# EVALUATION AND CORRELATION OF WATER-QUALITY DATA FOR THE NORTH FORK FLATHEAD RIVER, NORTHWESTERN MONTANA]

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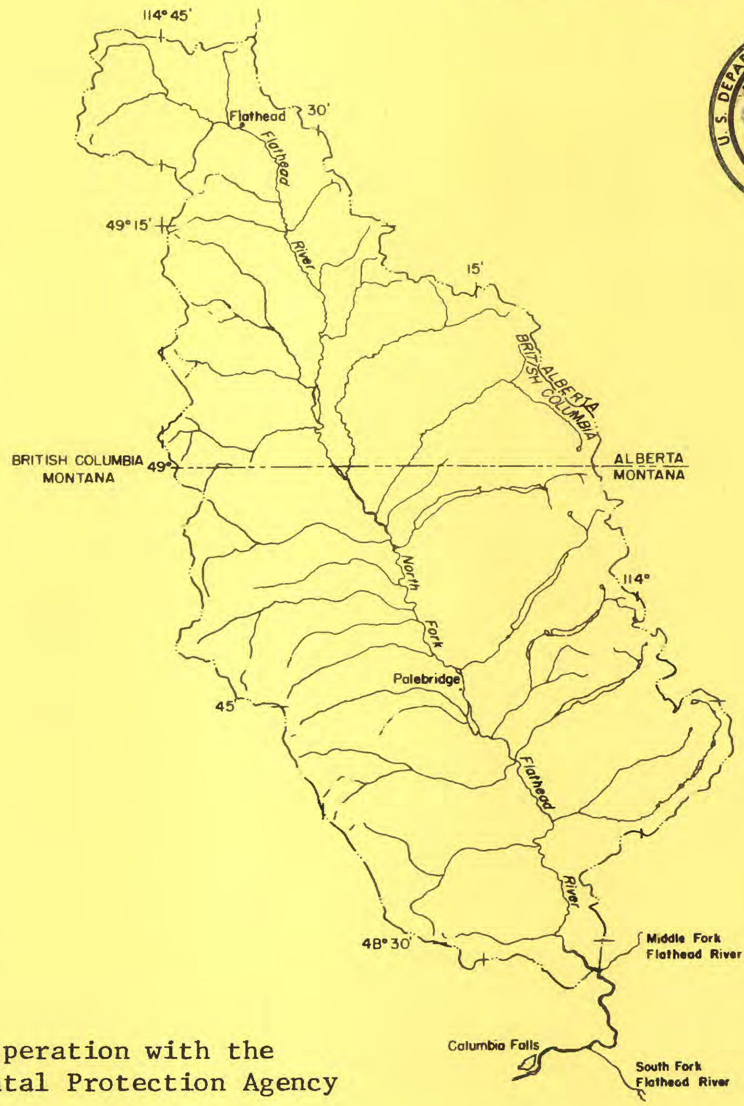
U.S. GEOLOGICAL SURVEY

Water-Resources Investigations 78-111



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J. R. Knapton

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U.S. Geological Survey, Water Resources Division
428 Federal Building, Drawer 10076
Helena, Montana 59601

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This report is a compilation and evaluation of water-quality measurements that have been made by the U.S. Geological Survey at two stations on the North Fork Flathead River. Historical streamflow records show an annual mean daily discharge of 3,010 cubic feet per second near the mouth--a threefold increase compared to discharge at the international boundary. The chemical character of the water is dominated by calcium and magnesium cations and the bicarbonate anion. Base flow, in contrast to high flows from runoff, is characterized by higher dissolved constituents and lower concentrations of suspended sediment. The several lakes that contribute water throughout the middle and lower drainage have a dampening effect on both streamflow and constituent concentrations. Using the available data and computer techniques, regression equations were developed between certain water-quality variables.

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UNITED STATES DEPARTMENT OF THE INTERIOR
CECIL D. ANDRUS, Secretary
GEOLOGICAL SURVEY
H. William Menard, Director

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For additional information write to:

U.S. Geological Survey
Federal Office Building
301 South Park
Drawer 10076
Helena, Montana 59601

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## METRIC CONVERSION TABLE

The following factors can be used to convert the U.S. customary units published herein to the International System of Units (SI).

| Multiply U.S. customary units | By | To obtain SI units |
|---|---|---|
| acre-foot (acre-ft) | 1233 | cubic meter ($m^3$) |
| acre | 4047 | square meter ($m^2$) |
| | .4047 | hectare (ha) |
| cubic foot per second ($ft^3/s$) | 28.32 | liter per second (L/s) |
| foot (ft) | .3048 | meter (m) |
| inch (in) | 25.40 | millimeter (mm) |
| mile (mi) | 1.609 | kilometer (km) |
| pound (lb) | 453.6 | gram (g) |
| square mi ($mi^2$) | 2.590 | square kilometer ($km^2$) |
| ton (short) per day (ton/day) | 907.2 | kilogram per day (kg/d) |

temperature, degrees Celsius (°C) = 0.556 (°F-32)

# GLOSSARY

Alluvium. A general term for sand, silt, and mud deposited by a stream along its banks or upon its flood plain.

