maximum daily, 806 micromhos Sept. 26; minimum daily, 259 micromhos Mar. 5.

Water temperatures: Maximum, 82° F July 28; minimum, freezing point on many days during December to March.

EXTREMES, 1956-63.--Dissolved solids: Maximum, 479 ppm Nov. 11-20, 1956; minimum, 143 ppm May 22, 1962.

Hardness: Maximum, 329 ppm Nov. 1-10, 1958; minimum, 102 ppm May 22, 1962.

Specific conductance: Maximum daily, 806 micromhos Sept. 26, 1963; minimum daily, 207 micromhos May 8, 1961.

Water temperatures: Maximum, 85° F July 22, 1967; 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.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180° C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25° C)	pH	Color
														Calcium	Non-magnesian			
Oct. 1-31, 1962.....								241	109	40	0.7	7.2	446	290	92	718	--	
Nov. 1-30.....								192	88	26	0.5	7.4	343	244	90	569	--	
Dec. 1-12, 17-31....								200	93	29	0.4	7.4	360	252	88	597	7.6	
Jan. 1-23, 1963.....								194	82	26	0.4	12	344	246	87	549	7.7	
Feb. 10-28.....								192	83	30	0.1	9.4	359	239	82	555	8.1	
Mar. 1-5, 13-19, 25-31.....								140	51	12	0	11	240	170	56	370	--	
Apr. 1-30.....								226	71	18	0.2	10	354	266	80	550	--	
May 1-31.....								232	78	20	0.5	5.8	378	266	76	565	--	
June 1-30.....								256	93	26	0.5	5.5	387	292	82	645	--	
July 1-31.....								276	99	37	0.5	4.4	447	312	86	713	7.5	
Aug. 1-31.....								268	106	42	0.7	4.6	458	309	89	739	6.9	
Sept. 1-30.....								278	106	46	0.5	5.5	475	314	86	758	7.2	
Time-weighted average <sup>a</sup> .....								230	90	30	0.4	7.2	390	272	84	623	--	

<sup>a</sup> Represents 91 percent of days.

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

Analyses based on monthly extremes of specific conductance

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-magnesium			
Oct. 2, 1962 (maximum).....								263	122	42	0.7	6.9	496	310	94	772	--	
Oct. 13 (minimum)....								210	94	32	.5	4.6	378	250	78	615	--	
Nov. 1 (maximum)....								234	116	49	.9	7.0	454	290	98	773	7.3	
Nov. 11 (minimum)....								82	40	9.0	.2	5.3	156	104	40	264	7.5	
Dec. 17 (maximum)....								272	114	44	.5	5.1	460	294	70	771	7.6	
Dec. 31 (minimum)....								103	60	18	.0	5.6	196	146	62	357	7.9	
Jan. 10, 1963 (maximum).....								228	89	34	.4	7.5	376	276	88	624	7.6	
Jan. 14 (minimum)....								134	60	18	.4	17	250	184	74	414	8.0	
Feb. 28 (maximum)....								206	96	32	.5	9.2	400	264	94	614	7.1	
Feb. 13 (minimum)....								152	73	22	.4	10	312	206	82	469	7.9	
Mar. 1 (maximum)....								a204	85	29	.6	5.5	377	266	90	601	8.5	
Mar. 5 (minimum)....								106	27	7.0	.2	4.9	164	116	29	259	7.6	
Apr. 18 (maximum)....								b246	80	24	.4	8.0	410	302	84	624	8.6	
Apr. 24 (minimum)....								142	48	12	.3	11	238	173	56	367	8.0	
May 12 (maximum)....								260	82	25	.4	5.0	412	295	82	616	7.7	
May 18 (minimum)....								172	65	18	.4	6.5	304	212	70	454	8.2	
June 30 (maximum)....								296	96	40	.5	4.2	440	323	80	724	7.7	
June 10 (minimum)....								204	63	32	.4	8.2	312	236	69	494	8.2	
July 6 (maximum)....								300	112	35	.4	.4	496	328	82	753	7.6	
July 1 (minimum)....								210	72	27	.2	3.0	338	238	66	542	7.2	
Aug. 7 (maximum)....								286	108	45	.8	5.3	496	394	89	771	7.8	
Aug. 31 (minimum)....								266	89	29	.5	3.5	414	288	70	655	7.8	
Sept. 26 (maximum)....								288	114	51	.5	3.5	510	322	86	806	7.4	
Sept. 2 (minimum)....								274	86	26	.4	3.5	422	288	63	655	7.3	

a Includes 10 ppm carbonate (CO<sub>3</sub>).  
b Includes 18 ppm carbonate (CO<sub>3</sub>).

## SCIOTO RIVER BASIN---Continued

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

Temperature (°F) of water, water year October 1962 to September 1963  
(Once-daily measurement at approximately 1030)

Month		Day																												Average				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		29	30	31	
October.....	58	64	63	64	63	63	65	67	66	65	65	67	67	67	68	68	--	62	60	60	62	--	--	54	51	--	43	47	50	50	48	60		
November.....	45	45	46	46	46	--	--	47	48	48	48	47	47	45	46	48	50	48	46	45	46	46	45	44	43	41	40	41	41	--	45	--		
December.....	40	40	40	41	43	40	37	36	36	32	32	32	--	--	--	--	32	33	33	37	36	34	35	33	33	34	33	32	--	32	32	35		
January.....	32	32	32	32	--	34	36	35	35	37	40	40	35	32	32	32	34	34	35	35	32	32	32	--	--	--	--	--	--	--	--	--	--	
February.....	--	--	--	--	--	--	--	--	--	--	34	35	32	32	32	32	34	36	36	35	35	32	35	34	34	33	32	33	--	--	--	--	--	
March.....	34	33	32	35	35	--	--	--	--	--	--	--	42	42	42	40	42	45	45	--	--	--	--	--	46	48	47	48	50	52	51	--	--	
April.....	53	56	58	58	55	49	53	54	54	53	52	52	52	52	52	53	55	59	--	62	62	62	60	54	52	53	55	56	60	60	--	55	--	
May.....	55	55	57	62	63	65	65	67	69	65	62	62	62	62	64	66	66	64	66	66	65	65	63	62	63	64	65	66	68	68	64	64	--	
June.....	68	70	72	71	70	--	--	73	--	78	77	74	71	73	--	--	71	73	74	71	71	71	71	71	72	74	76	77	78	77	78	--	73	--
July.....	77	79	77	76	76	76	73	74	73	72	72	73	73	73	75	76	77	78	80	78	78	78	76	77	78	80	81	82	80	79	79	77	77	
August.....	80	79	80	81	80	78	76	78	76	76	75	77	73	72	70	72	74	74	72	73	73	74	76	75	71	73	74	75	74	73	73	75	75	
September.....	72	71	74	73	72	70	70	71	72	73	73	75	72	69	69	70	70	69	70	71	68	68	63	62	62	62	62	62	63	61	--	69	--	

## LICKING RIVER BASIN

## 3-2495. LICKING RIVER AT FARMERS, KY.

LOCATION.--At gaging station at bridge on U.S. Highway 60, 300 feet upstream from Chesapeake and Ohio Railway bridge, 0.8 mile downstream from Farmington, Swan County, and 1.1 miles upstream from Fripsett Creek.

DRAINAGE AREA.--831 square miles.

RECORDS AVAILABLE.--Chemical analyses: September 1949 to August 1950.

Water temperatures: October 1949 to September 1963.

Sediment records: November 1960 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 79°F Aug. 3-6, 8, 9; minimum, freezing point on many days during January and February.

Sediment concentrations: Maximum daily, 849 ppm May 29; minimum daily, 1 ppm Apr. 27.

Sediment loads: Maximum daily, 15,700 tons Mar. 12; minimum daily, less than 0.5 ton on many days during October, November, and December.

EXTREMES, 1949-63.--Water temperatures: Maximum, 92°F July 19, 1951; minimum, freezing point on many days during winter months. Sediment concentrations (1960-63): Maximum daily, 1,070 ppm June 10, 1961; minimum daily, 1 ppm on several days during December 1960, November 1961, May, June, September 1962, and April 1963.

Sediment loads (1960-63): Maximum daily, 29,700 tons Feb. 28, 1962; minimum daily, less than 0.5 ton on many days.

REMARKS.--No temperature record Jan. 28 to Feb. 4; recorded range 32°F. Flow affected by ice Dec. 11, 14-16, Jan. 4-10, 17-31, Feb. 9, 10, 17-19, 25-28.

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

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





## QUALITY OF SURFACE WATERS, 1963

## LICKING RIVER BASIN--Continued

## 3-2495. LICKING RIVER AT FARMERS, KY.--Continued

Suspended sediment, water year October 1962 to September 1963

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	21	3	T	28	12	1	275	7	5
2..	30	5	T	41	11	1	248	7	5
3..	7	4	T	42	8	1	224	7	4
4..	55	9	1	42	2	T	206	8	4
5..	73	10	2	47	3	T	191	8	4
6..	71	8	2	47	5	1	194	8	4
7..	52	8	1	47	4	1	227	4	2
8..	44	6	1	52	5	1	248	5	3
9..	38	7	1	86	13	3	251	4	3
10..	38	5	1	1370	106	S	473	230	5
11..	38	7	1	2320	173	1080	200	5	3
12..	34	9	1	1450	105	411	180	5	2
13..	32	7	1	975	94	247	160	4	2
14..	30	5	T	494	54	72	150	4	2
15..	30	4	T	323	32	28	150	7	3
16..	30	5	T	263	22	16	140	8	3
17..	30	3	T	236	17	11	154	5	2
18..	28	5	T	350	20	19	194	6	3
19..	26	5	T	1060	46	132	233	9	6
20..	24	6	T	1150	49	152	284	20	15
21..	24	5	T	875	32	76	1880	204	S
22..	23	7	T	760	27	55	6640	468	8390
23..	23	5	T	1890	124	633	6930	242	4530
24..	21	6	T	1910	159	820	5040	152	2070
25..	20	5	T	1160	107	335	2690	88	639
26..	21	6	T	685	44	81	1220	50	165
27..	21	7	T	502	24	33	1250	35	118
28..	23	7	T	395	13	14	1180	27	86
29..	23	4	T	341	8	7	1320	32	114
30..	27	7	1	305	9	7	2740	78	577
31..	30	8	1	--	--	--	2930	117	926
Total	1027	--	20	19246	--	4712	37959	--	19053
Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	2140	111	641	362	3	3	1400	35	132
2..	1490	57	229	670	20	36	3520	176	S
3..	1100	26	77	3570	90	868	3460	236	1800
4..	900	24	58	4000	150	1620	2630	206	2200
5..	700	20	38	3750	216	2190	4380	382	S
6..	600	19	31	2460	195	1300	7250	514	1460
7..	550	16	24	1490	123	495	6950	355	10100
8..	500	13	18	820	66	146	5580	228	6660
9..	450	14	17	600	36	58	4240	164	3440
10..	450	16	19	700	22	42	2650	95	1880
11..	554	29	43	900	22	53	2640	388	S
12..	1120	51	154	1500	43	174	7930	733	3590
13..	2340	166	1050	1620	52	227	11400	492	15700
14..	2080	156	876	1600	53	229	10400	336	15100
15..	1210	83	271	1350	49	179	8890	324	9430
16..	935	40	101	1000	33	89	6980	122	7780
17..	800	31	67	900	16	39	3050	112	2300
18..	700	15	28	800	11	24	4700	112	922
19..	600	10	16	750	20	40	5080	212	S
20..	540	10	14	750	30	61	6240	241	3140
21..	470	8	10	1500	41	166	4720	112	4060
22..	420	6	7	3000	79	640	3240	148	1430
23..	380	5	5	2000	103	556	2160	93	1290
24..	360	4	4	1610	92	400	1670	49	542
25..	350	4	4	1300	46	161	1410	39	221
26..	330	3	3	1200	33	107	1240	32	148
27..	320	3	2	1100	30	89	1170	26	107
28..	310	4	3	1000	28	76	1070	20	82
29..	300	4	3	--	--	--	905	19	58
30..	300	3	2	--	--	--	875	16	46
31..	300	2	2	--	--	--	1220	42	38
Total	23599	--	3817	42302	--	10068	129050	--	100754

S Computed by subdividing day.

T Less than 0.5 ton.

## 3-2495. LICKING RIVER AT FARMERS, KY.--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..	1060	22	63	466	3	4	2490	154	1040
2..	860	15	35	404	4	4	1140	69	212
3..	730	13	26	380	3	3	770	38	79
4..	665	13	23	350	3	3	602	27	44
5..	642	9	16	308	3	2	514	23	32
6..	558	8	12	284	3	2	462	17	21
7..	510	6	8	326	5	4	410	10	11
8..	482	5	7	338	5	5	341	39	57
9..	458	6	7	293	5	4	950	45	115
10..	430	6	7	251	5	3	835	168	379
11..	386	5	5	215	5	3	598	134	216
12..	356	5	5	179	5	2	458	131	162
13..	332	4	4	165	5	2	374	47	47
14..	311	3	2	167	5	2	323	25	22
15..	296	3	2	230	6	4	293	20	16
16..	278	3	2	221	5	3	257	15	10
17..	266	4	3	1020	147	5	617	11	7
18..	254	5	3	3270	270	5	2490	197	9
19..	245	4	3	2430	221	5	1610	176	9
20..	239	5	3	1140	73	225	162	9	4
21..	233	4	2	705	34	65	206	10	6
22..	239	5	3	522	21	30	1270	294	5
23..	272	6	4	404	18	20	2530	700	4780
24..	263	2	1	332	16	14	2130	210	5
25..	239	2	1	290	11	9	785	77	1300
26..	215	2	1	262	10	7	454	43	53
27..	200	1	1	254	10	7	326	26	23
28..	185	2	1	459	33	5	83	266	20
29..	154	2	1	5160	819	5	11400	233	17
30..	287	4	3	6240	450	7580	442	66	5
31..	--	--	--	4820	198	2580	--	--	--
Total	11645	--	256	31885	--	26787	20418	--	10418
	JULY			AUGUST			SEPTEMBER		
1..	510	123	169	182	24	12	50	20	3
2..	305	59	48	147	24	10	44	22	3
3..	227	39	24	127	24	8	42	27	3
4..	191	160	82	90	20	5	52	37	5
5..	179	78	38	69	23	4	34	31	3
6..	157	41	17	59	20	3	33	36	3
7..	132	31	11	50	17	2	32	42	4
8..	118	24	8	41	13	1	34	28	2
9..	134	20	7	36	18	2	38	25	2
10..	147	22	9	60	20	3	42	23	3
11..	144	24	9	314	29	24	38	18	2
12..	111	21	5	221	42	25	33	23	2
13..	90	19	5	142	88	34	52	39	5
14..	79	19	4	170	48	22	59	25	4
15..	69	21	4	162	29	13	69	18	3
16..	65	21	4	115	24	7	49	16	2
17..	61	22	4	88	25	6	55	16	2
18..	61	29	5						

S Computed by subdiv  
T Less than 0.5 ton.

## LICKING RIVER BASIN--Continued

3-2495. LICKING RIVER AT FARMERS, KY.--Continued

Particle-size analyses of suspended sediment, water year October 1962 to September 1963

(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)	Sam- pling point	Water tem- per- ature (°F)	Discharge (cfs)	Sediment concent- ration (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	
Dec. 22, 1962.....	1350			7040	550		35	55	71	85	94	97	100	--				SBWC
Dec. 22.....	1350			7040	550		30	43	67	86	95	95	100	--				SBWC
Mar. 12, 1963.....	1420			9540	820		45	78	82	85	95	98	100	--				SBWC
Mar. 13.....	1615			11600	610		35	53	76	88	93	94	97	100				SBWC
Mar. 13.....	1615			11400	404		35	53	76	88	93	94	97	100				SBWC
May 29.....	1155			5410	1760		53	67	81	91	97	99	100	--				SBWC
June 23.....	0635			2410	843		61	74	87	95	98	99	100	--				SBWC

## LICKING RIVER BASIN--Continued

3-2515. LICKING RIVER AT MCKINNEYSBURG, KY.

LOCATION: --At gaging station at county highway bridge at county highway bridge at Pendleton County, 6.5 miles southeast of Falmouth, 9.0 miles upstream from Blanket Creek, and 12.6 miles upstream from South Fork.

DATA: --Values reported for iron are in solution when analyzed. Records of specific conductance of daily samples available in district office at Columbus, Ohio. Flow affected by ice Dec. 11, 12, 16, Jan. 20, 21.

RECORDS AVAILABLE: --Chemical analyses: October 1952 to September 1963.

Water temperatures: October 1952 to September 1963.

Sediment records: October 1952 to September 1963.

EXTRIMES, 1962-63. --Dissolved solids: Maximum, 174 ppm Oct. 1-31; minimum, 116 ppm Mar. 1-31.

Specific conductance: Maximum daily, 381 microhos Nov. 18; minimum, freezing point on many days during December to February.

Water temperatures: Maximum, 81°F July 30, Aug. 4; minimum, freezing point on many days during December to February.

Sediment concentrations: Maximum daily, 1,900 ppm June 8; minimum daily, 3 ppm Dec. 7, 8, 11-16, 19.

EXTRIMES, 1962-63. --Dissolved solids: Maximum, 256 ppm Nov. 13-20, 1961; minimum, 57 ppm Apr. 16-17, 1953.

Hardness (1952-62): Maximum, 170 ppm Nov. 17-30, 1955; Nov. 7-22, 1959; minimum, 39 ppm Aug. 2-5, 1961.

Specific conductance: Maximum daily, 674 microhos Nov. 20, 1961; minimum daily, 83 microhos Mar. 4, 1962.

Water temperatures: Maximum, 87°F July 31, 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 to 1956.

Sediment loads: Maximum daily, 223,000 tons Feb. 25, 1956; minimum daily, less than 0.5 ton on many days during 1952 to 1956, 1961.

REMARKS: --Values reported for iron are in solution when analyzed. Records of specific conductance of daily samples available in district office at Columbus, Ohio. Flow affected by ice Dec. 11, 12, 16, Jan. 20, 21.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (microhos at 25°C)	pH	Color
														Calcium	Non-magnesium			
Oct. 1-31, 1962.....	177	5.4	0.00					130	19	14			174	132	26	294	8.0	18
Nov. 1-30.....	2832							--					163			270	--	--
Dec. 1-31, 1961.....	3271							89					141			249	7.8	--
Jan. 1-19, 1963.....	2824							--					129			212	--	--
Feb. 5-28.....	2980							--					126			206	--	--
Mar. 1-31.....	12450							--					116			173	7.5	9
Apr. 1-30.....	1188							--					146			250	--	--
May 1-31.....	1578							--					139			225	--	--
June 1-30.....	1967							--					129			231	--	--
July 1-31.....	301							--					132			239	--	--
Aug. 1-31.....	374							--					144			256	--	--
Sept. 1-30.....	175							--					124			221	--	--
Weighted average..	a2422							--					129			208	--	--
Time-weighted average.....	--							--					139			235	--	--
Tons per day.....	--							--					870			--	--	--

a Mean discharge based on 365 days; mean discharge for 345 days of chemical analyses, 2,492 cfs.

## LUCKING RIVER BASIN--Continued

3-2515. LUCKING RIVER AT MCKINNEYSBURG, KY.--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963

(Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity
													Calcium	Non-magnesium				
Oct. 5, 1962 (maximum conductance)	794	4.1	0.00					114	16	34			121	28	333	7.9	13	--
Oct. 4 (minimum conductance)	700	6.3	.19					104	20	5.5			110	25	238	7.9	60	--
Oct. 31 (maximum turbidity)	298	--	--					--	--	--			--	--	--	--	--	230
Nov. 18 (maximum conductance)	4160	7.1	.05					108	24	47			134	46	381	7.7	35	--
Nov. 13 (minimum conductance)	4790	6.8	.07					70	21	11			83	26	199	7.4	40	--
Nov. 10 (maximum turbidity)	12200	--	--					--	--	--			--	--	--	--	--	800
Dec. 19 (maximum conductance)	316	7.0	.00					102	27	32			122	38	328	8.0	3	--
Dec. 25 (minimum conductance)	9490	6.3	.05					42	18	5.0			54	20	137	7.6	17	--
Dec. 22 (maximum turbidity)	10100	--	--					--	--	--			--	--	--	--	--	450
Jan. 11, 1963 (maximum conductance)	4450	6.2	.04					98	24	4.0			145	108	235	7.7	18	--
Jan. 2 (minimum conductance)	4050	7.1	.08					62	20	8.0			103	70	170	7.6	20	--
Jan. 11 (maximum turbidity)	--	--	--					--	--	--			--	--	--	--	--	2000
Feb. 13 (maximum conductance)	3500	7.9	.04					100	28	8.0			150	110	241	7.6	22	--
Feb. 6 (minimum conductance)	5350	7.9	.04					59	19	7.0			107	67	165	7.3	30	--
Feb. 21 (maximum turbidity)	3000	--	--					--	--	--			--	--	--	--	--	650



## LICKING RIVER BASIN--Continued

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

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued  
 (Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity--Continued)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub> Calcium, Non-magnesium	Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity	
Aug. 16, 1963 (maximum conductance).....	281	6.2	0.05					100	19	40			197	124	42	337	6.9	40	--
Aug. 10 (minimum conductance).....	576	4.4	.10					60	14	6.0			108	68	19	162	6.6	25	--
Aug. 10 (maximum turbidity).....	--	--	--					--	--	--			--	--	--	--	--	2600	--
Sept. 8 (maximum conductance).....	267	8.2	.02					92	17	56			202	118	42	364	6.9	10	--
Sept. 20 (minimum conductance).....	157	7.0	.07					74	13	4.1			98	78	18	168	6.7	20	--
Sept. 6 (maximum turbidity).....	804	--	--					--	--	--			--	--	--	--	--	--	55

LICKING RIVER BASIN--Continued

Temperature (°F) of water, water year October 1962 to September 1963																																		
Month		Day																																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
October .....		58	60	62	60	61	63	63	64	63	64	67	67	68	69	67	66	61	60	62	63	57	53	50	45	45	46	47	44	46	47	44	46	46
November .....		48	46	47	45	45	44	46	46	48	49	48	47	47	48	46	47	48	46	47	47	47	45	44	43	42	46	47	44	46	47	44	46	46
December .....		41	39	41	40	41	40	39	40	36	33	32	--	--	--	--	32	32	34	33	34	35	36	36	38	36	35	33	35	34	33	36	33	36
January .....		33	32	36	33	34	32	34	34	36	38	40	37	35	34	33	34	34	34	33	--	--	--	--	--	--	--	--	--	--	--	--	--	--
February .....		--	--	--	--	--	32	32	32	32	32	32	32	32	32	32	32	32	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32
March .....		33	33	35	36	37	36	38	40	41	42	44	44	44	43	46	48	47	48	46	45	45	47	48	48	48	47	52	51	54	54	54	54	54
April .....		57	58	57	57	57	58	57	56	56	57	57	56	56	55	53	52	51	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
May .....		58	57	59	60	62	63	66	68	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69
June .....		63	64	67	67	68	68	67	69	71	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
July .....		76	77	76	76	74	77	78	78	73	72	74	74	74	74	74	76	76	79	78	76	74	75	76	77	77	77	77	77	77	77	77	77	77
August .....		77	79	81	79	78	77	78	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77
September .....		73	70	72	73	71	68	70	71	73	74	73	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
October .....		78	77	79	78	78	77	78	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77
November .....		73	70	72	73	71	68	70	71	73	74	73	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
December .....		41	39	41	40	41	40	39	40	36	33	32	--	--	--	--	32	32	34	33														



## LICKING RIVER BASIN--Continued

## 3-2515. LICKING RIVER AT MCKINNEYSBURG, KY.--Continued

Suspended sediment, water year October 1962 to September 1963

Day	OCTOBER				NOVEMBER				DECEMBER			
	Mean discharge (cfs)	Suspended sediment		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		Mean concentration (ppm)	Tons per day
1..	35	22	2	195	74	39		733	19		38	
2..	50	32	4	125	44	15		640	15		26	
3..	469	200	250	106	34	10		570	9		14	
4..	700	156	295	90	17	4		510	6		8	
5..	794	75	161	87	17	4		464	5		6	
6..	428	37	43	89	18	4		450	4		5	
7..	270	27	20	89	10	2		473	3		4	
8..	203	27	15	90	7	2		520	3		4	
9..	178	29	14	713	440	850		510	5		7	
10..	152	32	13	12200	778	24700		500	5		7	
11..	137	26	10	12400	468	15700		400	3		3	
12..	108	26	8	9840	265	7150		350	3		3	
13..	96	26	7	4790	139	1800		310	3		2	
14..	85	28	6	2460	90	280		280	3		2	
15..	79	26	6	1580	63	269		260	3		2	
16..	78	23	5	1090	42	124		250	3		2	
17..	96	37	10	2200	56	333		267	5		4	
18..	73	47	9	4160	116	1300		295	4		3	
19..	66	27	5	6080	146	2400		316	3		2	
20..	62	19	3	4930	99	1320		350	6		6	
21..	60	20	3	3570	76	732		3430	--	E	4500	
22..	58	16	2	2730	64	472		10100	696		19000	
23..	56	22	3	2780	49	368		12400	412		13800	
24..	54	19	3	2640	47	335		11900	297		9540	
25..	52	13	2	2880	46	358		9490	198		5070	
26..	50	6	1	2400	50	324		6520	128		2250	
27..	50	5	1	1630	51	224		3510	87		824	
28..	50	6	1	1180	43	137		2360	57		363	
29..	344	--	210	975	42	110		5430	380	S	9070	
30..	267	157	113	860	32	74		8490	377		8640	
31..	298	113	91	--	--	--		7430	190		3810	
Total	5498	--	1316	84959	--	59758		89508	--		77015	
Day	JANUARY				FEBRUARY				MARCH			
	Mean discharge (cfs)	Suspended sediment		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		Mean concentration (ppm)	Tons per day
1..	5780	115	1790	700	20	38		5000	--	E	1300	
2..	4050	80	875	1000	20	54		8200	495		11000	
3..	2940	63	500	4000	20	216		10500	440		10200	
4..	2110	62	353	5500	20	297		8260	454	S	14500	
5..	1710	31	143	6000	110	1780		25200	1670		114000	
6..	1500	19	77	5350	209	3020		25000	818		55200	
7..	1300	15	53	4560	164	2020		20300	492		27000	
8..	1170	14	44	3000	187	1510		15000	295		11900	
9..	1080	14	41	2500	124	837		11300	245		7470	
10..	1030	10	28	1500	62	251		8350	185		4170	
11..	4450	599	9950	2300	63	391		7270	470	A	9200	
12..	5710	552	8510	2700	65	474		11800	841		26800	
13..	4670	285	3590	3500	84	794		15900	670		28800	
14..	4280	143	1650	3500	77	728		17200	515		23900	
15..	3880	88	922	2600	50	351		16400	360		15900	
16..	2850	114	877	2000	36	194		19000	966	S	58600	
17..	2040	85	468	1600	28	121		28900	1170		91300	
18..	1670	66	298	1400	24	91		25900	544		38000	
19..	1430	35	135	1400	30	113		22100	850		50700	
20..	1200	21	68	2500	43	290		20800	735		41300	
21..	1000	20	54	3000	57	462		17100	263		12100	
22..	950	20	51	4000	73	788		13000	123		4320	
23..	900	20	49	4000	90	972		8560	133		3070	
24..	850	20	46	3500	89	841		5110	109		1500	
25..	800	20	43	3000	75	608		3640	92		904	
26..	760	20	41	2300	69	428		3100	83		695	
27..	740	20	40	2700	52	379		2870	67		519	
28..	720	20	39	2600	36	253		2630	54		383	
29..	710	20	38	--	--	--		2400	50		324	
30..	700	20	38	--	--	--		2120	51		292	
31..	700	20	38	--	--	--		3020	133		1080	
Total	63680	--	30849	82710	--	18301		385930	--		666427	

E Estimated.

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 1962 to September 1963--Continued

Day	APRIL			MAY			JUNE		
	Suspended sediment			Suspended sediment			Suspended sediment		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	7060	151	1610	788	10	21	6270	529	8960
2..	7680	134	1330	1250	18	61	4550	262	3220
3..	2720	75	580	1270	21	72	2250	166	1010
4..	2210	46	274	1010	17	46	1610	259	1120
5..	1870	28	141	887	11	26	1250	196	662
6..	1680	27	122	788	8	17	4090	--	19000
7..	1530	17	70	690	7	13	3890	1700	18000
8..	1480	16	60	610	12	17	9810	1900	50000
9..	1280	12	41	585	9	14	5080	990	13600
10..	1190	9	29	555	7	10	3190	670	5770
11..	1100	9	27	486	8	10	1780	360	1730
12..	1040	6	17	432	8	9	1520	153	628
13..	953	5	13	693	58	154	1070	71	205
14..	887	6	14	1570	544	2560	904	52	127
15..	826	7	16	887	244	584	782	59	124
16..	782	6	13	555	58	87	620	42	70
17..	755	6	12	1690	--	3300	510	31	43
18..	711	6	12	2980	340	2700	446	23	28
19..	670	7	13	4440	436	5610	386	23	24
20..	645	5	9	5540	549	8210	346	17	16
21..	610	7	12	3250	245	2290	320	19	16
22..	575	8	12	1640	118	522	306	20	16
23..	575	6	9	1180	71	226	274	17	12
24..	590	6	10	920	42	104	1120	38	152
25..	615	6	10	750	31	63	2480	160	1070
26..	610	6	10	625	26	44	1750	317	1500
27..	560	4	6	545	21	31	882	150	375
28..	510	5	7	520	20	28	605	124	202
29..	496	4	5	1360	57	285	486	77	101
30..	615	6	10	3950	490	5880	419	54	61
31..	--	--	--	6470	848	14800	--	--	--
Total	35625	--	4494	48916	--	47789	58996	--	127842
Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	338	45	41	760	64	131	398	37	40
2..	358	46	44	595	40	64	267	36	26
3..	610	48	79	402	46	50	180	32	16
4..	437	38	45	302	37	30	138	34	13
5..	338	30	27	251	57	39	113	36	11
6..	284	26	20	221	66	39	804	91	198
7..	260	25	18	192	50	26	455	63	77
8..	248	22	15	167	36	16	267	41	30
9..	227	21	13	154	85	172	185	37	18
10..	203	20	11	576	945	1900	138	38	14
11..	178	17	8	150	210	85	115	33	10
12..	169	17	8	102	105	29	103	34	9
13..	178	20	10	996	516	2050	95	31	8
14..	212	20	11	500	178	240	103	39	11
15..	190	17	9	334	76	68	118	37	12
16..	169	20	9	281	53	40	257	35	24
17..	152	23	9	320	42	36	206	35	19
18..	140	26	10	254	36	25	185	37	18
19..	131	26	9	1050	--	1100	182	36	18
20..	353	210	200	1110	243	807	157	41	17
21..	665	116	208	398	128	138	129	43	15
22..	486	66	87	281	117	89	118	37	12
23..	316	36	31	406	88	96	101	33	9
24..	281	25	19	382	64	66	87	25	6
25..	281	29	22	302	46	38	75	23	5
26..	306	27	22	236	38	24	65	23	4
27..	302	29	24	182	34	17	59	19	3
28..	306	32	26	150	36	14	52	16	2
29..	284	30	23	136	31	11	47	16	2
30..	236	26	16	124	33	11	41	24	3
31..	691	73	158	295	31	25	--	--	--
Total	9329	--	1232	11609	--	7476	5240	--	650

Total discharge for year (cfs-days).....882000

Total load for year (tons).....1043149

E Estimated.

S Computed by subdividing day.

A Computed from partly estimated-concentration graph.

## LICKING RIVER BASIN--Continued

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

Particle-size analyses of suspended sediment, water year October 1962 to September 1963  
 (Methods of analysis: B, bottom water sampler; C, chemically digested; 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 tem- per- ature (°F)	Discharge (cfs)	Sediment concen- tration (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	
Dec. 22, 1962.....	1100			10400	696		46	56	67	81	93	97	99	100			SBWC
Jan. 11, 1963.....	1300			6050	1100		54	63	75	85	97	99	100				SBWC
Mar. 5.....	0945			26500	2020		38	57	68	84	97	99	100				SEN
Mar. 5.....	0945			26500	2020		38	50	67	82	95	98	100				SEN
June 8.....	0900			11300	1860		62	71	83	90	98	99	100				SBWC
June 8.....	0900			11300	1860		44	56	74	88	97	99	100				SEN
June 13.....	0750			1070	488		55	65	77	88	97	99	100				SEN

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

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 milldam 2.6 miles downstream.

**DRAINAGE AREA.--621 square miles.**

RECORDS AVAILABLE.--Chemical analyses: October 1950 to August 1951.

Water temperatures: October 1949 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 82°F July 27, Aug. 1, 6; minimum, freezing point on several days during January and February.

EXTREMES, 1949-63. ---Water temperatures: Maximum, 87°F June 30, 1952, July 14, 1954; minimum, freezing point on many days during winter months.

REMARKS. --Stream frozen Jan. 27 to Feb. 2.

Temperature (°F) of water, water year October 1962 to September 1963  
(Twice-daily measurements at approximately 0700 and 1800)

	Month												Day												Aver- age							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October	64	66	65	68	67	68	67	69	70	67	69	70	70	70	71	70	69	68	65	64	62	59	58	55	52	47	45	46	46	45	62	
p.m.	68	67	66	69	69	69	70	72	70	70	71	71	71	72	72	71	70	68	66	65	63	60	59	55	50	47	46	47	46	45	63	
November	40	41	39	38	40	41	40	40	38	38	39	39	40	41	40	38	36	35	34	32	30	28	25	22	19	18	19	18	17	40	40	
a.m.	42	40	40	41	40	41	40	40	39	39	40	41	42	41	40	38	36	35	34	32	30	28	25	22	19	18	19	18	17	40	40	
December	43	41	42	40	41	41	40	39	38	39	40	41	42	41	40	38	36	35	34	32	30	28	25	22	19	18	19	18	17	40	40	
a.m.	43	41	40	41	41	40	39	38	39	40	41	42	41	40	38	36	35	34	32	30	28	25	22	19	18	19	18	17	40	40	40	
p.m.	43	41	42	41	40	38	39	38	39	40	41	42	41	40	38	36	35	34	32	30	28	25	22	19	18	19	18	17	40	40	40	
January	33	33	34	35	35	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	
a.m.	34	34	34	35	35	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	
p.m.	34	34	34	35	35	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	
February	32	31	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	
a.m.	32	31	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	
p.m.	32	31	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	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
a.m.	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
p.m.	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
April	49	51	54	51	49	50	51	49	47	46	47	46	46	45	46	50	57	62	63	60	58	56	53	50	47	44	45	44	44	40	38	38
a.m.	49	51	54	51	49	50	51	49	47	46	47	46	46	45	46	50	57	62	63	60	58	56	53	50	47	44	45	44	44	40	38	38
p.m.	52	54	56	53	50	51	52	50	49	47	46	46	47	48	47	50	57	63	60	58	56	53	50	47	44	45	44	44	40	38	38	38
May	56	55	57	58	60	61	62	61	62	61	62	61	62	62	63	64	62	63	64	62	63	62	60	59	61	62	63	64	63	62	60	60
a.m.	58	56	58	59	60	61	62	61	62	61	62	61	62	62	63	64	62	63	64	62	63	62	60	59	61	62	63	64	63	62	60	60
June	65	65	65	66	68	69	71	73	71	69	68	69	70	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
a.m.	65	65	65	66	68	69	71	73	71	69	68	69	70	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
p.m.	65	65	65	66	68	69	71	73	71	69	68	69	70	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
July	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79
a.m.	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79
p.m.	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
August	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
a.m.	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
p.m.	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
September	75	76	78	77	76	77	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
a.m.	75	76	78	77	76	77	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
p.m.	75	76	78	77	76	77	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
October	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93

## GREAT MIAMI RIVER BASIN

3-2631.1. GREAT MIAMI RIVER NEAR TAYLORSVILLE DAM, AT TAYLORSVILLE, OHIO  
(Formerly published as Miami River near Taylorsville Dam, at Taylorsville)

LOCATION.--At highway bridge on Little York Road, 0.8 mile downstream from Poplar Creek, 0.8 mile south of Taylorsville, Montgomery County, 1.3 miles downstream from gaging station, and 1.5 miles downstream from Taylorsville Dam.

DRAINAGE AREA.--135 square miles at gaging station.

PERIOD OF RECORD.--Records available from 1938 to July 1963 (discontinued).

TESTS AVAILABLE.--Chemical analyses. Methods used as noted.

REMARKS.--Samples for iron and manganese filtered clear when collected. Records of discharge are given for Great Miami River at Taylorsville.

Chemical analyses, in parts per million, October 1962 to July 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Alumina (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate as residue (NO <sub>3</sub> )	Phosphorus as residue (PO <sub>4</sub> )	Hardness as CaCO <sub>3</sub>		Toxicity (micro-H <sup>+</sup> at 25°C)	pH	Color		
																	Calcium, mg.	Non-calcium, mg.					
Oct. 10, 1962	106	--	--	0.10	0.10	--	--	--	--	--	302	0	69	30	--	3.2	5.4	408	318	70	688	7.9	--
Oct. 17, 1962	106	--	--	0.16	.12	--	--	--	--	--	311	0	68	29	--	5.2	5.8	416	328	72	701	7.8	--
Oct. 24, 1962	82	--	--	.18	.04	--	--	--	--	--	314	0	72	30	--	5.7	5.4	424	334	76	701	7.9	--
Oct. 31, 1962	80	--	--	.17	.03	--	--	--	--	--	320	0	76	31	--	6.4	5.3	441	346	84	718	7.9	--
Nov. 7, 1962	90	--	--	.12	.06	--	--	--	--	--	334	0	85	28	--	7.3	6.0	460	362	88	753	7.9	--
Nov. 28, 1962	244	--	--	.18	.07	--	--	--	--	--	276	0	92	20	--	8.6	3.3	396	324	98	655	8.2	--
Jan. 14, 1963	a450	23	--	.51	.54	77	26	14	3.7	236	0	85	24	0.6	15	1.6	391	299	103	620	8.0	50	
Feb. 13, 1963	204	4.8	--	.21	.13	69	23	15	5.3	230	0	71	25	.5	8.7	2.1	352	267	73	575	7.8	40	
Mar. 12, 1963	3270	4.5	--	.26	.45	42	13	5.8	4.0	126	0	46	12	.2	9.3	.40	227	159	56	344	7.8	50	
Apr. 16, 1963	a340	1.0	--	.11	.04	78	31	13	1.9	256	12	82	20	.4	6.0	.82	390	322	92	623	8.5	8	
May 21, 1963	260	1.5	--	.21	.11	79	32	14	2.1	302	0	76	21	.4	4.9	1.8	399	329	81	645	8.1	8	
June 17, 1963	204	5.3	--	.24	.04	77	29	12	2.4	240	6	68	20	.4	15.0	2.8	383	302	86	655	8.3	12	
July 17, 1963	122	--	--	.25	.32	--	--	--	--	--	284	6	73	23	--	5.0	2.8	400	302	66	655	8.3	--
July 24, 1963	145	--	--	.20	.13	--	--	--	--	--	292	0	73	25	--	2.4	5.7	389	306	66	630	8.1	--

a Daily mean discharge.

GREAT MIAMI RIVER BASIN--Continued  
3-2631.1. GREAT MIAMI RIVER NEAR TAYLORSVILLE DAM, AT TAYLORSVILLE, OHIO--Continued  
(Formerly published as Miami River near Taylorsville Dam, at Taylorsville)

Chemical analyses, in parts per million, October 1962 to July 1963--Continued									
Date of collection	Dissolved oxygen		Organics		Ammonia nitrogen as NH <sub>4</sub>	Nitrite (NO <sub>2</sub> )	Cyanide (CN)	Turbidity	Threshold odor
	Parts per million	Percent saturation	Phenols as C <sub>6</sub> H <sub>5</sub> OH	Alkyl benzenesulfonate (ABS)					
Oct. 10, 1962.....	6.3	67	0.016	0.5	0.4	0.05		15	M-1
Oct. 17.....	3.7	39	.000	.6	.6	.10		9	0
Oct. 24.....	5.4	50	.006	.6	.4	.10		15	M-8
Oct. 31.....	7.6	64	.001	.6	.6	.10		6	G-2
Nov. 7.....	7.6	63	.000	.6	.6	.05		5	E-4
Nov. 28.....	7.2	59	.000	.3	.7	.05		6	0
Jan. 14, 1963.....	8.1	55	.008	.3	1.2	.10		70	E-4
Feb. 13.....	8.5	59	.003	.4	1.3	.15		8	M-4
Mar. 12.....	9.2	70	.004	.2	.6	.10		70	0
Apr. 16.....	10.2	94	.014	.2	.3	.10		7	0
May 21.....	9.0	96	.002	.2	.0	.10		10	0
June 13.....	7.1	79	.000	.1	.1	.20		45	0
July 17.....	4.6	58	.000	.4	.0	.05		45	0
July 24.....	5.2	64	.000	.2	.2	.10		30	0

## GREAT MIAMI RIVER BASIN--Continued

## 3-2660. STILLWATER RIVER AT ENGLEWOOD, OHIO

LOCATION.--At bridge on Interstate Highway 70, about 0.8 mile downstream from gaging station, about 1 mile downstream from Englewood Dam, and 1.8 miles southeast of Englewood, Montgomery County.

DRAINAGE AREA.--646 square miles at gaging station.

RECORDS AVAILABLE.--Chemical analyses: November 1961 to July 1963 (discontinued).

REMARKS.--Samples for iron and manganese filtered clear when collected.

Chemical analyses, in parts per million, October 1962 to July 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus as P <sub>2</sub> O <sub>5</sub> at 180°C	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	Color or pH		
																Calcium, mag-	Non-carbonate				
Oct. 10, 1962	65	--	0.09	0.07	--	--	--	--	--	318	0	20	--	3.2	1.1	392	332	71	659	7.9	--
Oct. 17	64	--	.08	.08	--	--	--	--	--	286	12	20	--	1.0	1.1	379	326	71	623	8.4	--
Oct. 24	60	--	.09	.09	--	--	--	--	--	330	0	20	--	2.2	1.0	404	350	79	674	7.8	--
Oct. 31	57	--	.14	.15	--	--	--	--	--	316	13	22	--	1.4	1.6	417	357	76	667	8.3	--
Nov. 7	57	--	.06	.09	--	--	--	--	--	338	0	21	--	3.7	1.4	416	352	74	668	7.9	--
Nov. 28	97	--	.20	.21	--	--	--	--	--	320	8	18	--	1.0	1.1	430	372	96	696	8.4	--
Jan. 14, 1963	254	5.6	.55	.60	63	25	8.2	4.1	210	0	60	18	0.5	2.0	.58	327	260	88	525	8.0	60
Feb. 13	111	5.1	.27	.20	61	22	10	6.6	246	0	54	20	4.0	1.0	1.5	315	243	66	506	7.7	55
Mar. 12	1940	5.7	.64	.52	46	15	4.6	4.7	146	0	40	12	3.5	1.5	.72	237	177	57	368	7.8	50
Apr. 16	213	.4	.16	.10	73	32	9.4	1.6	266	10	71	18	3.7	7.8	.18	363	314	79	596	8.4	5
May 21	161	1.5	.16	.17	76	32	9.9	1.9	308	0	64	18	3.5	5.2	.50	386	321	68	624	8.1	8
June 13	122	4.2	.24	.03	74	32	10	2.3	284	6	59	20	3.8	8.0	.58	370	316	74	608	8.3	10
July 17	74	--	.12	.22	--	--	--	--	268	0	58	20	--	4.7	.81	341	270	50	560	8.0	--
July 24	94	--	.16	.18	--	--	--	--	274	0	56	22	--	3.7	.82	340	278	53	572	7.7	--

GREAT MIAMI RIVER BASIN--Continued  
3-2660. STILLWATER RIVER AT ENGLEWOOD, OHIO--Continued  
Chemical analyses, in parts per million, October 1962 to July 1963--Continued

Date of collection	Dissolved oxygen		Organics			Cyanide (CN)	Turbidity	Threshold odor
	Parts per million	Percent saturation	Phenols as C <sub>6</sub> H <sub>5</sub> OH	Alkyl benzene sulfonate (ABS)	Ammonia nitrogen as NH <sub>3</sub>			
Oct. 10, 1962.....	8.0	84	0.004	0.3	0.1	0.05	15	0
Oct. 17.....	10.1	109	.000	.3	.1	.00	20	DI-2
Oct. 18.....	7.2	82	.003	.4	.2	.05	15	M-2
Oct. 21.....	10.0	86	.005	.4	.4	.05	15	M-2
Nov. 7.....	11.6	95	.000	.4	.1	.05	9	DI-128
Nov. 28.....	7.5	60	.001	.3	.2	.05	2	0
Jan. 14, 1963.....	8.5	58	.006	.2	.8	.10	120	0
Feb. 13.....	9.4	72	.000	.3	1.5	.10	15	0
Mar. 12.....	8.4	64	.012	.1	.9	.15	100	M-4
Apr. 16.....	10.8	99	.004	.1	.4	.05	10	0
May 21.....	8.2	88	.000	.2	.0	.05	15	0
June 13.....	6.8	77	.000	.1	.3	.10	65	M-4
July 17.....	4.4	56	.000	.2	.4	.10	35	A-2
July 24.....	4.8	61	.000	.2	.4	.05	30	M-2



## QUALITY OF SURFACE WATERS, 1963

## GREAT MIAMI RIVER BASIN--Continued

## 3-2660. STILLWATER RIVER AT ENGLEWOOD, OHIO--Continued

## Periodic determinations of suspended sediment, April 1960 to July 1963

Date	Time (24 hr)	Water tem- per- ature ("F)	Discharge (cfs)	Suspended sediment	
				Mean concen- tration (ppm)	Discharge (tons per day)
Apr. 5, 1960.....	1130		161	33	14
Nov. 1, 1961.....	1315		89	16	4
Nov. 9.....	1340		78	4	1
Nov. 15.....	1415		82	18	4
Nov. 22.....	1430		140	6	2
Nov. 30.....	1430		159	4	2
Feb. 14, 1962.....	1545		260	2	1
Feb. 26.....	1700		4260	704	8100
Feb. 28.....	1250		6240	130	2190
Apr. 18.....	1145		227	15	9
May 16.....	1520		159	16	7
June 13.....	1330		222	92	55
June 27.....	1430		69	40	7
July 18.....	1520		301	46	37
July 23.....	1110		2310	94	586
Aug. 1.....	1030		168	66	30
Aug. 8.....	1050		222	86	52
Sept. 12.....	1550		50	31	4
Sept. 19.....	1830		53	32	4
Sept. 26.....	1500		46	28	3
Oct. 10.....	1400		65	34	6
Oct. 31.....	1430		57	14	2
Nov. 7.....	1100		57	6	1
May 16, 1963.....	1445		195	22	12
May 21.....	1400		161	60	26
July 17.....	1430		74	32	6

GREAT MIAMI RIVER BASIN--Continued  
3--2700. MAD RIVER NEAR DAYTON, OHIO

LOCATION ---At bridge at gaging station on State Highway 444, about 600 feet downstream from Huffman Dam, 6 miles northeast of Dayton, Montgomery County.  
DRAINAGE AREA. --632 square miles.  
RECORDS AVAILABLE. --Chemical analyses: November 1961 to July 1963 (discontinued).  
REMARKS. --Samples for iron and manganese filtered clear when collected.

Chemical analyses, in parts per million, October 1962 to July 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> ) (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate as (NO <sub>3</sub> ) PO <sub>4</sub>	Phosphorus as residue at 180°C	Hardness as CaCO <sub>3</sub>		Total conductance (micro-mhos at 25°C)	Color or pH	
																Calcium, carbonate	Non-carbonate			
Oct. 10, 1962	238	--	0.12	0.07	--	--	--	--	--	314	79	20	--	10	2.2	426	358	100	709	7.6
Oct. 17.....	247	--	.13	.07	--	--	--	--	--	312	81	20	--	8.6	2.2	424	356	100	697	7.8
Oct. 24.....	199	--	.14	.06	--	--	--	--	--	324	85	24	--	10	2.3	440	371	105	725	7.6
Oct. 31.....	199	--	.15	.09	--	--	--	--	--	320	86	23	--	10	2.4	444	369	107	718	7.6
Nov. 7.....	203	--	.10	.08	--	--	--	--	--	316	81	20	--	11	2.4	426	356	96	701	7.9
Nov. 28.....	266	--	.18	.10	--	--	--	--	--	346	86	19	--	8.6	2.1	448	382	98	733	8.0
Dec. 12.....	210	7.2	.15	.12	78	28	12	3.1	260	79	80	20	0.2	6.9	.62	382	310	96	618	8.0
Jan. 14, 1963	440	8.0	.23	.17	87	34	10	2.5	316	80	84	18	.5	10	.88	421	357	98	678	8.2
Feb. 13.....	256	5.5	.16	.11	94	33	38	2.6	336	84	60	16	.3	6.5	1.7	502	370	94	826	7.9
Apr. 16.....	401	2.0	.25	.20	90	35	9.7	1.9	330	87	87	16	.3	5.8	.70	424	369	98	689	8.1
May 21.....	359	3.8	.26	.19	85	34	11	2.1	320	78	78	18	.3	10	1.1	427	352	90	678	7.9
June 17.....	213	7.2	.15	.13	89	34	12	2.2	334	81	81	20	.3	6.5	1.1	438	362	88	696	8.1
July 1.....	216	--	.15	.14	--	--	--	--	--	316	78	20	--	7.5	1.8	422	340	81	672	7.9
July 24.....	225	--	.25	.16	--	--	--	--	--	314	77	20	--	7.6	1.8	415	343	85	667	7.7

GREAT MAIMI RIVER BASIN--Continued  
3-2700. MAD RIVER NEAR DAYTON, OHIO--Continued

Chemical analyses, in parts per million, October 1962 to July 1963--Continued

Date of collection	Dissolved oxygen		Organics			Cyanide (CM)	Turbidity	Threshold odor
	Parts per million	Percent saturation	Phenols $C_6H_5OH$	Alkyl benzene sulfonate (ABS)	Ammonia nitrogen as $NH_4$			
Oct. 10, 1962.....	4.2	43	0.013	0.5	1.6	0.25	8	0
Oct. 17.....	5.0	51	.000	.6	.1	.20	4	M-4
Oct. 24.....	7.4	66	.018	.6	.4	.20	2	E-8
Oct. 31.....	5.9	51	.004	.7	.7	.20	3	M-4
Nov. 7.....	6.6	54	.000	.6	1.0	.20	4	M-2
Nov. 28.....	8.1	64	.007	.6	.7	.20	2	0
Dec. 12.....	8.4	58	.008	.3	.7	.15	10	0
Jan. 13, 1963.....	8.4	58	.006	.6	.7	.10	10	M-2
Feb. 13.....	9.6	70	.000	.6	.7	.25	3	M-1
Apr. 16.....	7.8	70	.022	.3	.3	.20	4	0
May 21.....	7.8	80	.000	.4	.1	.50	6	E-4
June 13.....	7.0	79	.010	.3	.1	.25	25	M-2
July 17.....	3.6	43	.000	.4	.2	.25	20	M-2
July 24.....	2.7	32	.000	.4	.2	.20	15	M-2

## GREAT MIAMI RIVER BASIN--Continued

3-2700. MAD RIVER NEAR DAYTON, OHIO--Continued

Periodic determinations of suspended sediment, November 1961 to July 1963

Date	Time (24 hr)	Water tem- per- ature (°F)	Discharge (cfs)	Suspended sediment	
				Mean concen- tration (ppm)	Discharge (tons per day)
Nov. 1, 1961.....	1115		252	4	3
Nov. 9.....	1230		247	3	2
Nov. 15.....	1045		275	2	1
Nov. 22.....	1130		301	1	1
Nov. 30.....	1100		367	2	2
Jan. 12, 1962.....	1525		500	42	57
Jan. 17.....	1115		880	47	112
Feb. 14.....	1130		513	8	11
Feb. 26.....	1445		4550	1320	16200
Feb. 28.....	1115		3130	238	2010
Mar. 14.....	1115		1300	64	225
Apr. 18.....	1100		454	8	10
May 16.....	1110		296	5	4
June 13.....	1020		271	40	29
June 27.....	1100		211	14	8
July 18.....	1130		215	31	18
July 25.....	0950		271	46	34
Aug. 1.....	0930		203	24	13
Aug. 8.....	0930		211	15	8
Sept. 19.....	1130		211	18	10
Sept. 26.....	1130		203	10	5
Oct. 10.....	1030		233	15	9
Oct. 24.....	1115		195	3	2
Nov. 7.....	1010		195	2	1
May 21, 1963.....	1045		359	22	21
July 17.....	1130		216	52	30
July 24.....	1230		225	44	27

## GREAT MIAMI RIVER BASIN--Continued

3-2715. GREAT MIAMI RIVER AT MIAMISBURG, OHIO  
(Formerly published as Miami River at Miamisburg)

LOCATION.--Temperature recorder at gaging station, 600 feet downstream from bridge on State Highway 725 at Miamisburg, Montgomery County, Ohio, and 0.3 mile downstream from Bear Creek.

DRAINAGE AREA.--2,718 square miles.

RECORDS AVAILABLE.--Water temperatures: October 1959 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 91°F July 27, 28, minimum, 34°F Mar. 4-8.

EXTREMES, 1959-63.--Water temperatures: Maximum, 91°F July 27, 28, 1963; minimum, freezing point Jan. 10, 11, 15-17, 1962.

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

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

## GREAT MIAMI RIVER BASIN--Continued

3-2716, GREAT MIAMI RIVER NEAR MIAMISBURG, OHIO  
(Formerly published as Miami River near Miamisburg)

LOCATION.--At Chautauqua Road Bridge, about 2 miles south of Miamisburg, Montgomery County, off old U.S. Highway 25, and 2.5 miles downstream from gaging station.  
DRAINAGE AREA, 12,718 square miles at gaging station.  
REMARKS.--Samples for iron and manganese filtered clear when collected. Samples for chemical analyses collected weekly, October and November, July to September; monthly, January to June. Records of discharge are given for Great Miami River at Miamisburg.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> ) (mg/l)	Alum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphate (PO <sub>4</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Total conductivity (microhm-cm at 25°C)	pH	Color
																		Calcium, mg/l	Non-carbonate, mg/l			
Oct. 10, 1962	499	--	--	0.13	0.12	--	--	--	--	--	282	84	36	--	6.8	4.5	437	317	86	736	7.3	--
Oct. 17.....	450	--	--	.17	.19	--	--	--	--	--	309	88	39	--	5.0	5.1	459	332	78	776	7.5	--
Oct. 24.....	422	--	--	.18	.14	--	--	--	--	--	308	91	39	--	8.9	4.8	466	347	94	778	7.4	--
Oct. 31.....	459	--	--	.18	.13	--	--	--	--	--	308	89	38	--	8.0	5.2	463	330	87	761	7.6	--
Nov. 7.....	450	--	--	.12	.13	--	--	--	--	--	296	89	38	--	5.8	3.3	463	330	87	761	7.5	--
Nov. 28.....	709	--	--	.27	.10	--	--	--	--	--	314	98	30	--	12	4.0	458	356	98	757	8.0	--
Jan. 14, 1963	1130	6.0	--	.27	.30	77	29	18	3.4	--	270	82	28	0.6	12	2.9	401	311	90	652	8.2	35
Feb. 13.....	651	7.4	--	.35	.63	71	27	36	5.3	--	260	82	49	.6	10	3.4	438	288	75	707	7.9	32
Mar. 12.....	8990	5.3	--	.32	.30	47	14	7.0	4.5	--	146	47	14	.2	13	.62	245	175	55	382	7.7	40
Apr. 16.....	1190	1.7	--	.14	.07	78	32	23	2.5	--	296	87	27	.6	8.5	2.7	422	326	84	690	8.0	8
May 21.....	970	2.6	--	.11	.14	76	32	23	2.6	--	294	77	31	.4	6.9	2.1	407	321	80	686	7.8	8
June 13.....	873	5.4	--	.39	.63	75	34	23	3.1	--	302	85	29	.6	8.5	2.5	436	327	80	702	7.9	10
July 17.....	535	--	--	.20	.30	--	--	--	--	--	300	88	38	--	1.5	3.9	448	314	68	734	7.5	--
July 24.....	10400	--	--	.16	.18	--	--	--	--	--	282	80	36	--	4.9	3.6	415	299	68	687	7.7	--
July 31.....	416	--	--	.18	.27	--	--	--	--	--	308	86	48	--	2.5	3.8	470	322	69	772	7.9	18
Aug. 7.....	790	--	--	.17	.28	--	--	--	--	--	300	95	41	--	.1	3.9	450	314	68	754	7.9	--
Aug. 14.....	428	--	--	.14	.18	--	--	--	--	--	270	80	40	--	3.4	4.2	408	282	60	677	7.7	--
Aug. 28.....	322	--	--	.31	.23	--	--	--	--	--	308	86	46	--	2.2	3.2	449	320	67	751	7.7	--
Sept. 5.....	298	--	--	.17	.29	--	--	--	--	--	324	99	50	--	2.6	3.4	490	342	76	815	7.6	--
Sept. 11.....	280	--	--	.17	.20	--	--	--	--	--	330	102	53	--	1.8	3.3	496	346	75	834	7.3	--
Sept. 18.....	280	--	--	.22	.17	--	--	--	--	--	308	98	56	--	1.0	2.8	494	319	66	812	7.4	--
Sept. 24.....	234	--	--	.17	.14	--	--	--	--	--	326	100	55	--	7.5	2.4	503	340	72	837	7.5	--

GREAT MIAMI RIVER BASIN--Continued  
3-2716. GREAT MIAMI RIVER NEAR MIAMISBURG, OHIO--Continued  
Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Dissolved oxygen		Organics			Ammonia nitrogen as $\text{NH}_4$	Nitrite ( $\text{NO}_2$ )	Cyanide (CN)	Turbidity	Threshold odor
	Parts per million	Percent saturation	Phenols as $\text{C}_6\text{H}_5\text{OH}$	Alkyl benzene sulfonate (ABS)						
Oct. 10, 1962.....	0.1	1	0.017	1.0		1.4	0.25		20	M-16
Oct. 17.....	.2	2	.011	1.1		2.5	.40		20	E-12
Oct. 24.....	.7	7	.010	1.1		1.8	.20		25	C-16
Oct. 31.....	.4	4	.004	1.1		1.6	.25		30	C-16
Nov. 7.....	1.6	15	.002	1.0		1.6	.25		8	C-16
Nov. 28.....	5.0	46	.007	.8		1.2	.10		30	M-16
Jan. 14, 1963.....	7.3	51	.005	.3		1.3	.15		25	C-32
Feb. 13.....	9.0	69	.016	.8		1.7	.25		35	C-32
Mar. 12.....	7.2	55	.010	.2		.8	.15		75	C-8
Apr. 16.....	4.7	46	.024	.8		1.1	.30		15	C-16
May 21.....	5.7	64	.007	.5		1.5	.50		15	C-16
June 13.....	4.9	58	.000	.5		1.0	.50		15	M-16
July 17.....	.2	3	.000	.8		1.8	1.5		25	C-16
July 24.....	1.1	14	.000	.5		1.0	.50		15	C-32
July 31.....	1.1	14	.020	.7		2.6	1.0		15	C-16
Aug. 7.....	.6	8	.000	.8		2.6	2.0		10	C-32
Aug. 14.....	.3	4	.000	.8		2.0	.50		15	E-4
Aug. 28.....	.2	2	.004	.6		2.1	.60		20	C-16
Sept. 5.....	0	0	.020	1.0		3.1	2.0		3	M-4
Sept. 12.....	1.6	20	.003	1.0		2.7	.80		20	M-4
Sept. 18.....	.9	11	.009	1.0		2.7	1.5		20	C-16
Sept. 24.....	.8	10	.032	1.1		2.7	1.0		20	C-8

## GREAT MIAMI RIVER BASIN--Continued

3-2716. GREAT MIAMI RIVER NEAR MIAMISBURG. OHIO--Continued

Periodic determinations of suspended sediment, November 1961 to July 1963

Date	Time (24 hr)	Water tem- per- ature (°F)	Discharge (cfs)	Suspended sediment	
				Mean con- cen- tration (ppm)	Discharge (tons per day)
Nov. 1, 1961.....	1600		769	23	48
Nov. 9.....	1610		814	24	53
Nov. 30.....	1200		1010	34	93
Feb. 14, 1962.....	1300		1550	22	92
Feb. 28.....	1730		19700	220	11700
Mar. 14.....	1215		12000	142	4600
Apr. 18.....	1015		1310	8	28
June 13.....	1110		700	38	72
June 27.....	1200		471	20	25
July 18.....	1220		958	38	98
July 25.....	1320		1150	77	239
Aug. 1.....	1220		550	14	21
Aug. 8.....	1235		558	14	21
Aug. 22.....	1145		429	34	39
Sept. 19.....	1230		422	24	27
Sept. 26.....	1220		354	32	30
Oct. 31.....	1145		415	29	32
Nov. 7.....	1235		450	8	10
July 17, 1963.....	1230		520	18	25
July 24.....	1330		644	20	35



## GREAT MIAMI RIVER BASIN--Continued

3-2721. GREAT MIAMI RIVER AT MIDDLETOWN, OHIO

LOCATION.--At left bank at County Park dock at Middletown, Butler County, about 0.6 mile downstream from New York Central Railroad bridge, and 0.3 mile downstream from Twin Creek.