Anion. Negatively charged ion.

Base flow. Sustained or fair weather runoff, which in most streams is composed largely of ground-water inflow.

Biomass. The amount of living matter present at any given time, expressed as mass per unit area or volume of habitat.

Cation. Positively charged ion.

Chemosynthesis. The synthesis by plants of organic chemical compounds with energy derived from other chemical reactions.

Colloidal. A substance in a state of fine subdivision with particles ranging from $10^{-5}$ to $10^{-7}$ centimeters in diameter.

Concentration. A measure of the amount of dissolved substance contained per unit volume.

Correlation. Degree of linear association of two or more random variables.

Diel. Relating to a 24-hour period that usually includes a day and the adjoining night.

Direct runoff. Water entering stream channels promptly after rainfall or snowmelt.

Fluvial. Produced by or pertaining to a river.

Hydrograph. A graph showing stream discharge or constituent concentration with respect to time.

Ion. An atom or molecularly bound group of atoms which has gained or lost one or more electrons, resulting in a negative or positive charge.

Linear regression. A statistical technique for defining the relationship between a dependent and an independent variable.

Lithology. The physical character of rock, defined by such characteristics as color, mineralogic composition, and grain size.

Overland flow. The flow of rainwater or snowmelt over the land surface toward stream channels.

Photosynthesis. The synthesis of carbohydrates from water and the carbon dioxide in chlorophyll-containing tissues of plants exposed to light.

Primary productivity. The rate at which new organic matter is formed and accumulated through photosynthetic and chemosynthetic activity of produced organisms.

Runoff. That part of the precipitation that appears in surface streams. Runoff is a combination of base flow and direct runoff.

Sorbed. The collective properties of absorption and adsorption that some substances have for attracting and holding certain ions or molecules.

Substrate. The physical surface upon which something lives.

Thermal inertia. The degree of slowness with which the temperature of a body approaches that of its surroundings.

# EVALUATION AND CORRELATION OF WATER-QUALITY DATA FOR THE NORTH FORK FLATHEAD RIVER, NORTHWESTERN MONTANA

by

J. R. Knapton

## ABSTRACT

This report is a compilation and evaluation of water-quality measurements that have been made by the U.S. Geological Survey at two stations on the North Fork Flathead River. About 60 different water-quality variables measured on a routine schedule at each station are summarized in the report.

The past 25 years of streamflow records of the North Fork Flathead River show an annual mean daily discharge of 3,210 cubic feet per second near the mouth--a threefold increase compared to discharge at the international boundary. Between 80 and 90 percent of the annual suspended-sediment load is transported during the approximately 4-week period of peak runoff.

The chemical character of the water which is a reflection of drainage, soils, and lithology is dominated by calcium and magnesium cations and the bicarbonate anion. Base flow, in contrast to high flows from direct runoff, is characterized by higher dissolved constituents and lower concentrations of suspended sediment. The several lakes that contribute water throughout the middle and lower drainage have a dampening effect on both streamflow and constituent concentrations. The reported values of bacteria densities, phytoplankton populations, and dissolved oxygen are indicative of a biologically healthy stream.

Using the available data and computer techniques, regression equations were developed between certain water-quality variables. Correlations between suspended sediment and water discharge improved when the data were segregated according to streamflow conditions.

## INTRODUCTION

During the past several years concern has been expressed about the environmental impact that may result from new and existing land-use practices in the North Fork Flathead River drainage basin. Large amounts of high grade, low-sulfur coal lie just north of the United States-Canadian border along Cabin Creek, a tributary of the Flathead River. Proposed surface mining of the coal deposits and activities related to mining are thought by many to threaten the natural balance of the physical, chemical, and biological processes now present in the downstream river and lake system. In addition to potential coal mining, continued timber harvest throughout the drainage both in the United States and Canada, a steady increase in recreational usage, and recent interest in oil and gas exploration all could affect the drainage and downstream waters.

Thus, beginning in 1974 several local, State, and Federal agencies implemented water-quality monitoring programs in an attempt to assess the quality of water in the North Fork Flathead River. As one of the participants the U.S. Geological Survey established two water-quality stations on the North Fork--each at an existing long-term stream-gaging station.

## Purpose and scope

The purpose of this report is (1) to summarize and evaluate the water-quality data acquired to date and (2) to determine functional relationships between water-quality variables. In addition to professionals in water quality and affiliated fields, land users and other interested citizens may find the report useful. It provides an insight to water quality at each station throughout the annual flow cycle and depicts the many changes that occur between the stations.

About 60 different water-quality variables have been measured on a routine schedule at each station and are summarized herein. This interim report represents only the water-quality investigations of the U.S. Geological Survey and is but part of the environmental study being conducted in the drainage.

## Acknowledgments

The author acknowledges with appreciation the individuals responsible for the collection of water-quality data and streamflow records used in this report. Particular thanks are given to James L. Schrankel and Jack M. Heil, observers at the downstream data-collection station; to Laurie G. Wagner, observer at the upstream station, whose interest and observations have been invaluable at this remote station; and to Raymond J. Weinberg of the U.S. Geological Survey for overseeing the data-collection program on the North Fork.

## Drainage

The North Fork Flathead River originates in the Rocky Mountains of British Columbia, Canada, and flows south into Montana (fig. 1). From the international boundary the river flows south and slightly east for about 40 miles until it joins the Middle and South Forks to form the main Flathead River (in Canada the North Fork is named the Flathead River). The Flathead River continues generally south about 20 miles from Columbia Falls where it enters Flathead Lake, the largest and one of the more pristine natural freshwater bodies in the western continental United States. Flathead Lake then drains westward to the Columbia River via the Flathead, Clark Fork, and Pend Oreille Rivers.