DRAINAGE AREA.--3,140 square miles, approximately.

RECORDS AVAILABLE.--Chemical analyses: July to September 1963.

REMARKS.--Samples are collected on a weekly basis July to November and monthly from December to June. Samples for iron and manganese were filtered clear when collected. No discharge records available.

Chemical analyses, in parts per million, July to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Alu- mi- num (Al)	Iron (Fe)	Man- ga- nese (Mn)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Potas- sium (K)	Lith- ium (Li)	Bi-car- bon- ate (HCO <sub>3</sub> )	Car- bon- ate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Phos- phorus (PO <sub>4</sub> )	Hardness as CaCO <sub>3</sub>		Specific conduct- ance (micro- mhos at 25°C)	Col- or or pH		
																		Cal- cium, mag- nesium	Non- car- bon- ate				
July 31, 1963				0.14	0.13						312	88	40			5.5	2.8	466	330	74	752	7.9	18
Aug. 7, .....				.17	.21						306	90	44			2.7	3.8	465	317	66	762	7.8	
Aug. 14, .....				.15	.09						288	83	37			5.7	2.9	426	308	72	703	7.7	
Aug. 28, .....				.16	.10						310	84	46			4.3	3.3	454	321	66	760	7.6	
Sept. 5, .....				.11	.11						326	87	46			4.5	3.2	475	338	70	785	7.6	
Sept. 11, .....				.06	.16						316	88	50			3.5	3.0	488	340	72	819	7.5	
Sept. 18, .....				.16	.06						314	94	49			1.8	3.1	483	323	65	808	7.4	
Sept. 24, .....				.14	.12						322	96	58			.7	2.1	516	332	68	839	7.6	

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

Date of collection	Dissolved oxygen		Organics		Ammonia nitrogen as NH <sub>4</sub>		Cyanide (CN)	Turbidity	Threshold odor
	Parts per million	Percent saturation	Phenols C <sub>6</sub> H <sub>5</sub> OH	Alkyl benzene sulfonate (ABS)	Percent	As			
July 31, 1963, .....	2.7	36	0.016	0.6	1.2	1.2		7	C-4
Aug. 7, .....	.9	12	.002	.8	1.7	1.7		6	M-8
Aug. 14, .....	1.2	15	.005	.6	1.5	1.5		7	E-4
Aug. 28, .....	1.3	16	.006	.6	1.9	1.9		8	M-4
Sept. 5, .....	1.0	12	.001	.8	2.4	2.4		6	M-16
Sept. 11, .....	4.4	57	.004	.8	2.0	2.0		15	Cs-8
Sept. 18, .....	1.2	15	.017	.8	2.0	2.0		10	C-8
Sept. 24, .....	3.6	42	.018	1.0	1.2	1.2		15	V-32

## GREAT MIAMI RIVER BASIN--Continued

3-2724. GREAT MIAMI RIVER NEAR MIDDLETOWN, OHIO

LOCATION.--At dock on left bank beneath Baltimore and Ohio Railroad bridge near Middletown, Butler County, 0.7 mile downstream from Woodsdale Road Bridge.  
 DRAINAGE AREA.--3,300 square miles, approximately.  
 RECORDS AVAILABLE.--Chemical analyses: July to September 1963.  
 REMARKS.--Samples are collected on a weekly basis July to November and monthly from December to June. Samples for iron and manganese were filtered clear when collected. No discharge records available.

Chemical analyses, in parts per million, July to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> ) (Al)	Alu- mi- num (Al)	Iron (Fe)	Man- ga- nese (Mn)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Pot- tas- sium (K)	Lith- ium (Li)	Bi-car- bon- ate (HCO <sub>3</sub> )	Car- bon- ate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Dis- solved phos- phor- solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		To- tal con- duct- ance (micro- H <sup>+</sup> at 25°C)	pH or	Col- or	
																	Cal- cium, car- mag- bon- esum	Non- cal- cium, car- bon- ate				
July 31, 1963				0.40	0.18						258	140	44		1.7	0.20	510	338	126	794	7.6	16
Aug. 7, .....				.65	.19					216	178	46	46		1.6	.13	534	334	157	821	7.6	
Aug. 14, .....				.67	.24					226	127	42	42		2.6	.11	453	298	113	717	7.4	
Aug. 28, .....				.44	.11					244	145	46	46		2.4	.08	508	325	125	792	7.5	
Sept. 5, .....				.26	.23					228	183	50	50		1.5	.10	556	356	169	854	7.1	
Sept. 11, .....				.35	.34					244	188	57	57		1.7	.14	576	363	163	890	7.1	
Sept. 18, .....				.26	.21					234	196	61	61		1.7	.06	584	356	164	914	7.1	
Sept. 24, .....				.49	.15					314	115	62	62		.0	.30	537	340	82	867	7.6	

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

Date of collection	Dissolved oxygen		Organics			Ammonia nitrogen as $\text{NH}_4$	Nitrite ( $\text{NO}_2$ )	Cyanide (CN)	Turbidity	Threshold odor
	Parts per million	Percent saturation	Phenols as $\text{C}_6\text{H}_5\text{OH}$	Alkyl benzene sulfonate (ABS)						
July 31, 1963.....	4.5	59	0.000	0.6	0.6	0.8	0.25		30	C-4
Aug. 7, .....	4.0	52	.000	.6	.6	2.0	.30		15	M-8
Aug. 14, .....	3.7	50	.000	.6	.6	1.0	.35		15	M-4
Aug. 28, .....	4.3	52	.011	.6	.6	2.3	.8		8	M-2
Sept. 5, .....	3.2	38	.021	.8	.8	2.2	.40		10	M-3
Sept. 11, .....	5.6	69	.017	.9	.9	1.5	.25		15	Cs-8
Sept. 18, .....	3.6	43	.006	.9	.9	3.2	.10		6	M-8
Sept. 24, .....	5.0	56	.000	1.0	1.0	2.6	.20		8	M-4

## GREAT MIAMI RIVER BASIN--Continued

3-2740. GREAT MIAMI RIVER AT HAMILTON, OHIO  
(Formerly published as Miami River at Hamilton)

LOCATION.--Temperature recorder at gaging station, 1,000 feet downstream from Columbia Bridge at Hamilton, Butler County, and 3.0 miles from Hamilton, Hamilton County, Ohio.  
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 1963.  
EXTREMES, 1950-51, 1957-63.--Water temperatures: Maximum, 92°F Aug. 4; minimum, 33°F Mar. 4-7.

EXTREMES, 1950-51, 1957-63.--Water temperatures: Maximum, 92°F Aug. 23, 24, 1959, Sept. 2, 1960; minimum, freezing point on several days during December 1950, January and February 1951.

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

Month		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Average
October	Maximum	72	70	70	70	71	72	72	72	72	72	74	76	76	77	77	75	72	72	71	71	69	67	63	59	56	54	56	59	58	57	69	
	Minimum	68	69	68	68	70	71	71	70	71	72	73	75	75	75	75	71	70	70	69	69	67	63	59	56	54	53	53	56	57	54	67	
	Mean	70	69	69	69	70	71	71	71	71	71	73	75	75	76	76	73	71	71	70	70	68	65	61	57	54	54	57	58	56	60		
November	Maximum	55	55	55	54	54	54	54	54	54	54	54	52	51	52	54	55	51	49	49	48	46	46	46	46	45	46	45	46	47	51	51	
	Minimum	54	54	54	54	53	53	53	53	53	53	53	52	50	50	51	52	54	51	49	48	48	46	45	45	45	45	45	45	45	50		
	Mean	54.5	54.5	54.5	54.5	53.5	53.5	53.5	53.5	53.5	53.5	53.5	53	51.5	51.5	52.5	54.5	52.5	50	49	48.5	47	46	45.5	45.5	45.5	45.5	45.5	45.5	45.5	50.5		
December	Maximum	48	48	48	48	48	45	42	42	40	37	35	35	35	36	38	40	42	43	44	43	43	41	40	40	38	38	39	39	39	42	40	
	Minimum	47	48	47	48	45	42	40	37	35	35	35	34	34	35	36	38	40	41	43	43	41	40	39	38	37	38	38	37	40	39		
	Mean	47.5	48	47.5	48	46.5	43.5	41	38.5	36.5	36	34.5	34.5	34.5	35.5	37	39	41	42	43	43.5	42	41	40.5	39.5	38.5	38.5	38.5	38.5	38.5	40.5		
January	Maximum	37	37	39	40	42	42	42	42	44	45	42	41	36	35	36	38	40	41	42	40	38	37	36	34	35	37	37	37	38	40	39	
	Minimum	36	36	37	37	39	40	42	41	42	41	41	36	34	34	35	36	38	39	40	38	37	36	34	34	35	37	37	37	38	37		
	Mean	36.5	36.5	38	38	40.5	41	41	41.5	43	42.5	41.5	38.5	35	34.5	35.5	37	39	39.5	39	38.5	37.5	36.5	34.5	34.5	35.5	37.5	37.5	37.5	37.5	37.5		
February	Maximum	42	42	40	41	41	41	40	39	39	39	39	39	39	38	39	40	42	44	45	45	42	40	40	41	40	39	41	--	--	41	41	
	Minimum	39	41	40	40	40	40	39	39	39	39	39	38	38	38	39	40	42	44	42	40	39	40	40	39	38	38	--	--	40	40		
	Mean	40.5	41.5	40	40.5	40.5	40.5	39.5	39	39	39	39	39	38.5	38.5	39	40	42	44	43	43	40.5	39.5	39.5	39.5	38.5	38.5	--	--	40.5			
March	Maximum	41	38	40	37	33	33	34	34	36	37	37	38	40	40	42	44	45	45	45	45	44	44	44	45	47	49	50	51	53	55	42	
	Minimum	37	35	33	33	33	33	33	34	34	36	37	37	38	40	40	42	44	45	45	45	44	44	44	45	47	49	50	51	53	55	41	
	Mean	39	36.5	36.5	35	33	33.5	33.5	34	35	36.5	37	37.5	39	40	41	43	44.5	45	45	45	44.5	44.5	44.5	45.5	47.5	49.5	50.5	51.5	53.5	54		
April	Maximum	55	58	60	60	60	60	59	58	58	58	58	59	59	59	60	64	65	65	64	64	62	58	56	57	59	61	61	61	61	--	60	
	Minimum	55	55	58	60	60	60	59	58	58	58	58	59	59	59	60	64	64	64	64	62	58	56	55	56	57	59	61	61	--	59		
	Mean	55.5	56.5	59	60	60	60	59.5	58.5	58.5	58.5	58.5	59	59	59	60	64.5	64.5	64.5	64.5	63	61	59	58.5	58	59	60	61	61	61	60.5		
May	Maximum	61	59	60	62	65	65	66	68	70	71	71	68	66	68	69	70	70	71	71	71	71	71	72	73	73	74	74	75	75	68	68	
	Minimum	59	59	59	60	62	65	66	68	70	71	71	68	65	66	68	69	70	70	71	71	71	71	71	72	73	73	74	74	75	68		
	Mean	60	59.5	59.5	61	63.5	65.5	67	69	70.5	71	71	68	67	67.5	68.5	69.5	70	70.5	70.5	71	71	71	71	71.5	72.5	73.5	74	74.5	74.5	68.5		
June	Maximum	75	76	77	77	77	79	79	80	82	84	84	83	82	82	82	82	82	82	82	82	82	82	83	84	85	86	86	86	--	82	82	
	Minimum	75	75	76	77	77	79	79	80	82	84	84	83	82	82	82	82	82	82	82	82	82	82	83	84	85	86	86	86	--	81	81	
	Mean	75.5	75.5	76.5	77.5	77.5	79.5	79.5	81	83	85	85	83.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	83.5	84.5	85.5	86.5	86.5	86.5	86.5	81.5		
July	Maximum	87	87	87	87	87	87	86	86	85	84	84	84	84	84	85	87	88	89	87	85	85	85	85	85	85	85	85	89	89	86	86	
	Minimum	86	87	87	87	87	86	85	85	84	84	84	84	84	84	84	85	87	87	85	85	85	85	85	85	85	85	85	84	84	85		
	Mean	86.5	87	87	87	87	86.5	86.5	85.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	86	87.5	88	87	86	86	86	86	86	86	86	86.5	86.5	86.5	85.5		
August	Maximum	90	90	91	92	87	86	86	88	88	85	87	85	82	83	84	83	84	82	81	81	81	81	81	83	84	83	85	84	84	84	85	
	Minimum	85	85	85	86	83	84	84	84	84	84	84	82	80	82	80	79	79	79	76	75	74	78	78	79	76	77	78	80	80	81		
	Mean	87.5	87.5	88	89	85	85	86	86	86	86	86	85	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	84.5	84.5	84.5	84.5	84.5	84.5	85.5		
September	Maximum	84	81	82	80	82	80	81	83	83	81	82	80	77	77	79	78	79	80	79	78	76	74	73	73	73	70	70	70	--	78	78	
	Minimum	78	76	78	79	78	75	75	77	77	78	79	76	74	73	73	75	74	74	75	75	74	73	71	68	66	67	68	65	63	--	74	
	Mean	81	78.5	80	79.5	80	78.5	79	80	80	80	79.5	77.5	75.5	74	74	77	76.5	77	79.5	79.5	78.5	77.5	75.5	73.5	73.5	70.5	70.5	70.5	70.5	74.5		

## GREAT MIAMI RIVER BASIN--Continued

3-2740.5. GREAT MIAMI RIVER NEAR HAMILTON, OHIO

LOCATION --At American Materials Company private bridge at Hamilton, Butler County, about 5.5 miles below gaging station.

DRAINAGE AREA --3,680 square miles; 3,639 square miles at gaging station.

RECORDS AVAILABLE --Chemical analyses: July to September 1963.

REMARKS --Samples are collected on a weekly basis July to November and monthly from December to June. Samples for iron and manganese were filtered clear when collected. Records of discharge are given for Great Miami River at Hamilton.

Chemical analyses, in parts per million, July to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> ) (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Carbonyl sulfate (SO <sub>4</sub> ) (CO <sub>3</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (PO <sub>4</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Toxicity (micro-mos at H <sup>+</sup> 25°C)	pH or Col	
																	Calcium, carbonat-mag-nesium	Non-carbonat-residue			
July 31, 1963	521		0.23	0.14						238	150	43		4.9	0.16	497	332	137	777	8.0	16
Aug. 7, .....	534		.39	.23						238	128	46		8.0	.17	435	290	114	706	7.5	
Aug. 14, .....	554		.34	.13						270	119	44		2.5	.22	480	320	98	765	7.6	
Sept. 5, .....	389		.23	.16						298	123	52		1.8	.36	513	350	106	832	7.6	
Sept. 11, .....	346		.30	.34						286	138	53		2.1	.26	527	350	115	850	7.4	
Sept. 18, .....	323		.28	.11						310	120	58		1.4	.41	519	346	92	863	7.3	
Sept. 24, .....	275		.23	.22						256	168	55		.3	.20	558	350	140	878	7.3	

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

Date of collection	Dissolved oxygen		Organics			Ammonia nitrogen as NH <sub>4</sub>	Nitrite (NO <sub>2</sub> )	Cyanide (CN)	Turbidity	Threshold odor
	Parts per million	Percent saturation	Phenols as C <sub>6</sub> H <sub>5</sub> OH	Alkyl benzene sulfonate (ABS)						
July 31, 1963.....	8.3	109	0.010	0.5		0.4	0.35		25	C-4
Aug. 7, .....	5.0	66	.000	.6		1.8	.50		8	M-8
Aug. 14, .....	4.9	61	.000	.6		1.5	.50		15	Cc-2
Aug. 28, .....	4.6	58	.000	.6		2.0	.60		15	E-4
Sept. 5, .....	4.4	54	.018	.7		2.4	.70		4	M-8
Sept. 11, .....	4.0	49	.014	.8		1.5	.70		15	C-16
Sept. 18, .....	3.8	46	.010	.9		2.3	.50		10	M-4
Sept. 24, .....	4.1	47	.011	.9		2.7	.50		20	Ds-8

GREAT MIAMI RIVER BASIN--Continued  
3-2766. GREAT MIAMI RIVER AT ELIZABETHTOWN, OHIO  
(Formerly published as Miami River at Elizabethtown)

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 1963.

Water temperatures: October 1956 to September 1963.

EXTREMES, 1962-63.--Dissolved solids: Maximum, 552 ppm Sept. 1-30; minimum, 345 ppm Mar. 1-4, 28-31.

Specific conductance: Maximum daily, 309 ppm Aug. 30; minimum daily, 298 ppm Aug. 29.

Water temperatures: Maximum daily, 87°F Aug. 4; minimum, 33°F Dec. 13, 14.

EXTREMES, 1956-63.--Dissolved solids: Maximum, 552 ppm Sept. 1-30, 1963; 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, 1,040 micromhos Jan. 3, 1961; minimum daily, 286 micromhos Jan. 28, 1962.

Water temperatures: Maximum, 89°F June 29, Aug. 23, 24, 1959; minimum, freezing point on several days during winter months of most years.

REMARKS.--Records of specific conductance of daily samples available in district office at Columbus, Ohio. No discharge records available.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-magnesium			
Oct. 1-31, 1962.....		7.3	--	78	35	36	4.4	238	145	42	0.5	12	498	339	144	764	7.7	12
Nov. 1-30.....		5.7	80.00	82	32	39	3.7	249	134	40	.5	18	506	332	148	785	7.8	5
Dec. 1-31.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7
Jan. 1-31, 1963.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7
Feb. 1-31.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7
Mar. 1-4, 28-31.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7
Apr. 1-30.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7
May 1-31.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7
June 1-30.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7
July 1-31.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7
Aug. 1-31.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7
Sept. 1-30.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7
Time-weighted average.....		5.7	80.00	86	32	34	3.7	249	135	40	.5	18	506	332	148	785	7.8	7

a. In solution when analyzed.

b. Represents 91 percent of days.

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued  
(Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Turbidity
														Calcium	Non-carbonate			
Jan. 9, 1963 (maximum conductance).....								240	158	46	.6	20	542	371	174	849	7.6	--
Jan. 11 (minimum conductance).....								206	90	30	.4	14	386	270	101	624	7.6	--
Jan. 11 (maximum turbidity).....								--	--	--	--	--	--	--	--	--	--	1500
Feb. 6 (maximum conductance).....								242	100	130	.2	16	602	316	117	997	8.0	--
Feb. 11 (minimum conductance).....								240	78	34	.2	15	402	290	93	632	8.2	--
Feb. 13 (maximum turbidity).....								--	--	--	--	--	--	--	--	--	--	10
Apr. 13 (maximum conductance).....								a264	98	32	.2	11	425	328	103	686	8.4	--
Apr. 22 (minimum conductance).....								b165	54	20	.2	9.5	261	200	58	430	8.4	--
May 28 (maximum conductance).....								276	111	34	.6	12	453	342	116	742	7.6	--
May 1 (minimum conductance).....								212	79	22	.1	13	332	264	90	550	8.1	--
June 27 (maximum conductance).....								246	134	48	.6	10	468	345	143	782	7.4	--
June 9 (minimum conductance).....								204	74	29	.6	12	324	256	88	563	7.0	--
July 2 (maximum conductance).....								258	140	47	.4	10	504	350	138	798	7.3	--
July 23 (minimum conductance).....								198	106	40	.4	9.4	396	279	117	649	7.5	--
Aug. 9 (maximum conductance).....								215	174	55	.7	7.7	512	345	169	805	7.1	--
Aug. 22 (minimum conductance).....								229	113	44	.6	11	440	302	114	708	7.5	--
Sept. 30 (maximum conductance).....								228	186	75	0.5	17	621	366	179	943	7.4	--
Sept. 1 (minimum conductance).....								<b>236</b>	138	52	.5	12	509	320	126	784	6.7	--

a Includes 10 ppm carbonate (CO<sub>3</sub>).  
b Includes 8 ppm carbonate (CO<sub>3</sub>).

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

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

Month		Day																													Average
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October.....	68	66	68	67	68	70	72	71	69	72	72	72	74	75	76	76	72	69	68	68	67	65	62	58	54	52	51	56	58	57	55
November.....	53	54	54	53	52	53	54	54	54	54	53	53	53	52	51	55	56	54	52	50	50	50	50	49	48	48	49	50	50	50	52
December.....	51	51	49	50	49	47	44	43	40	38	34	34	33	33	34	36	40	43	44	43	42	39	40	40	40	37	38	40	38	38	41
January.....	38	39	38	40	41	42	43	45	46	42	42	40	37	34	34	38	43	41	40	34	35	---	---	---	---	---	---	---	---	---	---
February.....	---	---	37	39	43	45	43	39	38	39	39	41	40	38	36	37	41	43	45	46	40	36	38	40	40	40	38	42	---	---	---
March.....	40	37	40	42	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
April.....	59	62	64	60	58	57	59	58	59	58	59	59	59	60	60	57	67	67	65	67	57	54	53	56	59	61	65	64	59	---	60
May.....	65	67	69	72	69	69	74	72	68	63	61	67	68	68	70	73	71	70	66	68	69	71	72	70	73	72	75	73	69	70	68
June.....	76	77	76	74	75	77	82	83	84	85	82	78	79	81	78	76	80	80	80	76	80	81	83	84	84	82	85	82	---	---	---
July.....	83	84	84	84	83	77	79	82	80	78	80	80	78	78	82	84	86	85	85	82	83	83	82	84	84	86	86	85	82	86	83
August.....	85	86	86	87	86	84	84	86	85	85	84	83	81	80	79	77	77	78	73	73	77	79	80	80	76	77	78	79	80	78	81
September.....	78	77	77	76	75	77	76	77	78	79	79	78	74	71	74	75	77	76	77	78	75	73	71	70	71	71	69	64	65	---	---

## OHIO RIVER MAIN STEM

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

LOCATION:--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.

DATA AVAILABLE:--Chemical analyses: October 1959 to September 1963.

Water temperatures: October 1959 to September 1963.

EXTREMES, 1962-63.--Specific conductance: Maximum daily, 810 micromhos Oct. 21, minimum daily, 188 micromhos Mar. 16.

Water temperatures: Maximum, 84°F Aug. 4, 6-12; minimum, 33°F on several days during January and February.

EXTREMES, 1959-63.--Dissolved solids (1959-62): Maximum, 366 ppm Oct. 1-31, 1959; minimum, 152 ppm Apr. 1-2, 4-30, 1960.

Hardness (1959-62): Maximum, 199 ppm Oct. 1-31, 1959; minimum, 96 ppm on many days during April 1960, December 1961, March and April 1962.

Specific conductance: Maximum daily, 810 micromhos Oct. 21, 1962; minimum daily, 167 micromhos Mar. 3, 1962.

Water temperatures: Maximum, 88°F July 1, 1962; minimum, freezing point on many days during winter months.

REMARKS: Composite analyses of water samples collected during October 1962 to September 1963. Data based on maximum weekly, maximum monthly, and minimum monthly specific conductance of daily samples. Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. No discharge records available.

Chemical analyses, in parts per million, water year October 1962 to September 1963  
(Composite analyses and analyses based on maximum weekly, maximum monthly, and minimum monthly specific conductance)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> ) (mg/l)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (PO <sub>4</sub> )	Hardness as CaCO <sub>3</sub>			Specific conductance (micromhos at 25°C)	pH	Coliforms or C <sub>6</sub> H <sub>5</sub> SO <sub>3</sub> Na (ABS)	Organics as phenols or C <sub>6</sub> H <sub>5</sub> SO <sub>3</sub> Na (ABS)
																	Calcium	Non-carbonate	Hardness as CaCO <sub>3</sub>				
Oct. 1-31, 1962.																	220	176	742	--	--	--	--
Oct. 21, 1962.											54	170	84	0.6	8.9	--	441	220	176	742	--	--	--
Maximum monthly											54	174	105	.6	7.8	--	484	243	199	810	7.9	--	--
Oct. 7											60	150	73	.5	10	--	399	203	154	673	7.0	--	--
Minimum monthly											42	118	41	.2	5.8	--	288	152	118	483	--	--	--
Nov. 1-30, 1962.											49	186	83	.5	9.8	--	460	222	182	752	7.3	--	--
Nov. 1, 1962.											37	47	17	.1	3.2	--	146	81	50	238	8.3	--	--
Nov. 28, 1962.											40	63	18	.2	5.8	--	174	98	65	292	--	--	--
Maximum monthly											50	70	28	.3	6.3	--	205	114	73	336	7.6	--	--
Dec. 1-31, 1962.											37	46	14	.2	4.1	--	143	83	52	242	7.4	--	--
Dec. 24-25, 1962.											42	68	20	.2	5.3	--	179	104	70	300	--	--	--
Maximum monthly											44	77	26	.2	5.8	--	198	114	78	346	7.5	--	--
Dec. 1, 1962.											36	58	20	.2	4.6	--	150	88	58	263	7.5	--	--
Minimum monthly																							



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

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued  
(Composite analyses and analyses based on maximum weekly, maximum monthly, and minimum monthly specific conductance)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> ) (Al)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (P)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	Coliforms or C <sub>14</sub> OH (ABS)	Organics
																	Calcium, magnesium	Non-bicarbonate			
Feb. 1-28, 1963						--	--				44	69	22	0.2	5.8	--	191	108	72	316	--
Feb. 19-20, 22-23						--	--				42	79	26	.2	5.8	--	210	115	80	346	7.1
Maximum monthly						--	--				41	58	18	.2	4.2	--	166	92	58	269	7.6
Feb. 13, Minimum monthly						--	--				42	52	14	.0	2.9	--	134	87	52	235	--
Mar. 1-31,.....						--	--				56	68	26	.1	4.2	--	191	115	69	332	6.7
Mar. 3, Maximum monthly						--	--				30	45	13	.0	2.7	--	107	67	42	188	7.4
Mar. 18, Minimum monthly						--	--				64	73	20	.3	4.6	--	207	127	74	333	--
Apr. 1-30,.....						--	--				7	155	14	.4	4.0	--	265	103	98	441	6.0
Apr. 2, Maximum monthly						--	--				48	57	14	.2	4.1	--	155	98	58	258	7.0
Apr. 3, Minimum monthly						--	--				76	88	32	.3	4.6	--	233	149	87	402	--
May 1-31,.....						--	--				80	97	31	.3	7.5	--	257	164	98	438	7.3
May 5, Maximum monthly						--	--				78	81	26	.3	4.5	--	227	143	79	378	7.3
May 21, Minimum monthly						--	--				62	88	26	.2	4.2	--	244	138	86	386	--
June 1-30,.....						--	--				50	113	34	.2	4.0	--	245	148	107	444	7.0
June 12, Maximum monthly						--	--				50	58	16	.0	3.7	--	153	98	57	272	7.5
June 15, Minimum monthly						--	--				--	--	--	--	--	--	--	--	--	--	--
July 6, Maximum weekly.						--	--				--	96	--	--	0.29	--	--	--	--	392	7.2
July 13, Maximum weekly.						--	--				--	104	--	--	.22	--	--	--	--	426	7.0
July 14, Maximum weekly.						--	--				--	102	--	--	.21	--	--	--	--	417	7.4





Jan. 1-22, 1963....	384	--	--	--	--	--	--	--	--	202	--	304	--	--	--	--
Jan. 20,										226	--	518	7.2	3	--	--
Maximum conductance	360	5.9	.06							356	184					
Jan. 14,										120	47	145	7.0	7	--	--
Minimum conductance	580	7.2	.16													
Jan. 19,										--	--	--	--	--	--	--
Maximum turbidity..	460	--	--	--	--	--	--	--	--	--	--	--	--	--	700	--
Feb. 1-28.....	1029	--	--	--	--	--	--	--	--	209	--	321	--	--	--	--
Feb. 10,										338	210	480	6.8	2	--	--
Maximum conductance	441	3.7	.01							96	48	146	6.8	4	--	--
Feb. 21,										--	--	--	--	--	--	--
Minimum conductance	2150	6.6	.02							--	--	--	--	--	700	--
Feb. 21,										270	--	406	--	--	--	--
Maximum turbidity..	2150	--	--	--	--	--	--	--	--	812	514	973	7.2	12	--	--
Mar. 1-28.....	4512	--	--	--	--	--	--	--	--	95	52	164	6.8	15	--	--
Mar. 3,										--	--	--	--	--	450	--
Maximum conductance	1650	6.9	.19							--	--	--	--	--	--	--
Mar. 9,										279	--	462	--	0	--	--
Minimum conductance	1210	6.0	.02							288	181	512	7.2	10	--	--
Mar. 18,										258	156	425	6.9	5	--	--
Maximum turbidity..	33900	--	--	--	--	--	--	--	--	--	--	--	--	--	90	--
Apr. 8-30.....	161	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Apr. 27,										--	--	--	--	--	--	--
Maximum conductance	110	3.2	.02							228	--	395	7.2	--	--	--
Apr. 8-9,										330	180	541	6.9	5	--	--
Minimum conductance	238	5.1	.00							148	92	247	6.8	5	--	--
Apr. 9,										--	--	--	--	--	--	--
Maximum turbidity..	238	--	--	--	--	--	--	--	--	--	--	--	--	--	40	--
May 1-31.....	257	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May 15,										--	--	--	--	--	--	--
Maximum conductance	100	3.8	.00							--	--	--	--	--	--	--
May 22,										--	--	--	--	--	--	--
Minimum conductance	288	9.8	.00							--	--	--	--	--	--	--
May 28,										--	--	--	--	--	--	--
Maximum turbidity..	178	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

a A composite value of 0.8 ppm alkyl benzene sulfonate (ABS) was found Nov. 13-27.

b A daily value of 1.4 ppm alkyl benzene sulfonate (ABS) was found on Nov. 27.

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

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity
														Calcium	Magnesium-carbonate				
June 1-30, 1963.....	81.7	--	--	--	--	--	--	--	--	--	--	--	305	--	--	489	--	--	--
June 30, Maximum conductance	105	4.5	0.00	--	--	--	--	104	219	8.0	--	--	608	232	147	652	7.4	5	--
June 1, Minimum conductance	142	9.2	.00	--	--	--	--	54	118	4.0	--	--	214	142	98	374	6.9	5	--
June 18, Maximum turbidity..	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20
July 1-31.....	85.3	--	--	--	--	--	--	--	--	--	--	--	390	--	--	550	--	--	--
July 30, c Maximum conductance	130	6.7	.04	--	--	--	--	0	432	6.0	--	--	600	373	373	857	4.6	5	--
July 6, Minimum conductance	32	5.9	.00	--	--	--	--	24	165	4.0	--	--	252	184	160	439	6.8	5	--
July 24, Maximum turbidity..	166	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	25
Aug. 1-31.....	85.1	--	--	--	--	--	--	--	--	--	--	--	318	--	--	508	--	--	--
Aug. 11, Maximum conductance	110	7.5	.03	--	--	--	--	2	364	5.0	--	--	546	314	312	735	4.9	5	--
Aug. 5, Minimum conductance	80	8.1	.00	--	--	--	--	40	128	5.5	--	--	336	124	91	364	6.2	5	--
Aug. 11, Maximum turbidity	120	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	340
Sept. 1-30.....	30.7	--	--	--	--	--	--	--	--	--	--	--	407	--	--	612	--	--	--
Sept. 17, Maximum conductance	19	7.2	.00	--	--	--	--	28	308	13	--	--	470	236	213	716	6.2	5	--
Sept. 2, Minimum conductance	22	5.2	.00	--	--	--	--	98	168	7.5	--	--	348	187	107	524	6.6	5	--
Sept. 8, Maximum turbidity..	154	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10

c Sample for July 30 contained 0.7 ppm acidity (potential free acidity at pH 7.0).



## 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, and 0.9 mile upstream from lock 4.

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 1963.

Water temperatures: October 1949 to September 1963.

Sediment concentrations: 1952 to September 1963.

EXTREMES 1962-63.--Dissolved solids: Maximum, 164 ppm Oct. 1-31; minimum, 105 ppm June 1-30.

Specific conductance: Maximum daily, 573 micromhos Nov. 18; minimum daily, 126 micromhos Mar. 9.

Water temperatures: Maximum, 82°F July 3, 4; minimum, 34°F Jan. 29, 30, Feb. 4.

Sediment concentrations: Maximum daily, 980 ppm Mar. 13; minimum daily, 6 ppm Sept. 30.

Sediment loads: Maximum daily, 144,000 tons Mar. 14; minimum daily, 6 tons Oct. 28.

EXTREMES 1949-62.--Dissolved solids: Maximum, 250 ppm Dec. 1-14, 1960; minimum, 44 ppm Jan. 8, 1962.

Specific conductance: Maximum, 166 ppm Dec. 1-14, 1960; minimum, 21 ppm Jan. 8, 1962.

Water temperatures: Maximum, 82°F July 3, 4; minimum, 34°F Jan. 29, 30, Feb. 4.

Sediment concentrations: Maximum, 48°F July 22, 1957; minimum, freezing point on several days during January and February 1961.

Sediment loads (1952-63): Maximum daily, 420,000 tons Feb. 28, 1962; minimum daily, 1 ton on many days during 1952 to 1956.

REMARKS.--Values reported for iron are in solution when analyzed. Records of specific conductance of daily samples available in district office at Columbus, Ohio. Flow was regulated by Herrington Lake and by hydroelectric plant at lock 7.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)		Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
													Calcium	Non-carbonate	Calcium	Non-carbonate			
Oct. 1-31, 1962.....	1275	5.2	0.00					122	21	14			164	126	282	26	282	7.5	8
Nov. 1-31.....	5708							76					138		242		242	7.5	
Dec. 1-31.....	5259												120		207		207		
Jan. 1-31, 1963.....	9806												124		213		213		
Feb. 1-28.....	29800												109		172		172		
Mar. 1-31.....	3497												107		180		180		
Apr. 1-30.....	4672												151		258		258		
May 1-31.....	2371												128		215		215		
June 1-30.....	1425												148		267		267		
July 1-31.....	612												155		275		275		
Aug. 1-31.....																			
Sept. 1-30.....	6304												119		209		209		
Weighted average..	--												132		236		236		
Time-weighted average.....	--												2030		--		--		
Tons per day.....	--														--		--		

## KENTUCKY RIVER BASIN--Continued

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

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued  
(Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity
														Calcium	Non-magnesium				
Oct. 19, 1962 (maximum conductance).....	432	6.2	0.00					146	28	14			195	150	30	336	7.8	16	--
Oct. 2 (minimum conductance).....	4380	3.9	.00					100	18	9.5			136	102	20	238	7.5	7	--
Oct. 19 (maximum turbidity).....	432	--	--					--	--	--			--	--	--	--	--	--	600
Nov. 18 (maximum conductance).....	3640	6.8	.08					100	34	105			349	163	81	573	8.2	25	--
Nov. 24 (minimum conductance).....	11100	7.1	.05					96	30	12			160	114	36	261	8.2	18	--
Nov. 12 (maximum turbidity).....	16600	--	--					--	--	--			--	--	--	--	--	--	190
Dec. 25 (maximum conductance).....	14500	6.1	.04					82	35	30			184	120	53	304	7.7	15	--
Dec. 25 (maximum conductance).....	16000	5.9	.01					78	23	9.0			120	98	34	206	7.6	6	--
Dec. 25 (maximum turbidity).....	14500	--	--					--	--	--			--	--	--	--	--	--	450
Jan. 19, 1963 (maximum conductance).....	4590	7.0	.20					65	26	22			142	84	31	235	7.5	25	--
Jan. 26 (minimum conductance).....	2600	7.1	.12					58	24	9.0			114	70	22	178	7.5	20	--
Jan. 25 (maximum turbidity).....	2900	--	--					--	--	--			--	--	--	--	--	--	110
Feb. 6 (maximum conductance).....	16900	6.4	.04					74	31	15			164	95	34	241	7.4	5	--
Feb. 12 (minimum conductance).....	10300	5.6	.26					58	23	7.5			102	71	24	177	7.4	8	--
Feb. 7 (maximum turbidity).....	13000	--	--					--	--	--			--	--	--	--	--	--	130
Mar. 5 (maximum conductance).....	37400	6.2	.03					92	23	7.0			136	96	20	219	7.8	7	--



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

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity
														Calcium	Non-carbonate				
Mar. 9 (minimum conductance).....	37900	5.8	.16					42	19	5.0			82	49	14	126	7.3	16	--
Mar. 11 (maximum turbidity).....	16800	--	--					--	--	--			--	--	--	--	--	--	1000
Apr. 9 (maximum conductance).....	5530	7.8	.00					50	32	7.0			111	78	37	192	7.1	2	--
Apr. 12 (minimum conductance).....	4340	8.7	.00					46	27	11			96	64	26	168	6.8	4	--
Apr. 3 (maximum turbidity).....	6890	--	--					--	--	--			--	--	--	--	--	--	130
May 24 (maximum conductance).....	2700	6.4	.00					76	52	67			242	126	64	434	7.4	3	--
May 29 (maximum conductance).....	13000	7.0	.03					48	24	12			96	59	20	166	6.6	9	--
May 31 (maximum turbidity).....	19600	--	--					--	--	--			--	--	--	--	--	--	900
June 10 (maximum conductance).....	12900	8.4	.01					68	18	16			117	79	24	203	7.0	6	--
June 8 (minimum conductance).....	5360	6.2	.08					46	13	8.0			89	52	14	131	7.0	35	--
June 23 (maximum turbidity).....	14300	--	--					--	--	--			--	--	--	--	--	--	500
July 6 (maximum conductance).....	1340	7.5	.00					70	21	31			143	86	28	262	7.4	3	--
July 21 (minimum conductance).....	2040	7.8	.06					78	17	9.0			113	82	18	187	7.5	22	--
July 18 (maximum turbidity).....	804	--	--					--	--	--			--	--	--	--	--	--	80
Aug. 17 (maximum conductance).....	1020	6.9	.01					100	30	17			159	122	40	293	7.2	10	--
Aug. 2 (minimum conductance).....	3280	6.9	.02					80	26	14			120	80	14	232	7.3	5	--
Aug. 3 (maximum turbidity).....	3280	--	--					--	--	--			--	--	--	--	--	--	55

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

Sept. 7, 1963 (maxi- conductance)....	510	3.8	.02													116	27	16		169	118	23	288	7.0	10	--							
Sept. 18 (minim conductance).....	599	2.6	.02													88	29	17		150	106	34	261	6.9	5	--							
Sept. 9 (maximum turbidity).....	823	--	--													--	--	--		--	--	--	--	--	--	25							
Temperature (°F) of water, water year October 1962 to September 1963 (Continuous ethyl alcohol-actuated thermograph)																																	
Month		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Aver- age
October	Maximum ....	68	67	65	65	64	64	64	65	64	65	64	66	67	67	67	67	67	67	65	65	64	64	63	63	61	60	59	57	57	57	56	63
	Minimum ....	65	61	64	63	64	63	63	64	63	63	63	63	65	66	65	66	65	64	63	63	63	62	61	60	59	57	55	55	57	56	55	62
November	Maximum ....	55	55	54	53	53	52	52	52	51	52	51	52	52	51	50	50	50	50	49	49	48	48	48	47	47	46	44	46	46	46	46	50
	Minimum ....	54	54	53	53	52	52	51	51	50	51	50	51	50	50	50	50	49	49	48	48	48	48	47	47	46	44	46	46	46	46	46	50
December	Maximum ....	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	41
	Minimum ....	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	41
January	Maximum ....	40	39	38	38	38	38	38	38	38	38	39	41	41	40	39	38	38	38	38	38	38	37	38	--	--	36	36	37	36	35	35	38
	Minimum ....	39	38	37	37	38	38	38	38	38	38	38	38	38	38	38	37	37	37	37	37	37	36	37	--	--	36	36	36	34	34	35	37
February	Maximum ....	36	36	35	35	36	36	37	37	37	37	37	37	38	38	38	38	38	38	38	38	38	38	38	38	38	37	37	38	37	37	--	37
	Minimum ....	35	35	35	35	35	36	37	37	37	37	37	37	38	38	38	38	38	38	38	38	38	38	37	37	36	37	37	36	--	--	--	37
March	Maximum ....	38	38	39	40	42	45	45	46	46	46	46	46	46	46	47	48	48	49	50	50	50	49	48	48	48	49	49	49	50	51	52	47
	Minimum ....	37	38	37	39	40	42	44	45	46	46	46	46	46	46	47	48	49	49	50	50	49	48	48	48	48	48	48	48	49	50	51	46
April	Maximum ....	52	54	56	56	56	56	56	57	57	57	57	57	57	57	57	57	57	58	60	62	63	64	64	62	62	63	62	62	62	62	--	59
	Minimum ....	51	52	54	55	55	55	55	56	56	56	56	57	57	57	57	57	57	57	58	59	60	62	62	61	61	61	61	62	62	62	--	58
May	Maximum ....	62	61	62	63	67	67	67	68	68	68	68	68	68	68	68	68	68	68	67	68	68	68	68	68	68	68	68	68	68	68	67	67
	Minimum ....	61	61	61	62	63	64	65	65	66	67	67	67	67	67	67	67	67	67	66	67	67	67	67	67	67	67	67	67	67	67	66	67
June	Maximum ....	67	67	67	67	68	69	69	70	72	72	72	73	73	73	73	73	74	76	76	74	73	75	75	76	77	77	77	78	80	--	73	
	Minimum ....	66	66	67	67	67	68	68	69	70	71	71	72	72	72	72	72	73	74	74	74	72	72	73	74	75	76	76	76	76	--	72	
July	Maximum ....	80	81	82	82	83	79	78	78	78	76	71	71	71	75	76	77	79	80	80	78	78	77	77	77	77	78	77	78	77	78	80	78
	Minimum ....	75	77	78	77	77	76	76	76	76	69	69	70	70	71	73	75	76	77	77	76	77	76	76	76	76	76	77	76	76	76	75	75
August	Maximum ....	81	80	76	76	76	76	78	76	75	76	77	77	77	77	76	75	74	76	78	78	79	79	78	77	77	78	77	78	77	78	77	78
	Minimum ....	79	78	74	74	74	74	74	74	74	74	75	75	75	74	73	73	72	74	76	76	76	76	76	76	76	76	76	76	76	76	76	75
September	Maximum ....	79	78	78	77	79	77	79	78	80	78	78	78	77	76	75	75	76	77	76	76	76	76	76	76	76	76	76	76	76	76	76	75
	Minimum ....	75	74	78	76	76	75	74	74	76	76	76	76	74	73	74	74	73	74	73	73	73	73	73	73	72	72	72	71	70	69	--	73

## QUALITY OF SURFACE WATERS, 1963

## KENTUCKY RIVER BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1963

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean dis-charge (cfs)	Suspended sediment		Mean dis-charge (cfs)	Suspended sediment		Mean dis-charge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	471	--	14	406	7	8	2040	24	132
2..	4380	--	E 2100	804	7	15	1850	25	125
3..	7200	--	E 950	419	8	9	1540	23	96
4..	5230	18	254	582	9	14	1570	15	64
5..	3240	14	122	484	10	13	1480	15	60
6..	2580	13	90	471	10	13	1240	15	50
7..	1310	12	42	654	10	18	1240	15	50
8..	1340	42	152	564	11	17	1290	14	49
9..	1260	37	126	1970	43	S 323	1430	12	46
10..	940	10	25	14300	276	S 11400	1400	11	42
11..	920	7	17	18400	407	20200	1480	11	44
12..	728	7	14	16600	344	15400	1480	12	48
13..	528	7	10	13100	196	6930	1480	12	48
14..	690	66	S 132	8640	124	2890	1340	12	43
15..	582	56	88	5400	90	1310	980	13	34
16..	445	52	62	3720	67	673	880	18	43
17..	728	52	102	3240	52	455	1110	17	51
18..	709	52	100	3640	43	423	1020	15	41
19..	432	53	62	5020	42	569	1400	15	57
20..	582	54	85	6450	41	714	1510	15	61
21..	510	65	90	6540	41	724	4890	42	S 716
22..	564	49	75	6180	40	667	21800	241	S 15100
23..	510	44	60	7880	43	915	23500	416	26400
24..	484	35	46	11100	54	1620	19800	321	17200
25..	471	27	34	10400	57	1600	14500	358	14000
26..	510	19	26	7070	63	1200	9740	172	4520
27..	458	13	16	5190	47	659	7930	94	2010
28..	320	7	6	4170	33	372	7020	71	1340
29..	360	7	7	3120	26	219	10300	81	2240
30..	510	7	10	2440	24	158	13700	78	2880
31..	528	7	10	--	--	--	16000	84	3630
Total	39520	--	4927	168954	--	69528	176940	--	91230
Day	JANUARY			FEBRUARY			MARCH		
	Mean dis-charge (cfs)	Suspended sediment		Mean dis-charge (cfs)	Suspended sediment		Mean dis-charge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	14200	60	2300	2200	20	119	8350	21	473
2..	11200	47	1420	3880	22	230	13300	33	1180
3..	9000	38	923	11100	55	1650	15200	42	1720
4..	6180	37	617	14600	49	1930	17400	62	2910
5..	4930	29	386	18300	68	3360	37400	364	S 39300
6..	4210	26	296	16900	90	4110	46500	914	115000
7..	3720	26	261	13000	104	3650	44700	740	89300
8..	3600	26	253	9550	61	1570	42900	843	97600
9..	3040	26	213	7340	40	793	37900	733	75000
10..	2810	26	197	5620	58	880	22700	725	44400
11..	3360	26	236	7250	75	1470	16600	475	21300
12..	4550	26	319	10300	98	2720	42800	790	91300
13..	7880	31	660	10900	34	1000	50800	980	134000
14..	11500	42	1300	12700	33	1130	55800	955	144000
15..	11200	47	1420	12100	66	2160	60400	845	138000
16..	9360	36	910	8880	39	935	61100	790	130000
17..	6580	24	426	6450	32	557	49000	663	87700
18..	5360	23	333	5280	29	413	34300	530	49100
19..	4590	22	273	5190	25	350	41600	425	47400
20..	4210	21	239	7700	17	353	47500	580	74400
21..	3920	21	222	10300	15	417	41500	665	74500
22..	3680	21	209	13000	37	1300	28600	515	39800
23..	3320	22	197	14200	50	1920	20300	285	15600
24..	3400	22	202	12500	35	1180	16700	149	6720
25..	2900	22	172	10100	30	818	13800	146	5440
26..	2600	22	154	9500	43	1100	12600	129	4390
27..	2400	22	142	8260	37	825	10500	116	3290
28..	2200	22	131	7480	20	404	9260	124	3100
29..	2400	22	142	--	--	--	7760	116	2430
30..	2400	21	136	--	--	--	8110	111	2430
31..	2200	21	125	--	--	--	8350	111	2500
Total	162900	--	14814	274580	--	37344	923760	--	1544583

E Estimated.

S Computed by subdividing day.

## KENTUCKY RIVER BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1963--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..	7660	94	1940	1780	11	53	11100	345	S 11000
2..	7070	77	1470	2270	10	61	5920	192	3070
3..	6890	72	1340	2010	10	54	4090	177	1950
4..	6800	72	1320	1880	9	46	3400	168	1540
5..	6540	65	1150	1880	8	41	3320	160	1430
6..	6400	57	985	1540	8	33	5360	148	2140
7..	6140	50	829	1260	8	27	10900	134	3940
8..	5750	42	652	1310	9	32	12000	126	4080
9..	5530	38	567	1510	10	41	15800	197	8400
10..	5320	41	589	1240	10	33	12900	237	8250
11..	5190	40	560	1180	12	38	8350	126	2840
12..	4340	35	410	1020	13	36	5360	78	1130
13..	3320	28	251	1060	13	37	3920	69	730
14..	2380	21	135	1080	13	38	3240	66	577
15..	1600	20	86	1040	13	36	2850	66	508
16..	1600	20	86	1210	13	42	2240	66	399
17..	1540	21	87	3720	13	130	1970	66	351
18..	1480	21	84	6450	14	244	1720	65	302
19..	1370	21	78	10400	45	1260	1430	65	251
20..	1160	23	72	13400	76	2750	1370	65	240
21..	1480	31	124	9600	48	1240	5580	73	1100
22..	1130	19	58	6270	39	660	11800	132	S 4640
23..	1630	15	66	3800	26	267	14300	367	14200
24..	2300	15	93	2700	21	153	7300	104	S 2170
25..	1970	13	69	2240	20	121	3880	66	691
26..	1480	13	52	1720	20	93	2480	58	388
27..	2010	13	70	1510	20	82	1660	52	233
28..	1540	12	50	1750	22	104	1370	43	159
29..	1370	12	44	13000	153	S 6740	1400	38	144
30..	1910	12	62	25400	460	31500	1460	36	142
31..	--	--	--	19600	829	43900	--	--	--
Total	104900	--	13379	144830	--	89892	168470	--	76995
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..	1430	36	139	3280	40	354	445	13	16
2..	1290	36	125	3280	37	328	690	13	24
3..	861	36	84	2920	32	252	419	13	15
4..	672	36	65	2700	23	168	654	13	23
5..	940	36	91	2010	21	114	546	13	19
6..	1340	37	134	1720	21	98	370	12	12
7..	1510	37	151	1690	21	96	510	11	15
8..	3320	37	332	940	21	53	804	10	22
9..	3720	36	362	1820	21	103	823	10	22
10..	5360	36	521	2200	20	119	564	10	15
11..	4050	36	394	1780	20	96	484	10	13
12..	2770	36	269	1480	21	84	636	10	17
13..	2200	47	279	1820	20	98	654	10	18
14..	2070	55	307	1720	21	98	471	11	14
15..	1570	71	301	960	21	54	618	12	20
16..	1460	65	256	1370	22	81	484	9	12
17..	1400	58	219	1020	23	63	920	9	22
18..	874	56	132	1160	24	75	599	10	16
19..	804	55	119	823	33	73	747	10	20
20..	2080	--	E 480	1060	45	129	474	10	13
21..	2040	59	325	960	44	114	636	10	17
22..	3320	57	511	546	34	50	542	9	13
23..	4380	56	662	823	42	93	379	9	9
24..	3760	56	568	842	42	95	732	9	18
25..	2850	56	431	454	17	21	404	10	11
26..	2480	54	362	654	13	23	409	10	11
27..	2240	46	278	747	14	28	747	10	20
28..	1600	41	177	600	14	23	766	10	21
29..	1970	41	218	1040	13	36	1160	7	22
30..	4890	41	541	960	14	36	672	6	11
31..	4250	40	459	785	13	28	--	--	--
Total	73501	--	9292	44164	--	3083	18359	--	501

Total discharge for year (cfs-days).....2300878

Total load for year (tons).....1955568

E Estimated.

S Computed by subdividing day.

## KENTUCKY RIVER BASIN--Continued

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

Particle-size analyses of suspended sediment, water year October 1962 to September 1963

(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)	Sam- pling point	Water tem- per- ature (°F)	Discharge (cfs)	Sediment concentra- tion (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	
Mar. 13, 1963.....	1230			50400	947		48	58	72	86	96	98	100				SBWC
May 31.....	1330			19200	931		47	59	77	92	97	99	100				SBWC
June 23.....	0800			14800	483		72	85	94	98	99	100	--				SBWC

KENTUCKY RIVER BASIN--Continued  
3-2915. EAGLE CREEK AT GLENCOR, KY.

LOCATION.--At gaging station, 600 feet upstream from bridge on State Highway 16, 0.5 mile south of Glencoe, Gallatin County, 5.7 miles downstream from Tennale Creek, and 21 miles upstream from mouth.  
DRAINAGE AREA.--437 square miles.  
RECORDS AVAILABLE.--Water temperatures: October 1949 to September 1963.  
Sediment records: November 1961 to September 1963.  
EXTREMES, 1962-63.--Water temperatures: Maximum, 84°F June 9, July 2, Aug. 4; minimum, freezing point on many days during December to February.  
Sediment concentrations: Maximum daily, 2,400 ppm Mar. 17; minimum daily, 14 ppm Oct. 1, June 2, July 1, 19, September.  
Sediment loads: Maximum daily, 103,000 tons Mar. 5; minimum daily, less than 0.5 ton on many days during October, July, and September.  
EXTREMES, 1949-63.--Water temperatures: Maximum, 93°F Sept. 1, 2, 1953; minimum, freezing point on many days during winter months.  
Sediment concentrations (1961-63): Maximum daily, 2,400 ppm Mar. 17, 1963; minimum daily, 4 ppm Apr. 27, 1962.  
Sediment loads (1961-63): Maximum daily, 103,000 tons Mar. 5, 1963; minimum daily, less than 0.5 ton on many days in 1962 and 1963.  
REMARKS.--No temperature record Dec. 19 to Jan. 9, Jan. 18 to Feb. 20, May 17-28.

Temperature (°F) of water, water year October 1962 to September 1963  
(Twice-daily measurements at approximately 0700 and 1900)

Month			Day																												Aver- age		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
October																																	
60	62	64	72	73	70	63	63	64	64	65	68	67	--	70	69	61	63	61	61	61	59	53	50	40	45	43	50	55	51	60			
64	63	75	74	74	71	63	62	63	65	66	68	--	--	71	63	65	65	65	61	61	53	53	50	43	47	45	55	55	51	61			
November																																	
50	42	41	41	41	40	40	46	46	47	49	49	48	48	48	48	50	42	42	43	43	43	43	42	42	42	42	41	41	--	44			
49	45	43	43	46	45	46	46	46	49	49	49	48	48	49	47	42	42	43	43	43	43	43	43	42	42	41	41	41	--	45			
December																																	
40	40	41	40	34	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
40	40	41	40	33	32	32	32	32	32	32	32	32	32	32	32	32	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
January																																	
--	--	--	--	--	--	--	--	35	37	37	35	32	--	32	32	32	33	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
--	--	--	--	--	--	--	--	38	38	39	36	32	--	32	32	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
February																																	
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
March																																	
33	33	34	35	37	40	42	43	43	44	43	42	45	48	47	46	47	49	50	49	42	45	48	50	50	50	50	53	54	55	57	45		
33	34	35	35	38	42	43	43	44	44	42	44	47	48	47	45	49	50	51	48	40	45	47	49	51	50	53	53	55	57	57	46		
April																																	
58	40	40	60	59	58	58	58	58	58	58	56	56	57	57	58	59	66	70	69	68	67	69	68	67	66	67	68	69	58	--	62		
61	61	60	60	59	58	58	58	59	59	58	57	57	58	58	62	70	69	69	68	68	68	69	67	66	67	68	69	58	--	62			
May																																	
56	60	60	62	72	72	74	74	75	60	61	62	66	68	65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
56	60	60	62	72	72	74	76	74	61	62	66	69	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
June																																	
70	70	70	70	68	70	73	78	79	75	74	73	73	71	71	72	73	74	73	74	73	72	72	--	73	75	75	77	77	79	--	73		
73	73	71	72	72	73	80	84	83	79	76	76	77	75	75	77	78	76	76	75	76	77	78	77	78	80	80	81	82	83	--	77		

KENTUCKY RIVER BASIN--Continued  
 3-2915. EAGLE CREEK AT GLENCOE, KY.--Continued

Temperature (°F) of water, water year October 1962 to September 1963--Continued  
 (twice-daily measurements at approximately 0700 and 1900)

(Three-day measurements taken approximately 0700 and 2000)																																
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																																
a.m.....	79	78	76	77	74	76	73	73	73	72	72	73	73	72	--	74	76	79	79	78	74	74	74	74	74	75	76	76	75	77	76	75
p.m.....	83	84	80	78	80	75	75	78	75	76	77	76	77	76	76	79	80	80	80	82	76	75	75	77	76	80	82	81	82	82	83	79
August																																
a.m.....	77	77	77	78	77	--	76	74	77	76	77	76	75	--	71	70	71	71	70	70	65	66	68	71	70	70	--	70	72	72	73	73
p.m.....	83	83	83	84	83	82	82	82	82	80	81	81	78	75	74	75	75	74	73	70	73	71	73	75	73	75	75	75	72	74	76	77
September																																
a.m.....	72	70	72	72	71	68	68	71	71	72	73	72	71	69	69	67	68	68	67	67	66	65	61	60	60	60	59	59	59	56	--	67
p.m.....	74	74	73	73	73	72	73	75	76	76	76	75	70	69	73	73	72	72	73	72	71	70	65	65	65	65	64	63	59	61	--	70

## KENTUCKY RIVER BASIN--Continued

3-2915. EAGLE CREEK AT GLENCOE, KY.--Continued

Suspended sediment, water year October 1962 to September 1963  
(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..	3.2	14	T	52	26	4	53	71	10
2..	5.5	16	T	47	25	3	53	71	10
3..	958	--	1900	40	25	3	52	70	10
4..	3670	--	15000	33	23	2	50	64	9
5..	600	--	320	33	20	2	42	54	6
6..	147	--	20	30	18	1	38	47	5
7..	99	--	8	28	19	1	38	43	4
8..	73	--	6	25	16	1	35	30	3
9..	50	--	4	748	428	S	4080	35	37
10..	31	--	3	6060	816	13400	29	38	3
11..	24	--	2	4640	216	3480	25	44	3
12..	19	--	2	739	93	186	19	50	2
13..	17	--	2	258	74	52	15	53	2
14..	14	--	1	220	48	28	14	57	2
15..	12	--	1	105	37	10	13	--	2
16..	12	31	1	184	35	17	12	--	1
17..	11	36	1	562	79	S	202	11	--
18..	12	33	1	1570	--	500	11	--	1
19..	8.2	34	1	1500	--	450	11	--	1
20..	6.7	34	1	600	46	74	11	--	1
21..	3.6	32	T	350	37	35	14	--	1
22..	2.4	32	T	250	38	26	2600	--	8000
23..	2.6	32	T	180	39	19	1020	--	550
24..	4.0	32	T	130	40	14	543	--	94
25..	3.6	27	T	100	71	19	264	--	24
26..	4.9	20	T	81	106	23	147	--	11
27..	3.8	17	T	71	94	18	101	--	7
28..	6.7	21	T	64	67	12	81	--	6
29..	366	--	330	59	60	10	150	--	131
30..	111	74	22	56	66	10	500	--	36
31..	62	38	6	--	--	--	2000	--	146
Total	6343.2	--	17634	18815	--	22682	7987	--	8965
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..	800	--	60	100	28	8	3560	--	21000
2..	350	--	29	500	26	35	2620	430	3040
3..	250	--	22	1500	27	109	1160	410	1280
4..	150	--	13	700	25	47	4600	1600	S 36800
5..	120	--	11	300	27	22	15900	2250	S 103000
6..	100	--	9	150	31	12	9160	820	S 25500
7..	85	--	8	120	31	10	2170	118	S 805
8..	70	--	7	100	31	8	1070	50	144
9..	62	37	6	90	30	7	753	41	834
10..	65	36	6	200	31	17	1040	104	292
11..	71	32	6	450	29	35	2390	372	S 4080
12..	1780	700	A 3400	800	27	58	3500	436	S 4490
13..	647	224	S 441	450	28	34	1340	160	579
14..	258	326	S 250	300	30	24	830	113	253
15..	143	168	65	151	33	13	543	110	161
16..	101	78	21	120	33	11	4610	1060	S 34000
17..	79	51	11	93	34	8	13400	2400	A 87000
18..	71	37	7	85	36	8	3400	--	5200
19..	62	32	5	85	37	8	4180	--	21500
20..	54	33	5	89	37	9	6040	1010	S 18800
21..	46	33	4	103	38	10	1540	400	1660
22..	40	30	3	114	42	13	893	202	487
23..	35	32	3	93	43	11	615	134	222
24..	33	34	3	89	43	10	478	132	170
25..	31	31	2	87	30	7	406	114	125
26..	30	32	2	117	43	14	739	116	S 258
27..	28	30	2	193	61	32	1610	121	526
28..	27	28	2	135	88	32	1090	105	309
29..	26	27	2	--	--	--	653	94	166
30..	25	25	2	--	--	--	543	95	139
31..	25	27	2	--	--	--	949	96	246
Total	5664	--	4409	7314	--	612	91782	--	373066

S Computed by subdividing day.

T Less than 0.5 ton.

A Computed from partly estimated-concentration graph.



## KENTUCKY RIVER BASIN--Continued

3-2915. EAGLE CREEK AT GLENCOE, KY.--Continued

Suspended sediment, water year October 1962 to September 1963--Continued  
(Where concentrations are not reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	1330	94	338	1000	--	334	85	18	4
2..	614	96	159	248	58	39	69	14	3
3..	426	96	110	114	60	18	58	16	2
4..	281	89	68	87	62	14	54	20	3
5..	202	61	33	73	35	7	386	1300	A 1400
6..	159	94	40	65	22	4	1020	1200	A 3300
7..	135	92	34	58	24	4	198	155	83
8..	120	86	28	54	24	3	99	95	25
9..	129	86	30	50	24	3	64	56	10
10..	129	35	12	46	24	3	50	44	6
11..	114	25	8	40	28	3	48	43	6
12..	89	28	7	38	20	2	47	36	4
13..	79	28	6	436	--	1100	34	32	3
14..	69	22	4	1780	2000	A 9600	93	54	S 15
15..	67	36	6	530	520	744	71	94	18
16..	62	29	5	175	230	109	50	66	9
17..	62	34	6	2650	--	13000	32	44	4
18..	62	28	5	3260	440	3870	29	37	3
19..	62	26	4	872	210	494	30	34	3
20..	60	21	3	2190	--	13000	30	36	3
21..	56	17	2	1360	--	2400	30	38	3
22..	53	22	3	439	120	142	31	44	4
23..	48	19	2	230	84	52	23	32	2
24..	46	17	2	155	79	33	18	27	1
25..	44	21	2	120	73	24	23	21	1
26..	41	22	2	105	64	18	25	23	2
27..	38	26	3	97	46	12	21	24	1
28..	38	25	2	99	37	10	16	21	1
29..	38	29	3	111	37	11	13	26	1
30..	1040	--	550	103	27	8	12	18	1
31..	--	--	--	101	23	6	--	--	--
Total	5693	--	1477	16686	--	45067	2759	--	4921
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..	10	14	T	16	45	2	27	79	6
2..	11	20	1	13	37	1	22	56	3
3..	13	24	1	11	19	1	19	63	3
4..	10	35	1	10	30	1	23	46	3
5..	8.2	35	1	9.0	23	1	25	57	4
6..	10	34	1	11	20	1	38	46	5
7..	54	69	10	12	19	1	28	43	3
8..	21	73	4	11	35	1	19	35	2
9..	16	57	2	11	28	1	15	33	1
10..	11	46	1	12	30	1	12	28	1
11..	9.4	37	1	15	17	1	9.4	24	1
12..	7.0	29	1	24	21	1	7.4	24	T
13..	6.4	30	1	23	35	2	6.1	39	1
14..	8.6	28	1	436	--	230	5.2	39	1
15..	29	26	2	264	106	S 71	4.3	33	T
16..	19	20	1	101	105	29	3.4	35	T
17..	17	22	1	60	83	13	2.2	33	T
18..	12	22	1	40	106	11	1.5	24	T
19..	10	14	T	34	93	8	1.0	23	T
20..	272	215	S 340	1560	540	S 4290	1.0	24	T
21..	1620	1360	5950	1220	704	S 2600	.9	39	T
22..	680	470	1000	381	285	293	.8	40	T
23..	198	258	138	135	287	105	.6	45	T
24..	91	123	30	79	241	51	.6	37	T
25..	58	107	17	56	185	28	.4	35	T
26..	36	76	7	40	122	13	.3	46	T
27..	26	57	4	29	116	9	.3	48	T
28..	29	56	4	105	134	38	.3	42	T
29..	34	58	5	79	124	26	.2	60	T
30..	25	47	3	53	96	14	.2	42	T
31..	19	40	2	46	97	12	--	--	--
Total	337 .6	--	7532	4896	--	7856	274.1	--	36

Total discharge for year (cfs-days).....171583.9  
Total load for year (tons).....494757

S Computed by subdividing day.

T Less than 0.5 ton.

A Computed from partially estimated-concentration graph.

## KENTUCKY RIVER BASIN--Continued

3-2915. EAGLE CREEK AT GLENCOE, KY.--Continued

Particle-size analyses of suspended sediment, water year October 1962 to September 1963

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

Date of collection	Time (24 hour)	Water tem- per- ature (°F)	Discharge (cfs)	Sediment con- cen- tra- tion (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis	
						Percent finer than size indicated, in millimeters												
						0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000		
Mar. 1, 1963.....	2030			5200	996		45	58	69	85	97	99	100	--	--			SBWC
Mar. 2.....	1930			9460	3200		23	43	57	78	95	97	99	100	100			SBWC
Mar. 4.....	1930			9480	3300		29	43	62	79	94	97	99	100	100			SBWC
Mar. 19.....	1830			3860	833		43	54	67	82	97	99	100	--	--			SBWC
May 14.....	0630			1720	2130		44	56	70	84	99	00	--	--	--			SBWC
May 14.....	0630			1720	2130		22	34	50	72	96	99	100	--	--			SEN
June 6.....	0825			1080	1140		69	81	92	97	99	00	--	--	--			SBWC
Aug. 23.....	1800			187	421		84	90	94	97	98	99	100	--	--			SBWC



## GREEN RIVER BASIN

3-3064.9. GREEN RIVER NEAR GREENSBURG, KY.

LOCATION --At Sardine Fork 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 at gage.  
 RECORDS AVAILABLE --Chemical analyses: October 1959 to September 1963.

REMARKS.--Samples for iron and manganese filtered clear when collected. \*Records of discharge are given for Green River at Greensburg.

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Man- ga- nese (Mn)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Po- tas- sium (K)	Bicar- bonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Hardness		Specific conduct- ance (micro- mhos at 25 C)	pH	Col- or	Tur- bid- ity
														Cal- cium, magne- sium	Non- carbon- ate				
Oct. 9, 1962..	276	3.2	0.18	0.02	23	4.4	2.5	1.7	73	16	3.6	0.1	2.2	99	76	163	7.4	17	20
Nov. 6.....	65	3.8	.21	.10					91	19	6.5			111	--	203	7.2	14	3
Dec. 4.....	178	3.4	.16	.08					79	18	5.0			98	--	182	7.8	7	1
Jan. 8, 1963..	449	4.9	.11	.10					66	16	4.5			91	72	18	182	7.5	10
Feb. 12.....	2430	3.0	.18	--					27	13	1.5			84	--	172	7.5	100	5
Mar. 12.....	12000	4.7	.45	--					26	9.6	1.0			63	--	72	6.8	130	480
Apr. 9.....	296	2.9	.21	--					70	14	4.5			84	--	150	7.5	3	2
May 14.....	104	2.8	.13	--					78	15	4.5			96	--	168	6.9	3	3
June 11.....	310	6.2	.25	--					72	14	3.5			93	--	155	7.0	2	7
July 16.....	990	6.2	.18	--					72	14	3.0			94	--	153	7.1	7	20
Aug. 21.....	81	4.9	.11	--					86	10	3.5			98	--	172	7.1	4	10
Sept. 18.....	12	4.6	.28	--					98	12	4.5			108	--	193	7.1	3	15

Chemical analyses, in parts per million, water year October 1962 to September 1963

GREEN RIVER BASIN--Continued  
3-3078, LITTLE BARREN RIVER NEAR MONROE, KY.

LOCATION.--At bridge on State Highway 88, 1.2 miles east of Monroe, Hart County, and 6.3 miles upstream from mouth.

DATE.--At 2060 hours (October 11, 1962; October 12, 1962; and October 13, 1962).  
RECORDS AVAILABLE.--Chemical analyses, December 1960 to September 1963.

REMARKS.--No discharge records available.

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity
														Calcium	Non-magnesium				
Oct. 9, 1962.....		6.8	--					162	26	48			267			460	8.0	8	9
Nov. 6.....		5.2	--					200	53	80			382			662	7.7	18	2
Jan. 8, 1963.....		5.0	a0.09					168	29	54			246	184	46	444	7.9	15	4
Feb. 12.....		6.8	a.11					110	19	16			168			265	7.9	38	75
Mar. 12.....		--	--					--	--	7.5			115			212	--	--	--
Apr. 9.....		--	--					--	--	40			234			447	--	--	--
May 14.....		--	--					--	--	63			286			546	--	--	--
June 11.....		--	--					--	--	85			322			613	--	--	--
July 16.....		--	--					--	--	27			206			376	--	--	--
Sept. 18.....		--	--					--	--	210			578			1080	--	--	--

<sup>a</sup> In solution when analyzed.

## GREEN RIVER BASIN--Continued

3-3085, GREEN RIVER AT MURFORDVILLE, KY.

LOCATION.--At gaging station at bridge on U.S. Highway 31W, at Murfordsville, Hart County.

DRAINAGE AREA.--1,672 square miles, of which about 180 square miles is noncontributing.

RECORDS AVAILABLE.--Chemical analyses: October 1949 to September 1963.

Water temperatures: October 1950 to September 1963.

Sediment records: April 1951 to September 1963.

EXTREMES, 1962-63.--Dissolved solids: Maximum, 285 ppm Sept. 1-30; minimum, 139 ppm Mar. 1-31.

Specific conductance: Maximum daily, 719 micromhos Oct. 1; minimum daily, 116 micromhos Mar. 14.

Water temperatures: Maximum, 76° F. Aug. 8; minimum, 60° F. Mar. 6; minimum daily, 58° F. Mar. 8.

Sediment concentrations: Maximum daily, 1,800 tons Mar. 6; minimum daily, 100 tons Mar. 8.

Sediment loads: Maximum daily, 42,100 tons Mar. 6; minimum daily, less than 0.5 ton Sept. 26.

EXTREMES, 1950-63.--Dissolved solids: Maximum, 5,830 ppm Oct. 10, 1959; minimum, 73 ppm Feb. 19-21, 1956.

Hardness (1950-62): 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, 1949; minimum daily, 59 micromhos Mar. 25, 1952.

Water temperatures: Maximum, 82° F. July 20, 1957; minimum, freezing point on many days during winter months from 1957 to 1963.

Sediment concentrations (1951-63): Maximum daily, 3,180 ppm June 4, 1952; minimum daily, 1 ppm on many days in 1952 to 1957, 1960 to 1963.

Sediment loads (1951-63): Maximum daily, 137,000 tons Mar. 1, 1962; minimum daily, less than 0.6 ton many days in 1952 to 1957, 1960 to 1963.

REMARKS.--In 1952, when flow was low, records of specific conductance and specific conductance of daily samples available in district

Office at Columbus, Ohio. Flow affected by ice Jan. 23, 25-28.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180° C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25° C)	pH	Color
														Calcium	Non-magnesium carbonate			
Oct. 1-31, 1962.....	1115	8.3	0.00					134	13	57			229	143	33	423	7.8	9
Nov. 1-30.....	1373	--	--					124	--	--			239	--	--	431	--	--
Dec. 1-31.....	1557	--	--					--	--	--			237	--	--	438	7.9	--
Jan. 1-31, 1963.....	1125	--	--					--	--	--			223	--	--	380	--	--
Feb. 1-28.....	2903	--	--					--	--	--			166	--	--	302	--	--
Mar. 1-31.....	9343	--	--					--	--	--			139	--	--	240	--	--
Apr. 1-30.....	869	4.9	1.8	43	8.2			128	25	67			256	141	36	451	7.5	0
May 1-31.....	986	5.9	.00					118	17	48			204	126	30	366	7.3	5
June 1-30.....	1181	7.8	.01					100	18	31			157	104	22	281	7.3	5
July 1-31.....	1171	--	--					--	--	29			--	--	--	290	--	--
Aug. 1-31.....	637	--	--					--	--	46			207	--	--	376	--	--
Sept. 1-30.....	121	--	--					--	--	84			295	--	--	550	--	--
Weighted average..	1867	--	--					--	--	--			177	--	--	314	--	--
Time-weighted average.....	--	--	--					--	--	--			211	--	--	377	--	--
Tons per day.....	--	--	--					--	--	--			893	--	--	--	--	--

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

Chemical analyses, in parts per million, water year October 1962 to September 1963  
(Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity
													Calcium	Non-carbonate sum				
Oct. 1, 1962 (maximum conductance)...	242	11	0.00	--	--		151	17	132			388	191	68	719	8.1	7	--
Oct. 5 (minimum conductance).....	4130	7.6	.08	--	--		75	11	15			142	76	14	199	8.0	33	--
Oct. 3 (maximum turbidity).....	6010	--	--	--	--		--	--	--			--	--	--	--	--	--	500
Nov. 5 (maximum conductance).....	282	6.7	.00	--	--		158	16	105			339	182	52	612	8.2	6	--
Nov. 12 (minimum conductance).....	5910	7.7	.11	--	--		68	14	16			123	86	30	199	7.8	22	--
Nov. 11 (maximum turbidity).....	6410	--	--	--	--		--	--	--			--	--	--	--	--	--	150
Dec. 20 (maximum conductance).....	410	4.7	.01	--	--		140	22	102			312	180	66	590	8.1	3	--
Dec. 24 (minimum conductance).....	6710	7.2	.09	--	--		64	12	13			116	76	24	184	7.5	18	--
Jan. 28, 1963 (maximum conductance)...	550	7.0	.01	--	--		132	18	70			--	154	46	486	7.8	5	--
Jan. 29 (minimum conductance).....	4070	7.1	.01	--	--		88	14	19			143	92	20	235	7.7	5	--
Jan. 1 (maximum turbidity).....	4070	--	--	--	--		--	--	--			--	--	--	--	--	--	65
Feb. 3 (maximum conductance).....	2810	6.4	.00	--	--		137	20	62			254	153	41	457	8.0	4	--
Feb. 5 (minimum conductance).....	5240	7.5	.01	--	--		70	17	16			114	77	20	201	7.6	6	--
Feb. 5 (maximum turbidity).....	5210	--	--	--	--		--	--	--			--	--	--	--	--	--	380
Mar. 31 (maximum conductance).....	1820	6.6	.00	--	--		114	14	42			170	119	26	340	7.6	3	--
Mar. 14 (minimum conductance).....	22000	5.9	--	--	--		48	10	6.0			68	48	8	116	7.4	7	--
Mar. 6 (maximum turbidity).....	19500	--	--	--	--		--	--	--			--	--	--	--	--	--	2140





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

Temperature (°F) of water, water year October 1962 to September 1963  
(Once-daily measurement at 0700)

Month		Day																														Average		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				
October.....	59 61	58 61	60 63	63 65	63 65	63 65	63 65	61 63	63 65	63 65	61 63	63 65	66 67	65 66	59 59	62 59	62 59	57 57	57 51	56 42	56 42	56 42	56 42	56 42	56 42	56 42	56 42	56 42	56 42	59				
November.....	50 50	50 49	48 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	46 45	47				
December.....	42 43	43 43	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	45 45	36				
January.....	34 34	35 36	37 39	39 39	39 39	39 39	39 39	39 39	39 39	39 39	45 42	40 39	37 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	35			
February.....	34 39	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	32 32	35			
March.....	39 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	40 45	49			
April.....	61 63	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	64 60	59			
May.....	53 52	57 60	62 64	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	64 65	66			
June.....	68 70	70 69	69 70	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	74 74	72			
July.....	76 76	77 75	74 74	73 72	70 72	68 69	70 70	71 72	74 75	76 76	71 74	75 73	75 76	71 74	75 73	75 76	71 74	75 73	75 76	71 74	75 73	75 76	71 74	75 73	75 76	71 74	75 73	75 76	71 74	75 73	74			
August.....	76 76	77 78	77 74	78 76	76 74	75 74	75 73	71 73	70 71	73 71	70 71	73 71	70 71	73 71	70 71	73 71	70 71	73 71	70 71	73 71	70 71	73 71	70 71	73 71	70 71	73 71	70 71	73 71	70 71	73 71	74			
September.....	71 69	81 72	69 66	66 69	68 68	69 71	67	---	---	---	---	---	---	---	---	---	---	69	64 62	67 64	62 60	59 59	---	60	61 58	---	---	---	---	---	66			

## GREEN RIVER BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1963

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..	242	6	4	270	3	2	640	6	10
2..	1360	120	748	278	2	2	604	4	6
3..	6010	678	11000	274	2	1	568	3	5
4..	6130	716	11800	278	2	2	546	3	4
5..	4130	274	3060	282	4	3	523	4	6
6..	2200	115	689	278	5	4	505	4	5
7..	1460	48	189	278	5	4	492	3	4
8..	1130	34	104	282	7	5	478	4	5
9..	938	24	61	342	7	6	469	4	5
10..	770	17	35	2520	63	5	451	7	8
11..	662	14	25	6410	258	4460	433	5	6
12..	572	10	15	5910	150	2390	330	3	3
13..	613	126	59	3430	90	833	322	2	2
14..	1290	110	383	2020	60	327	354	2	2
15..	989	68	180	1480	37	148	354	4	4
16..	721	24	47	1180	16	57	362	2	2
17..	595	13	21	1010	14	38	362	3	3
18..	523	11	16	920	11	27	384	2	2
19..	492	12	16	1080	14	41	402	3	3
20..	433	10	12	1570	19	80	410	2	2
21..	410	6	7	1620	19	83	536	13	19
22..	384	5	5	1520	17	70	3510	120	1400
23..	342	4	4	1380	16	60	7150	271	5230
24..	318	5	4	1290	14	49	6710	158	2860
25..	266	4	3	1180	11	35	4130	55	577
26..	262	3	2	1020	10	28	2480	26	174
27..	270	4	3	890	7	17	2130	16	92
28..	278	4	3	800	8	17	1980	13	69
29..	266	4	3	730	7	14	1970	20	106
30..	262	4	3	680	7	13	3800	67	687
31..	262	3	2	--	--	--	4870	84	1100
Total	34571	--	28503	41202	--	9499	48255	--	12401
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..	4070	48	527	618	3	5	2520	23	156
2..	2930	31	245	770	8	17	4380	111	1310
3..	2280	15	92	2810	90	826	5810	165	2590
4..	1860	11	55	4610	198	2460	5530	127	1900
5..	1580	8	34	5240	285	4030	10300	628	20200
6..	1390	8	30	3460	96	897	19500	800	42100
7..	1260	7	24	2620	48	340	22800	430	26500
8..	1180	3	10	2120	20	114	23200	274	17200
9..	1110	4	12	1790	13	63	17200	88	4090
10..	1050	4	11	1520	10	41	6560	94	1660
11..	980	3	8	2270	41	312	5470	219	3780
12..	926	2	5	5200	214	3000	15200	772	31700
13..	1070	3	9	5640	138	2100	20500	418	24000
14..	1340	6	22	4440	72	863	22000	313	18600
15..	1250	6	20	3380	33	301	20500	176	9740
16..	1020	6	16	2620	23	163	9820	63	1670
17..	890	4	10	2080	13	73	6440	132	2450
18..	848	4	9	1850	10	50	10200	314	8650
19..	836	4	9	1790	12	58	12400	241	8070
20..	815	2	4	2400	16	104	11400	104	3200
21..	795	3	6	3550	41	393	8040	78	1690
22..	694	2	4	3440	38	373	5480	53	784
23..	550	2	3	2900	23	180	4060	37	406
24..	451	3	4	2570	15	104	3290	34	302
25..	450	2	2	2820	14	106	2820	24	183
26..	500	2	3	3060	14	116	2640	26	185
27..	500	2	3	2920	19	150	2780	22	165
28..	550	3	4	2590	14	98	2620	22	157
29..	564	3	4	--	--	--	2310	21	131
30..	572	3	5	--	--	--	2030	17	93
31..	577	2	3	--	--	--	1820	17	84
Total	34888	--	1193	81278	--	17337	289620	--	233746

S Computed by subdividing day.

## QUALITY OF SURFACE WATERS, 1963

## GREEN RIVER BASIN--Continued

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

## Suspended sediment, water year October 1962 to September 1963--Continued

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day
1..	1660	13	58	884	5	12	2030	120	658
2..	1527	16	66	1100	6	18	1290	51	178
3..	1400	11	42	1070	8	23	980	27	71
4..	1290	8	28	872	6	14	866	32	75
5..	1200	6	26	730	3	6	755	32	65
6..	1130	6	18	654	2	4	745	17	34
7..	1090	6	18	595	2	3	2260	116	708
8..	1050	6	17	554	1	1	2070	83	464
9..	998	7	19	514	2	3	1180	55	175
10..	938	7	18	478	2	2	902	33	80
11..	878	7	16	460	4	5	740	24	48
12..	825	6	13	428	6	7	690	19	35
13..	780	6	13	415	5	6	617	17	28
14..	745	7	14	428	4	5	595	15	24
15..	712	6	12	420	2	2	640	18	31
16..	694	6	11	474	26	33	914	55	140
17..	680	5	9	577	7	11	1000	26	70
18..	662	6	11	780	--	60	890	17	41
19..	644	8	14	1150	16	50	750	28	57
20..	631	8	14	836	8	18	618	30	50
21..	760	6	12	676	6	11	1120	128	584
22..	770	6	12	568	5	8	3650	392	3860
23..	765	5	10	496	4	5	3440	205	1940
24..	685	5	9	451	4	5	1700	89	408
25..	631	4	7	428	4	5	1090	44	129
26..	600	3	5	451	5	6	805	30	65
27..	572	6	9	554	105	210	649	21	37
28..	550	17	25	160	167	895	582	20	31
29..	564	4	6	3100	384	3210	980	--	890
30..	654	4	7	4350	320	3600	1010	366	1050
31..	--	--	--	4380	333	3940	--	--	--
Total	26078	--	539	30573	--	12378	35438	--	11936
Day	JULY			AUGUST			SEPTEMBER		
	Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day
1..	1130	102	311	3170	224	1920	178	6	3
2..	755	59	120	2200	126	748	175	4	2
3..	590	34	54	1300	69	242	169	5	2
4..	572	27	42	920	42	104	157	6	2
5..	460	23	28	720	26	50	151	4	2
6..	406	42	46	508	19	31	142	2	1
7..	755	197	491	532	16	33	140	2	1
8..	3280	792	7010	877	--	226	142	4	1
9..	2780	360	2700	965	46	123	135	3	1
10..	2170	148	867	795	104	238	132	2	1
11..	1360	76	279	735	87	173	128	2	1
12..	920	46	114	564	34	52	125	2	1
13..	740	36	72	600	37	60	120	2	1
14..	1430	136	603	676	44	80	120	2	1
15..	2270	198	1210	491	33	44	115	2	1
16..	1890	81	413	451	30	36	112	3	1
17..	1580	66	282	442	18	21	112	4	1
18..	1100	37	110	406	16	18	112	4	1
19..	920	34	84	350	11	10	108	3	1
20..	726	47	92	318	11	9	108	2	1
21..	740	23	46	286	14	11	105	2	1
22..	1110	12	96	274	10	7	102	4	1
23..	1360	48	176	266	11	8	100	2	1
24..	986	38	101	258	15	10	95	3	1
25..	836	35	79	250	22	15	95	3	1
26..	690	27	50	242	10	6	92	2	1
27..	613	37	61	230	11	7	92	3	1
28..	564	23	35	222	5	3	92	3	1
29..	505	16	22	222	5	3	90	3	1
30..	564	28	46	200	6	3	85	3	1
31..	2500	173	1170	185	7	3	--	--	--
Total	36302	--	16810	19755	--	4275	3629	--	36

Total discharge for year (cfs-days).....681589  
 Total load for year (tons).....348653

E Estimated.

T Less than 0.50 ton.

S Computed by subdividing day.

A Computed from partly estimated-concentration graph.

## GREEN RIVER BASIN--Continued

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

Particle-size analyses of suspended sediment, water year October 1962 to September 1963  
 (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)	Samp- ling point	Water tem- per- ature (°F)	Discharge (cfs)	Sediment concentra- tion (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							Percent finer than size indicated, in millimeters											
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Mar. 12, 1963.....	0700			14100	841		41	51	62	80	96	99	100				SBWC	
July 8.....	0700			3310	843		43	65	78	92	98	99	100				SBWC	

## GREEN RIVER BASIN--Continued

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

LOCATION.--At Mammoth Cave Ferry crossing, 350 feet upstream from gaging station, which is 0.2 mile downstream from Echo River, and 0.8 mile southwest of Mammoth Cave, Edmonson County.

DRAINAGE AREA.--1,963 square miles, of which about 444 square miles does not contribute directly to surface runoff.

RECORDS AVAILABLE.--Chemical analyses: September 1959 to September 1963.

Water temperatures: October 1959 to June 1961.

REMARKS.--No discharge records available.

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 6, 1962.....			--					--	--	19	--	--		--	--	239	--	
Oct. 13.....			--					--	--	40	--	--		--	--	385	--	
Oct. 20.....			--					--	--	36	--	--		--	--	377	--	
Oct. 28.....			--					--	--	56	--	--		--	--	468	--	
Nov. 1.....			--					--	--	38	--	--		--	--	448	--	
Nov. 10.....			--					--	--	44	--	--		--	--	418	--	
Nov. 17.....			--					--	--	33	--	--		--	--	329	--	
Nov. 24.....			--					--	--	38	--	--		--	--	355	--	
Dec. 1.....			--					--	--	45	--	--		--	--	398	--	
Dec. 8.....			--					--	--	65	--	--		--	--	468	--	
Dec. 15.....			--					--	--	70	--	--		--	--	503	--	
Dec. 22.....			--					--	--	62	--	--		--	--	461	--	
Dec. 29.....			--					--	--	28	--	--		--	--	307	--	
Jan. 5, 1963.....			--					--	--	29	--	--		--	--	315	--	
Jan. 12.....			--					--	--	40	--	--		--	--	373	--	
Jan. 19.....			--					--	--	40	--	--		--	--	359	--	
Jan. 26.....			--					--	--	42	--	--		--	--	398	--	
Feb. 2.....			--					--	--	38	--	--		--	--	386	--	
Feb. 9.....			--					--	--	26	--	--		--	--	293	--	
Feb. 16.....			--					--	--	20	--	--		--	--	267	--	
Feb. 23.....			--					--	--	21	--	--		--	--	269	--	
Mar. 2.....			--					--	--	17	--	--		--	--	267	--	
Mar. 9.....			--					--	--	7.5	--	--		--	--	146	--	
Mar. 16.....			--					--	--	11	--	--		--	--	187	--	

Mar. 23, 1963	16	---	---	---	---	242	---
Mar. 30	27	---	---	---	---	304	---
Apr. 6	39	---	---	---	---	367	---
Apr. 13	50	---	---	---	---	413	---
Apr. 20	62	---	---	---	---	468	---
Apr. 27	56	---	---	---	---	434	---
May 4	43	---	---	---	---	387	---
May 11	36	---	---	---	---	369	---
May 19	76	---	---	---	---	518	---
May 25	30	---	---	---	---	135	---
June 1	42	---	---	---	---	168	---
June 8	34	---	---	---	---	318	---
June 15	30	---	---	---	---	326	---
June 22	30	---	---	---	---	329	---
June 29	21	---	---	---	---	290	---
July 6	32	---	---	---	---	335	---
July 13	15	---	---	---	---	268	---
July 16	44	0.1	3.4	---	---	386	7.0
July 20	20	---	---	---	134	29	---
July 27	24	---	---	---	---	328	---
Aug. 3	13	---	---	---	---	311	---
Aug. 10	38	---	---	---	---	242	---
Aug. 17	44	---	---	---	---	372	---
Aug. 21	44	1	3.1	---	---	389	---
Aug. 24	45	---	---	---	146	30	7.0
Aug. 31	48	---	---	---	---	444	---
Sept. 7	62	---	---	---	---	444	---
Sept. 14	67	---	---	---	---	507	---
Sept. 18	66	---	---	---	---	469	---
Sept. 21	70	172	25	1.4	178	37	7.3
Sept. 28	71	---	---	---	---	453	---
		---	---	---	---	462	---

**a In solution when analyzed.**









July	a.m.	.....	78	76	76	75	76	74	73	75	74	73	74	74	73	76	74	73	75	75	75	76	77	76	75
July	p.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75
Aug.	a.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75
Aug.	p.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75
September	a.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75
September	p.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75
October	a.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75
October	p.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75
November	a.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75
November	p.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75
December	a.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75
December	p.m.	.....	79	78	77	77	76	75	76	77	76	78	77	78	78	78	78	78	78	78	78	79	78	76	75





GREEN RIVER BASIN--Continued  
3-3190.1. ROUGH RIVER AT ROUGH RIVER DAM, NEAR FALLS OF ROUGH, KY.--Continued  
Temperature (°F) of water, water years July 1962 to September 1963--Continued  
(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	
July, 1963																																
Maximum ....	56	56	57	57	57	57	57	58	58	58	58	58	58	58	59	59	58	58	61	61	60	59	59	59	59	59	59	59	62	60	60	60
Minimum ....	56	56	56	57	57	56	56	58	58	58	58	58	58	58	58	58	58	58	58	59	59	59	59	59	59	59	59	59	60	60	60	60
August																																
Maximum ....	62	60	61	60	61	60	60	60	59	59	59	59	60	60	60	60	60	60	60	60	60	60	61	60	60	60	61	61	62	64	64	60
Minimum ....	60	60	60	60	60	60	59	59	59	59	59	59	60	60	60	60	60	60	60	60	60	60	60	60	60	60	59	59	60	60	62	60
September																																
Maximum ....	64	65	64	64	65	65	65	66	65	65	65	66	66	66	66	66	66	66	66	65	65	65	65	65	65	65	65	66	67	67	--	65
Minimum ....	61	62	62	64	64	64	64	65	65	65	65	66	66	66	66	66	66	66	65	65	65	65	65	65	65	65	65	66	67	67	--	65

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 1963.

EXTREMES, 1962-63 -- Water temperatures: Maximum, 84° F Aug. 9; minimum, freezing point on many days during December to February.

EXTREMES, 1949-53 -- Water temperatures: Maximum, 89° F Aug. 3, 1955; minimum, freezing point on many days during winter months.

REMARKS -- Stream frozen Dec. 10-19, Jan. 16, Jan. 21 to Feb. 4.

Temperature (°F) of water, water year October 1962 to September 1963  
(Twice-daily measurements at approximately 0700 and 1600)

[illegible]

GREEN RIVER BASIN--Continued  
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 1963.

REMARKS.--Stream receives drainage from strip mine areas. Samples for iron and manganese filtered clear when collected. Acidity determined to pH 7.0 and is potential free. No discharge records available.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>	Total acidity as H <sup>+</sup>	Specific conductance (micro-mhos at 25°C)	pH	Color or turbidity
Oct. 31, 1962.	14	12	1.6	9.0	125	72	70	4.7	0	740	72	1.5	0.7	1150	609	609	3.5	1560	4
Dec. 5, 1963.	13	11	2.3	2.1	126	65	73	3.8	0	697	80	1.5	1.1	1080	582	582	2.2	1520	5
Jan. 8, 1963.	9.2	3.7	1.7	.36	--	--	--	--	0	284	21	--	--	446	79	79	4.1	951	12
Feb. 6, 1963.	9.5	3.2	1.8	6.0	--	--	--	--	0	450	77	--	--	790	--	.6	1120	4.3	
Apr. 4, 1963.	6.2	.0	.33	1.1	--	--	--	--	17	114	10	--	--	201	--	--	.1	312	6.2
May 3, 1963.	4.8	.0	.14	.99	--	--	--	--	77	148	113	--	--	479	--	--	.0	803	6.9
June 6, 1963.	5.8	.1	.45	3.8	--	--	--	--	12	423	75	--	--	676	--	--	.0	1080	6.1
Sept. 5, 1963.	2.6	--	.29	.44	--	--	--	--	70	137	318	--	--	804	234	177	.0	1400	6.5

## 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, and 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 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 80°F Aug. 13, 14; minimum, freezing point on many days during December to March.

EXTREMES, 1954-63.--Water temperatures: Maximum, 90°F July 30, 31, 1954; minimum, freezing point on many days during winter months.

REMARKS.--Some regulation at low stages caused by powerplants above station.

Temperature (°F) of water, water year October 1962 to September 1963  
(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	60	60	60	60	59	59	59	58	58	58	57	57	57	57	56	56	56	55	55	55	54	54	53	51	51	50	49	48	48	48	48	55	
	60	60	60	59	59	59	58	58	57	57	57	57	56	56	56	55	55	55	54	53	51	51	50	49	48	47	48	47	47	47	55		
	Maximum	60	60	60	59	59	59	58	58	57	57	57	57	56	56	56	55	55	55	54	53	51	51	50	49	48	47	48	47	47	47	55	
November	47	47	47	46	46	45	45	45	45	44	44	44	44	44	44	44	44	44	44	44	43	42	42	42	41	41	41	41	41	40	40	44	
	47	47	47	46	46	45	45	45	44	44	44	44	44	44	44	44	44	44	44	43	42	42	42	41	41	41	41	41	40	40	44		
	Maximum	47	47	46	46	45	45	45	44	44	44	44	44	44	44	44	44	44	44	43	42	42	42	41	41	41	41	41	40	40	44		
December	40	40	40	40	40	40	40	39	39	38	37	37	37	37	36	36	35	35	35	34	33	33	32	32	32	32	32	32	32	32	32	36	
	40	40	40	40	40	40	40	39	39	38	37	37	37	36	36	35	35	34	33	33	32	32	32	32	32	32	32	32	32	32	35		
	Maximum	40	40	40	40	40	40	39	39	38	37	37	37	36	36	35	35	34	33	33	32	32	32	32	32	32	32	32	32	32	32	36	
January	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32		
	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32		
	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		
February	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32		
	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32		
	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		
March	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	35	35	35	35	36	38	38	40	42	44	44	44		
	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	35	35	35	35	36	38	38	40	42	44	44	44		
	Maximum	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	35	35	35	35	36	38	38	40	42	44	44	44		
April	44	46	48	48	48	48	48	49	49	48	48	48	48	48	48	49	50	51	52	53	53	53	51	50	50	50	52	53	52	52	50		
	44	44	46	48	48	48	48	49	48	48	48	48	48	48	48	49	50	51	52	53	53	53	51	50	50	50	52	52	52	52	50		
	Maximum	44	44	46	48	48	48	48	49	48	48	48	48	48	48	49	50	51	52	53	53	53	51	50	50	50	52	52	52	52	50		
May	52	51	51	52	53	54	55	55	57	58	58	58	57	56	56	56	56	56	58	58	58	58	57	58	59	59	59	60	61	56	56		
	51	51	51	51	52	53	54	55	55	57	58	57	55	56	56	56	56	56	58	58	57	57	57	58	59	59	59	60	56	56	56		
	Maximum	51	51	51	51	52	53	54	55	55	57	58	57	55	56	56	56	56	58	58	57	57	57	58	59	59	59	60	56	56	56		
June	65	66	66	67	68	68	69	69	69	69	69	69	68	68	68	68	68	68	69	69	69	69	68	69	70	71	72	73	74	73	69		
	62	64	65	66	67	68	68	69	69	69	69	69	68	68	68	68	68	68	69	69	69	69	68	69	70	71	72	73	74	73	69		
	Maximum	62	64	65	66	67	68	68	69	69	69	69	69	68	68	68	68	68	69	69	69	69	68	69	70	71	72	73	74	73	69		
July	75	76	76	75	74	73	72	72	72	72	72	73	73	73	73	74	76	76	76	76	76	76	76	77	78	78	78	78	79	75	75		
	74	75	76	75	74	73	72	72	72	72	72	73	73	73	73	74	76	76	76	76	76	76	76	77	78	78	78	78	79	75	75		
	Maximum	75	76	76	75	74	73	72	72	72	72	73	73	73	73	74	76	76	76	76	76	76	76	77	78	78	78	78	79	75	75		
August	79	79	79	79	79	79	79	79	79	79	79	79	80	80	78	77	76	76	75	75	75	75	75	76	76	76	76	76	75	75	77		
	79	79	79	79	79	79	79	79	79	79	79	79	80	80	78	77	76	75	75	75	75	75	76	76	76	76	76	75	75	77	77		
	Maximum	79	79	79	79	79	79	79	79	79	79	79	80	80	78	77	76	75	75	75	75	75	76	76	76	76	76	75	75	77	77		
September	75	75	75	74	74	74	74	75	75	75	75	75	75	74	72	72	73	73	74	74	74	73	70	69	68	68	67	67	67	67	72		
	75	75	74	74	74	74	74	75	75	75	75	75	75	74	72	72	73	73	74	74	74	73	70	69	68	68	67	67	67	67	72		
	Maximum	75	75	74	74	74	74	75	75	75	75	75	75	75	74	72	72	73	73	74	74	74	73	70	69	68	68	67	67	67	72		
Minimum	75	75	74	74	74	74	74	74	74	75	75	75	75	74	72	72	73	73	74	74	74	73	70	69	68	68	67	67	67	67	72		
	75	75	74	74	74	74	74	74	74	75	75	75	75	74	72	72	73	73	74	74	74	73	70	69	68	68	67	67	67	67	72		
	Maximum	75	75	74	74	74	74	74	74	74	75	75	75	75	74	72	72	73	73	74	74	74	73	70	69	68	68	67	67	67	72		





WABASH RIVER BASIN--Continued  
 3-3418.5. WABASH RIVER NEAR SULLIVAN, IND.--Continued  
 Temperature (°F) of water, July to September 1963

Month	Day																															Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
July.....	82	82	--																													82
August.....	81	81	84	84	83	84	82	83	81	83	81	79	77	74	74	76	72	72	71	72	73	74	78	77	78	75	76	77	76	72	78	
September.....	74	--	75	74	75	72	74	76	77	78	78	77	75	72	73	74	74	74	75	74	76	72	70	68	68	68	68	68	73	68	--	73

WARASH RIVER BASIN--Continued  
3-3420. WARASH 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.  
DRAINAGE AREA.--13,100 square miles, approximately.  
RECORDS AVAILABLE.--Water temperatures: July 1964 to September 1963, October 1962 to September 1963.  
TEMPERATURE MEASUREMENTS.--Water temperature, 83°F, July 22, 1963; minimum, 83°F, August 4, 1963; maximum, 83°F, August 17-20, 1963.  
EXTREMES, 1954-61, 1962-63.--Water temperatures: Maximum, 91°F July 26, Aug. 29, 1954; minimum, freezing point on many days during winter months.

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

Month	Day																														Aver- age		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		31	
October	61	61	61	61	61	61	61	61	61	61	62	62	62	62	63	63	63	63	63	63	62	61	61	61	60	59	58	57	56	56	55	60	
Maximum	61	61	61	61	61	61	61	61	61	61	62	62	62	62	63	63	63	63	63	63	62	61	61	61	60	59	58	57	56	56	55	60	
Minimum	61	61	61	61	61	61	61	61	61	61	61	62	62	62	62	63	63	63	63	63	62	61	61	61	60	59	58	57	56	55	55	60	
November	55	54	53	53	52	51	51	51	51	51	50	50	50	50	50	50	50	50	50	50	50	50	50	50	49	49	49	48	47	47	--	50	
Maximum	55	54	53	53	52	51	51	51	51	51	50	50	50	50	50	50	50	50	50	50	50	50	50	50	49	49	49	48	47	47	--	50	
Minimum	54	54	53	53	52	51	51	51	51	51	50	50	50	50	50	50	50	50	50	50	50	50	50	49	49	49	48	47	47	--	50		
December	47	47	47	47	47	47	45	44	43	42	42	43	42	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40	39	39	39	42	
Maximum	47	47	47	47	47	47	45	44	43	42	42	43	42	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	39	39	39	42
Minimum	47	47	47	46	46	45	44	44	43	42	41	41	41	41	40	40	39	39	39	39	39	39	40	40	40	40	40	40	39	39	39	42	
January	39	39	39	39	39	39	39	39	40	41	42	42	41	41	40	39	39	39	39	39	39	39	39	38	38	38	38	38	37	37	39	39	
Maximum	39	39	39	39	39	39	39	39	40	41	42	42	41	41	40	39	39	39	39	39	39	39	38	38	38	38	38	38	37	37	39	39	
Minimum	39	39	39	39	39	39	39	39	40	41	42	41	41	41	40	39	39	39	39	39	39	39	38	38	38	38	38	38	37	37	39	39	
February	37	36	36	36	36	35	35	35	35	35	36	36	36	36	36	36	35	35	35	35	36	37	37	37	36	36	37	37	--	--	36	--	
Maximum	37	36	36	36	36	35	35	35	35	35	36	36	36	36	36	36	35	35	35	35	36	37	37	37	36	36	37	37	--	--	36	--	
Minimum	36	36	36	35	35	35	35	35	35	35	36	36	36	36	36	36	35	35	35	35	36	37	37	37	36	36	37	37	--	--	36	--	
March	37	38	37	38	39	38	37	37	38	38	39	40	41	42	43	44	45	46	46	46	46	46	48	48	48	48	49	50	51	52	53	43	
Maximum	37	38	37	38	39	38	37	37	38	38	39	40	41	42	43	44	45	46	46	46	46	48	48	48	48	48	49	50	51	52	53	43	
Minimum	37	37	37	38	37	37	37	37	38	38	38	39	40	41	42	43	44	45	46	46	46	46	48	48	48	48	49	50	51	52	53	43	
April	56	57	57	57	56	56	56	56	56	56	56	56	56	55	55	55	56	57	58	58	59	59	58	59	60	60	59	58	57	57	--	57	
Maximum	56	57	57	57	56	56	56	56	56	56	56	56	56	55	55	55	56	57	58	58	59	59	58	59	60	60	59	58	57	57	--	57	
Minimum	53	55	56	57	56	56	56	56	56	56	56	56	56	55	55	55	56	57	58	57	58	59	58	59	60	60	59	58	57	57	--	56	
May	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	57	72	63	65	
Maximum	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	57	72	63	65	
Minimum	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	71	72	64	
June	74	74	74	75	75	74	78	78	80	80	80	80	80	80	79	79	79	79	79	79	79	79	78	78	78	79	80	80	82	--	--	78	
Maximum	73	74	74	75	75	74	78	78	80	80	80	80	80	80	79	79	79	79	79	79	79	79	78	78	78	79	80	80	82	--	--	78	
Minimum	72	73	74	74	74	74	77	77	78	79	79	79	79	79	79	79	79	79	79	79	79	79	78	78	78	79	80	80	82	--	--	78	
July	82	81	79	79	80	79	79	79	79	78	77	77	77	77	77	78	79	78	79	82	83	82	81	80	79	79	79	79	79	80	79	79	
Maximum	82	81	79	79	80	79	79	79	79	78	77	77	77	77	77	78	79	78	79	82	83	82	81	80	79	79	79	79	79	80	79	79	
Minimum	81	79	79	79	79	79	79	79	79	78	77	76	76	76	77	77	77	77	77	78	82	81	80	79	79	79	79	79	79	79	79	79	
August	81	81	81	81	81	81	82	83	81	80	80	79	79	79	79	77	76	75	74	75	75	75	75	75	75	75	75	75	75	75	75	76	
Maximum	81	81	81	81	81	81	82	83	81	80	80	79	79	79	79	77	76	75	74	75	75	75	75	75	75	75	75	75	75	75	75	76	
Minimum	80	81	81	81	81	81	81	81	81	80	80	79	79	79	79	77	76	75	74	73	75	75	75	75	75	75	75	75	75	75	75	76	
September	75	74	74	74	74	74	73	73	73	74	74	74	74	73	72	72	72	72	72	72	72	72	72	71	70	69	69	68	67	--	72	72	
Maximum	75	74	74	74	74	74	73	73	73	74	74	74	74	73	72	72	72	72	72	72	72	72	72	71	70	69	69	68	67	--	72	72	
Minimum	74	74	74	74	74	74	73	73	73	73	73	73	73	72	71	72	72	72	72	72	72	72	71	70	69	69	68	67	--	72	72	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. Oct. 1961 to December 1961, October 1962 to June 1963 (discontinued).

RECORDS AVAILABLE.--Chemical analyses: October 1961 to December 1961, October 1962 to June 1963 (discontinued).

EXTREMES, October 1962 to June 1963.--Dissolved solids: Maximum, 429 ppm Dec. 1-31; minimum, 226 ppm Mar. 1-31.

Hardness: Maximum, 316 ppm Dec. 1-31; minimum, 149 ppm Mar. 1-31.

Specific conductance: Maximum daily, 791 micromhos Nov. 17; minimum daily, 215 micromhos Mar. 18.

Water temperatures: Maximum, 84°F June 9, 10; minimum, freezing point Dec. 11-13.

EXTREMES, 1956-61, 1962-63.--Dissolved solids: Maximum, 480 ppm Jan. 1-24, 1961; minimum, 176 ppm Dec. 21-31, 1957.

Hardness: Maximum, 331 ppm Jan. 1-24, 1961; minimum, 16 ppm May 11, 1961.

Specific conductance: Maximum daily, 609 micromhos Jan. 22, 1961; minimum on 8 days, 215 micromhos May 11, 1961.

Water temperatures: Maximum, 84°F Sept. 18, 1960; minimum, 32°F Dec. 11-13, 1961.

REMARKS.--Records of specific conductance and pH of daily samples available in district office at Columbus, Ohio. No discharge records available.

Chemical analyses, in parts per million, October 1962 to June 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180° C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25° C)	pH	Color
														Calcium	Non-carbonate			
Oct. 11-31, 1962.....								240	74	24	0.1	4.2	354	268	71	590		
Nov. 1-4, 8-30.....								265	90	34	.2	4.2	416	310	92	672		
Dec. 1-31.....								284	83	32	.3	5.1	429	316	83	686		
Jan. 1-29, 1963.....								234	84	40	.2	7.1	386	276	84	645		
Feb. 11-28.....								254	83	42	.2	7.9	428	290	82	665		
Mar. 1-31.....								129	43	16	.0	4.3	226	149	44	352		
Apr. 1-30.....								168	59	18	.0	7.9	288	230	68	483		
May 1-31.....								220	59	20	.4	6.0	298	265	84	529		
June 1-23.....								220	70	22	.4	5.0	304	253	72	526		
Time-weighted average.....								225	70	27	0.2	5.7	344	259	75	564		

Analyses based on monthly extremes of specific conductance

Oct. 21, 1962 (maximum).....								246	79	34	0.2	5.6	386	284	82	641		7.4
Oct. 12 (minimum)...								216	67	18	.1	2.9	320	245	68	529		7.3
Nov. 17 (maximum)...								269	115	51	.2	4.0	491	339	118	791		7.9
Nov. 1 (minimum)...								258	79	28	.2	5.4	386	302	90	635		7.5
Dec. 27 (maximum)...								274	119	50	.3	5.7	502	345	120	788		7.9
Dec. 1 (minimum)...								a264	74	30	.2	4.9	400	298	76	631		8.3
Jan. 2, 1963 (maximum)...								236	92	77	.2	6.5	462	292	98	782		7.4
Jan. 11 (minimum)...								190	68	35	.3	9.5	326	227	72	554		8.2

a includes 6 ppm carbonate (CO<sub>3</sub>).



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

Chemical analyses, in parts per million, October 1962 to June 1963--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Feb. 12, 1963 (maximum)....								958	92	44	0.1	8.5	453	312	92	728	7.3	
Feb. 19 (minimum)....								b226	72	38	.4	4.0	381	281	74	658	7.7	
Mar. 2 (maximum)....								c244	88	42	.4	4.0	420	298	84	671	8.5	
Mar. 18 (minimum)....								68	24	18	.1	3.9	144	83	28	215	8.1	
Apr. 21 (maximum)....								d206	70	29	.0	5.5	340	251	74	550	8.4	
Apr. 1 (minimum)....								148	48	15	.0	6.6	246	175	54	383	7.7	
May 14 (maximum)....								262	67	18	.3	6.6	350	284	69	584	7.8	
May 21 (minimum)....								164	53	18	.4	4.1	250	190	56	435	7.5	
June 2 (maximum)....								238	76	28	.4	3.2	355	278	82	578	7.7	
June 19 (minimum)....								180	57	18	.4	7.2	296	209	62	455	7.7	

b Includes 8 ppm carbonate (CO<sub>3</sub>).

c Includes 16 ppm carbonate (CO<sub>3</sub>).

d Includes 10 ppm carbonate (CO<sub>3</sub>).



## TRADEWATER RIVER BASIN

3-3830. TRADEWATER RIVER AT OLNEY, KY.

LOCATION.--At gaging station at highway bridge at Olney, Hopkins County, 1.1 miles upstream from Cave Creek, 5.1 miles downstream from Flynn Creek, and 9.5 miles downstream from Cave Creek, 1.1 miles upstream from Cave Creek, 5.1 miles downstream from Flynn Creek, and 9.5 miles downstream from Cave Creek.

DRAINAGE AREA.--255 square miles, of which about 9 square miles is noncontributing.

RECORDS AVAILABLE.--Chemical analyses: October 1949 to August 1950, October 1951 to September 1963.

Water temperatures: October 1951 to September 1963.

Sediment records: October 1952 to September 1963.

EXTREMES, 1962-63.--Dissolved solids: Maximum, 403 ppm Oct. 1-31; minimum, 145 ppm Aug. 1-31.

Specific conductance: Maximum daily, 1,050 micromhos Oct. 5; minimum daily, 114 micromhos Mar. 6.

Water temperatures: Maximum 80°F on several days during June, July, and August; minimum, freezing point on many days during December to February.

Flow: Maximum daily, 1,000 cfs during June, July, and August; minimum, no flow Sept. 27-30.

Sediment loads: Maximum daily, 1,770 tons Mar. 22-24, 1958; minimum daily, 54 tons Sept. 21-30, 1954.

EXTREMES, 1951-63.--Dissolved solids: Maximum, 1,700 ppm Nov. 22-24, 1958; minimum, 54 ppm Sept. 21-30, 1954.

Hardness (1951-62): 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 (1952-63): Maximum daily, 764 ppm June 5, 1954; minimum daily, no flow on many days during winter months.

Sediment loads (1952-63): Maximum daily, 2,220 tons Jan. 22, 1959; minimum daily, 0 tons on many days during 1952 to 1957, 1960, 1963.

REMARKS.--Values reported for iron and manganese are in solution when analyzed. Records of specific conductance of daily samples available in district office at Columbus, Ohio. Acidity values are potential free and determined to pH 7.0. Flow affected by ice Jan. 18-31.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Hardness as CaCO <sub>3</sub>			Specific conductance (micro-mhos at 25°C)	pH	Color	
															Calcium, carbonate	Non-carbonate	Acidity (H <sup>+</sup> )				
Oct. 1-31, 1962	106	11	3.0	0.01	1.4						273	7.2			403	259	259	0.4	550	4.5	6
Nov. 1-30, 1962	109														368				503	5.7	
Dec. 1-31, 1962	109														373				501	5.8	
Jan. 1-9, 1963	117														278				407	6.6	
Feb. 1-28, 1963	109														274				398	6.6	
Mar. 1-31, 1963	1123														156				231	6.9	
Apr. 1-30, 1963	106														250				375	6.0	
May 1-31, 1963	108														262				383	6.1	
June 1-30, 1963	35.0														165				259	7.1	
July 1-31, 1963	42.4														183				394	6.4	
Aug. 1-31, 1963	14.7														145				230	7.1	
Sept. 1-30, 1963	2.6														156				247	7.1	
Weighted average.....	al65																				
Time-weighted average.....	--														250						
Tons per day.....	--														98						

a Mean discharge based on 365 days; mean discharge for 348 days of chemical analyses, 169 cfs.

Chemical analyses, in parts per million, water year October 1962 to September 1963  
(Analyses based on maximum and minimum monthly specific conductance, and maximum monthly turbidity)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> ) (Al)	Aluminum (Fe)	Iron (Mn)	Manganese (Mn)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity
														Calcium	Non-carbonate magnesium				
Oct. 5, 1962 (maximum conductance).....	49	15	13	0.11	.14			0	573	7.5			840	408	408	1050	3.6	6	--
Oct. 24 (minimum conductance).....	111	9.3	.2	.00	.01			18	158	3.4			255	174	159	377	7.1	8	--
Oct. 15 (maximum turbidity).....	314	--	--	--	--			--	--	--			--	--	--	--	--	--	15
Nov. 15 (maximum conductance)...	203	13	8.2	.20	.11			4	452	4.0			680	404	401	836	4.7	23	--
Nov. 8 (minimum conductance)...	74	8.0	.1	.02	7.0			15	203	2.0			322	210	198	453	6.1	10	--
Nov. 15 (maximum turbidity).....	211	--	--	--	--			--	--	--			--	--	--	--	--	--	5
Dec. 25 (maximum conductance)...	108	12	6.3	.48	.11			0	461	3.0			750	419	419	869	4.3	9	--
Dec. 30 (minimum conductance)...	568	6.7	--	.01	.09			22	94	4.0			196	107	89	260	7.2	4	--
Dec. 30 (maximum turbidity).....	568	--	--	--	--			--	--	--			--	--	--	--	--	--	280
Jan. 17-18, 1963 (maximum conductance).....	63	8.2	.1	.03	4.4			11	199	4.0			313	202	193	450	6.5	2	--
Jan. 1 (minimum conductance)...	424	7.7	.1	.33	2.5			7	119	4.0			200	121	116	294	6.5	0	--
Jan. 3 (maximum turbidity).....	181	--	--	--	--			--	--	--			--	--	--	--	--	--	15
Feb. 25 (maximum conductance)...	71	7.6	.1	.01	4.9			12	195	5.0			310	200	190	445	6.7	2	--
Feb. 15 (minimum conductance)...	139	7.3	.1	.01	3.0			16	130	4.0			214	136	123	330	6.7	0	--
Feb. 13 (maximum turbidity).....	226	--	--	--	--			--	--	--			--	--	--	--	--	--	15
Mar. 1 (maximum conductance)...	199	6.5	.3	.23	8.6			17	191	8.0			303	193	179	433	6.9	10	--
Mar. 6 (minimum conductance)...	2070	5.1	.2	.12	1.4			16	30	3.0			84	38	25	114	7.0	20	--
Mar. 5 (maximum turbidity).....	1660	--	--	--	--			--	--	--			--	--	--	--	--	--	700

## TRADEWATER RIVER BASIN--Continued

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

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity
														Calcium	Non-carbonate				
Apr. 29, 1963 (maximum conductance).....	77	7.8	0.7	0.00	3.3			16	238	3.0			354	253	240	0.1	512	6.5	5
Apr. 1 (minimum conductance).....	258	9.7	--	.00	1.7			16	118	2.0			188	127	114	.0	294	6.2	5
Apr. 25 (maximum turbidity).....	72	--	--	--	--			--	--	--			--	--	--	--	--	--	10
May 31 (maximum conductance).....	64	12	2.8	.00	9.2			4	397	4.0			580	396	393	.7	787	5.1	5
May 14 (minimum conductance).....	193	6.7	.1	.00	.00			30	65	2.0			136	88	64	.0	206	7.0	5
May 14 (maximum turbidity).....	193	--	--	--	--			--	--	--			--	--	--	--	--	--	30
June 1 (maximum conductance).....	55	8.2	1.2	.00	.03			8	224	3.0			360	228	222	.0	499	6.1	10
June 22 (minimum conductance).....	38	4.6	.0	.00	.00			46	37	2.0			124	78	40	.0	167	6.5	10
June 10 (maximum turbidity).....	31	--	--	--	--			--	--	--			--	--	--	--	--	--	10
July 8 (maximum conductance).....	43	7.6	.1	.00	.00			20	170	3.0			284	188	172	.0	272	6.8	10
July 18 (minimum conductance).....	44	4.6	.1	.00	.00			48	47	6.0			138	85	46	.0	187	7.2	10
July 4 (maximum turbidity).....	38	--	--	--	--			--	--	--			--	--	--	--	--	--	15
Aug. 28 (maximum conductance).....	2.2	4.4	1.8	.21	.00			60	87	3.0			190	136	87	.0	290	7.1	5
Aug. 12 (minimum conductance).....	18	4.8	.0	.13	.00			70	34	2.0			106	84	26	.0	189	6.7	5
Aug. 2 (maximum turbidity).....	27	--	--	--	--			--	--	--			--	--	--	--	--	--	35
Sept. 3 (maximum conductance).....	12	4.9	--	.00	.02			64	88	4.0			190	131	78	.0	298	6.6	10
Sept. 30 (minimum conductance).....	--	4.5	.0	.00	.00			98	31	3.5			140	104	24	.0	233	6.7	5
Sept. 4 (maximum turbidity).....	9.9	--	--	--	--			--	--	--			--	--	--	--	--	--	15



## QUALITY OF SURFACE WATERS, 1963

## TRADEWATER RIVER BASIN--Continued

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

## Suspended sediment, water year October 1962 to September 1963

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	48	3	0.4	77	1	0.2	70	2	0.4
2..	114	3	.9	68	1	.2	68	2	.4
3..	195	3	1.6	62	1	.2	67	2	.4
4..	151	3	1.2	70	1	.2	67	2	.4
5..	49	2	.3	95	1	.2	66	2	.4
6..	116	2	.6	81	1	.2	65	2	.4
7..	47	2	.2	74	1	.2	65	2	.4
8..	42	1	.1	74	1	.2	61	2	.3
9..	60	1	.2	73	2	.4	65	2	.3
10..	60	1	.2	81	2	.4	64	2	.3
11..	64	2	.3	97	2	.5	60	2	.3
12..	66	1	.2	137	3	1.1	56	2	.3
13..	246	144 S	123	211	9	5.1	55	2	.3
14..	356	-- E	230	242	-- E	7	54	2	.3
15..	314	27	23	203	-- E	3	53	2	.3
16..	122	17	5.6	157	-- E	2	53	2	.3
17..	167	-- E	8	131	-- E	1	53	2	.3
18..	106	-- E	5	186	-- E	2	54	2	.3
19..	68	-- E	3	143	2	.8	56	2	.3
20..	95	-- E	5	126	3	1.0	60	3	.5
21..	128	-- E	6	124	3	1.0	67	3	.5
22..	85	-- E	4	114	2	.6	102	4	1.1
23..	35	-- E	2	107	2	.6	152	10	4.1
24..	111	18	5.4	91	2	.5	138	5	1.9
25..	41	14	1.6	79	2	.4	108	2	.6
26..	36	5	.5	74	2	.4	89	4	1.0
27..	58	4	.6	74	2	.4	78	4	.8
28..	71	3	.6	72	2	.4	73	8	1.6
29..	73	1	.2	71	2	.4	158	30 S	165
30..	74	1	.2	70	2	.4	568	121 S	165
31..	75	1	.2	--	--	--	623	38	64
Total	3273	--	430.1	3264	--	31.0	3368	--	263.5
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..	424	7	11	56	8	1.2	199	--	17
2..	247	10	4.7	62	8	1.3	703	175 E	332
3..	181	6	2.9	70	9	1.7	779	142	299
4..	156	5	2.1	108	9	2.6	597	32	52
5..	134	5	1.8	151	9	3.6	1660	414 S	1770
6..	128	5	1.7	137	9	3.3	2070	237	1320
7..	126	4	1.4	126	9	3.1	2100	166	961
8..	124	4	1.3	126	10	3.4	2310	137	854
9..	114	4	1.2	114	11	3.4	2430	68	446
10..	104	5	1.4	104	11	3.1	2040	29	160
11..	97	4	1.0	143	12	4.6	1600	36	156
12..	90	4	1.0	220	18	11	1520	108	443
13..	82	3	.7	226	21	13	1400	141	533
14..	73	2	.4	181	8	3.9	1310	67	237
15..	70	4	.8	139	3	1.1	1010	28	76
16..	66	5	.9	101	3	.8	834	35	79
17..	64	5	.9	84	2	.4	1040	246 S	740
18..	62	5	.8	78	1	.2	1110	65	195
19..	60	5	.8	77	1	.2	1160	61	191
20..	58	6	.9	77	1	.2	1100	49	166
21..	57	7	1.1	78	1	.2	867	34	80
22..	56	8	1.2	73	1	.2	541	19	28
23..	54	8	1.2	70	1	.2	354	9	8.6
24..	54	8	1.2	71	1	.2	241	6	3.9
25..	52	8	1.1	71	1	.2	218	8	4.7
26..	51	8	1.1	78	1	.2	1070	260 S	793
27..	51	8	1.1	78	2	.4	1250	142	479
28..	50	7	.9	74	2	.4	1210	85	278
29..	50	7	.9	--	--	--	1020	36	99
30..	50	7	.9	--	--	--	660	17	30
31..	50	7	.9	--	--	--	417	22	25
Total	3035	--	49.3	2973	--	64.1	34820	--	10821.2

E Estimated.

S Computed by subdividing day.

## TRADEWATER RIVER BASIN--Continued

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

Suspended sediment, water year October 1962 to September 1963--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..	258	8	5.6	522	58	82	55	4	0.6
2..	200	6	3.2	359	20	19	49	5	.7
3..	170	5	2.3	203	19	10	47	5	.6
4..	146	5	2.0	139	17	6.4	42	5	.6
5..	130	5	1.8	107	16	4.6	40	5	.5
6..	120	4	1.3	89	15	3.6	37	5	.5
7..	109	2	.6	77	15	3.1	36	5	.5
8..	104	2	.6	71	15	2.9	35	5	.5
9..	98	2	.5	68	15	2.7	33	5	.4
10..	91	2	.5	66	15	2.7	31	5	.4
11..	88	2	.5	64	15	2.6	32	5	.4
12..	79	2	.4	67	16	2.9	33	7	.6
13..	77	2	.4	180	64	33	36	8	.8
14..	74	2	.4	193	187	97	30	5	.4
15..	72	2	.4	114	125	38	27	5	.4
16..	72	2	.4	77	--	17	32	7	.6
17..	72	2	.4	70	--	8	35	11	1.0
18..	76	2	.4	65	--	4	40	11	1.2
19..	76	2	.4	61	--	2	38	11	1.1
20..	72	2	.4	58	4	.6	37	11	1.1
21..	70	2	.4	54	4	.6	36	11	1.1
22..	67	3	.5	52	4	.6	38	12	1.2
23..	68	3	.6	49	4	.5	32	12	1.0
24..	74	3	.6	47	4	.5	30	15	1.2
25..	72	4	.8	46	4	.5	29	12	.9
26..	71	4	.8	47	4	.5	28	14	.9
27..	70	3	.6	48	4	.5	28	12	.9
28..	67	3	.5	61	4	.6	32	12	1.0
29..	77	20	4.2	91	5	1.2	28	13	1.0
30..	358	179	5	72	4	.8	24	14	.9
31..	--	--	--	64	5	.9	--	--	--
Total	3173	--	208.5	3281	--	349.3	1050	--	23.0
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..	22	17	1.0	32	--	13	1.5	6	T
2..	29	20	1.6	27	--	7	5.2	15	0.2
3..	47	24	3.0	25	--	5	12	24	.8
4..	38	22	2.2	23	43	2.7	9.9	22	.6
5..	47	25	3.2	22	26	1.5	8.6	18	.4
6..	47	23	2.9	20	22	1.2	8.6	15	.3
7..	46	21	2.6	20	22	1.2	6.4	12	.2
8..	43	18	2.1	23	21	1.3	4.6	7	.1
9..	42	18	2.0	22	21	1.2	3.8	5	.1
10..	42	18	2.0	21	20	1.1	2.9	5	T
11..	41	18	2.0	18	20	1.0	1.8	5	T
12..	39	19	2.0	18	20	1.0	1.8	5	T
13..	41	16	1.8	20	20	1.1	1.8	5	T
14..	47	16	2.0	22	20	1.2	1.2	5	T
15..	47	16	2.0	19	20	1.0	1.1	5	T
16..	49	19	2.5	19	20	1.0	1.1	5	T
17..	47	16	2.0	13	20	.7	1.1	10	T
18..	44	14	1.7	11	20	.6	.9	12	T
19..	53	30	4.3	12	19	.6	.8	10	T
20..	53	28	4.0	12	17	.6	.6	9	T
21..	46	24	3.0	11	16	.5	.6	8	T
22..	40	20	2.2	10	15	.4	.5	8	T
23..	35	20	1.9	8.5	14	.3	.3	7	T
24..	34	20	1.8	7.3	13	.2	.2	7	T
25..	36	20	1.9	6.4	12	.2	.1	7	T
26..	34	20	1.8	4.9	10	.1	.1	7	T
27..	33	20	1.8	3.6	9	.1	0	--	0
28..	32	20	1.7	2.2	8	T	0	--	0
29..	34	20	1.8	1.5	8	T	0	--	0
30..	34	20	1.8	1.4	7	T	0	--	0
31..	55	234	5	35	1.4	7	--	--	--
Total	1313	--	117.8	457.2	--	47.2	77.5	--	3.0

Total discharge for year (cfs-days).....60084.7

Total load for year (tons).....12408

E Estimated.

S Computed by subdividing day.

T Less than 0.05 ton.



## TRADEWATER RIVER BASIN--Continued

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

Particle-size analyses of suspended sediment, water year October 1962 to September 1963  
 (Methods of analysis: B, bottom-trap; 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 tem- per- ature (°F)	Discharge (cfs)	Sediment concentra- tion (ppm)	Sediment discharge (tons per day)	Suspended sediment										Method of analysis	
							Percent finer than size indicated, in millimeters											
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000		2.000
Oct. 13, 1962.....	1725			292	310		78	84	86	96	98	99	100					SBWC
Mar. 5, 1963.....	1140			1390	655		55	67	78	94	97	98	100					SBWC
Mar. 5.....	1140			1390	655		45	62	77	90	95	98	100					SEN
Mar. 17.....	0705			1050	430		60	76	87	95	97	98	100					SBWC
Mar. 17.....	0705			1050	430		55	67	83	96	98	99	100					SEN
May 14.....	0820			216	216		74	88	97	98	99	99	100					SBWC

CUMBERLAND RIVER BASIN  
3-4035. CUMBERLAND RIVER AT BARBOURVILLE, KY.

LOCATION.--Temperature recorder 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 1963.  
EXTREMES, 1962-63.--Water temperatures: Maximum, 81°F July 18, 27, Aug. 5, 21; minimum, freezing point on several days during winter months.  
EXTREMES, 1963.--Water temperatures: Maximum, 91°F June 28, 1952; minimum, freezing point on many days during winter months.  
REMARKS.--Temperature record missing Jan. 24 to Mar. 14.

Temperature (°F) of water, water year October 1962 to September 1963  
(Twice-daily measurements at approximately 0800 and 1700)

Month		Day																												Aver- age				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
October	a.m.	75	74	73	74	73	73	74	73	74	73	73	74	73	62	55	64	55	56	57	57	53	51	53	52	51	53	55	56	55	54	57	63	
	p.m.	77	78	78	77	76	76	76	76	76	76	76	75	65	54	57	58	60	63	64	66	54	55	55	54	56	58	61	63	63	65	67	72	
November	a.m.	64	63	63	63	65	64	66	65	67	60	45	40	45	51	52	53	54	56	58	56	57	55	56	57	55	50	48	45	43	42	47	52	
	p.m.	64	62	58	59	56	54	49	49	51	53	52	54	56	58	60	62	58	61	62	63	62	63	64	58	53	51	47	46	45	--	56		
December	a.m.	44	43	42	43	41	36	35	36	34	33	32	--	32	32	33	34	33	32	34	33	35	36	36	35	36	35	33	32	33	34	35	36	
	p.m.	47	40	39	44	38	34	33	37	33	32	33	--	32	34	35	37	35	36	38	39	41	43	42	39	35	34	38	37	38	39	41	37	
January	a.m.	26	46	37	37	38	36	35	34	33	32	33	34	35	36	36	37	37	36	35	35	36	36	35	--	--	--	--	--	--	--	--	--	
	p.m.	37	38	41	42	43	39	38	37	38	36	37	38	36	39	38	42	42	40	38	39	41	42	33	--	--	--	--	--	--	--	--	--	
February	a.m.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	p.m.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
March	a.m.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	p.m.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
April	a.m.	60	60	62	64	61	59	58	57	59	59	58	58	55	54	55	58	60	63	62	65	69	69	61	61	60	64	66	61	60	64	60	60	
	p.m.	62	65	68	65	61	59	60	60	59	59	59	60	55	58	55	60	60	65	65	68	72	69	64	66	61	61	62	62	69	72	70	66	
May	a.m.	55	53	58	60	61	65	65	69	70	71	70	70	70	70	70	64	64	60	64	65	60	65	60	61	60	60	62	62	68	68	64	64	
	p.m.	58	62	60	62	65	69	69	70	71	74	72	70	70	70	71	70	70	62	65	61	64	65	64	66	61	61	62	62	69	72	70	66	
June	a.m.	68	75	70	70	70	69	70	69	70	71	75	75	72	75	72	72	70	71	71	72	71	70	70	71	72	72	79	78	71	80	--	72	
	p.m.	75	71	72	70	70	71	71	72	75	78	78	78	75	71	71	71	71	72	72	78	80	72	70	70	71	73	75	78	80	79	80	79	80
July	a.m.	78	80	79	80	75	79	70	71	70	70	70	71	70	71	72	72	72	78	81	80	79	72	75	75	79	79	81	77	77	75	74	74	
	p.m.	80	80	80	80	75	71	71	74	70	71	72	72	72	75	72	76	78	80	82	80	72	75	75	79	79	81	77	77	77	75	76	76	
August	a.m.	74	74	75	79	78	77	74	78	78	80	75	78	79	74	73	71	74	74	75	75	75	75	76	78	80	77	76	78	76	75	76	76	
	p.m.	75	80	79	80	81	80	79	80	80	75	79	76	76	74	73	76	76	76	81	78	79	80	78	80	78	78	79	80	79	78	78	78	
September	a.m.	75	74	75	75	75	74	72	73	70	72	75	76	75	70	70	70	70	70	70	70	70	70	69	68	63	62	63	61	62	65	--	70	
	p.m.	76	78	75	79	78	78	78	78	76	79	78	72	72	71	74	71	73	72	72	72	70	70	70	68	65	68	64	62	62	62	--	73	

## CUMBERLAND RIVER BASIN--Continued

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

LOCATION.--At gaging station, 2,100 feet upstream from confluence with West Fork, 2.5 miles northeast of Parkers Lake, and 2.6 miles east of Greenwood, McCreary County.

DRAINAGE AREA.--0.67 square miles.

WATERS AVAILABLE FOR CHEMICAL ANALYSES: January 1956 to September 1963.

WATERS AVAILABLE FOR SEDIMENT ANALYSES: January to September 1956 unpublished; October 1956 to September 1962.

SEDIMENT RECORDS: January 1956 to September 1962.

REMARKS.--Samples for iron and manganese filtered clear when collected. Acidity values reported are potential free and determined to pH 7.0.

## Chemical analyses, in parts per million, November 1962 to September 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub> Calcium, magnesium	Acidity (H <sup>+</sup> ) (micro-mhos at 25°C)	Specific conductance (micro-mhos at 25°C)	pH or Col.
Nov. 2, 1962..	0.1	--	--	--	--	--	--	--	--	0	242	--	--	--	--	--	--	674	3.4
Nov. 19.....	.2	--	--	--	--	--	--	--	--	0	192	--	--	--	--	--	--	558	3.2
Dec. 10.....	.1	--	--	--	--	--	--	--	--	0	217	--	--	--	--	--	--	566	3.0
Dec. 11.....	1.1	--	--	--	--	--	--	--	--	0	144	--	--	--	--	--	--	546	2.9
Dec. 1, 1963..	1.7	--	--	--	--	--	--	--	--	0	144	--	--	--	--	--	--	406	3.3
May 25.....	.3	9.0	5.3	4.4	10	26	17	1.5	2.0	0	186	2.5	0.2	0.1	287	135	1.6	557	3.3
June 24.....	.1	--	--	--	--	--	--	--	--	0	190	--	--	--	--	--	--	537	3.5
Aug. 5.....	.1	--	--	--	--	--	--	--	--	0	198	--	--	--	--	--	--	648	3.2
Sept. 10.....	.1	14	5.7	4.0	12	25	22	2.0	2.8	0	214	2.5	.3	.2	347	153	1.8	636	3.3
Sept. 17.....	.1	--	--	--	--	--	--	--	--	0	208	--	--	--	--	--	--	537	3.3
Sept. 24.....	.1	--	--	--	--	--	--	--	--	0	200	--	--	--	--	--	--	552	3.4

## Periodic determinations of suspended sediment, water year October 1962 to September 1963

Date	Time (24 hr)	Water temperature (°F)	Suspended sediment	
			Discharge (cfs)	Mean concentration (ppm)
Sept. 12, 1963.....	1000		0.12	6
Sept. 17.....	0815		.08	29
Sept. 24.....	1030		.08	28
T Less than 0.005 ton.				
			Discharge (tons per day)	
			T	
			.01	
			.01	

## 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 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 59° F Sept 20-23; minimum, 42° F Jan. 2 to Feb. 4.

Discharge: 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 1962 to September 1963 (Twice-daily measurements at approximately 0700 and 1500)																																Aver- age
Month	Day																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October	56	57	57	57	57	58	58	58	57	57	56	55	55	55	56	56	55	55	55	56	56	55	55	55	55	55	56	56	56	55	55	56
a.m.	56	57	57	57	57	58	58	58	57	57	56	55	55	55	56	56	55	55	55	56	56	55	55	55	55	55	56	56	56	55	55	56
p.m.	56	57	57	57	57	58	58	58	57	57	56	55	55	55	56	56	55	55	55	56	56	55	55	55	55	55	56	56	56	55	55	56
November	55	56	56	56	56	55	55	56	55	55	55	55	55	55	55	55	55	55	55	54	54	54	54	54	54	55	54	54	54	54	54	55
a.m.	55	56	56	56	56	55	55	56	55	55	55	55	55	55	55	55	55	55	55	54	54	54	54	54	54	55	54	54	54	54	54	55
p.m.	55	56	56	56	56	55	55	56	55	55	55	55	55	55	55	55	55	55	55	54	54	54	54	54	54	55	54	54	54	54	54	55
December	54	54	54	54	54	54	54	54	54	54	53	53	53	53	53	54	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
a.m.	54	54	54	54	54	54	54	54	54	54	53	53	53	53	53	54	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
p.m.	54	54	54	54	54	54	54	54	54	54	53	53	53	53	53	54	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
January	53	53	53	50	50	50	48	48	48	46	46	46	46	44	44	43	43	43	43	43	43	43	43	43	43	43	43	43	43	42	42	42
a.m.	53	53	53	50	50	50	48	48	48	46	46	46	46	44	44	43	43	43	43	43	43	43	43	43	43	43	43	43	43	42	42	42
p.m.	53	53	53	50	50	50	48	48	48	46	46	46	46	44	44	43	43	43	43	43	43	43	43	43	43	43	43	43	43	42	42	42
February	42	42	42	42	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
a.m.	42	42	42	42	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
p.m.	42	42	42	42	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
March	46	46	46	46	46	47	47	47	47	47	47	47	46	46	46	46	46	46	46	45	45	45	45	45	45	45	45	45	45	45	45	45
a.m.	46	46	46	46	46	47	47	47	47	47	47	47	46	46	46	46	46	46	46	45	45	45	45	45	45	45	45	45	45	45	45	45
p.m.	46	46	46	46	46	47	47	47	47	47	47	47	46	46	46	46	46	46	46	45	45	45	45	45	45	45	45	45	45	45	45	45
April	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
a.m.	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
p.m.	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
May	47	47	47	48	48	48	48	48	50	50	50	50	50	50	50	50	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51
a.m.	47	47	47	48	48	48	48	48	50	50	50	50	50	50	50	50	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51
p.m.	47	47	47	48	48	48	48	48	50	50	50	50	50	50	50	50	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51
June	53	53	53	54	54	54	54	54	54	54	55	55	55	55	55	55	55	55	55	56	56	56	56	56	56	56	56	56	56	56	56	56
a.m.	53	53	53	54	54	54	54	54	54	54	55	55	55	55	55	55	55	55	55	56	56	56	56	56	56	56	56	56	56	56	56	56
p.m.	53	53	53	54	54	54	54	54	54	54	55	55	55	55	55	55	55	55	55	56	56	56	56	56	56	56	56	56	56	56	56	56
July	56	56	56	56	56	56	56	56	55	55	55	55	55	55	55	55	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
a.m.	56	56	56	56	56	56	56	56	55	55	55	55	55	55	55	55	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
p.m.	56	56	56	56	56	56	56	56	55	55	55	55	55	55	55	55	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
August	56	56	56	56	56	57	57	57	57	57	57	57	57	57	57	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
a.m.	56	56	56	56	56	57	57	57	57	57	57	57	57	57	57	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
p.m.	56	56	56	56	56	57	57	57	57	57	57	57	57	57	57	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
September	56	56	55	55	55	55	55	55	55	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
a.m.	56	56	55	55	55	55	55	55	55	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
p.m.	56	56	55	55	55	55	55	55	55	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56

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

(Twice-daily measurements at approximately 0700 and 1500)



## TENNESSEE RIVER BASIN

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

LOCATION.—At gaging station at bridge on U.S. Highway 178 at Rosman, Transylvania County, and 1 mile upstream from East Fork.  
 DRAINAGE AREA.—79 square miles.  
 RECORDS AVAILABLE.—Chemical analyses: October 1957 to September 1963.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Chemical Analyses, in Parts per Million, water year October 1962 to September 1963																		
Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
													Calcium	Non-carbonate				
Oct. 3, 1962.....	724	4.1	0.04	1.7	0.6	1.5	0.8	8	2.4	1.7	0.0	0.0	23	6	0	23	6.0	25
Nov. 5.....	73	7.8	.02	1.5	.5	1.4	.6	8	1.2	1.7	.1	.1	21	6	0	15	6.5	5
Dec. 3.....	98	7.5	.04	1.0	.4	1.6	.5	8	1.8	1.2	.0	.0	22	4	0	20	6.3	25
Jan. 3, 1963.....	116	7.1	.03	1.0	.4	1.7	.4	10	1.2	1.7	.0	.5	20	4	0	17	6.6	20
Feb. 1.....	145	6.5	.01	1.4	.3	1.8	.6	8	1.2	1.8	.1	.2	A 18	5	0	18	6.3	5
Mar. 20.....	401	5.2	.00	1.4	.2	.8	.5	7	.8	.5	.0	.4	A 14	4	0	17	6.3	10
May 1.....	370	5.5	.02	1.1	.5	1.5	.5	7	1.6	1.6	.0	.0	17	5	0	17	6.2	10
June 4.....	124	8.0	.01	1.4	.7	1.4	.7	9	1.2	1.7	.1	.4	19	6	0	15	6.7	12
July 1.....	220	7.3	.02	1.9	.4	1.4	.9	9	1.6	1.7	.1	.4	22	6	0	18	6.3	5
Aug. 2.....	120	7.2	.02	1.4	.5	1.2	1.0	7	1.4	1.0	.1	.3	A 17	6	0	16	6.3	15
Sept. 5.....	86	8.3	.01	1.3	.5	1.7	.7	11	.6	1.2	.0	.7	22	5	0	18	6.5	10

A Calculated from determined constituents.

## TENNESSEE RIVER BASIN--Continued

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

LOCATION (revised).--At gaging station at bridge on Secondary Road 1803, 700 feet east of Blantyre railroad station, Transylvania County, and 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 1963.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 3, 1962.....	2510	5.8	0.03	2.2	0.9	6.9	1.0	12	12	2.8	0.0	1.0	39	9	0	59	6.0	25
Nov. 5.....	335	9.1	.07	7.0	.6	39	1.4	36	62	8.0	.2	.3	157	20	0	225	7.1	110
Dec. 4.....	560	8.2	.07	5.4	.7	26	1.0	26	44	6.1	.0	.8	106	16	0	162	6.2	60
Jan. 4, 1963.....	612	7.6	.08	3.5	.8	23	.9	22	36	5.8	.0	.2	100	12	0	138	6.3	75
Feb. 4.....	773	7.2	.04	3.6	.8	16	.9	14	29	4.7	.2	.1	72	12	1	110	6.1	25
Mar. 20.....	1820	6.3	.00	2.4	.4	6.8	.6	14	8.4	2.0	.0	1.0	37	8	0	54	6.3	20
Mar. 2.....	1400	6.2	.03	2.9	.7	10	.8	16	16	4.1	.0	.6	51	10	0	75	6.3	20
June 5.....	809	8.6	.07	5.1	.2	21	.8	20	35	4.1	.0	.0	485	14	0	135	6.5	35
July 2.....	1040	7.5	.02	3.0	.2	10	.6	13	17	3.0	.0	.1	53	8	0	174	6.2	20
Aug. 1.....	656	8.4	.00	5.2	.7	20	1.8	20	36	4.0	.1	.5	90	16	0	130	6.4	15
Sept. 5.....	336	9.3	.04	8.3	.8	34	2.9	41	53	7.7	.2	2.1	156	24	0	220	6.5	110

A Calculated from determined constituents.

## 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, and 6.7 miles south of Asheville, Buncombe County.  
 DRAINAGE AREA.--876 square miles.  
 RECORDS AVAILABLE.--Chemical analyses: October 1957 to September 1963.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 9, 1962.....	1190	8.5	0.10	1.4	0.9	2.2	0.7	13	2.6	2.2	0.0	0.1	29	8	0	28	6.8	25
Nov. 19.....	865	9.6	.03	5.0	1.3	1.2	22	26	3.7	3.7	.3	.7	83	13	0	123	6.6	20
Dec. 19.....	865	9.6	.03	4.9	1.3	1.2	22	26	3.7	3.7	.3	.7	83	13	0	123	6.6	22
Jan. 17, 1963.....	1110	8.1	.01	1.4	.5	3.0	.6	10	2.6	1.8	.1	.0	A23	6	0	25	6.4	10
Feb. 18.....	1040	7.4	.00	1.8	.6	1.2	.4	8	1.4	.9	.0	.7	20	7	0	16	6.4	7
Mar. 26.....	1880	7.2	.01	1.4	.5	2.6	.6	10	2.4	.6	.0	.3	25	6	0	28	6.3	10
Apr. 10.....	1380	7.4	.05	1.3	.9	1.5	.4	9	1.0	1.6	.0	.1	20	6	0	20	6.6	10
May 16.....	1110	8.1	.04	1.8	.8	3.7	.7	13	4.2	2.4	.0	.0	29	8	0	35	6.3	15
June 17.....	905	9.2	.22	4.6	.9	1.7	1.0	24	24	4.5	.1	.9	85	13	0	140	6.5	50
July 18.....	848	9.3	.03	3.8	.7	1.9	.9	18	16	2.8	.1	.4	80	10	0	76	6.3	22
Aug. 12.....	648	9.3	.07	2.6	.4	1.1	.9	18	16	2.8	.1	.4	80	10	0	76	6.3	22
Sept. 12.....	506	9.3	.09	4.8	1.5	1.6	.9	30	22	3.1	.1	.7	74	19	0	114	6.5	25

A Calculated from determined constituents.



TENNESSEE RIVER BASIN--Continued  
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, and 3.2 miles upstream from French Broad River.

DRAINAGE AREA --945 square miles.

RECORDS AVAILABLE --Chemical analyses: October 1950 to September 1951, October 1956 to September 1963.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)		Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
															Calcium	Non-carbonate			
Oct. 9, 1962.....	1460	9.3	0.01	3.9	1.5	22	1.6	34	27	7.5	0.0	0.5	91	16	16	0	138	6.2	20
Nov. 8.....	765	10	.03	5.3	1.4	35	1.9	46	44	10	.2	.4	134	18	0	205	7.0	32	
Dec. 19.....	1020	9.8	.07	4.1	1.9	52	1.5	43	42	9.6	.0	2.4	125	18	0	192	6.4	30	
Jan. 1963.....	1250	8.2	.01	4.3	1.6	18	1.4	26	25	5.3	.2	2.4	85	18	0	115	6.5	22	
Feb. 25.....	1280	8.2	.01	4.1	1.6	17	1.2	26	22	5.3	.2	.4	80	15	0	96	6.0	15	
Mar. 26.....	2360	8.2	.02	3.4	.9	13	1.2	22	11	7.0	.0	.7	58	12	0	96	6.0	15	
Apr. 10.....	1660	8.1	.03	3.6	1.0	15	1.3	28	16	5.1	.1	1.7	72	13	0	125	7.0	15	
May 16.....	1380	9.0	.05	4.3	1.2	20	1.5	33	22	6.1	.0	2.0	85	16	0	140	6.4	20	
June 17.....	1100	11	.17	5.4	1.6	26	1.7	29	33	10	.1	3.0	116	20	0	181	6.6	35	
July 18.....	1340	9.0	.04	4.9	1.1	22	1.4	28	30	6.1	.0	1.8	95	16	0	140	6.1	23	
Aug. 12.....	765	9.9	.05	6.2	1.4	23	3.9	13	47	6.2	.1	2.9	108	21	8	157	6.9	20	
Sept. 16.....	618	11	.00	6.7	1.7	35	2.9	26	61	6.3	.2	3.5	142	23	2	210	7.0	25	

A Calculated from determined constituents.

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

LOCATION.--At gaging station 0.7 mile upstream from Hayes Creek, 1 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 1963.

Water temperatures: October 1957 to September 1963.

EXTREMES, 1956-63.--Dissolved solids: Maximum, 143 ppm Sept. 1-15, minimum, 37 ppm Mar. 7-10.

Hardness: Maximum, 250 microhos Mar. 1-17.

Specific conductance: Maximum daily, 240 microhos Sept. 13; minimum daily, 46 microhos Mar. 10.

Water temperatures: Maximum, 80°F Aug. 5, 7, 8, 18; minimum, freezing point on several days in December, January and February.

EXTREMES, 1957-63.--Dissolved solids: Maximum, 143 ppm Sept. 1-15, 1963; minimum, 37 ppm Mar. 7-10, 1963.

Hardness: Maximum, 26 ppm Oct. 12, 1957; minimum, 12 ppm on many days in 1958-62.

Specific conductance: Maximum daily, 240 microhos Sept. 13, 1963; minimum daily, 39 microhos Mar. 31, 1960.

Water temperatures: Maximum, 80°F Aug. 5, 7, 8, 18, 1963; minimum, freezing point on many days in 1958-63.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Po- tas- sium (K)	Bicar- bonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluor- ide (F)	Ni- trate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 1-2, 1962.....	934	12	--	5.8	2.1	25	2.0	28	41	5.6	0.1	2.4	A110	24	0	180	6.6	18
Oct. 3-5.....	4827	7.8	0.13	4.0	1.0	7.0	1.8	16	12	2.4	0	3.2	A48	14	1	69	6.1	18
Oct. 6-10.....	2244	11	1.0	5.0	1.5	13	1.5	20	24	3.7	0	1.9	A72	18	2	110	6.3	23
Oct. 11-31.....	1220	12	18	5.9	1.3	24	1.7	29	35	5.9	0	2.3	A102	20	0	150	6.8	28
Nov. 1-9.....	1138	11	18	6.0	1.7	25	1.8	29	42	8.3	0	1.6	A112	22	0	168	6.7	30
Nov. 10-11.....	4225	3.2	.07	4.2	1.4	8.6	2.0	18	--	--	--	--	--	16	1	82	6.2	9
Nov. 12-23.....	1900	11	14	3.9	1.7	15	1.6	24	23	4.8	0	2.1	80	16	0	110	7.1	27
Nov. 24-30.....	1654	11	.04	4.5	1.6	14	1.5	21	24	4.2	0	2.3	76	18	1	110	6.9	7
Dec. 1-10.....	1562	11	.04	5.2	1.1	17	1.5	23	27	4.8	0	2.4	84	18	0	120	6.5	17
Dec. 11-25.....	1305	12	03	5.6	1.2	20	2.1	22	33	6.2	0	2.7	94	19	1	140	6.5	8
Dec. 26-31.....	2132	10	.02	3.2	1.9	9.8	1.2	18	17	1.0	0	1.8	A55	16	1	90	6.7	5
Jan. 1-13, 1963.....	1758	11	.05	5.6	1.2	15	1.3	24	26	4.7	0	2.4	85	19	0	115	7.4	12
Jan. 14.....	2080	--	--	--	--	--	--	20	--	2.6	--	--	--	17	0	79	7.1	--
Jan. 15-31.....	1941	10	.04	4.6	1.2	14	1.3	22	22	4.4	0	2.8	73	16	0	110	7.3	15
Feb. 1-28.....	1721	10	.08	4.4	1.3	15	1.2	23	22	4.6	0	3.1	76	16	0	110	7.1	25
Mar. 1.....	1560	--	--	--	--	23	1.5	29	26	9.0	--	--	--	19	0	145	7.6	20
Mar. 2-3.....	2225	9.9	.03	4.3	1.5	9.1	1.0	19	15	1.8	0	3.5	A56	17	2	90	6.5	17
Mar. 4.....	1970	--	--	--	--	4.4	1.0	14	7.6	4.9	--	--	--	14	2	54	6.6	15
Mar. 5-6.....	10925	9.1	.01	5.1	2.0	6.2	2.0	17	14	2.0	0	3	453	22	8	83	6.4	10
Mar. 7-10.....	6400	8.4	.03	3.6	1.1	3.7	1.4	10	7.4	2.2	0	3.8	A37	14	6	57	6.4	17
Mar. 11-17.....	11094	8.3	.00	3.4	1.1	4.2	1.5	14	8.2	1.9	0	2.9	43	13	2	59	6.5	15
Mar. 18-27.....	4004	11	.03	3.6	1.5	7.7	1.3	19	12	3.1	0	2.5	54	15	0	78	6.4	15
Mar. 28-31.....	2512	13	.05	6.1	2.3	9.5	1.2	26	18	4.6	0	2.2	A70	25	3	105	6.6	10
Apr. 1-30.....	2042	9.6	10	4.5	1.3	14	1.2	24	21	4.0	0	1.8	70	16	0	109	7.4	20

A Calculated from determined constituents.

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

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-magnesium			
May 1-7, 1963	3090	9.5	0.04	3.2	1.4	10	1.0	19	13	2.4	0.0	1.4	451	14	0	87	6.7	10
May 8-31	1733	11	0.13	4.8	1.5	16	1.5	25	26	4.0	0.0	2.1	82	18	0	130	6.9	20
June 1-21	1360	12	0.10	4.7	1.6	19	1.7	26	32	3.9	0.0	2.7	102	18	0	138	6.7	20
June 22-30	2096	9.9	0.04	4.0	1.6	13	1.0	20	23	3.0	0.0	1.2	A65	16	5	125	7.3	15
July 1-9	1769	11	0.04	4.4	1.6	12	0.9	--	--	3.3	0.2	3.1	71	18	6	110	6.2	10
July 10	1350	--	--	--	--	--	--	26	--	5.2	--	--	--	20	0	165	7.5	--
July 11-31	1280	--	--	--	--	--	--	16	--	3.8	--	--	--	18	4	109	7.1	--
Aug 1-31	1065	12	0.10	5.7	1.7	19	1.7	26	34	5.8	0.1	2.4	103	20	1	183	7.2	35
Sept. 1-15	856	13	0.09	6.8	2.0	33	1.7	34	57	7.9	0.1	3.9	143	25	0	220	6.7	28
Sept. 16-26	706	11	0.11	5.6	1.3	18	2.2	20	33	5.3	0.2	3.8	94	20	3	140	6.3	20
Sept. 27-30	1876	8.8	0.13	4.1	1.0	7.5	3.9	12	18	3.4	0.2	3.7	A57	14	4	78	7.0	40
Time-weighted average	1987	11	0.08	4.9	1.5	17	1.5	24	28	4.6	0.1	2.5	86	18	1	128	--	22

A Calculated from determined constituents.

Temperature °F of water, water year October 1962 to September 1963  
/Once-daily measurement between 0900 and 1835/

Month		Day												Average																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
October	56	62	52	60	52	52	60	62	62	64	64	64	64	64	64	65	64	64	64	64	58	58	62	60	56	50	44	48	50	50	57	
November	50	50	50	50	50	50	48	46	48	44	44	44	44	44	44	44	44	44	44	44	46	46	46	44	44	46	46	46	48	48	47	
December	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	34	34	34	34	34	34	32	32	34	34	36	
January	34	34	36	34	36	36	36	36	34	34	34	34	34	34	34	34	34	34	34	40	36	34	34	34	34	32	32	32	34	34	35	
February	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	34	34	34	34	34	32	32	32	34	34	35	
March	34	38	45	45	43	42	43	40	43	45	44	44	44	44	44	45	47	52	43	42	42	42	42	44	45	45	53	—	51	—	54	—
April	58	58	60	56	53	52	53	52	53	52	50	50	54	58	—	56	59	56	45	—	56	56	65	—	56	56	59	55	59	—	56	—
May	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	62	62	62	62	62	62	62	62	62	62	62	62	62
June	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	69	69	69	69	69	69	69	69	69	69	69	69	69
July	72	71	74	74	73	73	72	70	75	72	74	74	74	74	74	74	74	74	74	72	72	71	74	72	73	74	73	74	74	74	73	73
August	73	74	79	76	80	78	80	74	77	78	79	78	74	77	79	80	79	74	74	76	79	78	78	78	78	78	78	78	78	78	78	77
September	78	70	77	74	77	71	75	74	74	64	64	65	69	66	66	66	66	66	63	63	62	63	62	63	62	63	62	63	63	66	68	68

TENNESSEE RIVER BASIN--Continued  
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, and 0.2 mile upstream from Spring Creek.  
DRAINAGE AREA --1,567 square miles.  
RECORDS AVAILABLE --Chemical analyses: October 1945 to September 1946, October 1957 to September 1963.  
REMARKS --No discharge records available.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-magnesium			
Oct. 15, 1962.....		11	0.04	4.8	1.8	17	1.7	28	28	5.3	0.0	0.7	A85	20	0	128	6.1	20
Nov. 16.....		9.1	.02	5.0	2.1	17	1.5	28	28	6.3	.0	.0	86	22	0	132	6.3	30
Dec. 16.....		11	.03	4.7	1.8	20	1.3	26	35	5.5	.2	.7	A83	20	0	136	6.5	15
Jan. 16, 1963.....		9.8	.06	5.9	2.1	12	1.3	22	26	3.9	.2	1.0	A73	24	6	115	6.7	15
Feb. 18.....		9.6	.04	4.7	1.8	16	1.8	20	28	4.6	.2	2.5	80	20	3	125	6.1	38
Feb. 26.....		9.2	.02	3.4	1.1	8.0	1.2	16	12	2.9	.0	1.3	52	13	0	72	6.7	10
Apr. 16.....		7.7	.02	4.2	1.6	9.2	1.2	18	19	3.3	.0	.5	57	17	2	84	6.9	10
May 15.....		10	.03	5.1	1.4	16	2.2	24	27	3.8	.1	1.0	82	18	0	115	6.8	15
June 17.....		11	.01	5.5	1.4	18	2.5	27	27	4.6	.1	1.7	90	19	0	128	6.9	17
July 16.....		10	.02	4.7	1.7	18	1.4	24	32	4.2	.0	.2	88	19	0	130	6.2	15
Aug. 16.....		11	.00	6.3	1.8	26	1.8	30	48	6.0	.1	1.0	120	24	0	175	6.7	17
Sept. 16.....		11	.02	6.4	2.7	35	3.4	45	50	7.4	.1	.5	143	27	0	210	6.9	25

A Calculated from determined constituents.

TENNESSEE RIVER BASIN--Continued  
3-4570. PIGEON RIVER AT CANTON, N. C.

LOCATION (revised).--At gaging station, 100 feet upstream from small tributary, 200 feet downstream from Pigeon Street bridge, and 0.5 mile upstream from U.S. Highways 19 and 23 at Canton, Haywood County.  
DATE OF DATA. 1963.  
RECORDS AVAILABLE.--Chemical analyses: October 1957 to September 1963.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 2, 1962.....	323	7.7	0.01	2.1	0.6	1.8	1.0	12	0.4	2.5	0.2	0.0	23	8	0	25	6.7	5
Nov. 5.....	79	7.2	.02	1.6	.9	1.7	.8	10	2.0	1.4	.0	.6	A21	8	0	23	6.4	15
Dec. 4.....	180	6.4	.01	1.4	.4	1.4	.5	10	1.4	1.9	.0	.1	20	6	0	19	6.3	20
Jan. 2, 1963.....	185	6.2	.02	1.5	.4	1.3	.4	8	2.4	.5	.0	.0	A17	6	0	17	6.3	8
Feb. 1.....	202	6.1	.00	1.0	.7	1.9	.7	8	1.6	1.3	.1	.2	A18	6	0	20	6.1	8
Apr. 4.....	286	7.0	.02	1.4	.6	1.4	.4	9	2.4	1.2	.0	.2	20	6	0	20	6.3	10
May 3.....	331	5.8	.04	1.4	.5	1.3	.5	9	1.8	1.0	.0	.1	19	6	0	20	6.6	20
June 4.....	133	6.7	.01	1.6	.6	1.6	.7	10	1.8	1.0	.0	.4	23	6	0	23	6.6	10
July 2.....	249	6.0	.01	1.5	.3	1.3	.4	8	1.4	1.3	.0	.2	20	5	0	19	6.2	15
Aug. 2.....	117	6.8	.01	1.9	.2	1.5	.7	10	.4	.2	.3	.3	21	6	0	20	6.5	6
Sept. 9.....	61	7.2	.02	2.3	.4	1.9	1.1	13	1.6	.6	.1	.4	22	8	0	24	6.9	10

A Calculated from determined constituents.

## TENNESSEE RIVER BASIN--Continued

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

LOCATION.--At gaging station, 0.8 mile downstream from Jonathan Creek, 2.0 miles south of Hefco, 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 1963.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-magnesium			
Oct. 5, 1962.....	675	7.2	0.38	16	1.3	21	1.6	28	14	39	0.4	0.6	143	44	22	205	6.3	150
Nov. 1.....	226	10	.43	57	2.7	92	2.7	95	44	163	.1	.7	516	154	76	760	6.6	640
Dec. 4.....	371	9.5	.30	31	1.7	67	2.2	64	32	104	.6	.6	346	85	32	503	6.4	600
Jan. 3, 1963.....	436	9.1	.06	33	1.5	42	1.8	43	26	80	.4	.4	273	88	54	370	7.1	170
Feb. 5.....	705	8.3	.13	17	1.3	28	1.6	30	14	48	.4	.4	164	48	24	245	6.1	130
Apr. 1.....	808	8.0	.04	14	.8	25	1.5	23	13	42	.1	1.2	140	38	18	220	6.2	85
May 6.....	605	8.1	.11	23	1.4	31	1.8	42	19	55	.2	.4	193	62	28	300	6.4	75
June 4.....	328	9.6	.48	34	2.2	58	2.3	38	34	110	.4	.8	312	93	62	500	6.3	300
July 3.....	411	9.7	.15	32	1.8	39	1.9	59	26	69	.3	.7	247	87	38	330	6.5	150
Aug. 5.....	240	11	.15	46	2.3	65	2.2	57	38	128	.4	.9	401	126	79	570	6.4	320
Sept. 6.....	186	11	.54	71	2.7	100	3.7	101	60	185	.2	1.5	575	188	106	890	7.3	450

## TENNESSEE RIVER BASIN--Continued

## 3-4600. CATALOOCHEE CREEK NEAR CATALOOCHEE, N. C.

LOCATION.--At gaging station at bridge on State Highway 284, 500 feet upstream from Little Cataloochee Creek, and 2 miles north of Cataloochee, Haywood County.

DRAINAGE AREA.--49.2 square miles.

RECORDS AVAILABLE.--Chemical analyses: October 1962 to September 1963.

Water temperatures: October 1962 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 86°F Aug. 28; minimum, freezing point on several days in February.

. Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> ) (Fe)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 18, 1962.....	37	7.6	0.02	1.4	0.5	1.2	0.6	9	1.2	0.1	0.2	0.5	A17	6	0	19	6.4	25
Dec. 19.....	45	6.7	.00	1.0	.4	1.7	.5	6	1.2	.6	.1	.4	17	4	0	18	6.2	5
Jan. 9, 1963.....	69	6.5	.01	1.0	.2	1.2	.5	8	1.0	.5	.0	.3	A15	4	0	13	6.2	7
Feb. 13.....	105	6.6	.00	1.4	.4	1.0	.4	7	1.0	.5	.0	.9	A15	5	0	13	6.3	10
Apr. 28.....	78	6.3	.01	1.3	.3	1.4	.6	8	.6	1.0	.0	.0	17	4	0	18	6.3	5
May 1.....	180	5.7	.02	.8	.3	.6	.2	7	1.0	1.0	.0	.7	A12	4	0	14	6.7	5
May 30.....	74	7.1	.02	1.1	.5	1.1	1.3	5	2.2	.6	.1	2.7	20	5	1	17	5.5	20
June 22.....	86	7.4	.02	1.8	.1	1.5	.7	10	1.0	1.0	.1	.5	22	5	0	16	6.6	13
July 28.....	69	7.2	.03	.8	.7	1.3	1.0	6	2.0	1.1	.0	.1	22	5	0	17	6.0	20
Aug. 22.....	48	8.5	.02	1.6	.2	2.0	.6	9	.4	1.0	.0	.5	20	5	0	23	6.3	6
Sept. 6.....	34	8.3	.01	1.7	.7	1.7	.8	11	.8	.9	.1	.3	20	7	0	16	6.9	12

A Calculated from determined constituents.





## 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 1963.  
 REMARKS.--No discharge records available.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-magnesium			
Oct. 16, 1962.....		9.7	0.07	33	1.9	43	3.0	73	23	72	0.2	0.2	248	90	30	395	6.5	130
Nov. 20, .....		8.6	.36	23	1.8	36	2.0	49	18	66	.2	.7	210	66	26	315	6.4	180
Dec. 24, .....		9.8	.60	30	1.9	50	1.9	56	28	84	.3	.4	287	83	37	420	6.4	400
Jan. 21, 1963.....		8.5	.28	20	1.6	29	1.7	34	16	50	.3	.4	170	56	28	250	6.2	120
Feb. 13, .....		8.1	.33	17	2.1	27	1.6	36	16	46	.3	.6	166	50	21	225	6.5	140
Apr. 8, .....		8.9	.18	17	1.4	24	2.2	42	13	37	.1	.4	136	48	14	220	7.3	45
May 18, .....		8.3	.31	18	1.2	25	1.9	40	13	42	.2	1.5	154	50	18	240	6	110
June 18, .....		9.2	.73	22	1.8	34	2.2	44	16	61	.2	.4	209	63	27	329	6.4	210
July 16, .....		8.9	.38	27	1.5	39	4.8	62	18	64	.2	.4	216	72	22	342	7.2	220
Aug. 12, .....		10	.50	26	1.6	40	2.0	50	26	67	.3	.4	227	70	30	312	7.2	220
Sept. 16, .....		9.8	.43	33	1.8	57	4.8	70	26	94	.3	.6	303	90	32	462	7.0	--

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

LOCATION (revised).--Temperature recorder at gaging station 800 feet upstream from bridge on Secondary Road 1169, 0.3 mile downstream from White Oak Creek, 3 miles southeast of Celio, Yancey County.  
DRAINAGE AREA. 4,300 square miles.  
RECORDS AVAILABLE.--water temperatures: October 1958 to September 1963.  
EXTREMES, 1962-63.--water temperatures: Maximum, 76° Aug. 5, 8; minimum, 33° on several days in January and February.  
EXTREMES, 1958-63.--water temperatures: Maximum, 78° Aug. 1, 1961; minimum, freezing point on several days in 1958-60.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 10, 1962.....	113	5.3	0.02	1.4	0.4	0.6	0.4	6	1.2	1.0	0.1	0.2	A14	5	0	16	6.0	5
May 14, 1963.....	66.8	6.0	.00	1.6	.6	.9	.3	10	1.2	1.4	.0	0.0	A17	6	0	14	7.0	5

A Calculated from determined constituents.





TENNESSEE RIVER BASIN--Continued  
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 1963.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-magnesium			
Oct. 31, 1962.....	392	7.3	0.03	2.2	0.6	1.8	0.7	12	1.0	1.3	0.0	1.2	422	8	0	24	6.4	15
Nov. 9,.....	616	6.9	0.03	1.6	.9	18	.8	28	18	2.2	.2	1.6	84	8	0	94	6.7	150
Dec. 18,.....	366	7.5	.07	2.2	.5	28	.9	41	26	1.0	.2	1.2	144	8	0	128	6.9	120
Jan. 18, 1963.....	545	7.6	.07	1.3	.9	19	1.1	31	18	1.8	.2	.4	103	6	0	105	6.8	150
Feb. 4,.....	846	7.6	.00	1.4	1.0	2.1	.7	12	2.8	1.6	.0	1.0	424	8	0	27	6.4	8
Mar. 22,.....	1580	6.6	.00	1.8	.7	2.0	.6	10	1.6	1.0	.0	1.0	22	8	0	23	6.7	10
Apr. 2,.....	762	8.9	.00	2.4	.7	4.3	1.3	15	5.2	1.4	.0	.4	37	8	0	33	7.1	20
May 20,.....	449	8.5	.11	2.4	.9	42	1.3	48	58	2.2	.3	2.3	187	10	0	222	7.0	240
June 17,.....	519	9.1	.03	2.9	.9	6.3	1.5	21	8.4	2.4	.1	.9	49	10	0	63	6.6	45
July 12,.....	330	9.1	.04	2.1	.6	9.4	.8	18	5.6	1.5	.0	.5	44	8	0	46	6.5	48
Aug. 2,.....	564	8.2	.00	2.3	1.1	15	1.5	24	18	.9	.2	.6	74	10	0	82	6.3	70
Sept. 28,.....	798	7.2	.06	2.1	.6	2.3	1.9	12	4.2	1.1	.0	.3	426	8	0	30	6.3	30

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 1963.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 30, 1962.....	657	7.9	0.00	2.2	0.5	10	0.7	21	12	1.3	0.0	1.2	51	8	0	69	6.1	70
Nov. 28.....	928	7.0	.00	1.8	.3	9.6	.7	17	11	1.8	.0	1.7	45	6	0	62	6.1	60
Dec. 20.....	780	7.3	.09	1.8	.8	26	1.0	36	28	.9	.2	1.1	118	8	0	132	6.2	140
Jan. 29, 1963.....	1080	6.9	.02	1.5	.6	10	.9	15	11	2.3	.2	1.3	52	6	0	60	6.0	45
Feb. 28.....	1060	6.8	.03	1.8	.4	10	.7	18	12	1.2	.0	1.4	53	6	0	60	6.5	55
Mar. 28.....	2290	7.0	.02	1.2	.5	4.5	.7	12	5.6	1.5	.0	.5	31	5	0	38	6.3	30
Apr. 29.....	2480	7.1	.00	1.9	.6	2.0	1.1	12	1.6	1.2	.0	.4	22	8	0	23	6.9	5
May 23.....	896	7.6	.06	1.8	.8	7.5	.8	19	9.4	1.0	.0	.9	42	7	0	38	6.2	40
June 19.....	933	8.5	.04	2.2	.3	5.5	1.3	14	7.2	1.5	.1	.5	38	6	0	38	6.2	10
July 31.....	1510	7.4	.06	2.0	.5	5.4	.8	15	2.8	1.5	.3	.5	39	7	0	43	6.1	48
Aug. 29.....	706	8.8	.01	2.6	.2	17	1.8	26	20	1.4	.2	.8	83	8	0	89	6.9	100
Sept. 24.....	500	8.8	.03	2.6	.3	19	2.3	28	25	1.9	.2	.9	88	8	0	105	6.1	110















## TENNESSEE RIVER BASIN--Continued

3-5500. VALLEY RIVER AT TOMOTLA, N. C.

LOCATION (revised).--Temperature recorder at gaging station at bridge on Secondary Road 1373 at Tomotla, Cherokee County, 0.2 mile upstream from Rogers Creek, and 4.7 miles northeast of Murphy.

DRAINAGE AREA.--104 square miles.

RECORDING INSTRUMENTS.--Thermometers: October 1952 to September 1953.

ANALYSES.--Chemical analyses: October 1952 to September 1953.

WATER TEMPERATURES.--October 1952 to September 1953.

EXTREMES, 1962-63.--Water temperatures: Maximum, 72°F Aug. 7, 8; minimum, freezing point Dec. 12-16.

EXTREMES, 1962-63.--Water temperatures: Maximum, 74°F on several days in July, August 1953, and July 1962; minimum, freezing point Dec. 12-16, 1962.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 8, 1962.....	104	6.9	0.01	6.4	1.4	1.6	.8	24	3.6	0.4	0.0	0.4	A34	22	2	45	7.0	5
May 10, 1963.....	238	6.8	.00	3.2	1.1	.8	.5	16	1.0	.2	.0	.7	A22	12	0	30	7.2	3

A Calculated from determined constituents.



3-5710. SEQUATCHIE RIVER NEAR WHITWELL, TENN.

LOCATION.--Temperature recorder at gaging station, 15 feet downstream from highway bridge, 1.5 miles east of Whitwell, Marion County, 3 miles upstream from bridge on State Highway 27, and 4.5 miles downstream from Griffith Creek.  
DRAINAGE AREA.--384 square miles (does not include 17.8 square miles in Grassy, Swagerty, and Little Coves).  
RECORDS AVAILABLE.--Water temperatures: March to September 1962, unpublished; October 1962 to September 1963.  
EXTREMES, 1962-63.--Water temperatures: Maximum, 75°F July 5, 6, Aug. 26-28; minimum, 38°F Dec. 14, 15.  
REMARKS.--Records furnished by Tennessee Valley Authority.

Month	Temperature (°F) of water, water year October 1962 to September 1963 (Recorder with temperature attachment, continuous ethyl alcohol-actuated thermometer)																														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	64	66	66	65	66	66	67	67	67	66	66	67	67	67	68	68	67	65	63	64	63	61	59	55	53	51	52	54	54	55	63		
Minimum	61	62	64	65	64	64	65	66	67	65	65	65	65	66	66	66	67	65	63	62	63	61	59	55	53	51	50	50	52	53	53	61		
November																																		
Maximum	--	--	--	--	--	--	--	--	--	--	52	52	52	52	52	53	53	53	52	53	54	53	52	52	52	52	52	51	51	52	53	--		
Minimum	--	--	--	--	--	--	--	--	--	--	51	52	52	51	51	52	53	53	52	53	53	52	51	51	51	51	51	51	51	51	52	--		
December																																		
Maximum	63	63	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62		
Minimum	53	53	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52		
January																																		
Maximum	46	45	45	45	45	45	47	47	47	47	48	49	50	49	48	48	48	48	47	46	45	44	44	44	41	41	41	41	41	40	41	42	45	
Minimum	45	45	45	45	45	45	46	47	47	47	48	49	48	48	48	48	48	48	47	46	45	44	44	44	41	41	41	41	41	40	40	41	44	
February																																		
Maximum	43	45	45	45	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	
Minimum	42	43	44	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	
March																																		
Maximum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Minimum	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
April																																		
Maximum	--	--	63	62	62	62	62	62	62	62	60	60	60	60	60	59	58	58	60	62	63	66	65	67	67	65	62	61	63	60	60	61	61	
Minimum	--	--	62	62	62	62	62	62	62	62	59	59	59	59	59	58	57	56	57	58	60	61	62	63	65	66	60	60	60	60	60	60	60	
May																																		
Maximum	58	57	58	60	--	--	--	--	--	--	67	68	67	67	66	67	66	67	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	
Minimum	55	55	55	56	56	--	--	--	--	--	64	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	
June																																		
Maximum	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	
Minimum	57	58	59	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	
July																																		
Maximum	73	74	74	75	75	74	74	74	74	74	73	73	72	73	73	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	
Minimum	71	72	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	
August																																		
Maximum	70	71	72	72	73	73	74	74	73	71	71	71	71	71	70	70	71	72	73	73	73	73	73	73	74	75	75	75	74	75	74	73	73	73
Minimum	69	69	70	71	71	72	72	72	72	70	69	70	71	70	69	69	70	71	72	73	73	73	73	73	74	75	75	74	73	74	73	73	71	71
September																																		
Maximum	73	73	74	74	74	73	73	73	73	72	73	72	71	71	70	70	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71
Minimum	72	72	73	72	72	71	71	71	71	70	71	71	71	71	70	69	68	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69	69

Temperature (°F) of water, water year October 1962 to September 1963  
(Recorder with temperature attachment, continuous ethyl alcohol-actuated thermograph)





TENNESSEE RIVER BASIN--Continued  
3-5820. ELK RIVER ABOVE FAYETTEVILLE, TENN.

LOCATION.--Temperature recorder at gaging station, 100 feet downstream from highway bridge, 1.8 miles southeast of Fayetteville, Lincoln County, and 4 miles upstream from Norris Creek.

DRAINAGE AREA.--827 square miles.

RECORDS AVAILABLE.--Water temperatures: June 1960 to September 1963.

EXTREMES, 1960-63.--Water temperatures: Maximum, 84° Aug. 7, 8, 1960; minimum, 35° Dec. 13-16, 1962.

EXTREMES, 1960-63.--Water temperatures: Maximum, 84° Aug. 7, 8, 1960; minimum, 35° Dec. 13-16, 1962.

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

(Recorder with temperature attachment, continuous ethyl alcohol-actuated thermograph)

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



3-5980. DUCK RIVER NEAR SHELBYVILLE, TENN.

LOCATION.--Temperature recorder at gaging station, 150 feet downstream from Sims Bridge, 2.1 miles upstream from Sugar Creek, 2.2 miles west of Shelbyville, Bedford County, and 2.9 miles downstream from Flat Creek.

**DRAINAGE AREA,--481 square miles.**

RECORDS AVAILABLE.--Water temperatures: October 1960 to September 1962, unpublished; October 1962 to September 1963.

Water temperatures: Maximum, 84° F Aug. 6-8; minimum, freezing point on several days during December and

REMARKS.--Records furnished by Tennessee Valley Authority.  
January.

Temperature (°F) of water, water vapor October 1962 to September 1963 (Recorder with temperature attachment, continuous ethyl alcohol-actuated thermograph)																																		
Month		Day																														Average		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		31	
October	Maximum	64	65	66	66	67	68	69	71	70	70	70	71	71	72	72	72	68	67	67	67	67	67	66	65	62	59	57	54	56	56	56	65	
	Minimum	63	63	64	64	65	66	66	68	67	68	68	69	70	71	69	66	65	66	65	66	65	65	64	62	58	56	54	52	54	55	55	63	
	Maximum	53	56	53	53	51	50	49	50	49	49	51	52	52	52	53	54	54	53	51	53	55	54	51	53	51	52	51	50	50	50	57	52	
	Minimum	51	52	53	51	48	47	47	49	47	47	49	51	50	51	50	51	51	53	51	50	51	54	51	50	51	50	48	48	49	49	50	50	
November	Maximum	51	51	50	50	50	47	45	44	47	40	37	32	32	32	34	34	35	37	40	48	50	47	43	45	46	48	48	48	48	48	48	48	48
	Minimum	49	49	48	48	47	45	43	42	40	37	32	32	32	32	34	34	35	37	40	48	47	43	42	45	45	45	47	47	47	47	47	47	
	Maximum	42	42	42	43	44	45	45	46	47	50	51	49	45	40	36	37	38	41	42	43	40	34	34	33	33	33	34	37	39	41	41	41	
	Minimum	41	40	40	41	43	44	44	43	45	47	49	44	40	36	34	37	38	41	43	47	50	54	52	53	52	52	52	54	56	56	56	56	
December	Maximum	39	42	42	41	42	44	45	43	42	41	40	41	40	41	39	38	39	40	41	41	37	37	39	41	42	41	40	40	40	40	40	40	
	Minimum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
	Maximum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
	Minimum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
January	Maximum	47	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	
	Minimum	47	48	48	48	47	45	43	42	40	37	32	32	32	32	34	34	35	37	40	48	47	43	42	45	45	45	47	47	47	47	47	47	
	Maximum	42	42	42	43	44	45	45	46	47	50	51	49	45	40	36	37	38	41	42	43	40	34	34	33	33	33	34	37	39	41	41	41	
	Minimum	41	40	40	41	43	44	44	43	45	47	49	44	40	36	34	37	38	41	43	47	50	54	52	53	52	52	52	54	56	56	56	56	
February	Maximum	41	40	40	41	43	44	44	43	45	47	49	44	40	36	34	37	38	41	43	47	50	54	52	53	52	52	52	54	56	56	56	56	
	Minimum	39	42	42	41	42	44	45	43	42	41	40	41	40	41	39	38	39	40	41	41	37	37	39	41	42	41	40	40	40	40	40	40	
	Maximum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
	Minimum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
March	Maximum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
	Minimum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
	Maximum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
	Minimum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
April	Maximum	47	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	
	Minimum	47	48	48	48	47	45	43	42	40	37	32	32	32	32	34	34	35	37	40	48	47	43	42	45	45	45	47	47	47	47	47	47	
	Maximum	42	42	42	43	44	45	45	46	47	50	51	49	45	40	36	37	38	41	42	43	40	34	34	33	33	33	34	37	39	41	41	41	
	Minimum	41	40	40	41	43	44	44	43	45	47	49	44	40	36	34	37	38	41	43	47	50	54	52	53	52	52	52	54	56	56	56	56	
May	Maximum	47	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	
	Minimum	47	48	48	48	47	45	43	42	40	37	32	32	32	32	34	34	35	37	40	48	47	43	42	45	45	45	47	47	47	47	47	47	
	Maximum	42	42	42	43	44	45	45	46	47	50	51	49	45	40	36	37	38	41	42	43	40	34	34	33	33	33	34	37	39	41	41	41	
	Minimum	41	40	40	41	43	44	44	43	45	47	49	44	40	36	34	37	38	41	43	47	50	54	52	53	52	52	52	54	56	56	56	56	
June	Maximum	41	40	40	41	43	44	44	43	45	47	49	44	40	36	34	37	38	41	43	47	50	54	52	53	52	52	52	54	56	56	56	56	
	Minimum	39	42	42	41	42	44	45	43	42	41	40	41	40	41	39	38	39	40	41	41	37	37	39	41	42	41	40	40	40	40	40	40	
	Maximum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
	Minimum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
July	Maximum	47	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	
	Minimum	47	48	48	48	47	45	43	42	40	37	32	32	32	32	34	34	35	37	40	48	47	43	42	45	45	45	47	47	47	47	47	47	
	Maximum	42	42	42	43	44	45	45	46	47	50	51	49	45	40	36	37	38	41	42	43	40	34	34	33	33	33	34	37	39	41	41	41	
	Minimum	41	40	40	41	43	44	44	43	45	47	49	44	40	36	34	37	38	41	43	47	50	54	52	53	52	52	52	54	56	56	56	56	
August	Maximum	47	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	
	Minimum	47	48	48	48	47	45	43	42	40	37	32	32	32	32	34	34	35	37	40	48	47	43	42	45	45	45	47	47	47	47	47	47	
	Maximum	42	42	42	43	44	45	45	46	47	50	51	49	45	40	36	37	38	41	42	43	40	34	34	33	33	33	34	37	39	41	41	41	
	Minimum	41	40	40	41	43	44	44	43	45	47	49	44	40	36	34	37	38	41	43	47	50	54	52	53	52	52	52	54	56	56	56	56	
September	Maximum	41	40	40	41	43	44	44	43	45	47	49	44	40	36	34	37	38	41	43	47	50	54	52	53	52	52	52	54	56	56	56	56	
	Minimum	39	42	42	41	42	44	45	43	42	41	40	41	40	41	39	38	39	40	41	41	37	37	39	41	42	41	40	40	40	40	40	40	
	Maximum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
	Minimum	45	46	46	45	46	45	46	45	45	42	42	42	42	42	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	
October	Maximum	47	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	
	Minimum	47	48	48	48	47	45	43	42	40	37	32	32	32	32	34	34	35	37	40	48	47	43	42	45	45	45	47	47	47	47	47	47	
	Maximum	42	42	42	43	44	45	45	46	47	50	51	49	45	40	36	37	38	41	42	43	40	34	34	33	33	33	34	37	39	41	41	41	
	Minimum	41	40																															





## OHIO RIVER MAIN STEM

3-6115. OHIO RIVER AT METROPOLIS, ILL.

LOCATION.--Temperature recorder at gaging station at Paduch 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 1953.

EXTREMES: 1962-63.--Water temperatures: Maximum, 84°F Aug 5-10; minimum, freezing point Jan. 27 to Feb. 20.

EXTREMES: 1953-54.--Water temperatures: Maximum, 88°F Aug. 3-6, 1953; minimum, freezing point on Feb. 20-24, 1953, Jan. 27 to Feb. 20, 1953.

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

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

## 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 near Grand Chain, Pulaski County, 7,300 feet downstream from Bledsoe Creek, 18.5 miles downstream from gaging station at Metropolis, and 29.7 miles downstream from Tennessee River.

DATA AVAILABLE.--Chemical analyses: October 1954 to September 1963.

RECORDS AVAILABLE.--Chemical analyses: October 1954 to September 1963.

Water temperatures: October 1954 to September 1963.

EXTREMES, 1962-63.--Specific conductance: Maximum daily, 664 micromhos Nov. 16; minimum daily, 221 micromhos Mar. 23.

EXTREMES, 1954-63.--Dissolved solids (1954-62): Maximum, 310 ppm Dec. 1-9, 1958; minimum, 128 ppm Mar. 11-20, 1955.

Hardness (1954-62): Maximum, 192 ppm Dec. 1-9, 1958; minimum, 84 ppm Mar. 11-20, 1955.

Specific conductance: Maximum daily, 664 micromhos Nov. 16, 1962; minimum daily, 170 micromhos Feb. 9, 1957.

Water temperatures (1954-62): Maximum, 87°F Aug. 5, 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. Records of discharge are given for gaging station at Metropolis.

(Composites of daily samples and analyses based on maximum weekly, monthly, and minimum monthly specific conductance)

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub> Calcium-magnesium sum	Specific conductance (micromhos at 25°C)	pH	Color
Nov. 7-27, 1962.....	182700	--	--	--	--	--	--	76	102	45	0.4	5.6	299	167	105	504	--
Nov. 16 (maximum monthly).....	247000	--	--	--	--	--	--	74	162	66	.7	8.9	420	220	160	684	7.4
Nov. 28 (minimum monthly).....	198000	--	--	--	--	--	--	70	54	26	.0	3.1	190	113	56	320	7.5
Dec. 4-24.....	114900	--	--	--	--	--	--	76	42	18	.3	3.5	167	108	46	283	--
Dec. 23 (maximum monthly).....	141000	--	--	--	--	--	--	92	50	18	.3	4.3	184	128	52	322	8.0
Dec. 20 (minimum monthly).....	109000	--	--	--	--	--	--	72	32	14	.1	2.6	133	93	34	244	7.6
Jan. 11-19, 1963.....	191200	--	--	--	--	--	--	72	55	19	.2	4.8	184	116	57	310	--
Jan. 18 (maximum monthly).....	247000	--	--	--	--	--	--	72	61	22	.3	5.1	194	122	63	336	7.3
Jan. 11 (minimum monthly).....	135000	--	--	--	--	--	--	70	42	14	.3	4.6	154	102	44	265	7.1
Feb. 3-12.....	214600	--	--	--	--	--	--	80	66	20	.3	6.0	220	132	66	349	--
Feb. 9 (maximum monthly).....	243000	--	--	--	--	--	--	80	75	23	.2	6.8	244	140	74	379	7.2
Feb. 15 (minimum monthly).....	126000	--	--	--	--	--	--	80	55	18	.3	5.0	180	123	58	316	7.3
Mar. 5-14, 23-31.....	846500	--	--	--	--	--	--	66	46	15	.1	2.5	159	100	46	260	--
Mar. 5 (maximum monthly).....	261000	--	--	--	--	--	--	80	66	30	.2	2.9	201	128	62	350	7.2
Mar. 23 (minimum monthly).....	1100000	--	--	--	--	--	--	58	40	12	.1	2.6	138	88	40	221	7.5

Apr. 1, 11-30, 1983.	238100	--	--	58	21	.2	5.4	197	144	66	317	--
Apr. 27 (maximum monthly).....	190000	--	--	67	23	.2	4.9	224	156	64	380	7.6
Apr. 1 (minimum monthly).....	943000	--	--	58	43	.1	4.7	155	90	42	230	7.3
May 1-31.....	192000	--	--	114	62	.1	4.6	224	159	66	387	--
May 22 (maximum monthly).....	187000	--	--	122	74	.4	4.0	266	187	87	436	7.6
May 30 (minimum monthly).....	193000	--	--	90	33	.3	2.3	154	104	30	260	7.4
June 1-30.....	141900	--	--	96	64	.4	3.5	229	143	64	373	--
June 10 (maximum monthly).....	171000	--	--	106	68	.3	4.8	244	156	69	403	7.3
June 30 (minimum monthly).....	86300	--	--	82	46	.3	4.4	178	117	50	296	7.3
July 17 (maximum weekly) <sup>a</sup> .....	95300	--	--	44	--	--	--	--	--	--	287	7.4
July 23 (maximum weekly) <sup>b</sup> .....	107000	34	8.6	94	44	--	2.2	172	121	44	299	7.3
July 21 (minimum monthly).....	117000	26	6.1	72	30	--	1.6	137	90	31	230	7.0
Aug. 23 (maximum monthly).....	79100	30	7.6	88	38	--	1.8	154	106	34	268	7.1
Aug. 18 (minimum monthly).....	79800	28	3.4	70	30	--	3.6	128	84	26	227	7.2
Sept. 30 (maximum weekly) <sup>b</sup> .....	56400	--	--	31	--	--	--	--	--	--	252	6.9
Sept. 7 (maximum monthly).....	75500	30	6.1	80	33	--	3.7	148	100	34	259	7.1
Sept. 10 (minimum monthly).....	79200	28	4.4	74	27	--	2.5	133	88	28	231	6.9

<sup>a</sup> Sample for this date contained 0.16 ppm phosphorus (PO<sub>4</sub>) and 0.1 ppm alkyl benzene sulfonate (ABS).

<sup>b</sup> Sample for this date contained 0.17 ppm phosphorus (PO<sub>4</sub>) and 0.0 ppm alkyl benzene sulfonate (ABS).



OHIO RIVER MAIN STEM--Continued  
 3-6125. OHIO RIVER AT LOCK AND DAM 53, NEAR GRAND CHAIN, ILL.--Continued  
 Temperature (°F) of water, November 1962 to September 1963

Month			Day																												Average
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
November ..	--	--	--	--	--	62	61	52	62	60	58	57	57	55	58	--	57	56	55	55	56	55	52	50	59	58	--	--	--	--	--
December ..	--	--	46	46	45	40	40	40	38	37	36	--	37	36	37	36	36	35	34	40	40	39	39	--	--	--	--	--	--	--	--
January .....	--	--	--	--	--	--	--	--	--	--	42	43	37	38	36	36	36	35	35	36	--	--	--	--	--	--	--	--	--	--	--
February .....	--	--	33	34	34	35	35	35	35	35	35	34	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
March .....	--	--	--	--	40	38	39	38	37	38	38	37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April .....	51	--	--	--	--	--	--	--	--	--	50	47	46	46	48	48	48	47	48	55	57	57	56	54	58	43	43	43	43	--	
May .....	44	44	45	44	44	44	44	44	50	51	48	49	49	51	51	51	51	50	60	60	59	57	57	57	58	58	55	55	--	51	
June .....	--	52	51	51	50	49	49	49	48	47	44	46	47	47	47	47	46	46	47	46	--	--	--	48	51	57	63	62	62	--	50
July .....	--	62	63	63	63	--	--	--	--	--	--	--	--	68	63	73	73	72	73	72	73	72	--	--	--	--	--	--	--	--	--
August .....	--	--	--	--	--	--	--	--	--	--	--	--	65	--	--	64	65	67	67	67	67	63	--	--	--	--	--	--	--	--	--
September ..	--	--	--	--	--	--	63	62	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	73	72	71	72	71	--	--

## MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN

Chemical analyses, in parts per million, water year October 1962 to September 1963																				
Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Alum- inum (Al)	Iron (Fe)	Man- ga- nese (Mn)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Pot- tas- sium (K)	Bicar- bonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Total acid- ity as H <sup>+</sup>	Specific conduct- ance (micro- mhos at 25°C)	Col- or
																Cal- cium	Non- carbon- ate			
ALLEGHENY RIVER MAIN STEM																				
3-125. ALLEGHENY RIVER NEAR KINZUA, PA.																				
Nov. 8, 1962..	1480	5.1	0.01	0.01	0.01	21	4.4	29	1.4	40	18	59	0.0	0.1	174	71	38	327	7.3	5
Jan. 17, 1963.	2500	6.4	.00	.00	.00	16	3.4	22	2.0	24	16	44	.1	4.0	152	54	35	258	6.2	3
Feb. 20, 1963.	900	7.4	.00	.00	.00	27	5.8	50	1.5	45	20	95	.0	2.1	266	92	55	468	6.7	5
Apr. 3, 1963..	13100	6.2	—	—	—	8.4	1.9	7.3	.7	18	14	12	—	.7	67	29	14	111	6.9	5
May 2, 1963..	4250	2.3	—	—	—	14	1.2	13	.6	30	13	25	—	.3	100	40	16	184	7.3	7
June 6, 1963..	1680	6.2	.00	.00	.00	18	2.9	27	4.5	32	12	55	.2	1.0	152	57	31	258	7.1	3
July 11, 1963.	505	6.5	.00	.01	.01	32	6.3	45	2.5	72	18	91	.1	.4	268	106	47	452	7.3	3
Sept. 19, 1963.	314	4.3	.02	.03	.03	38	7.8	60	3.8	76	20	135	.2	.2	353	127	65	598	7.6	8
FRENCH CREEK BASIN																				
3-240. FRENCH CREEK AT UTICA, PA.																				
Oct. 9, 1962..	240	7.1	0.01	0.02	0.02	34	7.8	8.3	2.0	103	37	9.4	—	0.9	175	117	33	287	7.4	5
Nov. 15, 1962..	3100	11	.00	.00	.00	34	6.1	6.4	3.0	88	26	5.0	0.1	9.3	168	110	38	281	7.1	5
Dec. 20, 1962.	540	2.2	.00	.00	.00	28	4.9	5.5	.5	84	24	6.5	.1	1.3	128	90	21	220	6.9	10
May 9, 1963..	709	—	0.00	0.00	0.00	28	4.9	5.5	.5	84	24	6.5	.1	1.3	128	90	21	220	6.9	10
June 11, 1963.	630	4.3	.01	.00	.00	30	6.8	6.5	1.2	102	22	7.5	.2	2.7	138	103	20	236	7.5	2
July 25, 1963.	186	3.2	.02	.01	.01	39	8.0	8.0	2.8	126	29	10	.1	1.5	170	131	27	290	7.7	10
Aug. 23, 1963.	112	3.2	.04	.02	.02	42	8.8	10	3.0	134	36	12	.2	2.1	190	141	31	323	8.0	20
Sept. 26, 1963.	95	3.2	.00	.00	.00	44	8.3	9.7	1.8	142	28	12	.2	2.6	186	144	28	313	7.0	7
CLARION RIVER BASIN																				
3-294. TOMS RUN AT COOKSBURG, PA.																				
Nov. 5, 1962..	5.1	8.0	0.01	0.19	0.19	8.0	4.1	7.0	1.4	8	39	4.0	0.0	0.1	80	37	31	131	6.4	5
Jan. 14, 1963.	17	6.2	.00	.00	.00	6.0	3.6	3.1	1.2	3	29	3.0	.0	1.4	67	30	28	101	5.6	3
Mar. 4, 1963..	4.0	5.5	.00	.02	.02	4.8	2.7	4.0	.5	2	25	2.0	.1	1.0	60	23	22	79	5.6	5
Apr. 29, 1963.	12	4.9	.00	.01	.01	5.6	2.2	4.5	1.0	6	25	3.0	.0	.3	65	23	18	92	6.6	5
July 9, 1963.	1.9	7.7	.02	.00	.00	8.0	4.9	14	2.0	16	43	7.5	.2	1.1	95	40	27	164	6.5	3
Sept. 17, 1963.	1.0	6.6	.00	.00	.00	14	6.8	23	2.0	31	72	12	.2	1.1	153	63	38	257	6.8	4

## MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Total acidity as H <sup>+</sup>	Specific conductance (micro-mhos at 25°C)	pH	Color	
															Calcium	Non-carbonate					
CLARION RIVER BASIN--Continued																					
3-295. CLARION RIVER AT COOKSBURG, PA.																					
Nov. 5, 1962..	978	5.8		0.05	0.02	15	4.1	9.6	1.2	12	41	16	0.1	0.1	116	55	45		184	6.5	7
Feb. 19, 1963.	380	22		.19	.33	35	6.3	19	1.6	45	59	36	--	.9	251	114	77		370	7.0	3
Mar. 4.....	400	5.2		.00	.00	12	3.6	7.5	1.5	9	35	14	.1	.8	86	45	38		142	6.0	5
Apr. 30.....	7600	5.2		--	--	13	4.4	9.0	1.0	12	41	15	--	.5	105	51	41		179	6.6	7
July 9.....	408	5.7		.09	.02	30	1.2	10	2.0	12	57	28	.1	.8	163	90	70		246	6.4	15
Aug. 13.....	296	4.4		.01	.02	26	5.4	16	1.6	10	74	36	.2	.6	175	87	76		293	6.3	3
Sept. 17.....	268	4.5		.00	.01	34	7.8	26	2.0	10	60	20	.2	.5	274	117	109		393	7.0	3
3-305. CLARION RIVER NEAR PINEY, PA.																					
Nov. 5, 1962.	1110	5.7		0.04	0.01	19	5.1	9.5	1.6	7	51	24	0.0	0.1	143	69	63		234	6.7	5
Feb. 19, 1963.	720	6.4		.14	.89	22	5.8	11	1.4	16	64	20	--	.4	162	79	66		266	6.4	5
June 3.....	1170	4.8		.00	.00	13	4.6	7.0	1.8	6	44	12	.2	.8	91	52	47		160	5.7	3
Aug. 12.....	648	5.1	1.3	.00	2.1	27	10	12	1.7	0	103	26	.2	3.0	199	109	109		340	4.4	2

## MONONGAHELA RIVER BASIN

## 3-500. TYGART VALLEY RIVER NEAR DAILEY, W. VA.

July 11, 1963.	15	3.0		0.03		12	1.5	2.5	1.1	44	4.0	1.5		0.3	53	37	1	89	8.2
Sept. 20.....	9.5	1.8		.00	0.00			1.8		40	6.4	1.2	0.0	.0	46	36	3	83	6.9

## 3-507. LEADING CREEK AT GILMAN, W. VA.

May 10, 1963...				0.08			0.7	10	10	1.0		0.3		11	4	0.05	36	6.4
July 10.....	3.27	4.4		.16			2.0	13	6.4	2.0		.4	31	14	4	44	7.8	

## 3-570. TYGART VALLEY RIVER AT COLFAX, W. VA.

May 9, 1963...	410	4.3	0.9	0.19	0.08	10	3.0	1.8	0.3	0	43	2.4	0.1	0.2	81	38	38	0.38	130	4.7
July.....	625	4.6		.01		4	1.4	2.1	.9	5	0	1.0	.0	.6	87	28	24		107	5.1
Aug. 30.....	935	4.4		.00	.30	12	1.9	3.5	--	3	39	1.5	.0	.4	65	38	36		106	5.5

## 3-580. WEST FORK RIVER AT BROWNSVILLE, W. VA.

May 9, 1963...	23			0.05	0.00	24	7.1	4.3		24	48	5.0	0.3		50	30	0.17	138	7.0
Aug. 29.....	4	4.3		.00				12		17	79	12	0.2	.7	163	89	75	246	6.3
																			5

## 3-582. STONECOAL CREEK AT WESTON, W. VA.

May 9, 1963...				0.01				8.4		5	126	12	0.1	0.1	129	125	0.00	332	5.4
Aug. 29.....	A1.8	4.9		.05	0.08	56	14	16		0	204	23	0.1	.5	324	198	198	557	3.8
																			3

## 3-585. WEST FORK RIVER AT BUTCHERVILLE, W. VA.

May 9, 1963...	44	4.5	0.1	0.02	34	9.2	5.5	22	81	8.0	1.7	78	60	0.11	212	6.3			
Aug. 29.....	11			.00			8.2	2.8	23	106	11	0.2	3.0	194	123	104	311	6.5	10

## 3-590. WEST FORK RIVER AT CLARKSBURG, W. VA.

May 9, 1963...	87			0.01			13	26	199	7.0	1.2	208	187	0.00	490	6.6
Aug. 29.....	42	5.1	0.1	.00	0.00	55	15	37	182	3.3	0.2	298	200	170	441	6.9

A Estimated.

## MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued																			
Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Alum-inum (Al)	Iron (Fe)	Man-ga-nese (Mn)	Cal-cium (Ca)	Mag-nesium (Mg)	Sodium (Na)	Pot-ash-tas-tum (K)	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo-ride (F)	Ni-trate (NO <sub>3</sub> )	Dis-solved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub> Cal-Non-carbon-ate cium-magne-sium	Phos-phor-us as PO <sub>4</sub>	Specific conduct-ance (micro-mhos at 25°C)	Col- or pH	
MONONGAHELA RIVER BASIN--Continued																			
3-597. SIMPSON CREEK AT MEADOWBROOK, W. VA.																			
May 9, 1963.....		30	23	34	7.8	158	41	109	3.6	0	1390	30	1.8	792	792	0.08	2650	3.0	
Aug. 29.....				18				83		0	1170	4.0	0.9	565	565	.00	2270	3.0	
3-610. WEST FORK RIVER AT ENTERPRISE, W. VA.																			
May 9, 1963.....	208	20	16	1.6	6.3	206	63	112	4.3	0	690	10	0.3	482	482	0.01	1440	3.3	
July 12.....	60			11			63	112	4.3	0	1060	11	0.9	1670	774	.774	2300	3.0	
Aug. 30.....	158	14	.5	.91	4.1	139	40	62	4.0	0	690	8.1	.8	970	510	.25	1470	3.2	
3-621. PAW PAW CREEK NEAR RIVESVILLE, W. VA.																			
May 8, 1963.....		3.08	29	0.5	60	19	318	150	893	5.4	127	639	78	1.8	380	276	0.05	1630	6.6
Sept. 19.....										0	3520	187	.7	5310	1410	.22	6390	2.6	
3-625. DECKERS CREEK AT MORGANTOWN, W. VA.																			
May 8, 1963.....	35			0.02		116	36	7.6	4.1	0	165	6.0	0.2	137	137	0.03	402	4.3	
Sept. 20.....	3.0	19	4.0	.15	2.0			38		0	578	14	2.5	906	436		1110	4.1	
3-626.5. SCOTT RUN AT OSAGE, W. VA.																			
May 8, 1963.....			75	88	0.81	388	139	125	3.4	0	1720	13	0.3	678	678	0.12	3080	2.8	
Sept. 20.....	2.89	94	70	420	7.6			245		0	4400	12	0.2	6140	1540	.06	5450	2.4	
3-651. BLACKWATER RIVER NEAR CORTLAND, W. VA.																			
May 10, 1963.....		5.34	3.9		0.21			0.7		38	3.6	2.4	0.8	34	34	0.08	71	7.1	
July 10.....				.15				1.7		51	4.4	1.0	1.6	45	45		95	7.2	
3-673. BLACK FORK RIVER AT PARSONS, W. VA.																			
May 10, 1963.....	A380			0.07		11	3.3	1.5	0.6	15	18	1.6	0.1	26	14	0.03	71	6.6	
July 10.....	A220	4.9		.02				1.2		3	38	1.0	0.0	72	41	.38	120	4.9	
													.2					2	

## 3-700. CHEAT RIVER AT ROWLESBURG, W. VA.

May 10, 1963..	500	1.3	0.1	0.14	0.00	7.3	0.6	1.4	0.5	15	12	1.6	0.2	0.0	36	20	8	0.18	62	7.1	4
July 11.....	330	4.8		.03	--	10	2.2	2.0	.6	7	30	3.0	.0	.4	63	34	28		91	6.2	3
Aug. 28.....	400	3.4		.05	.00	8.5	1.2	3.4	--	14	17	2.5	.1	.4	46	26	15		68	6.9	7
Sept. 19.....	280	3.6		.00	.00	9.5	1.1	1.2	.6	11	22	1.1	.0	.1	44	28	19		74	6.9	--

## 3-702.75. MUDDY CREEK NEAR RUTHELLE, W. VA.

May 10, 1963..	420			0.04				0.4		0	91	6.0		0.0		62	62	0.40	222	4.0	
July 11.....	6.10	9.4		4.5	2.4			1.0		0	224	6.5		.1	337	134	134		549	3.4	

## 3-705. BIG SANDY CREEK AT ROCKVILLE, W. VA.

May 10, 1963..	140	3.6	0.0	0.17	0.00	6.0	1.4	0.9	0.7	8	18	1.0	0.2	0.1	38	21	14	0.06	58	6.4	4
July 11.....	39	4.7		.00		12	3.7	1.4	1.0	6	39	2.5	.1	.5	70	45	40		118	6.8	2

## 3-850. MONONGAHELA RIVER AT BRADDOCK, PA.

Nov. 26, 1962..	22400	--	--	--	--	--	--	12	--	6	75	7.5	--	4.1	--	71	68	--	232	6.0	5
Dec. 26, 1963..	2440	7.7	0.5	0.00	0.52	36	8.8	1.4	3.0	132	10.5	6.5	1.1	5.2	304	178	134	0.3	478	4.2	4
Aug. 26.....	2860	8.8	2.0	.00	1.7	60	16	40	3.3	0	291	10	.4	5.9	446	216	216	.4	654	4.3	4

## OHIO RIVER MAIN STEM

## 3-860. OHIO RIVER AT SEWICKLEY, PA.

Oct. 3, 1962..	12800	6.9		0.01	2.6	42	23	45	6.1	0	237	34		1.6	420	200	200		663	4.5	2
Nov. 3, 1963..	15200	8.4				48	38.2	40	3.5	5	164	14		1.4	231	131	164		468	3.8	3
July 31.....	6120	8.2		.04	1.5	40	12	30	3.5	5	166	24	0.4	3.9	304	156	146		477	5.6	3

A Estimated.

## MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (calcinated)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro- mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
KANAWHA RIVER BASIN																		
3-1610. SOUTH FORK NEW RIVER NEAR JEFFERSON, N. C.																		
Dec. 28, 1962.....	454	8.0	0.02	2.4	1.0	1.4	0.5	15	1.4	1.1	0.2	0.4	23	10	0	33	6.6	5
Aug. 14, 1963.....	135	8.8	.02	2.8	1.5	3.1	.6	17	2.4	1.2	.0	.2	28	9	0	31	7.1	10
Sept. 10.....	133	8.5	.02	3.8	1.8	1.9	.8	16	6.4	.6	.2	.7	33	16	4	32	6.5	5
TENNESSEE RIVER BASIN																		
3-4410. DAVIDSON RIVER NEAR BREVARD, N. C.																		
Nov. 5, 1962.....	44.3	8.3	0.01	1.8	0.1	0.7	0.4	8	1.2	0.8	0.1	0.0	17	5	0	14	6.7	5
Apr. 22, 1963.....	76.1	5.4	.02	3.2	.2	1.5	.3	13	.4	1.4	.1	.0	19	9	0	17	6.5	20
3-4414.4. LITTLE RIVER, ABOVE HIGH FALLS, NEAR CEDAR MOUNTAIN, N. C.																		
Nov. 9, 1962.....	333	4.4	0.00	1.3	0.6	0.6	0.8	5	2.4	1.0	0.0	0.4	14	6	2	19	5.8	10
Apr. 22, 1963.....	54.0	7.2	.00	2.2	.6	1.7	.3	11	.4	3.2	.0	.0	21	8	0	22	6.6	10
3-4460. MILLS RIVER NEAR MILLS RIVER, N. C.																		
Nov. 5, 1962.....	61.1	7.3	0.01	0.8	0.4	1.2	0.5	8	2.0	0.6	0.1	0.0	17	4	0	14	6.5	10
May 2, 1963.....	190	5.6	.04	.6	.4	.8	.4	8	.8	.8	.0	.2	14	3	0	14	6.7	6
3-4485. HOMINY CREEK AT CANDLER, N. C.																		
Nov. 2, 1962.....	46.2	13	0.01	3.5	1.1	3.1	1.3	20	3.2	1.8	0.1	1.3	38	14	0	43	6.6	5
May 2, 1963.....	105	11	.06	2.5	1.3	2.2	1.0	19	1.6	1.0	.0	1.1	31	11	0	44	6.9	10
3-4500. BETTIE CREEK NEAR SWANNOA, N. C.																		
Oct. 11, 1962.....	2.5	10	0.00	1.3	0.7	1.0	0.7	10	2.0	0.0	0.0	0.1	23	6	0	20	6.5	5
Apr. 26, 1963.....	4.95	8.2	.00	1.3	.9	1.3	.5	9	2.6	1.6	.0	.3	21	6	0	21	6.4	3
3-4510. SWANNOA RIVER AT BILTMORE, N. C.																		
Nov. 6, 1962.....	44.8	13	0.04	4.5	3.0	12	2.0	30	8.0	9.0	0.1	2.7	70	24	0	107	6.5	10
May 2, 1963.....	277	7.6	.00	2.1	1.3	3.2	1.0	17	2.4	2.4	.0	.5	29	10	0	38	6.7	4

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

Oct. 8, 1962.....	65.1	15	0.03	5.9	2.0	4.0	2.3	32	4.6	1.8	0.2	0.1	52	24	0	66	7.4	5
Apr. 23, 1963.....	113	9.8	.02	4.8	2.3	3.7	1.5	35	1.2	.0	.1	1.0	43	22	0	70	7.1	5

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

Oct. 8, 1962.....	74.2	11	0.00	4.2	1.8	3.0	1.5	32	1.6	0.8	0.2	0.1	40	18	0	48	7.1	10
Apr. 23, 1963.....	147	7.6	.04	3.4	1.4	2.2	.8	20	1.4	.8	.1	.7	28	14	0	46	7.0	5

## 3-4555. WEST FORK PIGEON RIVER, ABOVE LAKE LOGAN, NEAR HAZELWOOD, N. C.

Nov. 2, 1962.....	23.5	6.6	0.01	1.8	0.1	0.6	0.4	8	0.8	0.2	0.1	0.1	15	5	0	16	5.9	5
May 2, 1963.....	110	4.5	.02	.7	.4	.7	.3	7	1.2	.0	.0	.4	11	4	0	13	6.6	5

## 3-4560. WEST FORK PIGEON RIVER, BELOW LAKE LOGAN, NEAR WAYNESVILLE, N. C.

Nov. 2, 1962.....	36.7	5.8	0.06	2.4	0.1	1.3	0.7	8	1.8	0.8	0.1	0.0	17	6	0	19	6.0	15
May 3, 1963.....	1.72	4.7	.00	1.0	.2	.7	.3	8	1.4	.4	.0	.7	13	4	0	15	6.6	8

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

Nov. 5, 1962.....	41.4	6.5	0.00	1.4	0.6	0.9	0.6	10	1.8	0.1	0.0	0.5	18	6	0	21	6.3	8
May 2, 1963.....	152	5.2	.03	1.0	.6	1.1	.3	8	1.0	.0	.0	.9	14	5	0	20	6.6	5

## 3-4575. ALLEN CREEK NEAR HAZELWOOD, N. C.

Nov. 1, 1962.....	6.99	8.4	0.00	1.8	0.9	1.1	0.7	11	1.6	0.2	0.0	0.2	20	8	0	23	6.7	5
May 3, 1963.....	40.8	6.7	.00	1.3	.4	.7	.5	9	1.2	.2	.0	.5	16	4	0	16	6.9	5

## 3-4590. JONATHAN CREEK NEAR COVE CREEK, N. C.

Nov. 1, 1962.....	454	11	0.02	1.9	1.2	2.5	1.1	16	2.4	0.6	0.0	1.3	30	10	0	33	6.5	5
May 3, 1963.....	157	8.5	.00	2.2	.6	1.8	.9	10	1.4	1.2	.1	2.6	24	8	0	27	6.8	3

## 3-4640. CANE RIVER NEAR SIOUX, N. C.

Oct. 10, 1962.....	113	11	0.02	3.4	1.3	1.8	1.3	20	3.6	0.8	0.1	0.1	34	14	0	42	6.7	5
May 14, 1963.....	169	8.7	.00	3.2	1.7	2.0	1.3	19	1.2	.6	.0	1.3	29	15	0	39	7.4	3



## MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potas- sium (K)	Bicar- bonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Dissolved solids (calcu- lated)	Hardness as CaCO <sub>3</sub>		Specific conduct- ance (micro- mhos at 25°C)	pH	Color
														Calcium	Non- carbon- ate			
TENNESSEE RIVER BASIN--Continued																		
3-4790. WATAUGA RIVER NEAR SUGAR GROVE, N. C.																		
Oct. 10, 1962.....	59.5	14	0.00	7.1	2.2	2.7	1.5	32	3.2	2.6	0.1	1.1	51	26	0	69	6.8	5
May 13, 1963.....	64	9.3	.00	4.8	2.7	2.5	1.2	26	2.4	1.2	.1	1.8	39	23	2	55	7.5	4
3-5000. LITTLE TENNESSEE RIVER NEAR PRENTISS, N. C.																		
Oct. 11, 1962.....	156	9.3	0.01	1.9	0.2	2.9	0.9	15	0.8	0.4	0.0	0.2	24	6	0	28	7.2	10
Apr. 26, 1963.....	237	8.2	.00	1.6	.8	2.2	.7	12	3.0	.4	.0	.4	24	7	0	26	6.6	5
3-5002.4. CARTOOGECHEAYE CREEK NEAR FRANKLIN, N. C.																		
Nov. 6, 1962.....	41.5	11	0.04	1.9	1.8	2.0	0.8	16	1.4	0.8	0.0	0.5	28	12	0	31	6.9	5
Apr. 26, 1963.....	92.8	9.3	.00	2.1	.9	1.8	.6	17	.8	.2	.0	.3	24	8	0	29	6.8	0
3-5005. CULLASAJA RIVER AT HIGHLANDS, N. C.																		
Oct. 10, 1962.....	8.66	4.1	0.04	1.1	0.4	1.1	0.5	4	2.4	0.4	0.1	0.8	13	4	1	14	6.6	25
May 6, 1963.....	52.8	3.5	.04	1.3	.2	.8	.3	0	9.6	.4	.1	1.1	17	4	4	46	4.2	7
3-5010. CULLASAJA RIVER AT CULLASAJA, N. C.																		
Nov. 6, 1962.....	41.6	9.3	0.00	1.6	0.7	1.8	0.7	16	1.8	0.8	0.0	0.1	25	7	0	24	6.9	10
Apr. 26, 1963.....	110	4.8	.01	2.2	.7	1.6	.4	15	1.2	1.2	.0	.0	19	8	0	21	7.0	20
3-5030. LITTLE TENNESSEE RIVER-AT NEEDMORE, N. C.																		
Nov. 1, 1962.....	333	9.2	0.05	2.6	0.8	2.0	0.7	18	0.2	0.8	0.0	0.2	26	10	0	26	6.8	10
Apr. 23, 1963.....	850	8.2	.00	2.4	.3	1.8	.5	14	.8	1.4	.0	.0	22	7	0	18	7.5	25
3-5040. NANTAHALA RIVER NEAR RAINBOW SPRINGS, N. C.																		
Oct. 11, 1962.....	62.6	7.5	0.00	2.9	0.4	1.0	0.5	10	3.0	0.4	0.1	0.3	21	8	0	19	6.6	10
May 8, 1963.....	212	6.1	.00	1.3	.7	1.2	.7	11	1.2	.4	.0	.0	17	6	0	19	7.0	5
3-5055. NANTAHALA RIVER AT NANTAHALA, N. C.																		
Oct. 8, 1962.....	632	5.9	0.01	1.8	0.9	0.9	0.4	8	1.4	1.1	0.0	0.4	17	8	2	18	6.6	5
May 10, 1963.....	660	5.4	.00	1.4	.5	.6	.3	9	1.2	.6	.0	.3	14	6	0	15	7.0	3

## 3-5080. TUCKASEGEE RIVER AT TUCKASEGEE, N. C.

Nov. 2, 1962.....	730	5.4	0.01	2.2	0.6	1.6	0.5	8	2.4	1.6	0.0	0.0	18	8	2	15	6.5	10
May 3, 1963.....	528	5.2	.00	1.4	.3	.8	.4	8	.6	1.2	.0	.5	14	4	0	16	6.8	5

## 3-5090. SCOTT CREEK ABOVE SYLVA, N. C.

Nov. 2, 1962.....	54.7	11	0.01	2.7	1.2	2.2	0.9	16	1.4	2.0	0.0	0.8	30	12	0	34	7.0	5
Apr. 22, 1963.....	103	8.9	.00	2.2	.6	1.5	.8	12	1.6	.2	.0	.6	22	8	0	24	7.0	3

## 3-5120. OCONALUFTEE RIVER AT BIRDTOWN, N. C.

Nov. 29, 1962.....	332	6.4	0.02	1.1	0.3	0.9	0.3	10	1.2	0.0	0.0	0.1	15	4	0	19	6.9	5
Apr. 22, 1963.....	330	6.0	.00	1.3	.6	1.1	.6	10	1.8	.4	.0	.4	17	6	0	17	7.0	3

## 3-5135. NOLAND CREEK NEAR BRYSON CITY, N. C.

Nov. 28, 1962.....	36.9	5.1	0.00	1.9	0.4	1.0	0.3	6	1.0	0.6	0.0	0.2	14	6	2	9	6.5	5
Apr. 19, 1963.....	30.6	5.2	.00	1.0	.2	.7	.3	6	1.2	1.0	.0	.4	13	4	0	11	6.8	3

## 3-5450. HIWASSEE RIVER AT PRESLEY, GA.

Oct. 9, 1962.....	50.5	8.0	0.02	2.2	0.2	1.6	0.7	10	1.2	1.0	0.0	0.1	20	6	0	17	6.6	0
May 8, 1963.....	134	6.7	.00	1.6	.2	1.1	.5	9	.2	.4	.0	.3	13	5	0	14	6.8	3

## 3-5470. HIWASSEE RIVER, BELOW CHATUGE DAM, NEAR HAYESVILLE, N. C.

Oct. 9, 1962.....	20.4	4.3	0.04	1.3	0.6	0.9	0.7	8	0.6	0.6	0.0	1.2	14	6	0	19	6.9	5
May 8, 1963.....	1400	3.5	.00	1.9	.6	1.6	.6	13	1.2	1.0	.0	.6	17	8	0	21	6.9	20

## 3-5485. HIWASSEE RIVER ABOVE MURPHY, N. C.

Oct. 8, 1962.....	187	6.9	0.01	2.3	1.3	1.7	0.9	14	2.6	0.6	0.0	0.2	25	11	0	25	6.8	0
May 10, 1963.....	566	5.2	.00	1.6	1.0	1.0	.7	14	1.0	1.0	.0	.9	19	8	0	21	7.0	2

## 3-5505. NOTTLEY RIVER NEAR BLAINSVILLE, GA.

Oct. 9, 1962.....	73.8	9.7	0.02	2.9	0.6	2.0	0.8	14	2.8	0.4	0.0	0.4	27	10	0	25	7.2	5
May 10, 1963.....	176	8.1	.00	1.6	.5	1.4	.5	9	.6	1.0	.0	.5	18	6	0	19	7.0	3

## 3-5535. NOTTLEY RIVER, AT NOTTLEY DAM, NEAR IVYLOG, GA.

Oct. 9, 1962.....	1630	7.4	0.23	1.8	0.8	1.6	1.0	10	0.8	1.7	0.0	1.2	22	8	0	26	6.1	15
May 10, 1963.....	1390	3.3	.01	2.2	.8	1.4	.8	13	.8	1.0	.0	.0	17	8	0	22	7.4	40



## 3-700. GREAT RIVER AT ROWLESBURG, W. VA.

May 10, 1963 <sup>a</sup>	330	1.3	0.1	0.14	0.00	7.3	0.6	1.4	0.5	15	12	1.6	0.2	0.0	0.18	36	20	8	62	7.1	4	0.0
July 11, .....		4.8		.03	10	2.2	2.0	2.0	.6	7	30	3.0	.0	.4		63	34	28	91	6.2	3	

## 3-702.75. MUDDY CREEK NEAR RUTHELLE, W. VA.

May 10, 1963.	20			0.04			0.4			0	91	6.0	0.0	0.40		337	62	62	222	4.0		0.0
July 11, .....	6.1	9.4		4.5	2.4		1.0			0	224	6.5	.1				134	134	549	3.4		

## 3-705. BIG SANDY CREEK AT ROCKVILLE, W. VA.

May 10, 1963 <sup>a</sup>	39	3.6	0.0	0.17	0.00	6.0	1.4	0.9	0.7	8	16	1.0	0.2	0.1	0.06	38	21	14	58	6.4	4	0.0
July 11, .....		4.7		.00	12	3.7	1.4	1.0	1.0	6	39	2.5	.1	.5		70	45	40	118	6.8	2	

## HOCKING RIVER BASIN

## 3-1575. HOCKING RIVER AT LANCASTER, OHIO

Sept. 21, 1962	12		3.8	0.39	191	64	149	3.7	330	80	490	0.3	3.3		1340	740	469	2130	7.5	12	
Feb. 5, 1963.	8.4		.73	1.2	536	153	357	7.0	208	80	1780	.2			3580	1970	1800	5620	7.6	37	

## GREAT MIAMI RIVER BASIN

## 3-2710. WOLF CREEK AT DAYTON, OHIO

Oct. 6, 1962.									246	66	48	0.2	0.90		308	285	83	697	7.4		
Nov. 19, .....									267	73	66	2.3	1.2		448	314	94	772	7.6		

## WOLF CREEK AT DAYTON, OHIO (AT OLIVE ROAD BRIDGE)

Oct. 12, 1962									264	70	40	7.0	6.8		417	300	83	727	7.1		
Nov. 19, .....									293	74	46	18	3.5		460	336	96	761	7.6		

<sup>a</sup> Includes 0.0 ppm ammonia nitrogen (NH<sub>3</sub>) and 0.00 ppm nitrite (NO<sub>2</sub>).

## MISCELLANEOUS ANALYSES OF STREAMS IN OHIO RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Carbonyl Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (PO <sub>4</sub> )	Hardness as CaCO <sub>3</sub>	Total Conductance (microhm-cm at 25°C)	pH	Organics

## GREAT MIAMI RIVER BASIN--Continued

## 3-2718. TWIN CREEK NEAR INGRAM, OHIO

Nov. 1, 1962 <sup>a</sup>											298	6	50	14			5.5	312	58	601 8.3
Nov. 15, .....											310	58	16				6.6	324	70	636 8.1

## 3-2745. GREAT MIAMI RIVER AT VENICE (ROSS P.O.), OHIO

July 31, 1963 <sup>b</sup>				0.27	0.14						252	134	42		4.9	0.20	487	328	121	761 8.0
Aug. 7, .....				.43	.28						238	155	47		1.8	.29	517	337	142	801 7.9
Aug. 14, .....				.34	.25						224	134	42		3.6	.23	456	306	122	727 7.6
Aug. 28, .....				.44	.26						244	102	44		2.0	.53	452	342	97	736 7.6
Sept. 5, .....				.48	.23						302	106	48		1.1	.53	498	340	92	803 7.7

## GREEN RIVER BASIN

## 3-3091. WET PRONG BUFFALO CREEK NEAR MAMMOTH CAVE, KY.

June 12, 1962	2.0			0.09							33	3.2	5.0	0.1	1.2			29	2	68 7.6
July 26, .....	1.5			.13							36	3.4	6.4	.1	1.2			34	4	72 7.8
Dec. 7, .....	1.4			.01							38	7.8	2.0	.1	.9			33	2	77 7.4

## DOG CREEK NEAR CUB RUN, KY. (0.1 MILE BELOW PINE BRANCH)

Nov. 1, 1961.	4.8			0.29							71	9.6	2.0	0.1	0.2			66	8	140 6.9
June 13, 1962	4.2			.35							62	6.8	3.0	.1	.9			61	10	123 7.8
July 26, .....	3.1			.53							62	5.8	2.0	.1	.8			62	10	124 7.8
Sept. 28, .....	2.6			.11							66	8.6	2.0	.1	.6			60	6	127 8.1
Dec. 7, .....	3.4			.08							63	10	2.0	.0	.6			58	6	124 7.8

a Includes 16.4 ppm dissolved oxygen (141 percent saturation).

b Includes 8.5 ppm dissolved oxygen (120 percent saturation), 0.4 ppm ammonia nitrogen as NH<sub>3</sub>, 0.35 ppm nitrite (NO<sub>2</sub>), 20 ppm turbidity, and threshold odor - M-2.c Includes 6.2 ppm dissolved oxygen (76 percent saturation), 1.6 ppm ammonia nitrogen as NH<sub>3</sub>, 0.50 ppm nitrite (NO<sub>2</sub>), 15 ppm turbidity, and threshold odor - M-8.d Includes 5.3 ppm dissolved oxygen (90 percent saturation), 3.6 ppm ammonia nitrogen as NH<sub>3</sub>, 0.60 ppm nitrite (NO<sub>2</sub>), 15 ppm turbidity, and threshold odor - E-2.e Includes 5.2 ppm dissolved oxygen (62 percent saturation), 2.2 ppm ammonia nitrogen as NH<sub>3</sub>, 0.70 ppm nitrite (NO<sub>2</sub>), 7 ppm turbidity, and threshold odor - M-8.



## MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN OHIO RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge, water year October 1962 to September 1963

Date	Time (24 hr)	Water tem- per- ature ("F)	Discharge (cfs)	Suspended sediment	
				Mean concen- tration (ppm)	Dis-charge (tons per day)

## UPPER TWIN CREEK BASIN

3-2372.8. UPPER TWIN CREEK AT McGAW, OHIO

Sept. 17, 1963.....	1130		0.6	18	T
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## GREAT MIAMI RIVER BASIN

3-2630. GREAT MIAMI RIVER AT TAYLORSVILLE, OHIO

Apr. 6, 1960.....	0930		1350	40	146
Nov. 1, 1961.....	1230		335	20	18
Nov. 9.....	1130		343	5	5
Nov. 15.....	1545		314	19	16
Nov. 30.....	1515		318	6	5
Feb. 14, 1962.....	1630		464	15	19
Feb. 26.....	1230		4410	1270	15100
Feb. 28.....	0940		9020	170	4140
Apr. 18.....	1230		424	10	11
June 13.....	1430		330	42	37
July 18.....	1645		130	32	11
July 25.....	0845		195	52	27
Aug. 1.....	0820		116	44	14
Aug. 8.....	0845		116	33	10
Sept. 19.....	1615		83	27	6
Sept. 22.....	1545		80	28	6
Oct. 10.....	1430		106	32	9
Oct. 31.....	1500		80	11	2
Nov. 7.....	0900		90	2	.5
Apr. 16, 1963.....	1530		—	14	—
May 21.....	1445		260	35	24

## 3-2650. STILLWATER RIVER AT PLEASANT HILL, OHIO

Apr. 5, 1960.....	1330		576	26	40
Jan. 12, 1962.....	1250		290	54	42
Jan. 17.....	1400		1410	186	708
Feb. 26.....	1815		7240	462	9630
Feb. 28.....	1445		2370	112	717

## CUMBERLAND RIVER BASIN

3-4040. CUMBERLAND RIVER AT WILLIAMSBURG, KY.

Mar. 6, 1963.....	1325		19400	1140	59700
Mar. 6.....	1700		20900	1860	105000
Mar. 7.....	0805		24400	1750	115000
Mar. 7.....	1700		24600	1760	117000

T Less than 0.05 ton.

PART 4. ST. LAWRENCE RIVER BASIN  
 TRIBUTARY TO LAKE SUPERIOR  
 4-185. SECOND CREEK NEAR AURORA, MINN.

LOCATION.--At bridge at mouth, 0.4 mile downstream from gaging station, 0.5 mile downstream from First Creek, and 2.1 miles east of Aurora, St. Louis County.  
 DRAINAGE AREA.--28.3 square miles upstream from gaging station.  
 RECORDS AVAILABLE.--Chemical analyses: April 1956 to September 1959, July 1960 to September 1963 (discontinued).  
 Water temperatures: April 1956 to September 1959, July 1960 to September 1963 (discontinued).  
 EXTREMES, 1962-63.--Dissolved solids: Maximum, 311 ppm Jan. 21 to Feb. 16; minimum, 189 ppm Apr. 1-17.  
 Hardness: Maximum, 223 ppm Jan. 21 to Feb. 16; minimum, 98 ppm Mar. 17-31.

Specific conductance: Maximum daily, 564 micromhos Aug. 25; minimum daily, 231 micromhos Apr. 3.  
 Water temperatures: Maximum, 79°F July 6; minimum, freezing point on several days during November to December, February to April.  
 EXAMPLS, 1956-59, 1963.--Dissolved solids: Maximum (1961-63), 311 ppm Jan. 21 to Feb. 16; minimum (1959, 1960-63), 104 ppm June 5-8, 1958.  
 Hardness: Maximum (1961-63), 223 ppm Jan. 21 to Feb. 16; minimum (1959, 1960-63), 110 micromhos June 7, 8, 1958.

Specific conductance: Maximum daily (1961-63), 564 micromhos Aug. 25; minimum daily (1957-59, 1960-63), 110 micromhos June 7, 8, 1958.  
 Water temperatures: Maximum, 82°F July 27, 28, 1959; minimum, freezing point on many days during winter months.  
 REMARKS.--Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Carbonate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as CaCO <sub>3</sub>		Sodium carbonate ratio	Specific conductance (micro-mhos at 25°C)	Color or pH
															Parts per million	Tons per acre-foot	Tons per day	Calcium	Magnesium			
Oct. 1-31, 1962.	8.6 14		0.58 34	20		A 20	--	142	0	67	17	--	1.5	--	265	0.36	6.15	167	51	--	411 6.8	23
Nov. 1-31, 1962.	6.16		.62 37	21		A 21	--	150	0	71	18	--	3.3	--	275	.37	4.97	160	57	--	437 7.0	23
Nov. 29-Dec. 1, 1962.	5.9 16		.70 35	20		A 17	4.0	143	0	62	16	0.3	2.3	0.03	261	.35	4.16	171	54	0.6	409 7.5	23
Dec. 1-24, 1962.	4.6 16		.64 32	19		17	2.5	132	0	62	14	.3	4.1	.09	246	.33	3.06	159	51	.6	388 7.2	23
Dec. 25-Jan. 20, 1963.																						
Jan. 1963.	3.5 21		1.3 42	22		17	3.5	186	0	55	17	.2	2.1	--	286	.39	2.70	197	44	.5	446 7.9	13
Jan. 21-Feb. 16, 1963.	1.7 24		.61 49	24		18	3.9	210	0	57	19	.2	3.3	--	311	.42	1.43	223	51	.5	486 7.7	12
Feb. 17-Mar. 16, 1963.	2.4 21		1.2 40	21		15	3.6	169	0	55	13	.4	5.1	.09	267	.36	1.73	187	48	.5	428 7.6	15
Mar. 17-Apr. 16, 1963.	27.9 8.1		.89 20	12		16	6.5	52	0	61	14	1.1	1.6	.05	192	.26	14.5	98	55	.7	302 7.0	37
Apr. 17-May 16, 1963.	17.1 11		.53 20	14		A 18	5.5	82	0	64	13	.7	2.3	.03	189	.25	10.6	106	38	.6	312 6.5	30
Apr. 18-May 17, 1963.						17	5.2	82	0	74	16				252	.32	10.6	134	67	.7	367 7.2	20
Apr. 19-30, 1963.	16.5 10		.52 24	17		A 17	--	78	0	71	14				216	.29	9.62	128	64	.7	346 6.8	25
May 1-31, 1963.	21.1	--	.35 24	13		A 14	--	73	0	60	13				190	.26	11.2	115	55	.6	298 6.8	29
June 1-26, 1963.	20.0 9.7		.36 27	12		17	4.2	90	0	57	14	.3	6.2	.06	207	.28	10.8	116	42	.7	315 7.0	46
June 27-Sept. 1, 1963.	20	11	.40 25	13		A 14	4.2	102	0	48	11	.4	4.8	--	209	.28	11.3	117	33	.6	302 7.3	38
July 1-31, 1963.	14.2	--	.41 31	18		A 29	--	139	0	66	18				284	.39	10.9	152	38	1.0	419 7.7	--

A Calculated Na plus K, reported as Na.



## STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued

4-155. SECOND CREEK NEAR AURORA, MINN.--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963.--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180° C)			Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25° C)	Color				
													Parts per million	Tons per acre-foot	Tons per day	Calcium, magnesium	Non-boron						
Aug. 1-31, 1963.	15.1	15	0.36	32	20	31	8.2	145	0	82	17	0.6	9.2	0.06	307	0.42	12.5	161	42	1.1	470	7.3	55
Sept. 1-30.....	10.3	16	.80	34	21	30	7.0	146	0	87	17	.6	3.3	.06	310	.42	8.62	173	53	1.0	477	7.2	45
Weighted average.....	--	12	0.57	28	16	20	--	102	--	66	15	--	8.6	--	235	0.32	8	135	51	0.8	366	6.9	35
Time-weighted average.....	12.9	16	0.65	33	18	21	--	133	--	66	16	--	5.9	--	259	--	--	158	50	0.7	404	7.1	29
Tons per day..	--	0.4	0.02	1.0	0.6	0.7	--	4	--	2.3	0.5	--	0.3	--	--	--	--	--	--	--	--	--	--

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

Month	Day																															Aver-	age
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
October....	56	53	58	53	58	56	54	56	55	55	54	52	52	54	59	48	47	46	45	46	43	40	36	34	34	38	37	38	36	36	48		
November...	36	37	34	33	32	33	34	34	35	36	34	35	36	34	36	35	34	33	33	33	32	33	32	33	34	34	35	34	34	35	--	34	
December...	40	39	38	32	32	33	33	33	33	32	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
January....	--	--	--	33	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
February....	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
March.....	--	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	34	--	--	
April.....	35	32	34	35	40	38	36	35	43	41	--	--	46	52	49	44	47	43	44	41	42	44	47	48	50	54	52	46	39	--	42		
May.....	55	50	53	54	48	58	58	61	57	55	57	49	47	46	56	55	53	48	47	46	48	52	59	60	59	59	52	55	63	58	54		
June.....	66	66	70	73	68	66	63	67	64	56	53	53	59	66	64	62	65	68	63	61	60	67	67	76	76	75	72	77	77	76	--	67	
July.....	78	68	68	73	76	79	74	73	78	72	71	72	68	66	68	69	70	69	74	74	77	75	73	74	76	74	70	68	68	67	72		
August.....	69	70	72	76	78	73	72	73	72	73	72	73	76	65	68	67	61	60	61	68	66	66	66	66	66	66	66	66	66	61	59	67	
September...	66	64	65	64	67	65	61	65	67	68	68	60	56	58	58	61	62	63	61	60	56	55	53	55	59	57	57	55	54	--	61		

## STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued

## 4-160. PARTRIDGE RIVER NEAR AURORA, MINN.

LOCATION.---At gaging station at highway bridge, 1,000 feet downstream from Second Creek, 2.5 miles east of Aurora, St. Louis County, and 2.8 miles upstream from

## DRAINAGE AREA--156 square miles.

RECORDS AVAILABLE.---Chemical analyses: April 1956 to September 1959, July 1960 to September 1963.

Water temperatures: April 1956 to September 1963 (discontinued).

EXTREMES, 1962-63.---Dissolved solids: Maximum, 192 ppm Feb. 11 to Mar. 6; minimum, 100 ppm June 1-26, 28-30.

Hardness: Maximum, 131 ppm Feb. 11 to Mar. 6; minimum, 45 ppm June 1-26, 28-30.

Specific conductance: Maximum daily, 307 micromhos Aug. 17; minimum daily, 99 micromhos June 22.

Water temperatures: Maximum, 82° July 6, 10; minimum, 42° July 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 1963.

EXTREMES, 1959-60.---Dissolved solids: Maximum, 192 ppm Feb. 11 to Mar. 6; minimum, 100 ppm June 1-26, 28-30.

Hardness: Maximum, 131 ppm Feb. 11 to Mar. 6; minimum, 45 ppm June 1-26, 28-30.

Specific conductance: Maximum daily, 307 micromhos Aug. 17; minimum daily, 99 micromhos June 22.

Water temperatures: Maximum, 82° July 6, 10; minimum, 42° July 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 1963.

REMARKS.---Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Carbonate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as CaCO <sub>3</sub>		Sodium adsorption ratio	Specific conductance (micro-mhos at 25°C)	Color or pH	
															Parts per million	Tons per acre-foot	Tons per day	Calcium-Magnesium sum	Non-bicarbonate				
Oct. 1-31, 1962.	30.8	11	1.4	18	8.0	49.3	--	69	0	29	6.4	--	2.9	--	156	0.21	13.0	78	21	--	188	6.9	140
Nov. 1-28, 30...	26.4	12	1.4	17	8.9	41.0	--	68	0	31	7.4	--	3.1	--	152	0.21	10.8	79	23	--	188	6.6	140
Nov. 29...	28	13	1.2	15	7.9	6.5	1.6	65	0	21	3.4	0.2	1.3	0.02	136	0.18	10.3	70	17	0.3	169	6.7	140
Dec. 1-24, 1962.	23.4	11	1.2	15	8.7	7.5	2.1	63	0	28	5.8	2	3.6	1.10	146	0.20	9.22	73	21	4	177	6.7	140
Dec. 25-Jan. 17, 1963.	15.1	14	1.3	22	11	8.8	2.0	95	0	27	5.8	3	1.5	--	175	0.24	7.13	100	22	4	231	7.5	70
Jan. 18-Feb. 10.	4.6	16	1.4	20	9.8	7.2	1.9	90	0	22	3.0	3	2.3	--	157	0.21	1.95	90	16	3	202	7.5	80
Feb. 11-Mar. 6.	3.8	19	1.4	20	15	9.5	2.8	125	0	35	7.8	3	2.1	0.06	192	0.26	1.97	131	29	4	292	7.8	38
Mar. 7-31...	25.4	7.7	1.2	18	7.9	5.6	3.4	65	0	48	13	1.1	1.4	0.04	141	0.23	10.6	76	17	0.3	208	6.7	35
Apr. 1-17...	59.4	14	1.3	23	8.4	8.1	3.1	42	0	40	8.3	1.2	1.2	0.06	128	0.19	18.3	67	33	4	208	6.7	50
Apr. 18...	53	7.3	1.3	23	8.4	8.1	3.1	42	0	36	6.7	2	1.2	0.06	128	0.17	18.3	67	33	4	189	6.8	50
Apr. 19-30...	60.7	6.6	1.2	23	7.6	A6.9	--	36	0	31	6.1	--	7.0	--	115	0.16	18.8	61	31	4	165	6.3	70
May 1-31...	127	--	--	33	11	5.0	A6.9	--	30	0	4.6	--	3.3	--	101	0.14	34.6	48	23	4	126	6.6	75
June 1-26, 28-30	136	5.6	1.2	42	10	4.9	5.7	1.6	33	0	3.9	2	3.0	0.06	100	0.14	36.7	45	18	4	115	6.4	95
June 27...	85	6.5	1.3	11	6.2	5.8	1.1	44	0	24	3.7	3	2.0	0.01	119	0.16	27.3	53	17	3	131	7.3	90
July 1-31...	48.3	8.2	1.4	16	8.0	12	2.7	67	0	28	6.6	3	3.7	0.07	145	0.20	18.9	73	18	6	200	6.8	--

A Calculated Na plus K, reported as Na.

## STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued

## 4-160. PARTRIDGE RIVER NEAR AURORA, MINN.--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Carbonate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Boron (B)	Dissolved solids (residue at 180°C)			Hardness as CaCO <sub>3</sub>		Sodium carbonate ratio	Specific conductance (microhmhos at 25°C)	pH	Color	
															Parts per million	Tons per acre-foot	Tons per day	Calcium magnesium	Non-carbonate					
Aug. 1-31, 1963.	42.2	9.7	1.3	17	10	15	3.4	77	0	38	7.3	.3	4.0	.07	165	.22	18.8	85	22	.7	235	6.9	--	--
Sept. 1-30.....	23.2	11	.68	20	11	17	3.7	85	0	46	9.2	.4	2.3	.08	180	.24	11.3	97	27	.8	263	7.0	--	--
Weighted average.....	--	8.3	0.75	14	7.2	9.1	--	49	--	30	6.0	--	4.6	--	129	0.18	17	64	24	0.5	170	6.6	--	--
Time-weighted average.....	47.6	11	1.0	17	9.0	10	--	67	--	32	6.8	--	4.3	--	150	--	--	80	24	0.5	203	6.7	--	--
Tons per day..	--	1.1	0.10	1.8	0.9	1.2	--	6	--	3.9	0.8	--	0.6	--	--	--	--	--	--	--	--	--	--	--

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

Month	Day																															Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October....	62	56	60	58	61	59	56	59	59	57	55	55	56	62	52	50	50	48	48	45	42	38	36	37	42	42	41	38	38	51		
November...	39	38	38	36	35	34	36	37	38	36	39	39	37	39	38	36	34	36	34	33	33	33	36	37	37	38	37	37	39	--	37	
December...	43	41	42	39	32	34	34	32	32	32	32	32	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
January.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
February.....	--	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
March.....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
April.....	38	34	35	38	42	44	42	42	46	44	--	--	48	55	52	45	50	45	47	44	45	47	52	52	52	57	58	48	44	--	46	
May.....	57	53	58	58	54	62	60	64	62	60	60	56	52	51	52	60	59	58	53	50	49	52	56	62	63	62	56	59	65	62	58	
June.....	68	68	72	74	71	70	68	70	68	61	59	62	64	69	67	65	70	71	67	67	66	70	70	78	77	78	76	81	80	79	--	70
July.....	80	71	74	75	78	82	76	78	82	73	72	75	70	71	70	71	70	75	73	76	76	71	78	77	76	78	76	73	72	70	69	75
August.....	72	72	74	78	79	74	76	75	74	69	68	70	67	70	72	61	63	63	63	71	70	68	73	69	69	65	65	68	64	62	69	68
September...	68	67	68	69	69	67	62	67	70	71	69	61	57	60	60	63	64	64	63	61	54	57	54	56	62	58	58	58	56	59	--	62

## STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued

4-165. ST. LOUIS RIVER NEAR AURORA, MINN.

LOCATION --At gaging station at highway bridge, 0.8 mile downstream from Partridge River and 1.5 miles south of Aurora, St. Louis County.

DRAINAGE AREA.--312 square miles.

RECORDS AVAILABLE.--Chemical analyses: April 1956 to September 1959, July 1960 to September 1963.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> ) num	Alu- min (Al)	Iron (Fe)	Mang- nese (Mn)	Cal- cium (Ca)	Mag- ne- sium (Mg)	Sodium (Na)	Po- tas- sium (K)	Bi- car- bonate (HCO <sub>3</sub> ) (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Boron (B)	Disolved solids (residue at 180° C)	Hardness as CaCO <sub>3</sub> Cal- mag- nesium	Sodium ad- orp- tion ratio	Specific conduct- ance (micro- mhos at 25° C)	pH	Col- or	
Oct. 27, 1962	73.3	11		1.2	--	12	6.6	4.2	1.3	54	0	15	1.6	0.3	1.5	0.04	116	57	13	126	7.0	120
Nov. 29, 1962	63.3	--	--	1.1	--	14	6.1	A 3.9	--	57	0	18	2.2	--	--	--	121	60	13	138	7.2	110
Jan. 4, 1963	36.0	--	--	--	--	--	--	A 4.2	--	72	0	16	2.5	--	--	--	134	70	11	156	7.7	--
Feb. 1, 1963	28.2	19	--	.87	0.00	23	8.2	5.7	1.8	100	0	15	3.3	.2	1.4	.04	145	91	9	199	7.6	50
Mar. 1, 1963	15.4	--	--	1.0	--	--	--	A 3.2	--	104	0	20	3.5	--	--	--	167	104	19	219	7.6	50
Mar. 29, 1963	151	--	--	--	--	13	6.2	A 6.8	--	44	0	26	6.9	--	--	--	121	58	22	165	7.2	--
Apr. 18, 1963	223	5.5	--	.45	.00	8.2	4.3	A 3.4	1.3	27	0	18	2.1	.2	3.3	.76	81	38	16	98	6.6	90
Apr. 26, 1963	205	--	--	.45	--	--	--	A 3.7	--	26	0	16	2.9	--	--	--	87	34	13	87	6.8	--
June 4, 1963	354	--	--	--	--	--	--	A 2.9	--	27	0	14	1.8	--	--	--	86	33	11	73	6.9	90
June 27, 1963	214	5.1	--	.42	--	8.2	4.3	A 2.8	.8	35	0	14	1.8	.2	1.1	.02	94	38	9	80	7.1	95
Aug. 4, 1963	81.5	8.3	--	.73	--	12	7.3	6.2	1.9	63	0	17	3.8	.3	1.0	.08	117	60	8	142	6.9	--
Sept. 5, 1963	85.9	7.1	--	.65	--	7.6	4.6	2.2	.7	40	0	7.8	1.3	.2	.4	.07	79	38	5	79	7.2	65

A Calculated Na plus K, reported as Na.

## STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued

## 4-170. EMBARRASS RIVER AT EMBARRASS, MINN.

LOCATION.--At gaging station at highway bridge at Embarrass, St. Louis County, 70 feet upstream from railroad bridge.

SOURCE OF DATA.--Source of water samples: April 1956 to September 1959, July 1960 to September 1963 (discontinued).  
RECORDS AVAILABLE.--Continued.

Water temperatures: April 1956 to September 1957.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Discharge (cfs)	Alumina (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>	Sodium adsorption ratio	Specific conductance (micro-mhos at 25°C)	pH	Color		
Nov. 28, 1962	12.0	--	1.4		15	4.5	A 3.5	--	57	0	13	2.4	--	--	111	56	9	--	132	7.5	70	
Jan. 4, 1963	3.7	19	1.5		18	5.6	A 3.7	1.1	76	0	9.0	1.8	0.2	1.0	0.03	68	6	0.2	146	7.6	--	
Feb. 28, 1963	1.4	--	1.8		27	7.2	A 4.0	1.8	105	0	9.2	.4	--	--	149	89	3	1.1	187	7.1	--	
Mar. 29, 1963	75.5	6.1	.68		6.9	2.1	1.2	4.0	22	0	9.8	1.6	.0	3.9	.05	63	8	1.1	208	7.4	30	
Apr. 17, 1963	79.7	--	.51	0.00		--	A 2.4	--	20	0	14	1.6	--	--	71	28	12	--	71	6.4	--	
Apr. 24, 1963	47.1	--	.58		--	--	A 2.6	--	22	0	12	2.2	--	--	82	28	10	.2	68	6.9	60	
June 4, 1963	85.7	--	--		--	--	A 2.6	--	26	0	11	2.1	--	--	88	30	9	.2	63	7.1	100	
June 27, 1963	48.3	7.9	.92		9.2	3.7	2.5	.4	34	0	11	1.8	.3	1.4	.04	103	38	10	.2	72	6.9	150
Aug. 3, 1963	14.4	12	2.1		14	2.7	1.1	.7	49	0	8.5	2.6	.3	.6	.03	109	46	8	.2	92	6.9	--
Sept. 4, 1963	12.5	13	1.9		12	3.4	2.7	.7	44	0	8.0	3.1	.3	.7	.02	106	44	.2	90	6.9	150	

A Calculated Na plus K, reported as Na.

STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued  
4-240. ST. LOUIS RIVER AT SCANLON, MINN.

LOCATION.--At gaging station at bridge on U.S. Highway 61 at Scanlon, Carlton County, 0.6 mile downstream from Minnesota Power and Light Co. powerplant, 3 miles upstream from Thomson Reservoir, and 3.2 miles upstream from Midway River.  
DRAINAGE AREA.--3,430 square miles, approximately.  
RECORDS AVAILABLE.--Chemical analyses: July 1958 to September 1959, July 1960 to September 1963.

Chemical analyses, in parts per million, water year October 1962 to September 1963

CHEMICAL ANALYSES, IN PARTS PER MILLION, WATER YEAR OCTOBER 1962 TO SEPTEMBER 1963																							
Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> ) (mg/l)	Aluminum (Al) (mg/l)	Iron (Fe) (mg/l)	Manganese (Mn) (mg/l)	Calcium (Ca) (mg/l)	Magnesium (Mg) (mg/l)	Sodium (Na) (mg/l)	Potassium (K) (mg/l)	Bicarbonate (HCO <sub>3</sub> ) (mg/l)	Sulfate (SO <sub>4</sub> ) (mg/l)	Chloride (Cl) (mg/l)	Fluoride (F) (mg/l)	Nitrate (NO <sub>3</sub> ) (mg/l)	Boron (B) (mg/l)	Dissolved solids (residue at 180°C) (mg/l)	Hardness as CaCO <sub>3</sub>		Sodium adsorption (micro-mhos at 25°C)	pH	Color		
																		Cal-	Non-				
																		cium,	carbon-				
																		ate	bon-				
																		medium	at 180°C)				
Oct., 24, 1962	1040	7.1		0.56	--	25	6.2	6.6	1.1	69	0	23	0.3	0.7	0.02	172	88	31	0.3	202	6.7	90	
Nov. 26, 1962	785	7.4		.00	--	26	6.4	8.0	1.5	72	0	25	.3	1.3	.05	177	91	32	.4	214	7.2	110	
Jan. 2, 1963	773	--		--	--	--	--	8.6	1.0	68	0	31	16	--	--	196	96	40	.4	226	7.3	--	
Jan. 28, 1963	674	10		.67	0.01	37	5.2	10	1.5	82	0	31	.21	.4	1.6	.09	240	114	47	.4	270	7.0	--
Feb. 25, 1963	731	--		.68	--	--	--	A6.2	--	97	0	33	18	--	--	232	126	46	.2	279	7.6	100	
Mar. 25, 1963	1100	--		--	--	33	6.7	A12	--	90	0	29	23	--	--	210	110	36	.5	277	7.1	--	
Apr. 17, 1963	2150	6.8		.41	.03	18	4.6	A5.8	3.1	54	0	21	7.9	.3	1.0	.16	141	64	20	.3	153	6.5	110
Apr. 22, 1963	1850	--		.60	--	--	--	A4.9	--	64	0	26	9.2	--	--	160	80	28	.3	183	6.9	--	
June 7, 1963	2200	--		--	--	--	--	A4.4	--	59	0	20	8.1	--	--	158	71	23	.2	134	6.9	160	
June 28, 1963	1660	7.0		.72	--	22	6.1	6.2	1.0	69	0	22	9.2	.5	1.6	.06	159	8	0	.3	178	7.0	160
July 31, 1963	1160	8.6		1.1	--	30	7.3	9.2	1.9	91	0	23	16	.4	1.2	.02	193	105	30	.4	241	7.2	140
Sept. 5, 1963	753	8.7		1.5	--	32	8.0	11	1.7	90	0	30	18	.4	3.0	.10	215	113	39	.5	272	7.0	150

A Calculated Na plus K, reported as Na.

## 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.

PERIOD OF RECORD.--October 1954 to September 1963.

RECORDS AVAILABLE.--Water temperatures: October 1954 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 82°F June 30, July 1, 23, 26, 27; minimum, freezing point during December to March.

EXTREMES, 1954-63.--Water temperatures: Maximum, 83°F Aug. 2, 1957; minimum, freezing point on many days during winter months.

REMARKS.--Complete ice cover during winter months.

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-accurated thermograph)

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





## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

## 4-579. BLACK RIVER NEAR REPUBLIC, MICH.

LOCATION --At gaging station at bridge on county highway, 2.2 miles downstream from Bruce Creek, and 4.4 miles east of Republic, Marquette County.

DATE OF COLLECTION --April 1, 1962 to September 1963.

RECORDS AVAILABLE --Water temperatures: October 1961 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 81°F July 1; minimum, freezing point during December to March.

Sediment concentrations: Maximum daily, 20 ppm Mar. 31; minimum daily, 1 ppm on many days during October, November, January to March, May, July to September.

Sediment loads: Maximum daily, 4.4 tons Apr. 1; minimum daily, less than 0.05 ton on many days during October to March, July to September.

EXTREMES, 1961-63.--Water temperatures: Maximum, 81°F July 1, 1963; minimum, freezing point on many days during winter months.

Sediment concentrations (1962-63): Maximum daily, 20 ppm Mar. 31, 1963; minimum daily, 1 ppm on many days.

Sediment loads (1962-63): Maximum daily, 4.4 tons Apr. 1, 1963; minimum daily, less than 0.05 ton on many days.

REMARKS --Records for Nov. 6-27, 1962, range 32°F to 35°F. Complete ice cover during winter months. Flow affected by ice Dec. 6-16, 19-31, Jan. 1, 2, 7-10, 13-28, Mar. 8-13, 17-22, 25-31, Apr. 1.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Carboxylate (CO <sub>2</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Total conductivity (micro-mhos at 25°C)	pH	Color or turbidity	Dissolved oxygen		
																	Calcium (Ca)	Non-carbonate (residue at 180°C)						
Nov. 15, 1962	14	13		0.84	0.05	9.5	3.5	4.2	1.4	26	19	3.0	0.2	8.9	93	38	16	101	6.7	120	11.4	84	2	
Jan. 15, 1963	9.2	--	--	--	--	--	--	--	--	36	20	4.0	--	8.1	112	52	22	134	6.9	80	--	--	8	
Apr. 5, 1963	105	--	--	--	--	--	--	--	--	32	10	3.0	--	--	--	15	--	44	--	90	--	--	1	
Apr. 9, 1963	54	31		.64	.15	--	--	--	--	60	24	8.0	--	34	--	22	0	81	6.8	90	--	--	1	
Sept. 24, 1963	3.4	5.7		--	--	--	--	11	4.9	--	--	--	--	--	--	--	87	38	249	7.0	35	10.0	92	1

4-579. BLACK RIVER NEAR REPUBLIC, MICH.--Continued

Month		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Aver- age
October	Maximum	50	50	52	54	54	54	54	54	54	54	54	52	54	56	58	52	49	49	49	46	45	44	42	38	36	36	37	37	39	39	48	
	Minimum	46	46	49	50	52	54	54	54	52	51	52	49	50	54	52	49	48	47	46	44	44	42	38	36	35	35	36	37	38	46	54	
	Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
	Minimum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
December	Maximum	39	37	34	34	34	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Minimum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
	Maximum	32	35	36	37	36	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33		
	Minimum	32	32	35	36	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		
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	
	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		
	Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
	Minimum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
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	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		
	Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
	Minimum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
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	
	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		
	Maximum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
	Minimum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
April	Maximum	32	34	37	37	36	40	40	40	38	38	40	40	43	46	47	50	48	48	45	45	43	43	47	46	46	50	51	51	46	---	43	
	Minimum	32	32	34	33	33	36	37	38	36	34	36	36	39	39	42	46	44	45	45	42	41	42	42	45	46	46	48	46	42	---	40	
	Maximum	48	51	53	55	50	56	55	57	56	50	50	48	54	56	56	54	56	55	52	52	49	50	54	58	60	61	62	64	54	50	54	
	Minimum	42	46	50	50	46	50	51	52	54	47	45	49	50	48	46	46	54	55	50	48	49	49	46	52	55	58	57	59	55	59	50	
June	Maximum	66	68	70	71	72	72	70	70	68	58	56	58	56	58	60	62	64	64	62	58	60	63	66	68	70	74	71	74	75	80	---	67
	Minimum	62	65	66	66	70	70	68	69	67	58	54	53	56	54	56	59	60	60	58	55	58	61	63	65	69	68	67	68	71	---	62	
	Maximum	81	78	70	69	70	71	70	70	68	69	69	70	70	66	66	64	68	70	72	72	73	74	74	73	74	74	74	72	69	66	71	
	Minimum	74	68	62	61	62	65	66	62	60	64	66	66	64	66	64	63	62	64	66	66	66	66	68	70	68	70	71	66	63	64	65	
August	Maximum	70	72	70	70	72	74	72	70	71	67	66	66	62	62	61	59	58	62	65	66	66	66	64	61	59	59	61	62	62	58	65	64
	Minimum	64	68	66	63	64	66	68	66	66	62	61	62	58	48	59	56	54	53	56	60	60	64	61	57	56	58	57	60	58	54	61	
	Maximum	58	58	57	55	58	60	62	62	62	61	54	54	55	59	59	60	62	62	57	56	53	51	52	55	56	56	54	50	52	---	57	
	Minimum	54	57	53	51	54	57	59	53	58	60	54	50	50	50	50	50	56	60	62	67	64	63	61	58	56	56	54	50	48	48	---	

QUALITY OF SURFACE WATERS, 1963  
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued  
4-579. BLACK RIVER NEAR REPUBLIC, MICH.--Continued

Suspended sediment, water year October 1962 to September 1963

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..	13	5	0.2	15	1	T	14	3	0.1
2..	12	2	.1	15	1	T	14	3	.1
3..	12	1	T	13	2	0.1	14	3	.1
4..	15	2	.1	12	2	.1	15	3	.1
5..	16	2	.1	13	2	.1	18	3	.1
6..	14	2	.1	13	2	.1	18	7	.3
7..	13	1	T	16	2	.1	16	7	.3
8..	12	2	.1	17	2	.1	15	7	.3
9..	13	2	.1	16	1	T	14	6	.2
10..	13	2	.1	15	1	T	12	5	.2
11..	13	1	T	14	1	T	11	4	.1
12..	12	2	.1	14	1	T	11	3	.1
13..	9.8	2	.1	13	2	.1	11	3	.1
14..	8.9	2	.1	12	2	.1	10	3	.1
15..	8.9	1	T	14	2	.1	10	3	.1
16..	8.5	2	T	16	2	.1	10	3	.1
17..	7.7	2	T	15	2	.1	10	3	.1
18..	6.9	2	T	15	2	.1	10	3	.1
19..	6.9	2	T	14	2	.1	9.5	3	.1
20..	6.6	3	.1	14	2	.1	9.5	3	.1
21..	6.6	4	.1	13	3	.1	9.5	3	.1
22..	6.6	4	.1	12	3	.1	9.5	3	.1
23..	6.9	3	.1	12	3	.1	9	3	.1
24..	6.9	3	.1	11	3	.1	9	2	T
25..	8.1	2	T	11	3	.1	9	4	.1
26..	8.5	1	T	10	3	.1	9	4	.1
27..	8.9	2	.1	10	3	.1	8.5	4	.1
28..	10	2	.1	11	3	.1	8.5	4	.1
29..	10	2	.1	12	3	.1	8	4	.1
30..	12	2	.1	13	3	.1	8	3	.1
31..	14	1	T	--	--	--	8	3	.1
Total	32 .7	--	2.5	401	--	2.6	348.0	--	3.8
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..	7.5	3	0.1	5	4	T	4.6	1	T
2..	7.5	2	T	5	4	0.1	4.6	1	T
3..	7.3	2	T	5	4	.1	4.6	1	T
4..	7.3	2	T	5	3	.1	4.6	1	T
5..	7.3	1	T	5.5	2	T	4.6	1	T
6..	7.3	1	T	5.5	2	T	4.6	1	T
7..	7.5	4	.1	5.5	2	T	4.6	1	T
8..	7.5	5	.1	5.5	2	T	4.5	1	T
9..	8	5	.1	5.5	3	T	4.5	1	T
10..	8	5	.1	5.5	3	T	4.5	1	T
11..	8.5	5	.1	5.5	3	T	4.5	1	T
12..	8.9	5	.1	5.5	3	T	4.5	1	T
13..	9	5	.1	6.2	1	T	4.5	1	T
14..	9	5	.1	5.5	1	T	4.4	1	T
15..	9	5	.1	5.2	1	T	4.4	1	T
16..	9	4	.1	4.9	1	T	4.4	1	T
17..	8.5	3	.1	4.9	1	T	4.5	1	T
18..	8	3	.1	4.9	1	T	4.5	1	T
19..	7.5	3	.1	4.9	2	T	5	1	T
20..	7	3	.1	4.9	2	T	5	1	T
21..	6.5	3	.1	4.9	2	T	5	1	T
22..	6	3	.1	4.9	2	T	5	1	T
23..	6	3	.1	4.9	2	T	5.5	1	T
24..	5.5	2	T	4.9	2	T	6.6	1	T
25..	5.5	2	T	4.9	2	T	8.5	7	0.2
26..	5	2	T	4.6	2	T	11	10	.3
27..	5	2	T	4.6	1	T	14	4	.2
28..	5	2	T	4.6	1	T	18	4	.2
29..	4.9	2	T	--	--	--	25	8	.5
30..	5	2	T	--	--	--	35	12	1.1
31..	5	3	T	--	--	--	55	20	3.0
Total	219.0	--	2.2	143.7	--	1.0	280.0	--	5.8

T Less than 0.05 ton.

## ST. LAWRENCE RIVER BASIN

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## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

## 4-579. BLACK RIVER NEAR REPUBLIC, MICH.--Continued

## Suspended sediment, water year October 1962 to September 1963--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..	90	18	4.4	50	8	1.1	29	3	0.2
2..	131	11	3.9	45	9	1.1	26	5	.4
3..	144	7	2.7	38	9	.9	28	5	.4
4..	127	4	1.4	34	8	.7	30	5	.4
5..	104	2	.6	30	8	.6	26	5	.4
6..	86	3	.7	28	7	.5	27	5	.4
7..	72	2	.4	26	6	.4	30	5	.4
8..	62	2	.3	38	5	.3	32	5	.4
9..	54	2	.3	45	5	.6	35	7	.7
10..	48	3	.4	40	5	.5	79	10	2.1
11..	43	4	.5	35	5	.5	103	6	1.7
12..	37	5	.5	30	5	.4	86	5	1.2
13..	32	5	.5	31	5	.4	74	6	1.2
14..	30	6	.5	34	5	.4	86	6	1.4
15..	28	4	.3	32	5	.4	69	5	.9
16..	27	5	.4	30	5	.4	61	5	.8
17..	28	5	.4	27	6	.4	50	5	.7
18..	26	5	.4	26	6	.4	41	4	.4
19..	48	6	.8	25	4	.3	57	5	.8
20..	60	5	.8	26	2	.1	84	5	1.1
21..	50	5	.7	29	1	.1	63	5	.8
22..	44	4	.5	28	1	.1	48	4	.5
23..	42	2	.2	27	2	.1	36	4	.4
24..	32	3	.2	26	4	.3	29	4	.3
25..	32	4	.3	84	10	2.3	24	4	.2
26..	28	4	.3	93	7	1.8	22	5	.3
27..	26	3	.2	71	2	.4	20	4	.2
28..	24	4	.2	59	1	.2	17	8	.4
29..	29	4	.3	50	3	.4	15	5	.2
30..	53	8	1.1	40	4	.4	13	2	.1
31..	--	--	--	32	3	.2	--	--	--
Total	1637	--	24.2	1209	--	16.9	1340	--	19.4
	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..	12	2	0.1	1.6	5	T	3.1	3	T
2..	9.8	2	.1	1.6	5	T	4.0	2	T
3..	8.9	2	T	1.6	4	T	5.2	5	0.1
4..	7.7	2	T	1.3	5	T	4.9	5	.1
5..	6.9	5	.1	1.0	3	T	4.0	7	.1
6..	6.2	5	.1	1.0	4	T	4.0	5	.1
7..	6.2	5	.1	2.7	6	T	13	3	.1
8..	7.7	3	.1	2.7	4	T	8.1	5	.1
9..	5.9	2	T	2.3	3	T	5.2	5	.1
10..	4.9	2	T	1.7	3	T	4.2	5	.1
11..	4.6	3	T	1.4	6	T	3.6	4	T
12..	4.2	2	T	2.0	5	T	4.0	3	T
13..	3.8	1	T	3.6	5	T	4.0	2	T
14..	4.0	1	T	4.2	7	0.1	3.6	2	T
15..	3.6	1	T	3.4	4	T	3.1	2	T
16..	3.4	1	T	4.2	2	T	2.9	5	T
17..	4.0	1	T	9.3	4	.1	3.1	2	T
18..	4.6	2	T	5.5	4	.1	3.1	2	T
19..	4.2	2	T	4.0	2	T	3.6	1	T
20..	4.2	2	T	3.4	1	T	4.0	2	T
21..	3.8	2	T	2.9	2	T	3.8	2	T
22..	3.1	4	T	2.7	4	T	4.0	1	T
23..	2.4	6	T	2.9	5	T	3.4	1	T
24..	2.3	5	T	2.7	2	T	3.4	2	T
25..	2.0	6	T	2.9	2	T	3.2	2	T
26..	1.8	3	T	2.9	5	T	2.7	5	T
27..	1.6	2	T	2.7	2	T	2.4	3	T
28..	1.4	3	T	2.9	2	T	2.4	7	T
29..	1.3	3	T	2.9	1	T	2.7	5	T
30..	1.2	2	T	2.7	1	T	2.7	4	T
31..	1.7	3	T	2.9	2	T	--	--	--
Total	139.4	--	1.1	89.6	--	0.9	121.4	--	1.3

Total discharge for year (cfs-days).....6248.8

Total load for year (tons).....81.7

T Less than 0.05 ton.

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued  
4-580. MIDDLE BRANCH ESCANABA RIVER NEAR ISHPENDING, MICH.

LOCATION.--Temperature recorder at gaging station 0.5 mile downstream from County Highway 581, 6 miles southwest of Ishpeming, Marquette County, and  
Drainage Area--128 square miles.  
RECORDS AVAILABLE.--Water temperatures: August 1961 to September 1963.  
EXTREMES, 1962-63.--Water temperatures: Maximum, 78°F July 1, 2; minimum, freezing point during Dec. 7 to Mar. 31.  
EXTREMES, 1961-63.--Water temperatures: Maximum, 78°F July 1, 2, 1963; minimum, freezing point on many days during winter months.  
REMARKS.--Complete ice cover during winter months.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> ) num	Alu- min (Al)	Iron (Fe)	Man- gane- sium (Mn)	Cal- cium (Ca)	Mag- nesium (Mg)	Sodium (Na)	Pot- tas- sium (K)	Lith- ium (Li)	Bil- car- bon- ate (HCO <sub>3</sub> )	Car- bon- ate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluo- ride (F)	Ni- trate (NO <sub>3</sub> )	Phos- phate (PO <sub>4</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		To- Specific conduct- ance (micro- mhos at H <sup>+</sup> 25°C)	Col- or or Tur- bid- ity		
																			Cal- cium, mag- nesium	Non- car- bon- ate				
Nov. 14, 1962	59	9.8		0.82	0.00						34		12	0.5		2.1		78	35	7	82	6.9	140	2
Jan. 15, 1963	33	--		--	--						40		9.2	1.5		.8		71	39	6	77	7.1	135	3
Apr. 6, 1963	724	--		--	--								10	--		--		--	30	--	72	--	90	1
Apr. 9, 1963	346	18		.57	.16						26		--	2.0		--		--	24	2	66	6.8	80	1
July 11, 1963	27	--		--	--						48		--	--		--		--	42	2	93	7.0	60	1

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued  
 4-580. MIDDLE BRANCH ESCANABA RIVER NEAR ISPEMING, MICH.--Continued  
 Temperature (°F) of water, water year October 1962 to September 1963  
 (Continuous ethyl alcohol-actuated thermograph)

Month		Day																															Aver- age
		1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
October	Maximum	--	--	--	--	--	--	--	--	55	53	53	52	--	--	--	50	50	50	50	47	46	46	--	--	--	--	--	--	--	--	--	
	Minimum	--	--	--	--	--	--	--	--	52	51	52	49	--	--	--	50	49	50	47	46	46	43	--	--	--	--	--	--	--	--	--	
	Number	--	--	--	--	--	--	--	--	35	35	34	34	34	34	35	35	35	34	33	33	33	33	33	33	33	33	33	33	33	33	--	
December	Maximum	--	--	--	--	--	--	--	--	35	34	34	34	34	34	35	35	34	33	33	33	33	33	33	33	33	33	33	33	33	--	--	
	Minimum	--	--	--	--	--	--	--	--	35	34	34	34	34	34	35	35	34	33	33	33	33	33	33	33	33	33	33	33	33	--	--	
	Number	--	--	--	--	--	--	--	--	35	34	34	34	34	34	35	35	34	33	33	33	33	33	33	33	33	33	33	33	33	--	--	
January	Maximum	33	34	35	36	35	34	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33	33	
	Minimum	33	33	34	35	34	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	
	Number	33	33	34	35	34	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	
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	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	
	Number	32	32	32	32	32	32	32	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	
	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	
	Number	32	32	32	32	32	32	32	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	34	34	36	35	34	35	37	37	37	36	36	38	38	42	44	44	48	48	47	44	42	40	40	44	44	44	48	48	49	46	--	41
	Minimum	33	34	34	34	33	33	35	37	36	35	35	35	38	38	39	43	43	44	42	40	40	40	40	42	43	44	46	45	42	--	39	
	Number	45	49	52	52	50	54	54	54	54	48	48	47	46	51	53	54	50	50	50	50	48	48	48	50	54	56	58	58	62	52	52	
May	Maximum	41	45	49	50	47	48	50	52	53	48	44	44	47	46	44	50	52	50	46	44	42	43	46	50	52	55	56	54	55	48	54	48
	Minimum	41	45	49	50	47	48	50	52	53	48	44	44	47	46	44	50	52	50	46	44	42	43	46	50	52	55	56	54	55	48	54	
	Number	64	66	68	69	70	69	68	68	66	64	56	54	54	55	56	60	62	62	61	59	58	60	64	67	69	73	73	74	77	--	65	
June	Maximum	58	62	62	63	65	66	66	66	64	56	52	51	54	54	55	58	58	59	57	54	56	58	60	63	67	67	66	67	71	--	60	
	Minimum	58	62	62	63	65	66	66	66	64	56	52	51	54	54	55	58	58	59	57	54	56	58	60	63	67	67	66	67	71	--	60	
	Number	78	78	70	68	68	70	70	69	69	70	70	71	70	67	66	64	69	70	72	72	73	74	73	74	74	74	74	72	70	66	71	
July	Maximum	73	68	62	62	62	65	66	62	61	64	64	66	66	64	64	62	65	66	67	66	66	67	69	68	70	70	66	63	64	65	65	
	Minimum	73	68	62	62	62	65	66	62	61	64	64	66	66	64	64	62	65	66	67	66	66	67	69	68	70	70	66	63	64	65	65	
	Number	70	72	70	69	71	72	72	70	70	68	67	66	62	64	64	62	60	62	65	67	67	67	64	61	59	59	61	62	62	57	65	
August	Maximum	64	57	54	53	55	55	57	55	55	51	61	62	59	58	60	57	55	55	56	59	63	64	56	55	58	56	59	57	53	61	57	61
	Minimum	64	57	54	53	55	55	57	55	55	51	61	62	59	58	60	57	55	55	56	59	63	64	56	55	58	56	59	57	53	61	57	
	Number	58	58	56	55	58	60	60	61	60	60	53	54	55	58	61	64	55	58	61	61	56	55	53	52	53	56	56	53	52	53	--	57
September	Maximum	54	56	54	51	52	56	58	56	57	56	58	53	50	49	50	54	56	58	53	51	47	51	47	51	53	52	53	51	49	49	--	53
	Minimum	54	56	54	51	52	56	58	56	57	56	58	53	50	49	50	54	56	58	53	51	47	51	47	51	53	52	53	51	49	49	--	53
	Number	54	56	54	51	52	56	58	56	57	56	58	53	50	49	50	54	56	58	53	51	47	51	47	51	53	52	53	51	49	49	--	53

## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

## 4-580. MIDDLE BRANCH ESCANABA RIVER NEAR ISHPEMING, MICH.--Continued

Periodic determinations of suspended sediment, water year October 1962 to September 1963

Date	Time (24 hr)	Water tem- per- ature ("F)	Discharge (cfs)	Suspended sediment	
				Mean concen- tration (ppm)	Discharge (tcns per day)
Oct. 9, 1962.....	1420		58	2	0.3
Nov. 5.....	1500		68	2	.4
Nov. 14.....	1705		59	1	.2
Dec. 10.....	1600		67	3	.5
Mar. 13, 1963.....	0945		22	1	.1
Apr. 5.....	1500		724	4	7.8
Apr. 9.....	1505		346	1	.9
May 8.....	1330		137	6	2.2
June 12.....	1000		360	5	4.9
July 8.....	1640		32	4	.3
Aug. 6.....	1700		16	2	.1
Sept. 12.....	1430		22	1	.1

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued  
4-582. SCHWEITZER CREEK NEAR PALMER, MICH.

LOCATION.--Temperature recorder at gaging station 10 feet upstream from highway bridge, and 2.5 miles southwest of Palmer, Marquette County.  
DRAINAGE AREA.--23.6 square miles.  
RECORDS AVAILABLE.--Water temperatures: August 1961 to September 1963.  
EXTREMES, 1962-63.--Water temperatures: Maximum, 66°F June 4-6; minimum, freezing point Dec. 9 to Mar. 31.  
EXTREMES, 1961-63.--Water temperatures: Maximum, 66°F June 4-6; minimum, freezing point Dec. 9 to Mar. 31.  
REMARKS.--Complete ice cover during winter months.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Carbonyl (CO <sub>2</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphate (PO <sub>4</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Total conductivity (micro-mhos at 25°C)	pH	Coliform or per cent mil-lionation	Dissolved oxygen	Turbidity
																		Calcium	Magnesium					
Nov. 14, 1962	11	22	0.21	0.13						76	14	14	3.0	2.4			120	69	7	161	7.6	25		2
Apr. 4, 1963	1.3	18.8	--	--						83	12	--	3.0	1.3			82	--	--	147	7.6	35		20
Apr. 9	2.0	17	1.2	.15						90	7.8	12	3.0				87	82	3	147	7.6	15		2
July 17	2.8	--	1.5	.75						90	--	--	--	--			77	76	2	162	7.1	15		2
Sept. 25	--	8.4	--	--						102	6.0	2.0	--	--			84	84	1	161	7.2	30		4
																				183	6.8	80	5.8	50





## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

## 4-582. SCHWEITZER CREEK NEAR PALMER, MICH.--Continued

Periodic determinations of suspended sediment, water year October 1962 to September 1963

Date	Time (24 hr)	Water tem- per- ature (°F)	Discharge (cfs)	Suspended sediment	
				Mean concen- tration (ppm)	Discharge (tons per day)
Oct. 10, 1962.....	0830		10	3	0.1
Nov. 5.....	1600		37	96	9.5
Nov. 14.....	1125		11	2	.1
Dec. 28.....	1000		7.5	2	T
Jan. 15, 1963.....	1700		1.5	1	T
Feb. 28.....	1030		1.7	5	T
Mar. 12.....	1500		2.5	3	T
Apr. 4.....	1145		--	3	T
Apr. 8.....	1150		7.0	2	T
Apr. 9.....	1235		2.1	6	T
June 11.....	1730		4.7	3	T
July 8.....	1430		13	4	.1
July 17.....	1730		2.8	8	.1
Aug. 8.....	1330		4.2	20	.2
Sept. 12.....	1530		3.4	15	.1

T Less than 0.05 ton.

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued  
4-585. EAST BRANCH ESCANABA RIVER AT GWINN, MICH.

LOCATION.--At gaging station in county park at Gwinn, Marquette County, 1 mile upstream from mouth.  
DRAINAGE AREA.--124 square miles.  
RECORDS AVAILABLE.--Water temperatures: November 1954 to September 1963.

Sediment records: August 1961 to June 1963.

EXTREMES, 1962-63.--Water temperatures: Minimum, freezing point Dec. 7 to Apr. 3.

Sediment concentrations: Maximum daily, 18 ppm Apr. 3, 4; minimum daily, 1 ppm on many days during October to January, April to June.

Sediment loads: Maximum daily, 23 tons Apr. 3, 4; minimum daily, 0.1 ton on many days during October, December to February.

EXTREMES, 1954-55.--Water temperatures: Maximum, 79°F July 4, 1955; minimum, freezing point on many days during winter months.

Sediment concentrations: Maximum daily, 18 ppm Apr. 3, 4; minimum daily, 1 ppm on many days during October to January, April to June.

Sediment loads: Maximum daily, 23 tons Apr. 3, 4; minimum daily, 0.1 ton on many days.

REMARKS.--Complete ice cover during winter months. Flow affected by ice Nov. 23, 24, 26, Dec. 7 to Jan. 27, Feb. 16 to Mar. 23, Mar. 25-31.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Carbocation (Ca)	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Total conductivity (micro-mhos at 25°C)	pH	Coliforms per milliliter	Turbidity		
																	Calcium	Non-carbonate						
Nov. 13, 1962	64	57		0.49	0.05	21	2.0	14	1.1	50	14	22	2.0	0.1	1.0	175	60	0	176	9.0	100	12.4	95	3
Apr. 4, 1963	505	6.0	--	--	--	--	--	--	--	--	0	--	--	--	--	--	31	--	81	--	55	--	--	10
Apr. 5.....	318	6.9	--	--	--	--	--	--	--	--	0	--	--	--	--	--	--	--	100	--	55	--	--	2
Apr. 6.....	196	8.3	--	--	--	--	--	--	--	--	0	--	--	--	--	--	48	--	119	--	45	--	--	2
Apr. 9.....	12	7.2	--	56	.18	--	--	--	--	52	0	24	4.0	--	--	--	63	16	146	7.9	40	--	--	2
Sept. 25.....	22	7.4	--	--	--	--	--	--	--	72	0	13	4.0	--	--	--	68	19	132	7.2	20	9.4	87	1



## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

4-585. EAST BRANCH ESCANABA RIVER AT GWINN, MICH.--Continued

Suspended sediment, October 1962 to June 1963

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..	53	3	0.4	77	2	0.4	57	2	0.3
2..	50	4	.5	78	1	.2	58	2	.3
3..	49	2	.3	75	2	.4	58	2	.3
4..	77	2	.4	72	2	.4	60	3	.5
5..	77	2	.4	71	1	.2	76	8	1.6
6..	70	1	.2	82	2	.4	77	6	1.2
7..	63	2	.3	89	11	2.6	65	2	.4
8..	60	2	.3	89	4	1.0	60	2	.3
9..	59	2	.3	80	1	.2	56	2	.3
10..	55	2	.3	72	1	.2	54	2	.3
11..	52	2	.3	69	2	.4	52	7	1.0
12..	52	1	.1	67	1	.2	50	5	.7
13..	46	2	.2	64	2	.3	49	3	.4
14..	46	1	.1	62	1	.2	48	3	.4
15..	45	1	.1	60	1	.2	47	3	.4
16..	45	1	.1	69	4	.7	47	3	.4
17..	43	1	.1	80	9	1.9	47	3	.4
18..	40	1	.1	74	4	.8	47	3	.4
19..	39	1	.1	70	2	.4	46	2	.2
20..	38	1	.1	67	2	.4	45	2	.2
21..	38	1	.1	67	2	.4	44	2	.2
22..	38	1	.1	66	2	.4	42	1	.1
23..	40	1	.1	60	2	.3	41	1	.1
24..	42	2	.2	57	2	.3	40	1	.1
25..	42	2	.2	56	2	.3	39	1	.1
26..	41	1	.1	55	2	.3	38	1	.1
27..	41	2	.2	55	2	.3	37	1	.1
28..	43	1	.1	54	2	.3	36	2	.2
29..	44	2	.2	54	2	.3	35	2	.2
30..	46	2	.2	55	2	.3	35	1	.1
31..	60	3	.5	--	--	--	34	2	.1
Total	1534	--	6.7	2046	--	14.7	1520	--	11.4
Day	JANUARY			FEBRUARY			MARCH		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	33	3	0.3	26	2	0.1	26	6	0.4
2..	33	3	.3	26	2	.1	26	6	.4
3..	32	2	.2	26	2	.1	26	6	.4
4..	32	2	.2	26	2	.1	26	6	.4
5..	31	2	.2	26	2	.1	25	6	.4
6..	31	2	.2	27	2	.1	25	6	.4
7..	30	1	.1	27	2	.1	25	6	.4
8..	30	1	.1	27	2	.1	25	6	.4
9..	30	1	.1	27	2	.1	24	6	.4
10..	29	1	.1	27	2	.1	24	6	.4
11..	29	1	.1	27	3	.2	24	7	.4
12..	29	2	.2	26	5	.4	24	7	.4
13..	28	2	.2	26	6	.4	24	6	.4
14..	28	2	.2	27	6	.4	24	6	.4
15..	28	2	.2	27	5	.4	24	6	.4
16..	27	2	.1	27	5	.4	24	6	.4
17..	27	2	.1	27	5	.4	24	6	.4
18..	27	2	.1	27	6	.4	24	6	.4
19..	27	2	.1	27	6	.4	25	6	.4
20..	27	2	.1	27	6	.4	25	6	.4
21..	27	2	.1	27	6	.4	25	5	.3
22..	27	2	.1	27	6	.4	26	5	.4
23..	27	2	.1	27	6	.4	27	5	.4
24..	27	2	.1	27	6	.4	28	5	.4
25..	27	2	.1	27	6	.4	29	5	.4
26..	26	2	.1	27	6	.4	31	5	.4
27..	26	2	.1	27	6	.4	34	5	.4
28..	26	2	.1	27	6	.4	38	5	.5
29..	26	2	.1	--	--	--	45	5	.6
30..	26	2	.1	--	--	--	60	5	.8
31..	26	2	.1	--	--	--	90	5	1.2
Total	879	--	4.3	749	--	8.0	927	--	13.8

## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

4-585. EAST BRANCH ESCANABA RIVER AT GWINN, MICH.--Continued

Suspended sediment, October 1962 to June 1963--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..	196	7	3.7	138	3	1.1	60	3	0.5
2..	362	13	13	126	2	.7	60	2	.3
3..	481	18	23	115	2	.6	61	2	.3
4..	479	18	23	105	1	.3	65	2	.4
5..	358	11	11	94	2	.5	60	1	.2
6..	279	7	5.3	87	2	.5	60	1	.2
7..	226	7	4.3	81	1	.2	63	1	.2
8..	194	6	3.1	109	2	.6	60	1	.2
9..	170	3	1.4	142	3	1.2	60	1	.2
10..	143	4	1.5	120	2	.6	84	2	.4
11..	134	3	1.1	106	1	.3	132	4	1.4
12..	121	3	1.0	93	1	.2	119	3	1.0
13..	113	2	.6	91	1	.2	117	3	.9
14..	105	2	.6	98	3	.8	152	8	3.3
15..	100	2	.5	92	3	.7	146	9	3.5
16..	96	4	1.0	85	2	.4	122	6	2.0
17..	95	3	.8	79	3	.6	107	3	.9
18..	90	2	.5	80	3	.6	94	3	.8
19..	124	4	1.3	76	3	.6	116	4	1.2
20..	154	3	1.2	71	3	.6	219	11	6.5
21..	136	3	1.1	73	2	.4	194	8	4.2
22..	116	2	.6	76	2	.4	145	3	1.2
23..	106	1	.3	71	3	.6	115	2	.6
24..	97	1	.3	67	2	.4	95	3	.8
25..	89	1	.2	79	3	.6	82	2	.4
26..	85	1	.2	100	4	1.1	71	1	.2
27..	83	1	.2	84	3	.7	62	3	.5
28..	81	1	.2	74	3	.6	60	2	.3
29..	83	1	.2	69	2	.4	59	1	.2
30..	126	3	1.0	65	2	.4	60	2	.3
31..	--	--	--	60	2	.3	--	--	--
Total	5022	--	102.1	2806	--	17.2	2900	--	33.1

Total discharge for period (cfs-days).....18383

Total load for period (tons).....211.4

## Periodic determinations of suspended sediment, water year October 1962 to September, 1963

Date	Time (24 hr)	Water temperature (°F)	Discharge (cfs)	Suspended sediment	
				Mean concentration (ppm)	Discharge (tons per day)
Aug. 14, 1962.....	1100		43	8	0.9
Aug. 7, 1963.....	0900		22	5	.2
Sept. 12.....	1700		27	2	.1

## 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 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 86°F July 1; minimum, Dec. 10 to Mar. 25, Apr. 3.

EXTREMES, 1962-63.--Water temperatures: Maximum, 86°F July 19, Aug. 2, 1957, July 1, 1963; minimum, freezing point on many days during winter months.

REMARKS.--Complete ice cover during winter months.

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermometer)

Month	Day															Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
October																
Maximum	55	55	55	56	55	56	56	56	57	57	57	57	55	55	58	58
Minimum	54	54	55	55	55	55	56	56	56	55	55	55	51	51	55	55
November																
Maximum	41	41	39	38	36	38	39	38	37	37	37	37	36	36	38	38
Minimum	39	39	38	36	36	36	38	36	35	35	37	36	36	36	38	35
December																
Maximum	33	35	38	38	38	36	33	33	33	33	32	32	32	32	32	32
Minimum	33	33	35	38	36	33	33	33	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
Minimum	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
Minimum	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
Minimum	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
April																
Maximum	33	33	33	33	36	42	42	43	40	41	43	43	45	45	50	50
Minimum	33	33	32	33	33	36	39	39	35	39	39	41	39	43	43	45
May																
Maximum	50	52	56	56	52	57	57	56	57	55	50	50	51	51	54	54
Minimum	43	47	51	51	47	52	54	52	49	46	47	49	51	48	47	52
June																
Maximum	68	69	73	74	74	74	74	74	72	62	63	63	65	66	68	69
Minimum	63	65	68	69	71	71	70	70	71	62	58	57	59	59	62	64
July																
Maximum	86	81	76	76	81	81	78	78	79	79	82	80	76	76	79	79
Minimum	79	74	70	68	71	74	74	71	69	70	73	75	73	72	72	73
August																
Maximum	82	80	79	81	84	83	83	81	79	79	78	72	72	70	68	69
Minimum	73	77	76	74	76	79	78	75	76	71	70	67	64	67	66	62
September																
Maximum	72	71	67	65	67	68	68	69	71	71	69	66	61	60	62	65
Minimum	65	65	64	61	60	62	66	63	66	65	66	60	56	55	56	60

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued  
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.--237 square miles.

RECORDS AVAILABLE.--Water temperatures: July 1986 to September 1963.

REMARKS.--Water temperatures: Maximum, 86°F July 1, 1963; minimum, freezing point on many days during winter months.

EXTREMES, 1962-63.--Water temperatures: Maximum, 86°F July 1, 1963; minimum, freezing point on many days during winter months.

REMARKS.--Complete ice cover during winter months.

Temperature (°F) of water, water year October 1962 to September 1963 (Continuous ethyl alcohol-actuated thermograph)																																Aver- age
Month			Day																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October	Maximum	55	54	53	54	54	55	55	55	57	56	57	58	56	58	60	59	55	53	53	52	50	48	47	43	41	39	40	39	40	41	51
	Minimum	49	49	52	53	54	54	54	54	54	55	52	53	56	55	51	50	49	49	47	46	43	40	37	36	37	38	37	39	39	48	
	N. Minimum	41	40	39	37	38	38	37	36	37	37	37	37	38	38	37	37	36	35	35	34	32	32	32	32	32	32	33	34	--	36	
November	Maximum	39	39	37	36	36	37	36	35	34	35	36	35	35	35	37	37	36	35	34	33	32	32	32	32	32	32	32	32	--	35	
	Minimum	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	32	32	33	
	N. Minimum	33	33	35	37	36	33	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	33	
December	Maximum	35	35	38	38	37	36	33	33	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	33
	Minimum	33	33	35	37	36	33	33	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	33	
	N. 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	
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	
	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	
	N. 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	
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	
	N. 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	
	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	
	N. 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	
April	Maximum	33	34	39	40	40	44	46	43	44	45	48	45	50	52	51	55	54	49	47	47	45	44	47	46	50	55	55	54	50	--	47
	Minimum	32	32	34	36	37	39	41	39	38	40	40	42	40	43	47	47	46	45	43	42	42	41	44	45	47	50	48	44	--	42	
	N. Minimum	52	53	55	54	54	58	55	57	54	49	51	51	50	54	56	57	55	53	51	53	52	60	62	64	65	64	67	67	56	56	
May	Maximum	45	48	51	49	48	50	52	54	53	48	45	47	48	50	48	47	52	54	52	50	51	48	46	50	51	56	59	61	60	59	62
	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	
	N. Minimum	70	72	76	78	75	74	73	72	71	62	63	61	64	64	68	70	69	67	67	69	71	74	76	81	78	81	85	--	72		
June	Maximum	64	66	69	69	71	70	69	69	62	57	55	58	59	60	61	63	64	64	61	60	61	64	66	67	70	72	71	72	74	--	65
	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	
	N. Minimum	86	81	76	75	78	79	76	74	75	77	77	78	77	75	73	75	78	78	81	79	79	81	82	82	83	83	80	76	74	78	
July	Maximum	77	71	67	68	71	71	67	65	68	70	72	71	69	70	69	70	71	72	73	73	72	73	75	74	77	77	74	71	71	71	
	Minimum	78	76	75	78	80	81	80	78	78	73	75	72	68	69	70	67	65	68	74	74	75	70	68	70	68	70	72	70	67	73	
	N. Minimum	69	72	71	69	72	74	72	72	68	68	67	63	62	64	61	58	58	60	64	66	70	70	66	63	62	65	64	66	63	61	
August	Maximum	69	67	65	63	66	67	68	70	71	69	65	60	60	62	64	63	66	62	60	58	55	56	60	61	60	57	54	56	--	63	
	Minimum	63	63	61	58	59	63	64	63	66	64	63	59	53	53	58	61	62	60	58	56	54	52	54	55	56	51	50	49	--	58	
	N. Minimum	63	63	61	58	59	63	64	63	66	64	63	59	53	53	58	61	62	60	58	56	54	52	54	55	56	51	50	49	--	58	







## 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 1963 (discontinued).

EXTREMES, 1962-63.--Water temperatures: Maximum, 69°F June 5, 7-8, June 30 to July 2; minimum, freezing point Mar. 27-29.

EXTREMES, 1952-63.--Water temperatures: Maximum, 73°F July 4, 1955; minimum, freezing point on many days during winter months.

Temperature (°F) of water, water year October 1962 to September 1963 (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	
October	50	50	51	52	54	54	54	55	53	53	56	57	56	53	54	57	54	50	49	49	48	46	45	44	41	39	39	39	39	40	49
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
November	47	48	49	51	52	54	52	53	52	51	51	56	52	51	53	54	50	48	47	48	46	45	44	41	39	37	39	38	38	40	47
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
December	40	40	40	40	40	38	38	38	38	38	38	38	38	38	38	38	37	35	35	35	35	35	34	33	33	33	33	33	33	33	37
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
January	34	34	37	37	37	37	34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
February	33	33	33	33	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
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
March	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
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
April	41	48	50	50	43	44	44	44	43	39	40	43	44	44	45	45	52	48	50	50	49	44	41	42	44	48	52	52	50	---	46
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
May	44	49	54	54	51	50	55	55	54	50	54	54	51	56	56	55	55	55	55	55	52	50	52	53	57	58	56	57	61	54	54
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
June	62	63	65	67	69	68	69	69	68	68	68	68	68	68	60	60	62	62	61	58	60	62	64	65	67	68	68	69	---	64	
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
July	69	69	64	61	62	63	62	59	61	62	62	61	60	60	61	62	66	67	67	65	66	66	66	67	65	65	64	63	64	63	64
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
August	63	63	63	62	61	62	61	62	62	61	59	57	57	57	57	57	56	57	58	60	61	61	60	58	58	58	59	59	58	60	60
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
September	59	58	57	57	56	58	58	59	58	57	54	52	53	55	56	59	59	57	55	53	52	50	54	54	54	54	54	51	49	---	55
	Maximum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Minimum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

## 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 1963 (discontinued).

EXTREMES, 1962-63.—Water temperatures: Maximum, 67°F June 7, 8; minimum, freezing point on many days during December to March.  
EXTREMES, 1963-64.—Water temperatures: Maximum, 69°F July 22, 1963, Aug. 1, 2, 5, 6, 1965; minimum, freezing point on many days during winter months.

REMARKS.--Recorder stopped Jan; 20 to Feb. 8, estimated temperatures of 32°F included for this period.

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

## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

4-1255. PINE RIVER NEAR HOXTYVILLE, MICH.

LOCATION.--Temperature recorder at gaging station, 500 feet upstream from bridge on State Highway 37, 4.2 miles northwest of Hoxtyville, Washtenaw 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 1963 (discontinued).

EXTREMES, 1952-63.--Water temperatures: Maximum, 65°F June 10, 30, July 2, 23, 27; minimum, freezing point Dec. 11-14.

EXTREMES, 1952-63.--Water temperatures: Maximum, 68°F Aug. 1, 1955; minimum, freezing point on several days during January 1955, February 1958, and December 1962.

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

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

## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

## 4-1262. LITTLE MANISTEE RIVER NEAR FREESOL, MICH.

LOCATION.--Temperature recorder at gaging station, 25 feet upstream from Sixmile Bridge, 5.8 miles north of Freesol, Mason County, 7.4 miles from Freesol, and 9.0 miles southeast of Manistee.

DRAINAGE AREA.--200 square miles.

RECORDS AVAILABLE.--Water temperatures: October 1956 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 71°F July 1; minimum, 34°F on many days during December to March.

EXTREMES, 1956-63.--Water temperatures: Maximum, 72°F June 17, 18, 1957; minimum, freezing point Dec. 10-16, 1957.

Temperature (°F) of water, water year October 1962 to September 1963 (Continuous ethyl alcohol-actuated thermometer)																																		
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	50	52	52	54	53	54	53	53	53	54	52	54	57	57	54	51	51	49	48	47	44	44	44	44	44	44	44	44	45	45	50	
	Minimum	48	48	50	51	51	53	52	52	50	50	52	49	50	53	54	50	49	48	49	47	47	44	44	43	41	42	44	42	43	45	48	48	
November	Maximum	45	45	46	46	44	44	44	44	44	43	43	43	43	43	44	43	42	41	41	42	41	40	40	40	40	40	40	40	40	40	40	43	
	Minimum	44	44	45	46	44	43	44	43	43	43	42	42	42	43	42	41	41	41	41	39	39	39	39	39	39	39	40	40	40	40	40	42	
December	Maximum	42	41	43	42	42	41	38	38	37	35	34	34	34	34	34	34	37	39	40	39	35	34	34	35	34	35	35	34	35	35	37	37	
	Minimum	40	39	41	41	41	38	38	37	35	34	34	34	34	34	34	34	34	37	39	34	34	34	34	34	34	34	34	34	34	34	34	36	
January	Maximum	35	35	35	36	37	37	38	39	39	37	35	35	34	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	36	
	Minimum	35	35	35	35	35	36	37	37	38	37	35	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	35	
February	Maximum	35	35	35	35	35	35	35	35	36	35	35	35	35	35	36	36	35	35	35	35	36	35	35	35	35	35	35	35	35	35	35	35	
	Minimum	35	34	34	35	35	34	34	34	34	34	34	34	35	35	35	35	35	35	34	34	34	34	34	34	34	34	34	34	34	34	34	34	
March	Maximum	36	36	36	35	35	35	36	35	36	37	36	39	40	40	40	40	40	40	39	38	37	39	42	43	45	41	40	41	45	47	47	39	
	Minimum	34	34	35	35	34	34	34	35	35	35	38	37	36	39	36	39	36	36	36	36	36	36	36	40	42	39	37	37	40	42	40	36	
April	Maximum	47	53	55	52	47	51	50	49	47	47	49	50	51	49	49	57	55	54	56	55	53	48	51	50	52	56	57	56	53	52	52	52	
	Minimum	47	47	52	47	45	46	46	47	45	43	44	44	45	45	48	49	50	51	51	51	48	46	45	46	48	49	51	53	48	47	47	47	
May	Maximum	52	54	57	57	56	56	54	58	56	54	54	56	56	54	56	52	58	56	58	56	54	55	56	57	57	59	59	57	59	62	57	57	
	Minimum	46	48	53	54	50	52	51	54	56	50	47	51	51	52	49	48	53	52	53	50	47	49	51	52	54	57	53	50	54	51	51	51	
June	Maximum	64	67	69	69	70	70	70	68	65	69	65	68	67	60	61	64	64	63	62	60	61	63	65	66	68	69	68	69	70	70	70	65	
	Minimum	56	60	62	62	63	64	64	64	62	56	54	55	54	57	56	57	59	57	53	53	54	56	58	60	63	64	65	64	64	64	59	59	
July	Maximum	71	70	66	64	64	65	65	64	63	63	64	65	61	61	62	64	66	69	68	67	67	68	68	68	69	67	67	66	64	66	66	66	
	Minimum	64	65	59	56	54	56	61	57	56	55	56	58	59	59	56	57	60	63	61	61	62	62	63	64	61	62	63	64	61	59	61	60	
August	Maximum	65	63	65	66	65	66	65	66	65	65	63	59	61	61	60	60	59	60	61	63	64	62	61	59	61	59	58	61	60	60	62	62	
	Minimum	58	61	59	59	59	61	61	59	61	59	58	59	56	55	57	54	57	58	60	58	55	55	55	55	56	57	56	56	55	57	57	57	
September	Maximum	60	59	57	57	58	58	58	60	60	59	57	57	54	54	56	57	61	59	56	55	53	53	52	56	57	58	56	54	53	51	50	50	
	Minimum	55	56	54	53	53	56	54	53	53	50	49	50	49	50	54	55	57	56	54	55	57	53	54	56	57	53	53	53	53	51	50	50	53

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

(Continuous ethyl alcohol-actuated thermograph)

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued  
4-1270. BOARDMAN RIVER NEAR WAYFIELD, MICH.

LOCATION --Temperature recorder at gaging station, 25 feet downstream from Browns Bridge, 300 feet downstream from East Creek, 1.0 mile northeast of Wayfield, Grand Traverse County, and 9.6 miles southeast of Traverse City.  
DRAINAGE AREA --223 square miles.  
RECORDS AVAILABLE --Water temperatures: June 1961 to September 1963.  
EXTREMES, 1962-63 --Water temperatures: Maximum, 73°F July 2, 1963; minimum, freezing point on many days during January to March.  
EXTREMES, 1961-63 --Water temperatures: Maximum, 73°F July 2, 1963; minimum, freezing point on many days during winter months.

Temperature (°F) of water, water year October 1962 to September 1963 (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	53	54	54	55	55	54	53	54	56	55	55	56	56	55	54	54	53	52	52	50	47	46	44	44	43	43	42	52	
	Minimum	51	52	53	53	53	53	54	52	52	51	52	51	52	53	53	53	54	53	52	52	50	47	46	44	43	43	42	42	50		
	November																															
November	Maximum	42	42	42	42	42	42	42	42	41	41	41	41	41	41	40	40	39	39	39	39	39	38	38	38	37	37	37	37	40		
	Minimum	42	42	42	42	42	42	42	41	41	41	41	41	41	40	40	39	39	39	39	39	38	38	37	37	37	37	37	37	40		
	December																															
December	Maximum	38	39	39	40	40	38	38	37	36	36	36	36	35	35	35	35	36	36	36	36	36	36	36	36	35	35	35	34	37		
	Minimum	37	38	39	39	39	38	37	36	36	35	35	35	35	35	35	35	36	36	36	36	36	36	36	35	35	35	34	34	36		
	January																															
January	Maximum	34	34	34	35	35	35	36	36	36	36	35	35	35	35	35	34	34	33	33	33	33	33	33	33	32	32	32	32	34		
	Minimum	34	34	34	34	34	35	35	36	36	35	35	35	35	35	34	34	33	33	33	33	33	33	33	32	32	32	32	32	34		
	February																															
February	Maximum	32	32	32	32	32	32	33	33	33	34	34	34	34	34	34	34	34	34	34	34	34	34	33	32	32	32	32	32	33		
	Minimum	32	32	32	32	32	32	32	33	33	33	34	34	34	34	34	34	33	33	33	33	33	33	33	32	32	32	32	32	33		
	March																															
March	Maximum	32	32	34	34	34	35	35	35	35	35	36	36	36	36	35	36	37	37	37	37	37	37	37	37	37	37	38	38	38	36	
	Minimum	32	32	34	34	34	35	35	35	35	35	35	36	36	36	35	36	37	37	37	37	37	37	37	37	37	38	38	38	36		
	April																															
April	Maximum	39	38	40	42	42	44	46	46	46	45	46	46	48	47	46	49	51	51	51	52	52	50	48	48	50	52	52	52	52	47	
	Minimum	38	38	38	40	42	42	43	45	45	44	44	43	44	44	45	46	49	50	50	50	50	50	48	48	50	52	52	52	50	46	
	May																															
May	Maximum	51	49	51	53	54	54	52	53	55	55	53	52	52	52	55	54	54	54	54	54	54	55	52	54	55	57	60	58	58	54	
	Minimum	48	48	49	51	52	52	51	52	53	52	52	50	51	51	54	51	54	54	54	54	54	53	52	52	55	57	55	53	54	52	
	June																															
June	Maximum	61	64	66	67	68	68	67	67	68	65	64	62	66	64	65	63	65	65	65	64	64	64	64	64	66	68	71	68	68	66	
	Minimum	58	61	64	66	67	67	67	65	66	62	62	59	59	60	61	61	62	58	63	62	62	63	63	63	66	67	67	67	67	63	
	July																															
July	Maximum	70	73	70	69	68	66	69	68	67	65	64	64	65	65	64	64	63	64	65	68	66	69	67	66	67	67	69	67	66	65	
	Minimum	67	68	67	65	65	63	66	65	64	63	62	61	64	63	62	62	60	63	63	60	65	65	65	65	64	65	66	66	63	64	
	August																															
August	Maximum	65	65	66	64	65	67	65	68	65	66	64	64	63	63	61	61	60	62	63	63	66	64	63	62	61	61	61	60	63		
	Minimum	64	64	61	63	63	65	63	62	63	63	61	60	59	56	57	58	58	60	60	60	62	62	60	59	57	59	58	61	60		
	September																															
September	Maximum	60	60	61	60	60	58	60	59	62	60	59	62	57	56	57	57	59	61	60	58	57	55	53	52	55	56	55	55	58	58	
	Minimum	56	59	58	58	58	55	57	55	58	57	58	57	54	52	53	53	53	53	54	55	54	53	52	50	51	53	55	52	55	55	

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

(Continuous ethyl alcohol-actuated thermograph)

STREAMS TRIBUTARY TO LAKE HURON  
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 1963.  
EXTREMES, 1962-63.--Water temperatures: Maximum, 73°F July 1; minimum, freezing point on many days during January to March.  
EXTREMES, 1958-63.--Water temperatures: Maximum, 73°F June 28, 1959, July 1, 1963; minimum, freezing point on many days during winter months.  
REMARKS.--Recorder stopped Dec. 9 to Jan. 14, range 34°F to 32°F.

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

(Continuous ethyl alcohol-actuated thermometer)

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



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 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 81° F July 1; minimum, freezing point on many days during December to March.

EXTREMES, 1950-63.--Water temperatures: Maximum, 81° F Aug. 1, 1955; minimum, freezing point on many days during winter months.

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

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

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.--10 square miles.  
TEMPERATURES.--March 1953 to September 1963.  
EXTREMES, 1962-63.--Water temperatures: Maximum, 82°F July 1, 2; minimum, freezing point on many days during December to March.  
EXTREMES, 1953-63.--Water temperatures: Maximum, 82°F July 1, 2, 1963; minimum, freezing point on many days during winter months.

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

Temperature of the air, of the water, of the soil, and of the atmosphere (Continuous ethyl alcohol-acautated thermometer)																																Average
Month	Day																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October	Maximum	56	56	55	58	58	58	58	56	56	57	58	59	62	62	60	53	54	54	51	49	47	42	41	38	40	40	39	39	39	39	52
	Minimum	52	53	55	55	58	58	57	56	55	54	57	53	54	58	60	53	51	50	51	49	47	42	40	38	36	37	39	38	38	39	50
November	Maximum	40	41	41	41	39	38	38	41	41	41	41	40	40	41	41	38	38	38	38	38	37	37	38	38	38	38	39	39	39	39	50
	Minimum	39	40	41	41	39	37	38	38	40	40	39	39	39	41	38	37	37	37	37	37	36	35	37	37	37	37	38	38	38	38	39
December	Maximum	39	40	42	42	42	41	35	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	
	Minimum	39	39	40	41	41	35	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	
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	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	
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	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	32	32	32	32	32	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	
	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	
April	Maximum	44	51	54	52	43	48	50	50	50	44	44	46	47	48	51	50	55	52	52	51	50	45	47	48	52	55	55	52	---	50	
	Minimum	41	43	50	43	41	42	45	46	44	39	41	43	44	44	45	46	47	48	48	47	44	42	42	45	47	49	51	44	---	45	
May	Maximum	49	53	57	57	56	56	55	55	58	58	52	53	57	52	60	60	59	57	56	56	53	53	58	59	63	64	59	61	67	57	
	Minimum	40	45	50	54	50	51	50	53	54	47	45	48	50	52	49	50	55	56	52	52	48	44	49	54	56	58	59	56	53	58	51
June	Maximum	68	72	74	75	77	75	76	76	74	69	58	59	59	65	66	67	70	67	63	66	70	73	75	76	77	77	77	79	---	71	
	Minimum	63	65	68	71	69	72	71	72	66	56	53	56	57	57	63	64	65	61	57	58	63	66	69	70	74	70	70	72	---	65	
July	Maximum	82	82	76	70	71	73	73	70	69	69	72	74	74	71	67	71	75	75	75	75	75	77	77	77	79	79	77	75	73	73	76
	Minimum	76	76	68	66	68	69	68	65	65	66	69	71	66	63	64	66	68	71	69	67	69	70	71	73	75	77	71	68	67	69	
August	Maximum	69	69	70	70	70	75	73	73	72	71	69	63	61	61	62	62	63	65	68	70	71	68	66	66	66	65	65	64	68	68	
	Minimum	65	66	66	66	67	68	69	68	67	66	63	60	57	58	59	60	62	65	67	67	65	62	61	63	63	62	60	64	61	61	
September	Maximum	65	65	60	61	63	63	64	66	66	64	64	59	57	60	62	63	66	62	59	58	56	55	58	59	61	61	60	56	56	---	58
	Minimum	61	60	59	58	58	59	61	60	62	61	62	59	55	54	55	58	61	63	62	59	58	56	53	52	54	57	59	56	53	50	---



## 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 Lawas City.

DRAINAGE--East branch of Au Gres River, Iosco County, Michigan.

RECORDS AVAILABLE--Water temperatures: October 1951 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 76°F July 1, 2; minimum, freezing point on many days during December to March.

EXTREMES, 1951-63.--Water temperatures: Maximum, 76°F Aug. 3, 1957, July 1, 2, 1963; minimum, freezing point on many days during winter months.

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

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																																	
Maximum	52	51	52	53	54	55	56	56	55	53	56	57	56	56	60	61	57	52	52	52	50	48	46	44	42	41	41	41	41	43	43	51	
Minimum	48	47	51	52	53	54	55	55	53	51	52	56	51	52	56	57	52	48	47	50	46	46	44	41	40	39	39	41	40	41	43	48	
November																																	
Maximum	44	44	43	43	42	40	42	42	43	43	42	40	39	40	41	41	39	36	37	39	37	36	35	34	33	33	34	35	35	35	35	--	39
Minimum	42	43	43	42	40	40	37	38	42	39	40	42	40	39	38	39	40	39	36	35	35	37	36	35	34	33	33	34	34	--	--	38	
December																																	
Maximum	37	37	39	39	38	38	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	33	
Minimum	35	36	36	37	38	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	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	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	
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	41	48	49	48	42	47	48	46	45	44	46	45	45	48	49	49	55	55	53	53	51	48	46	44	42	40	38	36	34	33	33	49	
Minimum	41	41	48	42	38	42	41	41	42	39	43	44	41	42	42	46	48	49	48	49	45	42	40	38	36	34	32	30	28	27	27	44	
May																																	
Maximum	49	53	56	56	55	56	55	57	59	58	50	53	54	54	54	60	58	58	57	53	50	53	57	57	61	62	60	55	60	64	56	56	
Minimum	40	45	50	53	49	51	50	54	56	47	45	49	52	53	51	52	54	54	53	50	46	42	47	51	52	54	55	53	57	51	51	51	
June																																	
Maximum	66	69	68	70	70	71	69	70	70	67	63	58	60	59	62	63	66	65	63	62	64	67	71	72	73	74	70	74	70	74	--	67	
Minimum	60	61	64	63	63	65	63	64	66	62	56	54	54	57	56	58	58	58	58	58	55	53	58	61	63	64	68	64	61	65	--	61	
July																																	
Maximum	76	76	71	69	69	71	68	66	62	64	67	70	68	65	63	66	63	70	67	69	68	69	70	73	72	70	70	67	64	68	64	68	
Minimum	68	70	63	60	60	61	64	58	55	55	60	63	60	58	58	60	60	65	63	62	64	61	61	63	63	66	66	64	59	61	62	61	
August																																	
Maximum	65	65	68	69	68	70	68	68	66	66	66	65	65	62	61	61	60	63	66	68	68	67	64	61	60	61	62	61	62	61	62	61	
Minimum	59	61	60	62	59	61	65	60	61	58	58	58	55	55	55	56	52	55	56	60	60	62	59	59	53	55	59	58	58	56	58	58	
September																																	



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 1980 to September 1983.

EXTREMES, 1896-83.--Water temperatures: Maximum, 78°; July 5, 2 minimum, freezing point on many days during December to March. Maximum, 72°; June 26, 1957, July 8, 9, Aug. 1, 1955; minimum, freezing point on many days during winter months.

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

Temperature (Continuous ethyl alcohol-actuated thermometer)																															Average		
Month	Day																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
October	Maximum	53	54	54	55	56	56	58	56	55	54	57	58	59	55	52	53	53	50	50	48	47	46	45	44	44	44	45	46	46	52		
	Minimum	48	48	53	54	54	55	55	54	53	52	54	50	52	55	50	49	48	50	47	48	47	45	44	43	44	44	43	45	45	50		
	Maximum	46	47	46	45	43	44	44	44	45	45	44	43	42	43	43	41	40	40	41	41	39	38	38	38	38	38	39	---	42			
	Minimum	45	45	46	45	43	41	42	44	43	44	44	43	42	41	42	43	41	39	40	40	39	38	37	37	36	36	37	37	---	41		
November	Maximum	40	40	42	42	40	40	35	36	33	33	33	33	33	34	35	38	39	38	34	35	36	35	34	34	34	34	34	34	36	36		
	Minimum	38	39	40	39	40	35	34	35	33	33	32	32	33	33	33	34	35	38	34	34	35	34	34	34	34	34	34	34	34	35		
	Maximum	34	34	35	35	36	36	36	37	37	35	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	33	33		
	Minimum	34	33	33	34	35	35	36	36	35	33	33	33	33	33	33	33	32	32	32	32	32	32	32	32	32	32	32	32	32	33		
December	Maximum	32	32	32	32	32	33	35	32	32	34	34	34	34	34	32	32	32	33	34	32	32	32	32	32	32	32	32	32	32	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	32	32	32		
	Maximum	32	34	36	36	37	36	37	35	36	33	37	37	37	38	38	38	37	36	36	38	42	41	39	34	36	36	38	41	42	37		
	Minimum	32	32	34	36	35	33	33	34	32	33	32	33	36	33	33	35	36	33	34	34	34	36	36	34	33	33	33	35	37	38		
January	Maximum	42	47	48	46	43	48	49	47	46	46	45	46	47	51	52	50	54	52	50	53	53	51	48	47	48	49	52	56	54	51	49	
	Minimum	40	41	45	41	45	43	42	42	39	42	44	43	44	44	46	47	46	47	47	48	44	43	42	43	45	46	47	49	42	---	44	
	Maximum	49	52	54	53	55	53	56	58	54	55	56	55	53	60	58	56	56	54	52	51	54	57	56	60	61	59	55	59	63	56	56	
	Minimum	40	44	48	51	46	49	49	52	55	46	45	48	51	52	50	52	53	53	52	51	50	47	48	51	51	53	55	53	52	55	50	
February	Maximum	65	65	64	64	66	64	66	64	62	59	56	56	56	55	51	58	59	62	60	59	58	60	63	65	65	66	65	63	66	68	---	62
	Minimum	57	57	59	57	58	60	58	59	60	56	51	50	51	53	51	55	53	53	53	50	53	55	57	58	57	58	61	60	58	60	---	56
	Maximum	70	70	64	63	63	65	63	62	63	65	66	63	63	62	62	60	66	66	66	66	66	67	67	68	67	68	66	66	62	65	65	
	Minimum	62	63	57	54	55	56	55	53	54	56	57	60	59	57	56	57	58	59	59	59	59	59	60	60	60	62	61	60	56	58	58	
March	Maximum	64	64	65	65	64	64	63	63	62	60	57	59	58	58	58	59	60	61	63	63	62	61	58	58	60	59	61	61	60	61	61	
	Minimum	57	58	58	59	56	58	60	57	58	56	55	56	54	54	55	52	54	55	55	56	58	59	57	53	53	55	57	56	57	55	56	
	Maximum	61	59	57	58	58	57	61	62	59	59	55	54	56	57	58	60	59	56	54	54	52	52	56	58	59	56	52	54	---	57	---	
	Minimum	54	56	56	55	52	55	55	56	55	53	50	48	50	52	54	56	54	56	54	52	51	49	48	51	53	54	52	50	48	---	53	

## STREAMS TRIBUTARY TO LAKE HURON--Continued

## 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 1.5 miles north of Selkirk, Ogemaw County.  
 DRAINAGE AREA.--19 square miles, approximately.  
 RECORDS AVAILABLE.--Water temperatures: October 1950 to September 1963.  
 EXTREMES, 1962-63.--Water temperatures: Maximum, 70°F July 1, 2; minimum, freezing point on many days during December to March.  
 EXTREMES, 1950-63.--Water temperatures: Maximum, 76°F Aug. 1, 1955; minimum, freezing point on many days during winter months.  
 REMARKS.--Temperature bulb covered Mar. 20-29.

Temperature (°F) of water, water year October 1962 to September 1963 (Continuous ethyl alcohol-actuated thermograph)																															Average	
Month	Day																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October	50	50	50	52	53	55	55	55	54	53	55	55	56	59	59	55	50	50	50	48	46	45	43	41	40	39	39	39	42	42	50	
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Minimum	43	45	49	50	52	53	54	54	53	53	52	55	54	55	55	47	46	48	44	44	43	40	38	38	38	39	38	39	41	47		
November	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Minimum	40	42	41	38	40	40	42	41	40	38	38	39	40	38	38	37	39	37	34	33	34	36	34	33	33	33	33	33	33	33	36	
December	40	42	42	41	38	35	35	40	38	39	40	38	38	37	37	39	37	34	33	33	34	36	34	33	33	33	33	33	33	33	36	
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Minimum	37	36	39	39	37	37	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	33		
January	34	35	35	36	37	32	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	
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
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	
February	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
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	
March	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
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	
April	42	46	48	48	44	45	46	46	45	43	42	43	43	45	46	46	44	44	46	46	47	47	44	43	46	48	50	55	53	49	47	
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Minimum	42	46	44	41	43	44	43	43	39	41	42	41	42	42	44	44	46	46	47	43	40	39	39	42	44	44	48	38	43	43	43	
May	46	49	52	52	52	52	51	57	57	56	52	52	54	54	51	57	56	55	56	53	51	50	51	54	53	57	58	57	54	55	60	54
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Minimum	37	42	47	50	47	48	47	51	55	44	42	46	49	51	48	50	51	51	49	48	45	42	45	48	48	50	54	52	50	53	48	
June	60	61	61	62	63	63	62	63	62	61	58	56	54	54	57	57	60	59	60	55	58	61	63	65	67	67	64	65	68	61	61	61
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Minimum	54	55	58	58	58	58	59	59	51	54	51	50	51	54	51	55	55	54	55	55	51	50	54	56	58	59	64	62	61	64	56	
July	70	70	66	62	63	64	64	61	60	60	63	65	64	63	61	62	62	67	66	66	65	64	66	67	68	69	68	68	64	63	65	
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Minimum	65	66	59	56	57	58	61	57	53	54	56	58	61	60	59	57	61	64	63	62	60	61	62	63	66	65	64	58	61	60	60	
August	64	63	66	65	63	66	66	65	64	62	61	61	57	57	57	57	56	58	60	62	64	63	62	57	57	59	58	59	58	61	61	
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Minimum	60	61	60	62	58	61	64	59	60	58	56	56	57	55	53	54	55	52	51	53	57	59	61	61	61	61	61	61	61	61	61	
September	58	58	56	56	55	55	55	58	60	59	57	57	52	51	53	55	57	61	61	58	55	53	52	49	55	58	57	57	52	53	55	
Maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Minimum	53	55	55	55	51	50	54	57	54	57	55	52	50	46	48	51	54	57	58	55	53	52	48	46	49	53	54	52	50	49	52	

Temperature (°F) of water, water year October 1962 to September 1963  
 (Continuous ethyl alcohol-actuated thermometer)







STREAMS TRIBUTARY TO LAKE ST. CLAIR  
4-1809. CLINTON RIVER NEAR DRAYTON PLAINS, MICH.

LOCATION.--Temperature recorder at gaging station, 14 feet downstream from bridge on State Highway 59, 1 mile downstream from Sta. fish hatchery, and 2.0 miles south of Drayton Plains, Oakland County.

RECORDS AVAILABLE.--Water temperatures: October 1961 to September 1963.

EXTREMES, 1961-63.--Water temperatures: Maximum, 87°F July 1; minimum, freezing point on many days during January to March.

EXTREMES, 1961-63.--Water temperatures: Maximum, 87°F July 1, 1963; minimum, freezing point on many days during winter months.

REMARKS.--Recorder stopped Nov. 1 to Jan. 4 and June 11-17.

Temperature (°F) of water, water year October 1962 to September 1963  
(Continuous ethyl alcohol-actuated thermograph)

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



## STREAMS TRIBUTARY TO LAKE ERIC--Continued

4-1935. MAUMEE RIVER AT WATERVILLE, OHIO--Continued

Suspended sediment, water year October 1952 to September 1963

Day	OCTOBER			NOVEMBER			DECEMBER		
	Suspended sediment			Suspended sediment			Suspended sediment		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	186	15	8	272	6	1	195	22	12
2..	186	14	7	230	5	1	195	22	12
3..	235	14	9	200	6	1	190	22	11
4..	248	14	9	215	7	1	186	20	10
5..	225	14	8	220	6	1	210	20	11
6..	210	14	8	215	7	1	340	19	17
7..	205	14	8	220	7	1	584	18	28
8..	256	14	10	248	7	1	184	17	8
9..	445	15	18	248	7	1	170	17	8
10..	342	15	14	346	7	1	200	16	9
11..	520	15	21	233	6	4	300	15	12
12..	397	15	16	190	6	3	250	14	9
13..	280	15	11	276	6	3	210	13	7
14..	240	15	10	364	6	6	190	11	6
15..	220	15	9	721	6	17	170	9	4
16..	323	18	16	716	6	12	170	8	4
17..	353	21	20	490	6	8	160	6	2
18..	296	19	15	430	6	7	160	5	2
19..	296	17	14	288	6	5	170	5	2
20..	272	16	12	419	6	7	190	5	2
21..	256	16	11	438	6	7	210	4	2
22..	230	16	10	688	7	13	210	4	2
23..	554	16	24	240	10	6	200	4	2
24..	320	15	13	706	11	85	200	4	2
25..	306	14	12	264	14	10	230	4	2
26..	328	13	12	210	13	7	210	4	2
27..	190	10	5	419	23	26	200	4	2
28..	186	7	4	312	26	22	190	4	2
29..	198	5	3	248	25	17	320	4	3
30..	164	4	2	210	23	13	280	4	3
31..	230	5	3	--	--	--	260	4	3
Total	8697	--	342	10276	--	317	6934	--	201
Day	JANUARY			FEBRUARY			MARCH		
	Suspended sediment			Suspended sediment			Suspended sediment		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1..	240	4	2	230	5	3	500	4	5
2..	240	3	2	220	4	3	550	3	4
3..	240	3	2	220	5	3	470	3	4
4..	250	3	2	220	5	3	440	3	4
5..	250	2	1	220	5	3	1000	12	32
6..	240	2	1	240	5	3	3600	145	6150
7..	240	2	1	250	5	3	21000	606	34400
8..	240	2	1	260	5	4	30200	549	44800
9..	250	1	1	280	5	4	35200	295	28000
10..	600	13	21	320	5	4	32600	186	16400
11..	1400	38	144	400	5	5	27400	194	14400
12..	500	11	15	450	5	6	24200	172	11200
13..	250	9	6	500	5	7	21000	122	6920
14..	230	9	6	550	5	7	18700	83	4190
15..	240	8	5	550	5	7	19200	109	5650
16..	240	7	4	500	5	7	18000	183	8890
17..	250	7	5	480	5	6	17100	210	9700
18..	270	7	5	460	5	6	16700	155	6990
19..	320	6	5	550	5	7	16500	137	6100
20..	330	6	5	1100	5	15	16600	126	5650
21..	320	5	4	400	5	5	16400	163	7220
22..	300	5	4	450	5	6	14600	225	8870
23..	290	5	4	1000	5	14	11500	146	4530
24..	280	5	4	1100	5	15	9260	108	2700
25..	280	5	4	900	5	12	7380	91	1810
26..	270	5	4	750	4	8	4960	86	1150
27..	260	5	4	650	4	7	7000	94	1780
28..	240	5	3	550	4	6	7860	79	1680
29..	220	5	3	--	--	--	8180	69	1520
30..	210	5	3	--	--	--	7150	65	1250
31..	230	5	3	--	--	--	5860	58	918
Total	9740	--	274	13800	--	178	421110	--	242917

E Estimated.

S Computed by subdividing day.

## STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-1935. MAUMEE RIVER AT WATERVILLE, OHIO--Continued

Suspended sediment, water year October 1962 to September 1963--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..	5330	55	792	1540	36	150	1180	28	89
2..	6350	56	960	1510	34	139	822	29	64
3..	7190	63	1220	1470	32	127	566	30	46
4..	6880	76	1410	1290	28	98	524	30	42
5..	5550	64	959	1140	26	80	510	27	37
6..	5070	54	739	1180	24	76	631	27	46
7..	4180	46	519	1220	21	69	1020	29	80
8..	3460	43	402	1220	18	59	3240	38	332
9..	2950	42	334	1010	15	41	5070	54	739
10..	2430	40	262	1010	13	35	6120	72	1190
11..	1890	38	194	733	11	22	9020	74	1800
12..	1710	36	166	786	8	17	5590	57	860
13..	1440	35	136	858	8	18	5180	53	741
14..	1250	34	115	930	21	53	3970	50	536
15..	1080	32	93	614	18	30	2640	47	335
16..	968	31	81	750	17	34	1970	44	234
17..	1140	30	92	804	17	37	1470	42	167
18..	1100	33	98	1080	18	52	1140	37	114
19..	3050	74	819	840	19	43	890	33	80
20..	10200	131	3610	987	20	53	699	29	55
21..	11500	168	5220	987	20	53	496	25	33
22..	9340	146	3680	949	20	51	440	21	25
23..	7500	124	2510	786	21	44	454	16	20
24..	5220	95	1340	733	22	44	440	13	15
25..	4040	76	829	614	23	38	396	13	14
26..	3600	68	661	648	24	42	374	13	13
27..	2820	59	449	648	24	42	321	13	11
28..	2030	50	274	750	25	51	267	14	10
29..	2050	42	232	768	26	54	303	14	11
30..	2030	39	214	631	26	44	374	15	15
31..	--	--	--	1400	27	102	--	--	--
Total	123348	--	28410	29886	--	1798	56121	--	7754
	JULY			AUGUST			SEPTEMBER		
1..	352	15	14	538	23	33	117	33	10
2..	369	15	15	352	23	22	100	34	9
3..	286	15	12	703	27	51	150	34	14
4..	240	14	9	2140	46	266	144	34	13
5..	225	14	8	2000	59	319	64	34	6
6..	202	14	8	1330	56	201	92	34	8
7..	240	13	8	1380	46	171	123	34	11
8..	200	13	7	1020	35	96	141	34	13
9..	159	13	6	840	28	64	135	35	13
10..	165	14	6	648	26	45	117	35	11
11..	172	15	7	510	26	36	117	36	11
12..	153	15	6	385	27	28	194	36	19
13..	153	15	6	490	27	36	87	37	9
14..	410	16	18	258	27	19	69	37	7
15..	278	16	12	218	27	16	78	38	8
16..	272	19	14	249	27	18	111	37	11
17..	716	22	42	258	27	19	159	36	15
18..	699	25	47	188	26	13	147	35	14
19..	1280	28	97	202	25	14	147	35	14
20..	1440	32	124	267	25	18	150	34	14
21..	3030	34	278	232	26	16	141	34	13
22..	4280	36	416	225	26	16	141	33	13
23..	3600	35	340	232	26	16	117	33	10
24..	3110	33	277	218	27	16	141	30	11
25..	2030	31	170	172	27	12	172	27	12
26..	1350	28	102	188	27	14	165	25	11
27..	1080	26	76	188	28	14	157	23	10
28..	858	24	56	188	29	15	152	20	8
29..	631	23	39	188	30	15	60	16	2
30..	396	22	24	188	31	16	123	16	5
31..	418	23	26	165	32	14	--	--	--
Total	28794	--	2270	16160	--	1649	3811	--	325

Total discharge for year (cfs-days).....728677

Total load for year (tons).....286435

S Computed by subdividing day.

## STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-1935. MAUMEE RIVER AT WATERVILLE, OHIO--Continued

Particle-size analyses of suspended sediment, water year October 1962 to September 1963

(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)	Samp- ling point	Water tem- per- ature (°F)	Discharge (cfs)	Sediment concen- tration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							Percent finer than size indicated, in millimeters											
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Mar. 7, 1963.....	1650			25400	746		56	67	78	87	94	96	99	100			SBWC	
Mar. 7.....	1650			25400	746		18	29	52	81	93	94	98	100			SEN	
Mar. 8.....	1655			30500	478		58	70	80	87	95	97	99	100			SBWC	
Mar. 21.....	1845			16100	187		84	93	96	97	98	99	100	--			SBWC	

## STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-1940.1. MAUMEE RIVER AT CRAIG BRIDGE, AT TOLEDO, OHIO

LOCATION --At Craig Bridge in Toledo, Lucas County, 1.5 miles downstream from Swan Creek, and about 3.5 miles upstream from mouth.

RECORDS AVAILABLE.--Chemical analyses: June 1962 to September 1963.

REMARKS.--Determinations of suspended solids, biochemical oxygen demand (BOD), and dissolved oxygen furnished by the city of Toledo, Division of Sewage Disposal. No discharge records available.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Carbonate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (PO <sub>4</sub> )	Dissolved solids (residue at 180°C)	Suspended solids at 110°C	Hardness as CaCO <sub>3</sub>		Toxicity (micro-mos at 25°C)	Specific conductance pH	Colloidal or (BOD)		
																			Calcium, magnesium	Non-carbonate					
Oct. 4, 1962.							37			161	108		41	--	7.5	0.46	376	66	226	94	614	7.3	50	4.5	
Oct. 17.....							46	--		181	--	--	--	--	7.1	--	--	62	--	--	--	--	7.1	--	--
Oct. 25.....							45			180	114	52	50	--	7.1	.52	410	50	242	94	684	7.4	44	4.8	
Nov. 1.....							50			186	112	50	50	--	8.4	.50	430	--	240	92	677	7.9	30	--	
Nov. 8.....							56			200	125	50	60	--	5.5	.45	466	54	262	101	720	7.9	36	5.7	
Nov. 15.....							52			197	130	60	60	--	5.4	.75	472	33	274	110	774	7.3	21	1.5	
Nov. 29.....							52			190	130	52	52	--	7.0	.84	466	31	266	138	747	7.3	34	3.0	
Dec. 6.....							54			192	144	58	58	--	11	.89	496	40	278	114	791	7.5	27	--	
Dec. 20.....							73			182	110	58	47	--	1.0	1.9	461	47	225	98	721	7.3	32	8.7	
Feb. 1.....							78			282	202	65	65	--	5.6	2.5	654	140	376	137	1060	7.5	40	16.2	
Feb. 13.....							60			315	201	70	70	--	4.2	3.4	682	40	394	136	1109	7.7	42	2.1	
Feb. 20.....							60			322	186	80	80	--	1.0	28	714	13	422	158	1090	8.0	15	9.0	
Mar. 27.....							8.4			118	75	19	19	--	3.28	.43	280	65	207	111	461	7.3	14	6.0	
Apr. 3.....							--			166	102	29	29	--	--	--	--	35	280	144	603	7.4	--	4.8	
Apr. 24.....							14			168	98	25	25	--	5.26	.66	356	70	264	126	583	7.0	20	5.0	
May 1.....							--			178	92	25	25	--	--	--	--	60	262	126	577	7.1	--	3.0	
May 8.....							--			162	100	25	25	--	--	--	--	16	262	129	561	7.2	--	4.0	
May 15.....							--			144	108	34	34	--	--	--	--	24	246	128	572	6.9	--	4.0	
May 22.....							21			146	108	32	32	--	4.16	.51	350	62	249	130	574	7.4	15	2.0	
May 29.....							--			174	112	30	30	--	--	--	--	32	270	127	601	7.1	--	--	
June 5.....							--			154	116	19	19	--	--	--	--	60	250	124	570	6.6	10	--	
June 12.....							16			232	115	21	21	--	15	.95	456	60	302	112	698	7.4	10	6.9	
June 19.....							--			196	100	18	18	--	--	--	--	46	274	113	624	6.7	20	10.5	
June 26.....							--			194	98	19	19	--	--	--	--	40	258	98	598	6.7	20	6.9	
July 3.....							--			160	94	19	19	--	--	--	--	--	237	106	549	6.6	10	--	
July 10.....							--			154	96	21	21	--	--	--	--	--	236	110	552	7.4	10	--	
July 17.....							--			144	96	20	20	--	--	--	--	--	220	102	537	6.7	10	--	

Date of collection	Dissolved oxygen		Organics			Turbidity	Dissolved oxygen		Organics			Turbidity
	Parts per million	Percent saturation	Phenols as $C_6H_5OH$	Alkyl benzene sulfonate (ABS)			Parts per million	Percent saturation	Phenols as $C_6H_5OH$	Alkyl benzene sulfonate (ABS)		
July 24, 1963												
July 31			31	124	96	28	6.7	378	214	113	482	6.7
Aug. 7			29	165	100	26	6.7	378	214	113	482	6.7
Aug. 14				166	86	19	3.1	391	230	70	587	7.3
Aug. 21				165	96	20			227	92	552	6.6
Aug. 28				161	96	22			229	97	550	7.4
Sept. 4				154	90	24			225	99	556	6.6
Sept. 11				174	91	22			227	84	574	6.7
Sept. 18				158	94	26			228	98	573	6.6
Sept. 25			31	158	100	24	10	380	230	100	573	6.6
Oct. 4, 1962	3.4	36		0.1	15	May 22, 1963		3.6			0.1	15
Oct. 17	7.5	70		--	--	May 29		6.7			--	30
Oct. 25	4.7	47		1	20	June 5		7.1			--	8
Nov. 1	8.5	78		1	20	June 12		11.1			.1	36
Nov. 8	8.5	78		1	20	June 16		11.2			--	6
Nov. 13	7.0	63		.2	15	June 26		11.2			--	6
Nov. 29	9.2	77		.3	40	July 3		--			--	4
Dec. 6	11.4	89		.4	30	July 10		--			--	6
Dec. 13	10.2	86		.7	15	July 17		--			--	2
Dec. 20	10.2	86		.7	15	July 24		--			--	15
Feb. 13, 1963	12.2	88		.8	10	July 31		--			.1	30
Feb. 20	12.6	93		.3	7	Aug. 7		--			.2	80
Mar. 27	11.4	93		.2	110	Aug. 14		--			--	70
Apr. 3	10.9	106		--	40	Aug. 21		--			--	35
Apr. 24	9.1	91		.1	45	Aug. 28		--			--	49
May 8	7.5	76		--	30	Sept. 4		--			--	45
May 15	5.5	57		--	15	Sept. 11		--			--	10
				--		Sept. 18		--			.2	75
				--		Sept. 25		--			--	15





Date of collection	Dissolved oxygen				Organics			Date of collection	Dissolved oxygen			Organics			Turbidity		
	Parts per million	Percent saturation	Phenols as $C_6H_5OH$	Alkyl benzene sulfonate (ABS)	Turbidity	Parts per million	Percent saturation		Phenols as $C_6H_5OH$	Alkyl benzene sulfonate (ABS)							
July 24, 1963																	
July 31																	
Aug. 7																	
Aug. 14																	
Aug. 21																	
Aug. 28																	
Sept. 4																	
Sept. 11																	
Sept. 18																	
Sept. 25																	
Oct. 2	2.4	26			--	May 15, 1963	3.6	38			15						
Oct. 17	6.2	56		0.1	8	May 22	3.5	36		0.1	10						
Oct. 25	7.1	68		.2	20	May 29	--	--		--	15						
Nov. 1	--			.2	15	June 5	--	--		--	15						
Nov. 8	4.6	42		.2	10	June 12	6.5	74		.1	8						
Nov. 15	3.4	35		.4	15	June 19	4.8	54		--	4						
Nov. 29	8.5	71		.4	70	June 26	11.0	131		--	30						
Dec. 6		51		.3	8	July 3	--	--		--	6						
Dec. 13	10.2	72		.3	90	July 10	--	--		2	4						
Dec. 20	13.2	88		.4	40	July 17	--	--		1	2						
Dec. 27	13.1	92		.6	40	July 24	--	--		--	35						
Feb. 6, 1963	8.2	59		1.3	8	July 31	--	--		--	4						
Feb. 13	9.0	65		1.0	6	Aug. 7	--	--		.3	15						
Feb. 20	10.1	78		.8	10	Aug. 14	--	--		--	25						
Mar. 20	13.7			--	140	Aug. 21	--	--		--	140						
Mar. 27	12.0	101		.1	35	Aug. 28	--	--		--	155						
Apr. 3	10.3	97		--	25	Sept. 4	--	--		--	190						
Apr. 10	14.7	104		--	7	Sept. 11	--	--		.5	110						
Apr. 24	8.5	78		.1	55	Sept. 18	--	--		--	120						
May 1	8.6	80		--	35	Sept. 25	--	--		--							
May 8	7.3	74		--	20												

## STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-1940.3. MAUMEE RIVER AT CENTER C. &amp; O. RAILROAD DOCK, AT TOLEDO, OHIO

LOCATION--At mouth at end of center dock of Chesapeake and Ohio Railroad coal-loading dock, at Toledo, Lucas County.

RECORDS AVAILABLE--Chemical analyses: June 1962 to September 1963.

REMARKS--Determinations of suspended solids, biochemical oxygen demand (BOD), and dissolved oxygen furnished by the city of Toledo, Division of Sewage Disposal.

No discharge records available.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Silica (SiO <sub>2</sub> ) (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (PO <sub>4</sub> )	Dissolved solids (residue at 180°C)	Suspended solids (residue at 110°C)	Hardness as CaCO <sub>3</sub>		Total conductivity (microhmhos at 25°C)	pH	Coliform or Biochemical oxygen demand (BOD)		
																		Calcium, magnesium, medium	Non-carbonate				
Oct. 4, 1962.						35			130	72	46	--	3.6	1.2	--	40	174	68	525	7.2	--	8.6	
Oct. 17.....						28			142	64	34	--	2.2	.61	270	104	176	60	483	7.3	20	4.5	
Oct. 25.....						29			156	66	36	--	1.3	.54	284	446	186	58	503	7.5	40	16.5	
Nov. 1.....						31			136	60	38	--	3.2	.92	288		170	58	478	7.3	15	--	
Nov. 8.....						31			132	68	40	--	8.8	.80	306	58	174	66	501	7.0	70	4.2	
Nov. 15.....						37			138	85	46	--	8.8	.39	334	69	195	82	564	6.7	36	6.9	
Nov. 29.....						39			148	88	46	--	12	.87	352	78	206	85	588	7.4	44	4.5	
Dec. 6.....						50			175	121	54	--	19.8	.78	346	136	246	103	722	6.9	40	--	
Dec. 13.....						38			144	79	44	--	6.5	.46	248	84	160	54	445	7.2	32	17.7	
Dec. 20.....						26			130	50	35	--	10.5	.92	312	51	180	67	534	7.5	20	6.0	
Dec. 27.....						34			138	62	44	--	4.4	2.4	462	--	240	86	795	7.3	28	--	
Jan. 3, 1963.						64			188	121	72	--	--	--	--	--	--	--	--	--	--	--	
Feb. 6.....						--			--	--	--	--	--	--	--	112	--	--	--	7.6	--	9.3	
Feb. 13.....						68			222	133	72	--	1.6	2.5	500	30	260	78	850	7.5	32	6.3	
Feb. 20.....						62			278	160	88	--	4.2	3.5	596	42	324	96	1010	7.1	15	14.4	
Mar. 6.....						71	9.0		354	183	98	--	1.6	--	--	93	385	94	1160	7.4	--	10.2	
Mar. 13.....						--			88	28	11	--	--	--	--	118	106	34	263	6.7	--	8.1	
Mar. 20.....						--			98	52	15	--	--	--	--	92	160	80	368	7.2	--	5.7	
Mar. 27.....						8.1			124	69	20	--	2	.30	.74	278	51	208	107	460	7.1	24	4.5
Apr. 3.....						--			168	95	26	--	--	--	--	33	268	130	572	7.6	--	3.9	
Apr. 17.....						--			192	108	34	--	--	--	--	24	286	128	639	7.2	--	5.4	
Apr. 24.....						14			166	96	25	--	4	.25	.58	62	262	126	572	7.5	15	3.0	
May 1.....						--			154	93	28	--	--	--	--	35	252	126	568	7.3	--	--	
May 8.....						--			172	96	28	--	--	--	--	7	264	123	587	7.1	--	5.0	
May 15.....						--			146	85	34	--	--	--	--	36	226	107	598	7.3	--	4.0	
May 22.....						21			148	98	35	--	3	.11	.55	330	236	115	556	6.8	15	4.8	
May 29.....						--			152	94	37	--	--	--	--	96	236	112	561	7.5	--	4.9	
June 5.....						--			170	114	38	--	--	--	--	--	236	96	589	7.3	--	4.8	
June 12.....						--			200	112	37	--	--	--	--	102	267	103	638	7.4	--	6.0	
June 19.....						30			202	110	40	--	2.6	1.0	412	28	266	100	655	7.2	20	7.2	

Date of collection	Dissolved oxygen			Alkyl benzene sulfonate (ABS)	Turbidity	Date of collection	Dissolved oxygen			Alkyl benzene sulfonate (ABS)	Turbidity	Date of collection	Dissolved oxygen			Alkyl benzene sulfonate (ABS)	Turbidity
	Parts per million	Percent saturation					Parts per million	Percent saturation					Parts per million	Percent saturation			
June 26, 1963																	
July 3, 1963																	
July 10, 1963																	
July 17, 1963																	
July 24, 1963																	
July 31, 1963																	
Aug. 7, 1963																	
Aug. 14, 1963																	
Aug. 21, 1963																	
Aug. 28, 1963																	
Sept. 4, 1963																	
Sept. 11, 1963																	
Sept. 18, 1963																	
Sept. 25, 1963																	
Oct. 2, 1962	2.6	27		0.4	45	Mar. 6, 1963	8.6	--	--	--	--	June 26, 1963	6.0	70	--	--	10
Oct. 17, 1962	7.8	71		.2	65	Mar. 20, 1963	19.9	--	--	--	--	July 3, 1963	2.4	86	--	--	5
Oct. 23, 1962	7.5	71		.3	8	Mar. 27, 1963	12.7	--	--	0.1	85	July 10, 1963	2.0	24	0.3	10	1
Nov. 1, 1962				.1	35	Apr. 3, 1963	10.1	96	--	--	--	July 14, 1963	2.0	24	--	--	6
Nov. 8, 1962	5.6	49								--	40	July 24, 1963	2.0	24	--	--	11
Nov. 15, 1962	5.6	49		.3	35	Apr. 17, 1963	9.8	93	--	--	15	July 31, 1963	1.0	12	--	--	20
Nov. 29, 1962	8.4	68		.3	70	Apr. 24, 1963	8.0	73	--	--	6	Aug. 7, 1963	--	--	--	--	95
Dec. 6, 1962	3.8	31		.5	45	May 1, 1963	--	--	--	--	55	Aug. 14, 1963	--	--	.2	25	25
Dec. 13, 1962	11.6	80		.2	60	May 8, 1963	7.2	73	--	--	83	Aug. 21, 1963	--	--	--	20	20
Dec. 20, 1962	13.5	93		.2	40	May 15, 1963	4.9	50	--	--	85	Aug. 28, 1963	--	--	--	20	20
Dec. 27, 1962	11.3	80		.3	20	May 22, 1963	4.2	43	--	--	15	Sept. 4, 1963	5.3	57	--	20	20
Jan. 3, 1963	--	--		.6	8	May 29, 1963	3.5	37	--	--	70	Sept. 11, 1963	1.9	21	--	120	120
Feb. 6, 1963	9.5	70		--	--	June 5, 1963	4.2	48	--	--	5	Sept. 18, 1963	1.6	21	--	170	170
Feb. 13, 1963	8.9	66		.7	2	June 12, 1963	5.1	59	--	--	15	Sept. 25, 1963	2.4	25	.4	15	15
Feb. 20, 1963	12.0	90		.5	7	June 19, 1963	5.5	62	--	--	3						

a Includes 16 ppm ammonia nitrogen as  $\text{NH}_4$  and 0.30 ppm nitrite ( $\text{NO}_2$ ).

## STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-1940.7, MAUMEE RIVER AT BUOY 31, AT TOLEDO, OHIO

LOCATION.--At buoy 31 in Maumee Bay at Toledo, Lucas County, 4.7 miles out from Center Chippewa and Ohio Railroad dock at mouth of Maumee River.

RECORDS AVAILABLE.--Chemical analyses: June to September 1963.

REMARKS.--Determinations of suspended solids, biochemical oxygen demand (BOD), and dissolved oxygen furnished by the city of Toledo, Division of Sewage Disposal. No discharge records available.

Chemical analyses, in parts per million, June to September 1963

Date of collection	Mean silica discharge (cfs)	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Carbonate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (P <sub>4</sub> at 100°C)	Hardness as CaCO <sub>3</sub>		Total acidity (micro-mhos at 25°C)	pH	Coliform demand (BOD)
																	Calcium	Non-magnesium			
June 26, 1963							17			113		38	28		0.4	0.09	129	36	344	7.2	5
July 3.....							--			106		45	30		--	--	141	54	365	7.0	5
July 10.....							--			108		47	30		--	--	142	54	374	6.9	5
July 17.....							--			114		34	29		--	--	134	40	341	6.9	0
July 24.....							16			118		46	29		4.9	.09	149	32	381	7.1	3
July 31.....							14			116		39	28		2.5	.07	144	36	374	6.9	3
Aug. 7.....							13			112		31	28		2.5	.07	130	36	332	7.1	3
Aug. 14.....							--			114		25	26		--	--	128	34	312	6.5	0
Aug. 21.....							--			120		26	26		--	--	133	34	326	6.9	0
Aug. 28.....							--			122		27	26		--	--	133	33	329	6.5	0
Sept. 4.....							--			145		35	30		--	--	148	29	379	7.0	5
Sept. 11.....							25			118		25	26		2.2	.11	128	32	320	6.5	0
Sept. 18.....							27			134		27	24		--	--	164	24	348	6.9	7
Sept. 25.....							--			143		27	25		--	--	141	24	353	6.5	5

Date of collection	Dissolved oxygen		Organics		Ammonia nitrogen as NH <sub>4</sub>	Nitrite (NO <sub>2</sub> )	Cyanide (CN)	Turbidity	Threshold odor
	Parts per million	Percent saturation	Phenols as C <sub>6</sub> H <sub>5</sub> OH	Alkyl benzene sulfonate (ABS)					
June 26, 1963.....				0.1				7	
July 3.....				--				10	
July 10.....				--				7	
July 17.....				--				4	
July 24.....				.1				10	
July 31.....				--				4	
Aug. 7.....				.1				6	
Aug. 14.....				--				4	
Aug. 21.....				--				5	
Aug. 28.....				--				8	
Sept. 4.....				--				10	
Sept. 11.....				--				3	
Sept. 18.....				.2				20	
Sept. 25.....				--				65	

STREAMS TRIBUTARY TO LAKE ERIE--Continued  
4-1980. SANDUSKY RIVER NEAR FREMONT, OHIO

LOCATION:--At gaging station at highway bridge, 2.3 miles upstream from Bellville Power Dam, 2.5 miles downstream from Wolf Creek, and 3.5 miles southwest of Fremont, Sandusky County, Ohio. Elevation, 248 feet above sea level.

RECORDS AVAILABLE:--Chemical analyses: October 1950 to February 1952, October 1962 to September 1963.

Water temperatures: October 1950 to September 1956, October 1962 to September 1963.

Sediment records: October 1950 to September 1956.

EXTREMES, 1962-63.--Water temperatures: Maximum, 86°F Sept. 10; minimum, not determined.

EXTREMES, 1950-56.--Dissolved solids (1950-52): Maximum, 646 ppm Nov. 1-10, 1951; minimum, 195 ppm Jan. 21-31, 1952.

Hardness (1950-52): Maximum, 450 ppm Nov. 1-10, 1951; minimum, 141 ppm Jan. 21-31, 1952.

Specific conductance (1950-52): Maximum daily, 992 micromhos Nov. 4, 1951; minimum daily, 184 micromhos Jan. 27, 1952.

REMARKS:--Samples for iron and manganese filtered clear when collected unless otherwise noted. Records of specific conductance of daily samples available in district office at Columbus, Ohio. Additional samples were collected to further define the quality of water at this station.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		pH	Color	Turbidity
														Calcium	Non-magnesium			
Oct. 11-31, 1962....	55.1	3.3	a.01	94	29	23	6.0	210	176	32	0.7	2.3	477	354	182	754	8.1	16
Nov. 1-30.....	292	6.2	a.03	86	31	19	5.6	190	169	28	.3	17	476	342	187	727	7.6	27
Dec. 1-6.....	74.3	7.7	a.03	90	31	17	4.2	206	159	26	.3	20	487	352	183	735	7.9	10
Mar. 4-31, 1963....	6655	--	--	--	--	--	--	108	58	12	.1	17	238	169	80	373	7.3	--
Mar. 4 (maximum conductance)....	80	--	--	--	--	--	--	176	109	24	0.4	14	390	268	124	589	8.0	--
Mar. 18 (maximum conductance)....	18700	--	--	--	--	--	--	46	18	6.0	.1	7.2	101	61	24	155	7.3	--
Mar. 18 (maximum turbidity).....	5750	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	400
Apr. 1-30.....	901	--	--	--	--	--	--	184	116	18	.2	14	383	288	137	591	7.6	--
Apr. 20 (maximum conductance)....	1250	--	--	--	--	--	--	214	139	21	.2	12	436	334	158	669	8.2	--
Apr. 20 (maximum conductance)....	1390	--	--	--	--	--	--	140	86	14	.2	18	304	223	109	476	7.7	--
May 1-30.....	152	--	--	--	--	--	--	218	168	24	.5	1.5	474	350	171	728	7.6	--
May 31 (maximum conductance)....	144	--	--	--	--	--	--	258	187	26	.5	2.2	552	403	191	808	7.6	--
May 5 (minimum conductance)....	234	--	--	--	--	--	--	158	157	22	.3	2.2	394	295	165	620	7.6	--
May 31 (maximum turbidity).....	144	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15

a In solution when analyzed.

## STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-1980. SANDUSKY RIVER NEAR FREMONT, OHIO--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity
														Calcium	Non-carbonate				
June 1-30, 1963.....	314	--	--	--	--	--	--	178	120	24	0.4	10	381	278	132	607	7.2	--	--
June 6 (maximum conductance).....	256	--	--	--	--	--	--	264	152	58	.5	3.4	544	380	163	838	8.0	--	--
June 11 (minimum conductance).....	1560	--	--	--	--	--	--	145	77	14	.3	24	296	218	99	475	7.0	--	--
June 12 (maximum turbidity).....	1010	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	400
July 1-31.....	44.2	--	--	--	--	--	--	204	156	34	.5	2.4	464	339	172	716	7.5	--	--
July 31 (maximum conductance).....	45	--	--	--	--	--	--	236	204	32	.3	2.0	558	409	215	826	7.6	--	--
July 17 (minimum conductance).....	34	--	--	--	--	--	--	186	139	30	.3	2.6	406	300	147	640	7.5	--	--
Aug. 1-31.....	50.9	--	--	--	--	--	--	212	203	36	0.5	1.4	535	386	212	808	7.5	--	--
Aug. 2 (maximum conductance).....	61	--	--	--	--	--	--	238	224	38	.5	1.8	612	434	239	873	7.5	--	--
Aug. 24 (minimum conductance).....	28	--	--	--	--	--	--	192	179	35	.4	1.1	486	345	187	742	7.4	--	--
Sept. 1-30.....	15.0	--	--	--	--	--	--	232	199	48	.5	1.1	554	381	191	852	7.2	--	--
Sept. 29 (maximum conductance).....	11	--	--	--	--	--	--	254	220	62	.6	.9	634	414	206	968	7.1	--	--
Sept. 1-2 (minimum conductance).....	22	--	--	--	--	--	--	218	187	40	.5	1.5	518	350	171	789	7.2	--	--

## Additional analyses of special determinations

Date of collection	Iron (Fe)	Manganese (Mn)	Phosphorus as PO <sub>4</sub>	Dissolved oxygen		Oxygen consumed		Alkyl benzene sulfonate (ABS)	Threshold odor
				Parts per million	Percent saturation	Filtered	Unfiltered		
Apr. 17, 1963....	0.15	0.03	0.39	10.8	108	1	3	0.1	M-2
May 16.....	57	2.8	.31	12.6	140	2	3	.1	0
June 1.....	29	1.3	.33	10.8	108	3	6	.1	0
July 25.....	.29	2.8	.31	17.5	175	4	5	.1	0
Aug. 30.....	.12	1.3	.80	9.4	115	4	4	.2	0
Sept. 25.....	.04	.01	.53	9.5	100	4	5	.3	0

STREAMS TRIBUTARY TO LAKE ERIE--Continued  
 4-1980, SANDUSKY RIVER NEAR FREMONT, OHIO--Continued

Month	Temperature (°F) of water, water year October 1962 to September 1963																															Aver- age	
	Day																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
October .....	--	--	--	--	--	--	--	--	--	--	72	68	67	72	72	71	66	65	65	62	62	69	53	51	47	45	47	57	51	51	46		
November .....	48	50	47	48	48	47	48	47	47	47	45	46	47	44	43	45	44	41	40	48	41	38	37	37	35	34	34	35	35	--	--	43	
December .....	35	35	37	36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	44
January .....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
February .....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
March .....	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April .....	--	--	--	--	33	33	33	34	33	33	34	36	34	35	37	37	41	42	43	40	38	38	40	43	49	49	50	50	54	55	50	40	40
May .....	55	58	58	52	50	51	54	51	52	53	53	53	54	56	57	54	63	64	67	60	60	55	52	53	59	60	61	62	60	53	--	56	
June .....	60	63	66	65	60	69	72	73	78	71	65	66	67	68	66	65	67	70	70	71	58	61	60	59	62	58	60	64	68	67	70	66	66
July .....	72	78	71	83	79	80	78	80	80	80	74	71	73	74	77	79	80	79	79	72	73	72	75	82	79	82	78	80	73	76	--	77	
August .....	81	82	79	71	72	70	75	71	64	68	70	76	78	59	69	68	75	76	67	69	71	67	71	71	69	70	70	71	61	63	65	71	61
September .....	61	58	60	56	59	77	85	84	77	82	83	83	75	72	78	77	72	69	68	77	83	82	82	74	78	77	80	82	79	75	72	72	72
October .....	80	76	80	78	70	75	71	70	80	86	79	68	66	70	69	75	75	76	80	67	71	70	66	70	71	74	75	63	62	53	--	72	

Temperature (°F) of water, water year October 1982 to September 1983





STREAMS TRIBUTARY TO LAKE ERIE--Continued  
4-2005. BLACK RIVER AT ELYRIA, OHIO

LOCATION.--At gaging station in Cascade Park at Elyria, Lorain County, 0.8 mile downstream from confluence of East and West Branches.

DRAINAGE AREA.--392 square miles.

RECORDS AVAILABLE.--Chemical analyses: October 1962 to September 1963.

Water temperatures: October 1962 to September 1963.

EXTREMES, 1962-63.--Dissolved solids: Maximum, 708 ppm June 1-30; minimum, 256 ppm Mar. 1-31.

Hardness: Maximum, 306 ppm Feb. 1-6; minimum, 196 ppm Mar. 1-6.

Specific conductance: Maximum, 1,452 micro-mhos/cm Sept. 26; minimum daily, 215 micro-mhos Mar. 13.

Freezing point: Maximum, 75°F Aug. 5, 8-13; minimum, freezing point on many days during December to March.

REMARKS.--Values reported for iron are in solution when analyzed. Records of specific conductance of daily samples available in district office at Columbus, Ohio.

Chemical analyses, in parts per million, October 1962 to August 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color
														Calcium	Non-carbonate			
Oct. 14-31, 1962.....	33.6	9.1	0.07	68	16	66	8.0	138	138	80	0.7	7.3	494	236	123	819	7.5	32
Nov. 1-9.....	18.7	9.5	10	66	19	76	6.5	128	169	83	.6	22	542	243	140	859	7.3	42
Nov. 10-21.....	322	8.4	.16	57	17	26	6.1	95	123	38	.2	17	359	212	134	563	7.2	50
Nov. 22-30.....	78.9	9.9	.03	74	22	51	5.4	122	175	62	.2	22	500	275	175	788	7.0	30
Dec. 1-11, 16-31.....	121	9.0	.09	71	28	59	5.4	125	184	76	.2	23	534	292	190	846	7.4	20
Jan. 1-31, 1963.....	131	--	--	--	--	--	--	128	167	78	.6	24	530	282	177	842	7.4	--
Feb. 1-28.....	85.1	--	--	--	--	--	--	142	168	112	.2	27	604	306	189	981	7.3	--
Mar. 1-31.....	1738	--	--	--	--	--	--	80	76	32	.1	10	256	150	84	436	7.2	--
Apr. 1-30.....	309	--	--	--	--	--	--	134	118	37	.1	6.6	370	224	114	581	7.5	--
May 1-31.....	50.0	--	--	--	--	--	--	164	164	78	.3	14	527	280	145	861	7.1	--
June 1-30.....	17.9	--	--	--	--	--	--	115	223	120	.5	37	708	286	192	1160	6.8	--
July 1-31.....	17.8	--	--	--	--	--	--	118	208	97	.2	22	616	270	173	986	7.0	--
Aug. 1-31.....	11.4	--	--	--	--	--	--	114	183	130	.6	13	600	207	114	1010	6.8	--
Weighted average..	a226	--	--	--	--	--	--	96	100	42	0.2	12	326	185	106	537	7.2	--
Time-weighted average.....	--	--	--	--	--	--	--	124	163	82	0.3	19	518	252	150	840	7.1	--
Tons per day.....	--	--	--	--	--	--	--	66	69	29	0.1	8.4	224	--	--	--	--	--

a Mean discharge based on 365 days; mean discharge for 318 days of chemical analyses, 255 cfs.

Additional analyses of special determinations

Date of collection	Iron (Fe)	Manganese (Mn)	Phosphorus (P <sub>2</sub> O <sub>5</sub> )	Dissolved oxygen	Oxygen consumed		Alkyl sulfonate (ABS)	Threshold odor
					Filtered	Unfiltered		
Apr. 17, 1963.....	0.71	0.04	1.8	9.8	2	3	0.1	0
May 15.....	.34	.29	.71	5.8	4	6	.3	0
June 18.....	.61	.16	.22	4.0	47	5	.4	0
July 25.....	.19	.30	.11	5.3	65	6	.4	0
Aug. 30.....	.27	.38	2.2	1.0	2	6	.7	0
Sept. 25.....				24	7	7		0



July 22, 1963 (maximum conductance).....	10	54	215	116	.8	50	644	246	202	1080	6.7	--
July 24 (minimum conductance).....	89	232	133	64	.4	12	516	286	96	845	7.7	--
Aug. 28 (maximum conductance).....	6.9	102	245	168	.7	.6	766	186	70	1290	7.3	--
Aug. 6 (minimum conductance).....	17	114	134	106	.5	10	472	209	116	820	6.7	--
Sept. 26 (maximum conductance).....	4.3	140	296	220	1.0	1.6	968	212	98	1620	6.8	--
Sept. 13 (minimum conductance).....	7.0	112	187	108	.8	11	585	160	68	958	6.6	--

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

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.....	--	--	--	--	45	45	43	44	44	--	--	46	43	43	68	66	67	65	65	62	62	62	61	50	48	48	48	46	46	44	--	--		
November.....	44	--	--	45	45	43	44	44	44	--	--	46	43	43	44	43	43	43	42	40	41	41	--	38	36	36	36	36	35	--	42	--		
December.....	34	34	34	34	34	34	34	34	33	33	34	--	--	--	--	34	34	34	34	34	34	32	32	32	32	32	32	32	32	32	32	33	33	
January.....	33	33	32	32	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	
February.....	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	
March.....	32	32	32	32	32	32	33	34	34	34	34	34	34	33	34	34	36	36	35	33	34	34	35	35	35	35	35	36	36	36	38	34	30	
April.....	38	38	38	38	37	38	38	40	40	40	38	40	40	40	40	40	42	42	42	42	42	42	44	44	44	44	44	45	45	45	45	41	--	
May.....	45	49	50	50	50	50	50	50	50	50	50	50	50	50	50	52	52	52	52	52	52	52	52	55	56	56	57	57	57	57	57	52	--	
June.....	57	58	57	58	58	58	58	59	59	59	59	59	59	59	63	64	66	66	66	66	66	67	67	67	67	68	68	70	70	70	70	70	63	--
July.....	70	74	73	73	73	73	73	73	73	73	74	74	74	74	74	74	74	73	73	73	73	73	73	73	73	73	73	74	74	74	74	73	--	
August.....	70	74	75	74	75	74	75	75	75	75	75	75	75	74	73	74	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	--
September.....	70	70	70	70	70	70	70	69	69	69	70	69	69	69	69	69	68	68	67	67	67	67	67	67	67	67	67	67	65	65	65	65	68	--

STREAMS TRIBUTARY TO LAKE ERIE--Continued  
4-2080. CUYAHOGA RIVER AT INDEPENDENCE, OHIO  
LOCATION.--At gaging station at bridge 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 1963.

Sediment concentrations: October 1950 to September 1963.

EXTREMES, 1962-63.--Water temperatures: Maximum, 83°F July 2, 3, 28; minimum, 33°F on several days during December to February.

Sediment concentrations: Maximum daily, 1,640 ppm June 9; minimum daily, 10 ppm on many days during June and July.

Sediment loads: Maximum daily, 16,200 tons Nov. 10; minimum daily, 2 tons July 5, 11-13.

EXTREMES, 1948-49, 1950-63.--Water temperatures (1948-49, 1952-63): Maximum, 88°F Aug. 18, 1949; minimum, freezing point on many days during winter months.

Sediment concentrations (1950-63): Maximum daily, 4,800 ppm Aug. 21, 1960; minimum daily, 1 ppm Sept. 4, 10, 1955.

Sediment loads (1950-63): Maximum daily, 35,300 tons Apr. 26, 1961; minimum daily, less than 0.5 ton on several days during June and July.

REMARKS.--Diurnal fluctuations caused by powerplants above station. Flow affected by ice Dec. 8-17, Jan. 15 to Feb. 9, Feb. 22 to Mar. 2.

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

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

## STREAMS TRIBUTARY TO LAKE ERIE--Continued

4-2080. CUYAHOGA RIVER AT INDEPENDENCE, OHIO--Continued

Suspended sediment, water year October 1962 to September 1963  
(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..	212	37	21	241	31	20	188	30	15
2..	198	40	21	275	29	21	176	30	14
3..	190	16	8	266	28	20	162	--	13
4..	304	--	40	282	27	20	176	--	14
5..	238	21	13	253	25	17	201	--	16
6..	403	--	85	218	24	14	411	--	40
7..	291	14	11	183	22	11	352	--	75
8..	298	--	25	169	20	9	320	--	70
9..	304	49	40	160	19	8	300	--	20
10..	226	43	26	4810	1060	S 16200	290	--	20
11..	188	42	21	2960	536	S 5120	290	--	20
12..	162	37	16	1340	223	807	260	--	18
13..	178	29	14	930	155	389	240	--	16
14..	132	20	7	800	100	216	230	--	16
15..	113	16	5	755	54	110	230	--	16
16..	162	21	9	719	32	62	240	--	17
17..	387	--	120	890	120	A 290	250	--	16
18..	204	25	14	911	--	370	304	--	20
19..	164	16	7	665	47	84	376	--	40
20..	147	15	6	561	34	51	714	--	390
21..	158	15	6	493	32	42	533	--	60
22..	138	15	6	441	30	36	497	--	45
23..	149	15	6	362	30	29	461	--	45
24..	202	15	8	328	30	26	369	--	35
25..	226	15	9	282	30	23	372	--	35
26..	269	17	12	253	30	20	362	--	35
27..	304	27	22	253	30	20	311	--	30
28..	412	100	A 110	218	30	18	318	--	30
29..	569	--	310	209	30	17	311	--	30
30..	304	70	57	201	30	16	338	--	30
31..	226	35	21	--	--	--	282	--	25
Total	7458	--	1076	20428	--	24086	9864	--	1166
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..	295	30	170	19	180	--	--	--	6
2..	266	25	170	20	190	--	--	--	7
3..	266	25	180	75	204	--	--	--	8
4..	241	25	200	50	383	--	--	--	100
5..	232	20	210	25	1900	490	A 2500	--	2500
6..	235	20	220	18	5010	1060	S 14200	--	14200
7..	235	20	250	75	3390	580	5310	--	5310
8..	256	25	300	35	2920	430	3390	--	3390
9..	286	35	260	25	2990	350	2820	--	2820
10..	435	140	241	20	2350	250	1590	--	1590
11..	1310	1500	223	18	1900	122	626	--	626
12..	1350	1400	220	17	3310	1000	A 8900	--	8900
13..	935	380	201	15	5890	750	A 12000	--	12000
14..	683	240	190	13	4070	400	A 4400	--	4400
15..	550	170	178	12	3730	450	A 4500	--	4500
16..	430	120	173	11	3650	400	A 3900	--	3900
17..	360	100	173	11	5240	725	S 10600	--	10600
18..	310	80	173	13	4890	480	6340	--	6340
19..	300	75	335	95	4200	440	4990	--	4990
20..	300	70	321	45	6060	780	S 12800	--	12800
21..	260	60	262	25	5050	358	4880	--	4880
22..	230	45	230	20	4010	355	3840	--	3840
23..	220	40	210	15	3400	382	3500	--	3500
24..	200	35	200	12	3200	321	2770	--	2770
25..	190	30	190	9	2530	285	1950	--	1950
26..	180	25	180	7	2190	292	1730	--	1730
27..	180	25	180	6	2610	271	1910	--	1910
28..	180	25	180	6	2230	176	1060	--	1060
29..	170	20	--	--	1950	180	948	--	948
30..	170	20	--	--	1880	172	873	--	873
31..	170	20	--	--	1740	154	723	--	723
Total	11405	4845	6020	712	93247	--	123171	--	123171

S Computed by subdividing day.

A Computed from partly estimated-concentration graph.

## QUALITY OF SURFACE WATERS, 1963

## STREAMS TRIBUTARY TO LAKE ERIE--Continued

## 4-2080. CUYAHOGA RIVER AT INDEPENDENCE, OHIO--Continued

Suspended sediment, water year October 1962 to September 1963--Continued  
(Where concentrations are not reported, loads are estimated)

Day	APRIL			MAY			JUNE		
	Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment		Mean discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day		Mean concentration (ppm)	Tons per day
1..	1600	145	626	984	--	380	266	23	16
2..	1440	141	548	998	--	480	232	20	12
3..	1300	240	850	770	--	220	185	18	9
4..	2720	650	4800	630	--	150	159	16	7
5..	1580	251	1070	566	--	120	190	15	8
6..	1280	168	581	535	--	100	185	15	7
7..	1130	130	397	493	--	85	178	15	7
8..	1030	110	306	440	--	70	163	15	7
9..	930	101	254	395	57	61	571	1640	2820
10..	806	94	204	355	54	52	364	--	800
11..	702	87	165	395	48	51	430	--	750
12..	618	80	133	336	43	39	311	64	54
13..	556	73	110	302	40	33	290	35	27
14..	504	67	91	302	40	33	281	23	17
15..	458	60	74	275	40	30	246	22	15
16..	465	53	66	252	40	27	208	20	11
17..	482	51	66	240	40	26	172	20	9
18..	919	100	750	246	40	26	169	18	8
19..	838	--	440	235	40	25	159	16	7
20..	2600	--	4200	266	40	29	148	15	6
21..	1240	--	550	293	38	30	152	29	12
22..	878	--	210	260	35	24	125	10	3
23..	1050	--	170	240	30	19	120	10	3
24..	1160	--	230	229	27	17	108	10	3
25..	952	--	160	210	24	14	119	10	3
26..	790	--	100	190	20	10	120	10	3
27..	670	--	60	183	25	12	120	10	3
28..	563	--	35	215	--	25	122	10	3
29..	514	--	30	468	--	130	144	10	3
30..	754	--	150	355	--	50	128	10	3
31..	--	--	--	284	25	19	--	--	--
Total	30529	--	17426	11942	--	2387	6145	--	4636
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..	114	10	3	185		35	106		5
2..	119	10	3	156		25	94		4
3..	120	10	3	150		20	98		4
4..	106	10	3	185		25	141		6
5..	89	10	2	135		16	130		5
6..	100	10	3	144		16	111		4
7..	100	10	3	159		16	98		4
8..	101	10	3	190		14	161		6
9..	108	10	3	135		12	172		5
10..	107	10	3	144		12	198		5
11..	92	10	2	113		9	150		4
12..	95	10	2	97		7	344		150
13..	91	10	2	113		8	284		50
14..	124	--	14	142		11	151		8
15..	139	--	25	125		9	119		5
16..	111	--	4	109		7	95		4
17..	120	--	20	105		6	109		4
18..	164	--	25	159		50	118		4
19..	135	--	16	107		7	150		5
20..	186	--	30	198		40	144		5
21..	227	--	65	156		17	128		4
22..	141	--	18	139		9	124		4
23..	237	--	75	126		7	120		4
24..	174	--	19	142		8	144		4
25..	178	--	12	141		8	135		4
26..	142	--	8	113		6	144		4
27..	112	--	6	124		7	133		4
28..	126	--	7	116		6	126		3
29..	407	--	180	120		6	128		4
30..	420	--	300	118		6	128		4
31..	181	--	41	122		6	--		--
Total	4666	--	900	4228		431	4293		326

Total discharge for year (cfs-days).....210225

Total load for year (tons).....181162

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 1962 to September 1963  
 (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)	Sam- pling point	Water tem- per- ature (°F)	Discharge (cfs)	Sediment concen- tration (ppm)	Sediment discharge (tons per day)	Suspended sediment											Method of analysis
							Percent finer than size indicated, in millimeters											
							0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Mar. 13, 1963.....	0700			6550	726		29	40	53	67	83	89	95	98	100			SBWC
June 9,.....	0900			862	2330		44	46	62	77	91	95	98	100				SBWC
June 9,.....	0900			862	2330		20	28	45	67	91	92	98	100				SEN



STREAMS TRIBUTARY TO LAKE ERIE--Continued  
4-2122. GRAND RIVER AT PAINESVILLE, OHIO

LOCATION --At bridge on State Highway 535 in Painesville, Lake County, 2.2 miles upstream from mouth, and 8 miles downstream from Kellogg Creek.  
DRAINAGE AREA.--712 square miles (at mouth).

RECORDS AVAILABLE.--Chemical analyses: March 1950 to February 1952, October 1962 to September 1963.  
Water temperatures: March 1950 to February 1952, October 1962 to September 1963.

EXTREMES, 1962-63.--Dissolved solids: Maximum, 7,500 ppm Oct. 12-23; minimum 1,190 ppm Nov. 10-14.  
Hardness: Maximum, 3,940 ppm Oct. 12-23; minimum, 558 ppm Nov. 10-14.

Specific conductance: Maximum daily, 16,400 microhos Oct. 17; minimum daily, 322 microhos Mar. 20.  
Temperature: Maximum daily, 72.7° Fahrenheit; minimum, 41.2° Fahrenheit.

EXTREMES, 1950-52, 1962-63.--Dissolved solids: Maximum 18,500 ppm Aug. 9, 1950; minimum, 430 ppm Dec. 1-10, 1950.  
Hardness: Maximum, 9,280 ppm Aug. 9, 1950; minimum, 190 ppm Jan. 21-31, 1952.

Specific conductance: Maximum daily, 26,800 microhos Aug. 9, 1950; minimum daily, 309 microhos Dec. 8, 1950.  
Water temperatures: Maximum, 88°F July 28, Aug. 15, 1951, July 28, 1963; minimum, freezing point on several days during winter months.

REMARKS.--Values reported for iron are in solution when analyzed. Diamond Alkali Company and Painesville Sewage Disposal plant are located just above station; water highly polluted. Records of specific conductance of daily samples available in district office at Columbus, Ohio. Records of discharge are given for Grand River near Madison.

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (microhos at 25°C)	pH	Color at 20°C	Density (at 20°C)
														Calcium	Non-magnesium				
Oct. 12-23, 1962 a..	22.1	2.7	0.15	1510	16	1140	8.7	71	108	4260	0.1	5.8	7500	3840	3760	12800	7.0	17	1.002
Oct. 24-31, b.....	106	5.4	.01	673	47	559	6.2	81	85	2080	.2	4.1	5830	1870	1810	6620	7.4	12	---
Nov. 1-9.....	72.7	4.7	.02	1107	30	840	9.8	60	94	3150	.1	---	5580	2870	2820	9330	7.3	20	---
Nov. 10-14.....	1900	8.5	.03	197	16	143	5.4	75	56	530	.1	4.1	1190	558	496	2020	7.5	22	---
Nov. 15-30.....	325	6.2	.03	592	26	424	6.1	64	86	1650	.1	---	3190	1580	1530	5280	7.3	15	---
Dec. 1-8.....	216	5.3	.02	1080	35	849	7.3	65	106	3150	.0	---	5920	2840	2790	9380	7.3	10	---
Dec. 9-10, 12-31.....	409	6.4	.04	365	26	361	4.9	72	82	1760	.7	---	2460	1600	1540	5890	7.3	17	---
Jan. 1-31, 1963.....	134	---	---	---	---	---	---	70	360	3250	.1	---	6780	2890	2830	9680	7.0	---	---
Feb. 1-28.....	2184	---	---	---	---	---	---	58	150	1100	.2	---	2510	1030	982	3630	7.0	---	---
Mar. 1-31.....	657	---	---	---	---	---	---	70	120	1120	.0	---	2790	1160	1100	3890	7.3	---	---
Apr. 1-30.....	106	---	---	---	---	---	---	62	86	2740	---	---	5160	2440	2390	8000	6.8	---	---
May 1-31.....	79.3	---	---	---	---	---	---	65	78	2900	.1	---	5620	2550	2500	8800	6.7	---	---
June 1-30.....	12.7	---	---	---	---	---	---	68	44	3380	.2	---	5280	3140	3080	10400	6.8	---	1.001
July 1-31.....	15.1	---	---	---	---	---	---	84	84	3840	.5	---	7110	3400	3340	12600	6.8	---	---
Aug. 1-31.....	27.7	---	---	---	---	---	---	64	128	1330	0.2	---	2920	1250	1200	4340	7.1	---	1.001
Sept. 1-30.....	388	---	---	---	---	---	---	67	113	2490	0.2	---	4860	2260	2210	7730	6.8	---	---
Time-weighted average.....	---	---	---	---	---	---	---	67	134	1400	0.2	---	3060	---	---	---	---	---	---
Tons per day.....	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

a Includes 0.1 ppm ammonia nitrogen as NH<sub>4</sub> and 2.5 ppm nitrite (NO<sub>2</sub>).  
b Includes 0.1 ppm ammonia nitrogen as NH<sub>4</sub> and 0.00 ppm nitrite (NO<sub>2</sub>).

STREAMS TRIBUTARY TO LAKE ERIE--Continued  
4-2122. GRAND RIVER AT PAINESVILLE, OHIO--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Analyses based on monthly extremes of specific conductance and maximum monthly turbidity			Specific conductance (micro-mhos at 25°C)	pH	Turbidity	Density (120°)
													Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>	Calcium	Non-carbonate			
Oct. 17, 1962 (maximum conductance)...	25							39	150	5800			--	5520	5490	16400	6.8	--	--
Nov. 12 (minimum conductance).....	2320							58	48	285	0.0	4.1	738	348	300	1160	7.5	--	--
Jan. 29, 1963 (maximum conductance)...	140							87	106	3400	.8	--	7020	3240	3170	10100	7.1	--	--
Jan. 13 (minimum conductance).....	1400							70	61	460	.2	5.2	1180	500	442	1740	7.6	--	--
Feb. 1 (maximum conductance).....	140							58	359	5490	.1	--	10300	5130	5080	15600	7.2	--	1.003
Feb. 9 (minimum conductance).....	200							90	330	2300	.2	--	5030	1990	1920	7200	7.4	--	--
Feb. 3 (maximum turbidity).....	150							--	--	--	--	--	--	--	--	--	--	20	--
Mar. 2 (maximum conductance).....	80							88	--	4750	.0	--	9240	4520	4450	13400	7.0	--	--
Mar. 20 (minimum conductance).....	6870							36	25	61	.2	3.3	244	104	74	332	7.3	--	--
Mar. 18 (maximum turbidity).....	10100							--	--	--	--	--	--	--	--	--	--	700	--
Apr. 19 (maximum conductance).....	228							80	200	2150	.0	--	5090	2180	2110	7100	6.8	--	--
Apr. 6 (minimum conductance).....	1500							64	43	228	.1	3.1	724	268	215	970	7.0	--	--
May 22-23 (maximum conductance).....	82							40	125	5300	--	--	9300	4920	4870	14400	9.3	--	--
May 5-6 (minimum conductance).....	175							70	55	940	--	--	2100	892	834	3170	7.3	--	--
June 1-2 (maximum conductance).....	120							50	100	4240	.1	--	7700	3760	3720	12400	6.8	--	1.002
June 16 (minimum conductance).....	142							65	63	1300	.1	--	2690	1160	1110	4300	7.1	--	--
June 15 (maximum turbidity).....	205							--	--	--	--	--	--	--	--	--	--	10	--

a Sample contained 28 ppm carbonate (CO<sub>3</sub>) and 2 ppm hydroxide (OH).

STREAMS TRIBUTARY TO LAKE ERIE--Continued  
4-2122. GRAND RIVER AT PAINESVILLE, OHIO--Continued

Analyses based on monthly extremes of specific conductance and maximum monthly turbidity--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Turbidity (at 120")	Density (at 120")
														Calcium	Non-carbonate				
July 30, 1963 (maximum conductance)....	36							62	64	4770	0.3	--	8610	4410	4360	13900	6.8	--	1.003
July 31 (minimum conductance).....	140							64	68	2120	.2	--	4260	2040	1990	6810	6.6	--	--
Aug. 27 (maximum conductance).....	12							70	81	4790	.3	--	8300	4470	4410	13500	6.5	--	1.003
Aug. 2-3 (minimum conductance).....	58							48	71	1460	.2	--	3640	1160	1120	4730	6.7	--	--
Sept. 14-15 (maximum conductance).....	2.4							44	108	5090	.5	--	9010	4960	4920	14600	6.0	--	1.004
Sept. 20 (minimum conductance).....	6.6							82	76	2720	.2	--	5080	2320	2250	8460	6.3	--	--

Additional analyses of special determinations

Date of collection	Iron (Fe)	Manganese (Mn)	Phosphorus as P <sub>2</sub> O <sub>5</sub>	Dissolved oxygen		Oxygen consumed		Alkyl sulfonate (ABS)	Threshold
				Parts per million	Percent saturation	Filtered	Unfiltered		
Apr. 17, 1963....	0.32	0.24	0.24	8.4	88	1	2	0.3	0
June 17.....	.21	.14	.27	6.2	88	4	5	.3	C-8
June 19.....	.11	.10	.04	6.4	78	7	7	.3	A-8
July 26.....	.06	.05	.06	4.2	56	4	6	.4	A-8
Aug. 30.....	.06	.60	.00	6.4	84	7	6	.4	0
Sept. 25.....	.04	.06	.16	6.3	79	5	6	.3	0

STREAMS TRIBUTARY TO LAKE ERIE--Continued  
 4-2122. GRAND RIVER AT PAINESVILLE, OHIO--Continued  
 Temperature (°F) of water, water year October 1962 to September 1963  
 (Once-daily measurement, usually at 0830)

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.....	52	51	55	54	55	54	54	53	58	56	--	76	75	75	76	76	73	70	70	72	70	64	65	52	46	49	50	50	52	--	48	
November.....	47	46	49	48	52	51	58	37	35	33	--	32	32	32	32	33	33	34	33	33	35	34	33	35	34	34	35	36	38	36	35	37
December.....	34	36	37	38	38	40	40	42	40	40	35	34	35	35	33	35	36	35	37	34	35	35	34	33	33	38	34	33	40	35	36	
January.....	38	42	40	38	40	42	44	36	38	36	38	38	40	42	40	30	42	42	45	38	40	38	38	38	38	34	36	38	--	--	39	
February.....	40	38	40	40	40	42	38	36	35	34	35	34	35	35	33	35	35	36	34	35	34	35	35	35	40	40	35	38	43	45	55	38
March.....	55	58	60	45	50	50	52	52	53	51	50	52	50	52	54	54	56	55	55	58	60	58	52	58	58	57	58	60	62	62	--	55
April.....	54	55	60	58	60	62	64	65	68	68	67	68	67	68	69	68	70	68	70	70	69	68	66	67	69	70	70	70	70	72	66	78
May.....	74	75	75	78	80	78	78	80	82	80	78	74	73	72	74	75	77	78	78	77	74	76	77	78	80	82	82	82	84	85	--	78
June.....	85	87	83	84	84	85	80	78	80	80	82	82	85	82	83	82	85	84	87	85	86	86	85	87	86	85	86	88	85	87	84	84
July.....	85	81	82	83	83	85	85	85	87	87	84	84	84	85	82	83	82	83	83	82	83	82	83	82	83	82	83	82	83	82	82	82
August.....	83	85	83	80	80	81	80	82	81	82	83	82	82	78	75	75	78	80	78	80	80	78	78	75	74	78	76	78	76	75	--	79
September.....	83	85	83	80	80	81	80	82	81	82	83	82	82	78	75	75	78	80	78	80	80	78	78	75	74	78	76	78	76	75	--	79



## STREAMS TRIBUTARY TO LAKE ONTARIO--Continued

4-2375. SENECA RIVER AT BALDWINVILLE, N. Y.

LOCATION.--At lock 24, Baldwinsville, Onondaga County, 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 1963.

**EXTREMES, 1962-63.**--Water temperatures: Maximum, 81°F July 29, 30; minimum, freezing point on many days in February and March.

EXTREMES, 1957-63.--Water temperatures: Maximum, 81°F July 29, 30, 1963; minimum, freezing point on many days during winter months.

Temperature °F of water, water year October 1962 to September 1963

Once-daily measurement at approximately 0800

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	.....	30	40	60	80	23	62	47	61	59	59	40	60	59	44	59	44	44	42	41	59	57	57	52	54	42	52	40	50	50	50	58	
November	.....	30	40	60	80	23	62	47	61	59	59	40	60	59	44	59	44	44	42	41	59	57	57	52	54	42	52	40	50	50	50	54	
December	.....	31	40	39	40	40	42	41	--	--	38	38	34	34	33	--	--	33	34	34	33	--	--	--	--	--	34	33	34	--	--	--	
January	.....	--	33	33	33	--	34	34	34	34	34	34	--	--	34	33	33	33	33	--	--	33	33	--	--	--	--	--	--	--	--	--	
February	.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	34	--	32	32	33	32	32	32	--	--	--	32	
March	.....	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	34	34	--	32	32	33	32	32	32	32	32	32	32	
April	.....	30	45	46	47	43	--	47	45	45	43	--	--	--	47	49	51	53	53	52	51	51	52	52	51	51	51	51	51	52	53	49	
May	.....	31	52	55	54	56	56	55	57	59	60	54	56	57	58	59	60	59	60	59	60	59	61	60	59	61	60	59	61	61	62	62	
June	.....	30	65	68	69	70	72	72	74	73	73	72	70	69	68	67	68	68	69	70	72	70	68	67	68	69	71	73	75	77	78	78	
July	.....	31	77	78	76	70	72	74	74	72	72	72	73	74	76	74	73	74	74	76	77	75	76	77	77	78	78	80	80	81	81	80	76
August	.....	30	78	78	77	75	76	76	75	75	74	74	72	71	71	71	71	71	71	71	70	70	70	72	72	72	72	71	70	71	70	73	
September	.....	30	69	71	70	70	69	68	67	69	70	69	68	67	66	66	66	66	66	66	66	65	65	64	62	62	62	62	62	60	--	66	



STREAMS TRIBUTARY TO LAKE ONTARIO--Continued  
4-2605. BLACK RIVER AT WATERTOWN, N. Y.

LOCATION.--At dam at Watertown Municipal Powerplant, Watertown, Jefferson County, and about 1.6 miles upstream from gaging station.  
DRAINAGE AREA.--1,876 square miles, approximately.  
RECORDS AVAILABLE.--Chemical analyses: October 1955 to September 1956.  
Water temperatures: October 1955 to September 1959, July 1962 to September 1963.  
EXTREMES, 1962-63.--Water temperatures: Maximum, 81°F July 29; minimum, 34°F on many days in January, February, and March.  
EXTREMES, 1959-59, 1962-1963.--Water temperatures: Maximum, 81°F July 29, 1963; minimum, freezing point on many days during winter months.

Temperature °F of water, water year October 1962 to September 1963  
Once-daily measurement at approximately 0930

Month	Day																															Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
October.....	56	57	58	59	60	59	59	60	59	59	59	59	59	59	57	57	59	58	57	--	--	55	54	53	52	49	48	46	46	45	44	55
November.....	44	44	43	42	43	42	42	42	--	--	43	42	41	41	41	41	41	--	41	41	41	41	41	40	39	39	39	40	41	41	--	41
December.....	41	40	41	41	41	40	40	39	39	38	37	35	35	35	35	35	35	35	35	35	35	35	--	35	35	35	35	35	35	35	35	37
January.....	--	35	35	35	35	35	35	35	35	35	35	35	--	35	35	35	35	35	35	--	35	35	35	34	34	34	--	34	34	34	34	35
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	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	34	34
April.....	37	39	40	38	39	39	41	42	42	42	42	43	45	46	47	48	50	52	53	--	51	50	49	49	49	48	50	52	54	--	45	
May.....	55	51	52	51	--	56	57	58	58	55	52	53	55	56	56	58	60	--	60	58	59	58	55	56	--	58	60	61	62	57	57	57
June.....	63	--	62	68	71	72	73	74	74	72	70	68	65	65	64	--	64	65	66	68	67	63	--	66	67	68	70	72	75	76	--	68
July.....	77	79	77	75	74	--	73	72	70	70	69	71	73	--	75	72	72	73	74	74	--	75	74	77	78	79	80	--	81	79	76	75
August.....	76	75	74	--	73	72	72	74	74	73	71	69	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
September.....	--	--	59	69	68	68	67	--	68	69	68	68	65	64	--	64	64	65	66	65	63	--	60	59	59	59	59	60	--	58	--	--





## MISCELLANEOUS ANALYSE: OF LAKES AND STREAMS IN ST. LAWRENCE RIVER BASIN

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> ) (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Boron (B)	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Sodium adsorption ratio	Specific conductance (micro-mhos at 25°C)	Col- or pH	
																	Calcium, magnesium	Non-carbonate				
Sept. 25, 1962.....	158	10		0.44	0.04	9.6	3.7	2.0	0.4	34	0	0.0	0.4	0.9	0.05	98	39	11	0.1	73	6.8	150
Feb. 27, 1963	4.3	15		.34	--	16	5.4	5.6	.6	64	0	5.0	.3	1.2	.05	102	62	10	.3	149	7.2	30
Apr. 17.....	199	6.6		.21	.03	6.9	1.9	1.6	.8	19	0	.1	.3	2.3	.03	67	25	9	.1	59	6.9	90

## STREAMS TRIBUTARY TO LAKE SUPERIOR

4-145. BAPTISM RIVER NEAR BEAVER BAY, MINN.

## MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN ST. LAWRENCE RIVER BASIN

Chemical analyses, in parts per million, water year October 1962 to September 1963

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (PO <sub>4</sub> )	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Coliforms per million	Turbidity per cent
																Calcium	Non-magnesium				

## STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued

## 4-442. CARP CREEK AT ISHPEMING, MICH.

July 20, 1961	6	11	0.48	0.08						91	12	3.5		0.9				179	7.0	25	--
Aug. 24, 1961	30	5.8	.34	.09						27	10	2.0		0.7		76	34	12	76	6.6	50
Nov. 14, 1962	8	19	.38	.16						92	16	4.0		1.2		138	86	10	193	7.5	45
Apr. 10, 1963	18	35	.48	.12						65	14	7.0		--			58	5	152	7.1	50

## 4-442.1. CARP CREEK NEAR ISHPEMING, MICH.

Oct. 5, 1961	10	9.6	0.86	0.30	--	--	--	--	--	96	28	13	0.1	3.6		192	122	40	387	6.8	30
Nov. 14, 1962	35	6.0	.48	.06	16	3.3	3.2	1.5		44	18	8.0	0.1	1.2		124	20	124	6.8	50	10
Nov. 24, 1962	10	11	.72	.06	28	7.9	6.3	2.0		94	27	8.0	0.1	6.2		147	103	26	238	6.9	50
Apr. 10, 1963	20	8.3	1.0	.35	--	--	--	--	--	64	23	8.0	10	--	--	81	28	196	6.6	30	4

## 4-443. GOLD MINE CREEK NEAR ISHPEMING, MICH.

Aug. 24, 1961	3	13	0.22	9.12						158	20	0.5		0.2		174	145	16	277	7.5	11
Apr. 24, 1962	15	7.8	.24	.06						46	14	1.0		0.4		98	53	16	108	6.8	58
Nov. 23, 1962	5	21	.48	.12						182	18	2.0		--		176	180	14	246	7.0	1
Apr. 5, 1963	12	13	.46	.12						80	18	2.0		--		--	84	18	172	7.0	30

## 4-444. CARP RIVER NEAR NEGAUNEE, MICH.

July 20, 1961	70	5.2	2.0	0.13	22	5.0	4.0	2.0		75	15	4.0	0.2	1.9		112	76	14	171	6.9	30
Aug. 24, 1961	51	7.2	.39	.14	25	5.8	3.9	1.6		98	12	4.5	0.2	0.8		124	86	6	188	7.1	21
Apr. 25, 1962	45	4.8	.27	.17	8.1	1.4	1.8	1.0		21	10	1.0	0.8	0.2		50	26	9	57	6.4	10
Nov. 14, 1962	25	10	.50	.06	--	--	--	--	--	192	26.6	2.0	--	1.1		160	101	15	245	7.4	3
Apr. 10, 1963	29	18	.79	.59	--	--	--	--	--	92	8.0	2.0	--	--	--	--	45	2	112	7.0	30

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 4-578. MIDDLE BRANCH ESCANABA RIVER AT HUMBOLDT, MICH.

July 20, 1961	9.7	12	1.9	0.22	13	2.9	1.4	1.0		50	7.0	0.5	0.1	0.4		68	44	4	98	7.4	50
Oct. 2, 1961	28	9.3	.83	.28	--	--	--	--	--	30	11.8	1.0	--	0.6		43	13	8	76	6.8	79
Nov. 24, 1962	326	9.1	.86	.00	--	--	--	--	--	38	13	1.5	0.9	0.9		89	36	5	86	7.1	85
Jan. 14, 1963	24	20	.95	.00	--	--	--	--	--	34	8.0	1.5	0.4	0.4		64	36	8	76	6.7	35
Oct. 2, 1961	9.7	12	1.9	0.22	13	2.9	1.4	1.0		50	7.0	0.5	0.1	0.4		68	44	4	98	7.4	50
Nov. 24, 1962	326	9.1	.86	.00	--	--	--	--	--	38	13	1.5	0.9	0.9		89	36	5	86	7.1	85
Jan. 14, 1963	24	20	.95	.00	--	--	--	--	--	34	8.0	1.5	0.4	0.4		64	36	8	76	6.7	35

## 4-578. MIDDLE BRANCH ESCANABA RIVER AT HUMOLDT, MICH.--Continued

Apr. 4, 1963.	452	5.4	--	--	--	--	--	--	--	--	--	--	--	40	--	65	--	1
Apr. 5,.....	378	5.8	--	--	--	--	--	--	--	--	--	--	14	40	--	65	--	1
Apr. 9,.....	158	--	--	--	--	--	9.2	1.0	--	--	--	--	20	4	55	6.6	55	--
July 26,.....	10	--	--	--	--	--	56	--	--	--	--	--	46	0	103	7.0	65	3.2

## 4-578.2. MIDDLE BRANCH ESCANABA RIVER NEAR GREENWOOD, MICH.

Apr. 25, 1962	450	5.7	0.29	0.03				8	8.8	1.0	0.8	56	16	10	38	6.0	70	0.3
Nov. 14,.....	35	12	.87	.00				38	14	.5	1.1	70	38	7	88	6.8	90	2
Apr. 9, 1963.	240	6.2	.50	.15				18	8.8	2.0	--	--	19	4	56	6.3	20	1

## 4-578.5. BLACK RIVER NEAR HUMOLDT, MICH.

July 20, 1961	1.5	3.8	a0.91	a.11				8	3.8	1.5	2.7	--	--	36	5.6	180	--	--
AUG. 24.....	.1	6.4	.57	a.00				12	6.8	1.0	.4	68	14	4	36	6.3	170	2
APR. 26, 1962	55	4.8	.85	.04				2	8.0	1.0	1.1	71	10	8	27	5.2	100	.6
NOV. 15.....	7	13	1.0	.05				14	8.6	.5	1.7	61	16	4	44	6.4	180	1
APR. 9, 1963.	30	6.1	.59	.13				6	6.4	2.0	--	10	5	31	5.8	100	--	.4

## 4-578.55. LAKE LORY OUTLET (UPPER STATION TRIBUTARY TO BLACK RIVER) NEAR HUMOLDT, MICH.

Oct. 2, 1961.	1	10	0.34	0.11	--	--	54	10	1.0	0.4	96	90	6	117	7.0	55	--	4
Apr. 26, 1962	5	8.0	2.0	.36	--	--	25	16	1.0	.9	69	27	6	90	6.3	46	110	--
Nov. 15,.....	1	35	.47	.05	--	--	72	14	3.0	1.0	129	61	2	150	7.1	100	3	--
Jan. 14, 1963	1	--	--	--	--	--	78	9.8	4.5	.2	108	70	6	153	7.1	25	2	--
Apr. 5,.....	5	--	--	--	--	--	--	--	--	--	25	--	--	66	--	65	1	--

## 4-578.6. MCKINNON LAKE OUTLET NEAR HUMOLDT, MICH.

Oct. 2, 1961.	3	9.6	2.7	3.6			32	17	2.0	0.6	94	32	6	102	6.7	35	8.9	75	190
Apr. 26, 1962	10	10	3.1	.88			46	17	5.0	6.1	103	49	12	148	6.5	30			210
Nov. 15,.....	1.5	39	.28	.05			88	44	8.0	38	244	128	56	338	7.8	60			4
Jan. 14, 1963	4						90	49	8.0	27	195	117	43	330	7.5	25			2
Apr. 5,.....	6	11								21	62			168		40			10
Apr. 9,.....	3	11	7.1	.10			24	37	9.0	45	182	89	70	287	6.0	30			8
Apr. 24,.....	1	11					90	25	7.0			100	26	253	7.0	45			15

a In solution when analyzed.

MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

[illegible]

# STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

4-578.7. LAKE LORY OUTLET (LOWER STATION TRIBUTARY TO BLACK RIVER) NEAR REPUBLIC, MICH.

[illegible]

4-579.8. BLACK RIVER NEAR GREENWOOD, MICH.

	9	9.0	1.5	0.17	--	--	38	7.2	1.0	--	--	77	6.8	65	--	3
July 19, 1961	5	7.6	1.1	15	8.6	2.9	41	8.0	1.0	0.0	34	0	79	6.9	46	8.0
Aug. 24, .....	250	6.0	.66	17	4.6	.6	7	8.8	1.0	1.2	52	14	35	6.1	50	10.4
Sep. 28, 1962	22	11	.92	.00	--	--	22	16	1.5	4.5	82	30	74	6.5	130	--
Nov. 14, ....	125	14	.62	.18	--	--	20	9.2	3.0	--	12	4	62	6.3	80	--
Apr. 9, 1963.					--	--					21					1

4-580.2. WEST BRANCH CREEK NEAR NATIONAL MINE, MICH.

	5.5	8.2	0.65	0.02	6.5	1.3	2.0	0.2	25	4.6	0.0	0.6		36	22	1	50	6.6	50	0.7
July 19, 1961																				
60 Apr. 25, 1962	60	5.5	1.6	.06					11	9.2	1.0	1.0		38	17	8	38	6.0	90	4
Nov. 14, .....	10	1.2	.00						38	9.2	1.5	1.4		71	36	5	74	7.3	100	
Apr. 9, 1963.	30	6.7	.93	.13					24	8.0	3.0	---		60	25	6	60	6.4	60	1
July 11, .....	3.0	---	---	---					63	6.8	1.0	---		---	53	2	11	6.7	35	2

4-580.5, MIDDLE BRANCH ESCANABA RIVER NEAR SUOMI, MICH.

[illegible]



## MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Aluminum (Al)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Calcium sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (PO <sub>4</sub> )	Disolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>	Specific conductance (micro-mhos at 25°C)	pH	Col or mil-lion	Dissolved oxygen	Per cent saturation	Turbidity
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued																								
4-583.37. GOOSE LAKE INLET NEAR PALMER, MICH.																								
Apr. 10, 1963	8	20	0.32	0.12	33	7.8	6.2	1.6	66	68	64	69	6.0	0.8	185	115	60	263	7.6	20	3			
May 7, 1963	4	7.0			37	6.6									177	120	67	261	7.3	25	2			
4-583.5. GOOSE LAKE INLET NEAR NEGAUNEE, MICH.																								
Nov. 7, 1961	5	5.8	40.09	94	14	8.3	15	5.9	107	204	155	21	21	3.0	427	292	205	632	7.3	15				120
May 7, 1963	10			75						82					348	221	154	512	7.3					
4-584. GOOSE LAKE OUTLET NEAR SANDS STATION, MICH.																								
Nov. 6, 1961	25		40.36	31	6.4		4.3	1.7		65	50	5.5	5.0	0.5	148	104	51	237	7.3	8				2
July 26, 1963	8.9									78	34					92	28	211	6.8					
4-621. PESKEE RIVER NEAR MICHIGAMME, MICH.																								
July 20, 1961	11	6.0	0.46	0.07						36	5.6	0.5		0.4				70	6.9	35				--
Apr. 25, 1962	1040	4.0	0.26	0.04						5	7.2	2.0	1.0	1.0		42	11	26	5.7	90				0.5
Nov. 14, 1963	55	7.2	0.59	0.00						20	8.8	1.0	1.4	1.4		62	20	52	6.6	140				4
Apr. 5, 1963	1270	--	--	--	--	--	--	--	--	--	--	--	--	--	--	12	--	30	--	75				1
Apr. 8, 1963	718	--	--	--	--	--	--	--	--	--	--	--	--	--	--	28	--	30	--	65				1
Apr. 10, 1963	430	4.6	0.34	0.00						10	5.2	1.0		--	--	--	11	3	30	6.0	65			2
4-622.2. SPUR RIVER AT MICHIGAMME, MICH.																								
Aug. 24, 1961	7	5.9	0.47	0.11						33	9.2	0.5	0.4		0.4		61	31	4	72	6.8	24		1
Apr. 25, 1962	120	5.5	0.27	0.08						10	19	1.0	0.1	0.1			63	27	19	66	6.3	75	9.6	83
Nov. 14, 1963	20	18	0.21	0.00						34	7.8	0.5	0.6		--	--	93	48	20	121	7.1	100		1
Apr. 10, 1963	100	6.5	0.62	0.40						16	26	3.0		--	--	--	35	22	87	7.0	55			1
4-623. MICHIGAMME RIVER AT REPUBLIC, MICH.																								
July 20, 1961	300	5.3	0.09	0.00						18	6.2	0.5	0.2	0.7			41	19	4	49	6.6	35	7.4	85
Apr. 26, 1962	1620	5.4	0.20	0.00						12	9.0	2.0	0.9	0.9			42	17	7	40	6.2	50		10
Nov. 15, 1963	283	6.0	0.28	0.00						20	9.0	0.5	0.8	--	--	--	40	22	6	53	7.0	100		5
Apr. 9, 1963	1560	39	0.31	0.14						36	4	8.4	3.0		--	--	31	0	87	8.3	65			2

## 4-623.2. TROUT FALLS CREEK NEAR REPUBLIC, MICH.

July 20, 1961	4	9.2	a.24	a.05				70	8.0	0.5	0.8	--	--	--	125	7.5	44	--
Apr. 26, 1962	100	5.5	.30	.04				15	10	1.0	.9	54	23	11	49	6.2	80	0.4
Nov. 15, 1962	15	17	.60	.02				50	12	1.5	.9	97	47	6	104	7.4	120	2
Apr. 9, 1963	70	8.0	.39	.15				24	11	1.0	--	--	29	10	65	6.4	65	1

## STREAMS TRIBUTARY TO LAKE ERIE

## 4-1780. ST. JOSEPH RIVER AT NEWVILLE, IND.

Aug. 15, 1962								314	46	12			287	29	585	7.7	9	20
Mar. 21, 1963								113	58	18			169	76	372	7.4		0.0

## 4-1809.4. ST. MARYS RIVER AT ST. MARYS, OHIO

Mar. 20, 1963								113	40	16			156	64	351	7.3		0.0
July 22, 1963							60	30	258	80	43	2.5	420	273	62	679	7.6	

## 4-1815. ST. MARYS RIVER AT DECATUR, IND.

Oct. 11, 1962	16.8							252	367	155			499	292	1560	7.6		10
Nov. 20, 1962	70	--						--	--	--			581	--	1820	--		0.5
Feb. 14, 1963		--						116	62	22			195	100	441	7.2		.0
Mar. 20, 1963		--																

## 4-1830. MAUMEE RIVER AT NEW HAVEN, IND.

Aug. 15, 1962	198							264	125	38			299	82	760	7.7	17	8
Feb. 15, 1963															958			1.0

## 4-1845. BEAN CREEK AT POWERS, OHIO

Feb. 15, 1963	15														721			0.3
Mar. 21, 1963															509			.0
July 23, 1963							80	25	300	70	19	1.5	391	303	56	625	7.9	--

a in solution when analyzed.



## MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Discharge (cfs)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Lithium (Li)	Bicarbonate (HCO <sub>3</sub> )	Carb sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Phosphorus (PO <sub>4</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH or millimolar ratio	Dissolved oxygen	Biochemical oxygen demand (BOD)	Organics		
														Calcium, magnesium	Non-magnesium					Phenols as benzene C <sub>6</sub> H <sub>5</sub> sulfonate (MS)	Alkyl benzenes C <sub>6</sub> H <sub>5</sub> OH (MS)	
STREAMS TRIBUTARY TO LAKE ERIE--Continued																						
4-1850. TIFFIN RIVER AT STRYKER, OHIO																						
Feb. 15, 1963	20																778				0.3	
Mar. 21, 1963		75	24				286	62	32		3.5			385	286	51	776				0.0	
July 23, 1963																	649	7.4			--	
4-1855. TIFFIN RIVER NEAR BRUNERSBURG, OHIO																						
Feb. 15, 1963	26																848				0.5	
Mar. 19, 1963		63	18				202	62	18		11		318	231	66	516	389				0.0	
July 23, 1963																	516	7.4			--	
4-1875. OTTAWA RIVER AT ALLENTOWN, OHIO																						
Feb. 14, 1963	18						--	--	--								2320	--			2.9	
Mar. 19, 1963		65	28				70	95	38					203	146	555	555	7.1			0.2	
July 22, 1963							414	12	317	66	1.0		754	277	0	1510	1510	8.3			--	
4-1939.9. MAUMEE RIVER AT ANTHONY WAYNE BRIDGE AT TOLEDO, OHIO																						
May 29, 1963				21			168	112	29		8.7	0.58	394	254	116	571	7.1	10	7.8	81	3.3	0.0
June 5, 1963							142	124	32					234	118	568	7.3	6.1	70		20	
4-1940.24. MAUMEE RIVER AT BUOY 49, AT TOLEDO, OHIO																						
May 29, 1963				25			148	100	33		15	1.4	364	232	111	563	7.2	27	3.8	40	1.8	0.2
May 29, 1963				25			152	107	34		17	1.4	398	244	120	586	7.2	15	3.9	41	4.8	0.1
June 5, 1963				--			176	115	34		--	--	--	248	104	613	6.8	--	3.7	42	--	40

## 4-1940.26. MAUMEE RIVER AT BUOY 48, AT TOLEDO, OHIO

May 29, 1963.	152	94	34	13	1.1	354	228	104	555	7.1	12	3.8	40	4.2	0.2	65
May 29.....	158	106	32	16	1.2	404	242	113	582	7.5	16	3.6	38	4.8	.2	30
June 5.....	160	113	34	--	--	--	246	115	593	6.6	--	4.3	49	--	--	--

## 4-1940.5. MAUMEE RIVER AT BUOY 39, AT TOLEDO, OHIO

Oct. 4, 1962.	112	42	28	3.6	0.42	140	48	372	7.1	8.5	85	4.3	0.1			
May 29, 1963.	122	47	28	6.6	.35	242	158	58	388	7.0	8	8.7	90	4.2	0.0	85
June 5.....	120	55	28	--	--	--	164	66	412	6.8	7.3	83	--	--	--	--

## 4-1940.6. MAUMEE RIVER AT BUOY 33 AT TOLEDO, OHIO

May 29, 1963.	124	48	30	6.3	0.42	222	160	58	389	6.8	6	8.7	90	1.0	0.0	75
June 5.....	125	44	27	--	--	--	154	52	385	6.8	7.5	84				

## 4-1980. BLANCHARD RIVER NEAR FINDLAY, OHIO

Nov. 20, 1962						512	154	76	733							--
Feb. 14, 1963	20								1140							1.0
Mar. 18.....									351	7.0						.1

## MISCELLANEOUS ANALYSES OF STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

Chemical analyses, in parts per million, water year October 1962 to September 1963--Continued

Date of collection	Discharge (cfs)	Silica (SiO <sub>2</sub> )	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO <sub>3</sub> )	Carbonate (CO <sub>3</sub> )	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Fluoride (F)	Nitrate (NO <sub>3</sub> )	Dissolved solids (residue at 180°C)	Hardness as CaCO <sub>3</sub>		Specific conductance (micro-mhos at 25°C)	pH	Color	Turbidity ABS	
																Calcium	Non-magnesium					
STREAMS TRIBUTARY TO LAKE ERIE--Continued																						
CATARAUGUS CREEK AT ARCADE, N. Y.																						
Apr. 17, 1963.	42	1.8	0.03	0.00	42	5.5	3.3	1.0	124	0	20	7.4	0.1	2.6	156	128	26	259	8.0	6	0.0	0.4
May 7.....	29	1.5	.02	.01	45	7.6	3.0	1.0	143	0	20	7.8	.1	2.3	166	144	27	288	7.8	5	0.0	.4
July 2.....	14.2	3.2	.01	.03	43	6.9	4.1	1.4	143	0	17	8.8	.1	1.5	165	136	19	288	8.1	5	0	.3
4-2134.1. CATARAUGUS CREEK NEAR ARCADE, N. Y.																						
Apr. 17, 1963.	102	2.8	0.01	0.01	42	5.6	4.1	1.2	125	0	18	8.0	0.1	5.2	162	128	26	278	7.7	4	0.0	0.4
May 7.....	70	1.7	.03	.01	44	7.4	3.9	1.1	140	0	18	8.8	.2	3.4	172	141	26	288	7.9	4	0	.5
July 2.....	30.5	2.8	.02	.01	44	6.7	6.0	1.8	145	0	18	9.7	.1	2.3	170	138	19	295	8.0	4	.1	.0
CATARAUGUS CREEK NEAR GOWANDA, N. Y. (ZOAR BRIDGE)																						
Apr. 17, 1963.	A500	3.4	0.07	0.01	48	6.3	3.8	1.2	136	0	28	7.7	0.2	5.7	180	146	35	302	7.8	5	0.0	0.8
May 7.....	307	1.6	.03	.01	46	7.9	3.6	1.3	140	0	29	8.0	.0	2.9	184	148	33	311	7.9	4	0	.8
July 5.....	110	3.3	.05	.01	51	8.0	5.0	1.6	157	0	32	10	.1	1.9	206	160	32	339	7.8	4	0	.3
4-2134.9. SOUTH BRANCH CATARAUGUS CREEK NEAR OTTO, N. Y.																						
Apr. 17, 1963.	25	2.1	0.04	0.00	31	2.6	3.2	1.3	80	0	20	6.1	0.1	2.0	114	88	23	194	7.7	5	0.0	0.3
May 7.....	19	1.2	.05	.00	32	4.9	3.2	1.3	97	0	20	6.8	.1	1.3	123	100	21	215	7.6	6	0	.4
July 5.....	2.83	4.1	.03	.01	53	6.3	4.9	1.8	163	0	27	9.0	.1	.9	201	158	25	336	7.4	3	0	.6
CATARAUGUS CREEK ABOVE GOWANDA (BELOW POINT PETER BROOK), N. Y.																						
Apr. 17, 1963.		3.6	0.87	0.02	45	6.0	4.1	1.3	122	0	29	7.8	0.1	4.8	177	137	37	296	7.6	4	0.0	0.4
May 7.....		1.4	.04	.01	45	8.0	3.7	1.2	135	0	30	7.3	.1	2.5	174	146	35	299	7.9	4	0	.4
July 5.....		4.8	.04	.00	51	7.8	5.0	1.6	159	0	24	7.4	.0	1.8	201	159	29	339	7.6	3	0	.5
4-2135. CATARAUGUS CREEK AT GOWANDA (AT GAGE), N. Y.																						
Apr. 17, 1963.	539	3.2	0.05	0.00	50	6.2	6.3	1.2	134	0	33	11	0.1	7.9	193	151	41	330	7.3	7	0.0	0.6
May 7.....	370	1.7	.03	.00	52	9.2	16	1.8	135	0	46	25	.1	11	233	168	57	423	6.9	4	0.0	0.0
July 5.....	135	3.4	.03	.00	57	8.4	24	1.8	162	0	41	37	.0	6.9	287	177	44	462	7.1	6	.1	.6
* Estimated.																						

\* Estimated

## 4-2142. EIGHTEENMILE CREEK AT NORTH BOSTON, N. Y.

May 7, 1963...	34	2.8	0.04	0.00	37	7.2	6.8	1.7	91	0	40	14	0.1	2.8	169	122	48	285	7.3	3	0.0	0.6
July 2, 1963...	2.96	4.9	.05	.00	52	9.4	12	2.6	148	0	43	19	.1	1.3	228	168	47	387	7.6	4	.0	.0

## 4-2142.4. EIGHTEENMILE CREEK AT HIGHLAND-ON-THE-LAKE, N. Y.

May 7, 1963...	58	1.2	0.07	0.00	41	8.9	12	1.8	95	0	55	22	0.1	2.7	186	139	61	350	8.2	6	0.1	0.0
July 2, 1963...	3.25	8.7	.06	.01	68	11	41	5.0	148	0	70	80	.4	1.0	374	215	93	629	7.3	7	.4	.0

## BUFFALO CREEK AT JAVA VILLAGE, N. Y.

May 8, 1963...	22	1.9	0.07	0.01	50	11	4.2	1.0	168	0	30	6.8	0.1	1.9	194	174	33	346	8.0	4	0.0	0.0
July 5, 1963...	7.10	5.0	.06	.01	53	11	4.5	1.4	180	0	33	6.0	.1	4.6	212	177	30	356	7.8	7	.0	.4

## 4-2144. BUFFALO CREEK NEAR WALES HOLLOW, N. Y.

May 8, 1963...	30	1.5	0.19	0.00	50	11	4.6	1.5	160	0	36	8.0	0.1	1.9	200	170	39	358	8.1	4	0.0	0.0
July 2, 1963...	6.98	5.0	.06	.00	58	11	6.2	2.8	175	0	41	10	.1	1.2	228	180	46	393	7.4	6	.0	.0

## BUFFALO CREEK AT ELMA, N. Y.

May 8, 1963...	58	0.8	0.05	0.00	51	14	5.4	1.6	162	0	44	10	0.1	1.7	216	185	52	380	7.7	4	0.0	0.0
July 5, 1963...	25.5	4.4	.07	.01	55	8.6	6.5	2.9	145	0	53	12	.2	2.6	227	173	54	378	7.5	9	.0	.8

## 4-2145. BUFFALO CREEK AT GARDENVILLE, N. Y.

May 8, 1963...	118	0.3	0.04	0.01	50	14	3.9	0.9	160	0	37	13	0.1	1.5	204	183	52	383	7.6	5	0.0	0.0
July 5, 1963...	21.3	3.9	.05	.01	51	8.7	6.5	3.1	136	0	55	12	.1	2.5	218	163	52	359	7.4	8	.0	.2

## 4-2150. CAYUGA CREEK NEAR LANCASTER, N. Y.

May 8, 1963...	28	0.1	0.03	0.01	48	13	6.2	2.0	149	0	43	14	0.1	1.4	205	174	52	370	8.1	3	0.0	0.0
July 5, 1963...	6.00	3.9	.07	.01	54	8.2	6.5	3.1	141	0	52	13	.1	1.7	227	168	53	372	7.6	9	.0	.3

## 4-2152.5. WEST BRANCH CAZENOVIA CREEK NEAR EAST AURORA, N. Y.

May 8, 1963...	42	0.7	0.03	0.00	36	6.6	6.1	1.5	92	0	39	12	0.1	0.4	153	117	42	267	7.6	2	0.0	0.0
July 5, 1963...	4.92	3.8	.16	.02	49	9.1	8.7	2.2	124	0	60	14	.1	.3	214	160	59	352	7.6	5	.0	.6

A Estimated.



## 4-2175. TONAWANDA CREEK NEAR ALABAMA, N. Y.

May 8, 1963...	99	1.9	0.10	0.01	80	14	16	1.7	205	0	73	31	0.2	2.5	333	257	89	562	8.1	6	0.1	0.4
July 2, .....	34.7	6.8	.05	.08	85	17	29	3.5	232	0	84	46	.2	3.0	410	282	92	670	7.6	12	.2	.2

## 4-2180. TONAWANDA CREEK AT RAPIDS, N. Y.

May 8, 1963...	165	1.5	0.15	0.01	102	16	12	1.7	219	0	134	31	0.2	1.8	437	321	141	675	7.4	7	0.0	0.4
July 2, .....	48.0	2.5	.09	.00	146	22	29	2.8	247	0	240	48	.3	.6	650	455	253	950	7.4	8	.1	.5

## 4-2184.5. ELLICOTT CREEK AT MILL GROVE, N. Y.

May 8, 1963...	8.6	1.0	0.13	0.03	74	11	17	2.1	204	0	49	32	0.3	1.1	302	230	63	507	7.7	9	0.1	0.4
July 5, .....	2.03	7.1	.06	.03	80	15	59	5.1	224	0	82	86	.4	.6	472	261	78	763	7.5	14	.7	.4

## 4-2185. ELLICOTT CREEK AT WILLIAMSVILLE, N. Y.

May 8, 1963...	24	1.0	0.14	0.02	86	14	22	2.8	196	0	103	42	0.3	1.0	384	272	112	626	7.7	8	0.1	0.6
July 2, .....	.88	5.5	.03	.02	165	18	27	3.1	113	0	353	57	.4	.7	717	486	393	1020	7.9	8	.1	.4

## MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge, water year October 1962 to September 1963

Date	Time (24 hr)	Water tem- per- ature (°F)	Discharge (cfs)	Suspended sediment	
				Mean concen- tration (ppm)	Discharge (tons per day)
STREAMS TRIBUTARY TO LAKE SUPERIOR					
4-442. CARP CREEK AT ISHPEMING, MICH.					
Apr. 25, 1962.....	0940		30	4	0.3
Nov. 14.....	1000		8	2	T
Apr. 10, 1963.....	1055		18	24	1.2
4-443. GOLD MINE CRREEK NEAR ISHPEMING, MICH.					
Apr. 24, 1962.....	1910		15	5	0.2
Nov. 13.....	2000		5	1	T
Apr. 10, 1963.....	1120		12	5	.2
4-444. CARP RIVER NEAR NEGAUNEE, MICH.					
Aug. 24, 1961.....	1140		51	8	1.1
Apr. 25, 1962.....	0815		85	12	2.8
Nov. 14.....	1030		30	2	.2
Apr. 10, 1963.....	1200		24	9	.6
STREAMS TRIBUTARY TO LAKE MICHIGAN					
4-578. MIDDLE BRANCH ESCANABA RIVER AT HUMBOLDT, MICH.					
Nov. 14, 1962.....	1820		24	16	1.0
Dec. 12.....	0850		26	1	.1
Dec. 27.....	1500		16	4	.2
Feb. 12, 1963.....	1700		8.8	1	T
Mar. 13.....	1615		6.3	1	T
Apr. 4.....	1440		452	3	3.7
Apr. 5.....	1430		378	2	2.0
Apr. 9.....	1245		194	2	1.0
Apr. 9.....	1955		158	2	.9
May 8.....	1700		64	6	1.0
June 13.....	1030		97	4	1.0
4-578.2. MIDDLE BRANCH ESCANABA RIVER NEAR GREENWOOD, MICH.					
Apr. 25, 1962.....	1605		450	3	3.6
Nov. 14.....	1730		35	2	.2
Apr. 9, 1963.....	1435		240	2	1.3
4-578.5. BLACK RIVER NEAR HUMBOLDT, MICH.					
Aug. 24, 1961.....	1745		0.1	8	T
Apr. 26, 1962.....	1023		55	8	1.2
Nov. 15.....	1005		7	3	T
Apr. 9, 1963.....	1900		30	4	.3
4-578.55. LAKE LORY OUTLET NEAR HUMBOLDT, MICH.					
Oct. 12, 1962.....	0750		0.5	2	T
Nov. 6.....	1515		1	3	T
Dec. 10.....	1400		1	2	T
Feb. 13, 1963.....	0900		.3	2	T
Mar. 13.....	1410		.2	1	T
Apr. 5.....	1030		5	1	T
May 8.....	1535		3	5	T
June 9.....	0905		3	16	0.1
June 13.....	1050		3	10	.1
4-578.6. MCKINNON LAKE OUTLET NEAR HUMBOLDT, MICH.					
Oct. 12, 1962.....	0740		1.5	12	T
Nov. 6.....	1500		2	3	T
Nov. 15.....	0920		1.5	3	T
Dec. 10.....	1400		1.5	15	0.1
Mar. 13, 1963.....	1400		.5	4	T

T Less than 0.05 ton.

## MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge, water year October 1962 to September 1963--Continued

September 1963--Continued

Date	Time (24 hr)	Water tem- per- ature (°F)	Discharge (cfs)	Suspended sediment	
				Mean con- cen- tra- tion (ppm)	Discharge (tons per day)
STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued					
4-578.6. MCKINNON LAKE OUTLET NEAR HUMBOLDT, MICH.--Continued					
Apr. 5, 1963.....	1045		6	4	0.1
Apr. 9.....	1935		3	4	T
May 8.....	1355		3	8	.1
June 13.....	1040		5	59	.8
July 9.....	0900		1	4	T
July 16.....	1920		.8	7	T
July 17.....	1230		1	8	T
Aug. 6.....	1430		.3	19	T
Sept. 11.....	1140		.8	20	T
Sept. 24.....	1815		1	11	T
4-578.7. LAKE LORY OUTLET NEAR REPUBLIC, MICH.					
Oct. 12, 1962.....	0800		3.5	14	0.1
Nov. 6.....	1525		4.5	4	T
Nov. 14.....	0955		4	4	T
Dec. 10.....	--		4	38	.4
Feb. 13, 1963.....	0900		2	3	T
Mar. 13.....	1400		1	1	T
Apr. 5.....	1010		20	1	.1
Apr. 9.....	1915		10	6	.2
May 8.....	1545		10	7	.2
June 13.....	1100		12	15	.5
July 9.....	0930		2	4	T
July 16.....	1905		.8	4	T
July 17.....	1300		1	4	T
Aug. 6.....	1445		.3	17	T
Sept. 11.....	1130		1	1	T
4-580.2. WEST BRANCH CREEK NEAR NATIONAL MINE, MICH.					
Apr. 25, 1962.....	1835		60	2	0.3
Nov. 14.....	1555		10	1	T
Apr. 9, 1963.....	1615		30	2	T
4-580.5. MIDDLE BRANCH ESCANABA RIVER NEAR SUOMI, MICH.					
Aug. 23, 1961.....	1830		45	5	0.6
Apr. 25, 1962.....	1140		800	10	22
Nov. 14.....	1230		95	15	3.8
Apr. 9, 1963.....	1210		450	1	1.2
4-580.8. BEAR CREEK NEAR PRINCETON, MICH.					
Apr. 25, 1962.....	1230		40	1	0.1
Nov. 13.....	1630		13	2	.1
Apr. 9, 1963.....	1140		25	4	.3
July 11.....	0845		3.7	1	T
4-581. MIDDLE BRANCH ESCANABA RIVER NEAR PRINCETON, MICH.					
Apr. 25, 1962.....	1430		830	2	4.5
Nov. 13.....	1430		371	1	1.0
Apr. 9, 1963.....	1100		472	1	1.3
4-581.3. GREEN CREEK NEAR PRINCETON, MICH.					
Apr. 24, 1962.....	1650		45	4	0.5
Nov. 13.....	1645		9	1	T
Apr. 10, 1963.....	1350		10	4	.1
4-581.7. ELY CREEK NEAR NATIONAL MINE, MICH.					
Apr. 25, 1962.....	1005		30	1	0.1
Nov. 14.....	1110		3	1	T
Apr. 9, 1963.....	1305		12	1	T

T Less than 0.05 ton.



## MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge, water year October 1962 to September 1963--Continued

Date	Time (24 hr)	Water tem- per- ature (°F)	Discharge (cfs)	Suspended sediment	
				Mean concen- tration (ppm)	Discharge (tons per day)

## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

## 4-583. WARNER CREEK NEAR PALMER, MICH.

Nov. 13, 1962.....	1715		7.5	2	T
Apr. 5, 1963.....	1545		83	8	1.8
Apr. 10.....	1300		28	6	.4

## STREAMS TRIBUTARY TO LAKE ERIE

## 4-1780. ST. JOSEPH RIVER NEAR NEWVILLE, IND.

Apr. 5, 1952.....	1545		1150	150	466
Apr. 7.....	0955		1820	86	425
Apr. 8.....	1005		1860	53	266
Apr. 14.....	0835		1900	255	131C
Apr. 15.....	0955		2300	178	111C
Apr. 16.....	1035		2700	151	110C
Apr. 18.....	1020		2300	60	372
Apr. 24.....	1105		770	57	116
May 24.....	1540		1620	419	183C
May 25.....	1010		--	336	--
May 26.....	1015		--	130	--
May 26.....	1935		2300	115	714
May 27.....	1045		2150	105	61C
May 28.....	0840		2050	80	442
May 29.....	1020		2350	43	272
Mar. 21, 1963.....	0930		--	31	--

## 4-1815. ST. MARYS RIVER AT DECATUR, IND.

Oct. 11, 1962.....	1440		--	26	--
Nov. 20.....	0840		--	28	--
Mar. 20, 1963.....	1430		--	139	--

## 4-1835. MAUMEE RIVER AT ANTWERP, OHIO

Apr. 5, 1952.....	1640		4210	384	436C
Apr. 7.....	1055		5280	176	251C
Apr. 8.....	1105		4450	110	1320
Apr. 14.....	0915		6080	194	318C
Apr. 15.....	1045		7830	341	721C
Apr. 16.....	1120		5680	227	3480
Apr. 18.....	1115		5380	155	225C
Apr. 24.....	1155		7170	276	534C
May 24.....	1620		6510	576	10100
May 25.....	1105		11800	712	22700
May 26.....	1115		12300	357	11900
May 27.....	1130		9620	290	7530
May 28.....	0950		7280	168	3300
May 29.....	1120		5280	140	2000
Mar. 20, 1963.....	1745		5160	110	1530

## 4-1845. BEAN CREEK AT POWERS, OHIO

July 18, 1963.....	1515		20	9	0.5
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## 4-1850. TIFFIN RIVER AT STRYKER, OHIO

Apr. 5, 1952.....	0925		770	387	805
Apr. 7.....	0850		1390	115	432
Apr. 8.....	0900		1420	62	238
Apr. 14.....	1045		1220	284	935
Apr. 15.....	0840		1780	235	1130
Apr. 16.....	0915		1880	143	726
Apr. 18.....	0915		1360	74	272
Apr. 24.....	1000		584	98	155
May 24.....	1440		313	86	73
May 25.....	1755		917	286	709
May 26.....	0915		1050	189	536
May 27.....	0925		1300	94	330
May 28.....	1515		1220	60	198
May 29.....	0810		1010	81	221
July 18, 1963.....	1650		34	77	7.1

T Less than 0.05 ton.

## MISCELLANEOUS ANALYSES OF LAKES AND STREAMS IN ST. LAWRENCE RIVER BASIN--Continued

Periodic determinations of suspended-sediment discharge, water year October 1962 to September 1963--Continued

Date	Time (24 hr)	Water tem- per- ature (°F)	Discharge (cfs)	Suspended sediment	
				Mean con- cen- tra- tion (ppm)	Discharge (tons per day)
STREAMS TRIBUTARY TO LAKE ERIE--Continued					
4-1890. BLANCHARD RIVER NEAR FINDALY, OHIO					
Nov. 20, 1962.....	1450		79	14	2.9
4-1915. AUGLAIZE RIVER NEAR DEFIANCE, OHIO					
Mar. 27, 1952.....	1615		2960	165	1320
Apr. 5.....	1750		2460	107	711
Apr. 7.....	1230		6280	143	2420
Apr. 14.....	1245		5470	257	3800
Apr. 15.....	1200		7980	244	5260
Apr. 16.....	1230		6790	188	3450
Apr. 17.....	2135		5470	141	2080
Apr. 18.....	1225		4230	109	1240
Apr. 24.....	1320		4990	129	1740
May 24.....	1710		3220	109	948
May 25.....	1550		8880	717	17200
May 26.....	1245		8700	400	9400
May 27.....	1310		7470	275	5550
May 28.....	1100		6450	205	3570
May 29.....	1235		3640	178	1750
Mar. 19, 1963.....	0930		5100	96	1320
4-1925. MAUMEE RIVER NEAR DEFIANCE, OHIO					
Mar. 21, 1952.....	1425		16900	318	14500
Apr. 5.....	1915		9750	479	12600
Apr. 7.....	1605		15700	191	8100
Apr. 14.....	1525		16500	284	12700
Apr. 15.....	1335		18900	267	13600
Apr. 16.....	1355		17700	259	12400
Apr. 18.....	1355		11600	146	4570
Apr. 24.....	1420		10000	174	4700
May 24.....	1810		10000	289	7800
May 25.....	1655		24600	930	61800
May 26.....	1340		23700	520	33300
May 27.....	1405		19800	276	14800
May 28.....	1245		16500	244	10900
May 29.....	1335		11000	170	5050
Nov. 20, 1962.....	1120		325	8	7
Mar. 18, 1963.....	1600		14300	133	5140

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