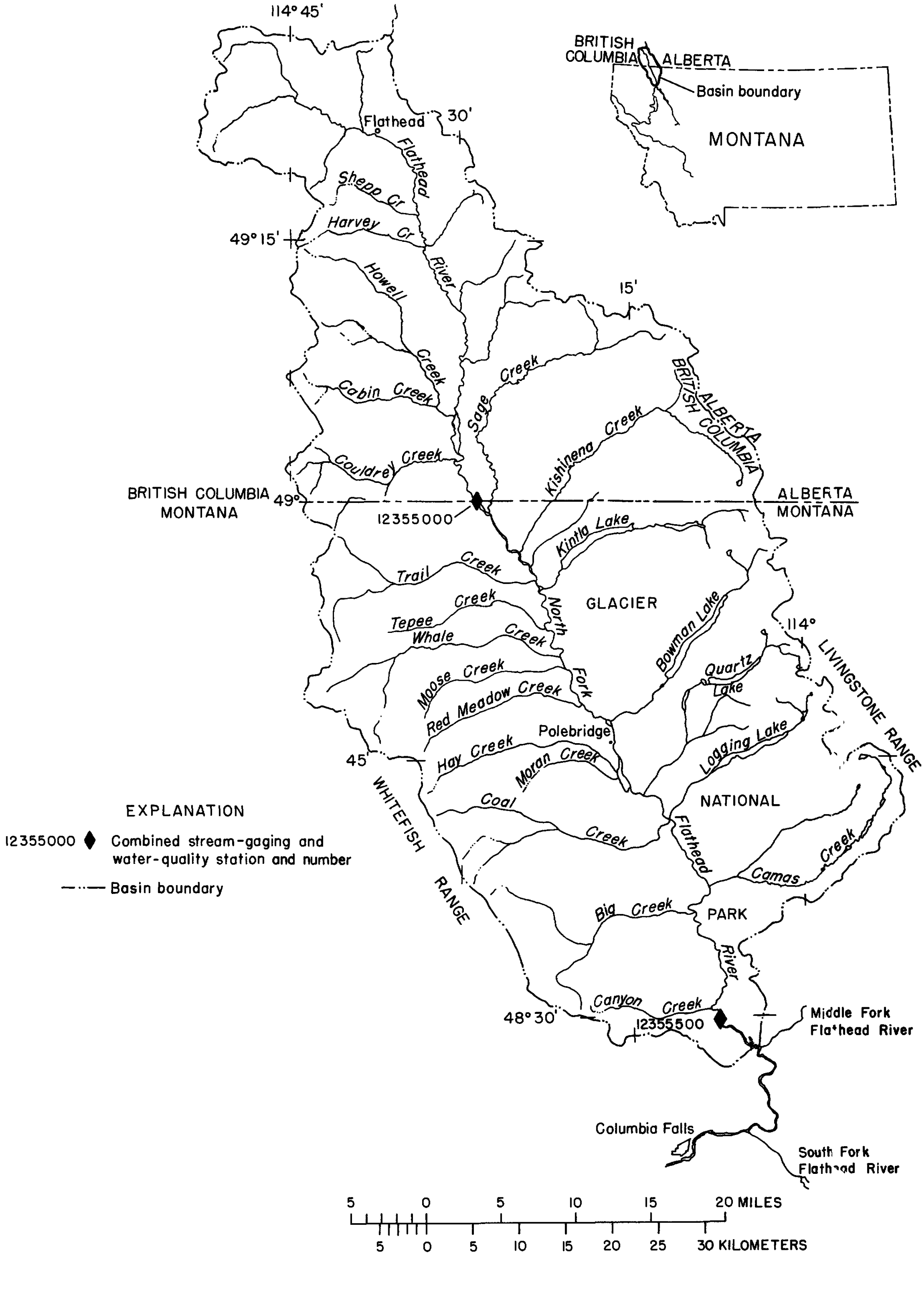


Figure 1.--Locations of North Fork Flathead River basin and streamflow and water-quality stations.

The North Fork watershed contains more than 1,121 $mi^2$, with about 40 percent of its area in British Columbia. In the United States the eastern side of the drainage is composed primarily of land within Glacier National Park. The western drainage is predominantly land in the Flathead National Forest, with some properties along the river valley in private ownership. The majority of the drainage north of the international boundary lies within the Flathead Provincial Forest.

The North Fork drainage from the headwaters to near Camas Creek is a broad glaciated valley bordered to the east and west by high rugged mountains of the Livingstone and Whitefish Ranges, respectively. In this section the unstable alluvial channel is composed of fine gravel to large boulders. From near Camas Creek to the mouth the river passes through a narrow confined valley having a more stable channel that often has bedrock exposed. The entire valley is heavily forested with the exception of the high mountain peaks, a few burned and logged areas, and some bottomland meadows.

During the past 25 years of corresponding station operation, records show that the average streamflow of the North Fork Flathead River is 979 $ft^3/s$ at the international boundary and 3,210 $ft^3/s$ near the mouth. The downstream increase in streamflow results from the numerous tributaries that drain the mountain flanks and from ground water that flows directly into the main channel. Much of the tributary inflow along the east side of the river comes from lakes that tend to moderate the streamflow during the year and create water mixing. The drainage along the west side has an absence of lakes, which causes a more immediate runoff and accounts for greater variations in both water quantity and quality.

## Stratigraphy

South of the international boundary the high glaciated mountain slopes that form the headwaters of the tributary drainages consist mostly of Precambrian rocks of the Belt Supergroup. The rocks are dominantly quartzites, argillites, and dolomitic limestones that are relatively resistant to weathering and solution. On the west side of the river many of the tributary streams flow from Precambrian rocks through a section of the Kishenehn Formation before entering alluvium of the river channel. The Tertiary Kishenehn Formation of British Columbia, which has been geographically extended into northwestern Montana by Johns, Smith, Barnes, Gilmour, and Page (1963), is composed of rather poorly consolidated sandstone and mudstone. The middle and lower valley east of the river is composed of sand, gravel, and silt of Tertiary age that is in places covered with a mantle of glacial till (Ross, 1959).

North of the international boundary many of the high ridges are Precambrian rocks, but Paleozoic and Mesozoic formations account for large portions of the surface exposure. The Paleozoic rocks are hard dolomites and limestones that are likely the parent rocks for much of the calcareous matrix that consolidates the younger rocks. The Mesozoic formations are moderately hard calcareous claystones, siltstones, and sandstones containing coal-bearing deposits of economic importance. Soils in the North Fork valley are of residual, alluvial, and glacial origin.

### Data-collection stations

Two combination stream-gaging and water-quality stations are located at the international boundary and near the mouth of the North Fork Flathead River (fig. 1). The upstream station, Flathead River at Flathead, British Columbia (12355000), is an international stream-gaging station located 45 feet north of the boundary and operated jointly by the Water Survey of Canada and the U.S. Geological Survey. Streamflow has been monitored at this site since 1929, although winter flows were not obtained prior to 1952. In October 1974, the station was included in the National Stream Quality Accounting Network (NASQAN) and routine measurements were begun for about 60 different physical, chemical, and biological variables. At the same time daily sampling for specific conductance was started. In April 1975 daily sampling for suspended sediment was initiated and in October a continuous water-temperature recorder was installed. Suspended sediment and water temperature are monitored through funding from the Department of State and the U.S. Environmental Protection Agency.

The downstream station, North Fork Flathead River near Columbia Falls (12355500), is located 1.5 miles downstream from Canyon Creek and 3.8 miles upstream from the Middle Fork. Streamflow records are intermittent from 1910 to 1935 and continuous from 1935 to the present. Monitoring of the same water-quality variables as obtained at the boundary station was started in October 1975. Funding was provided by the U.S. Environmental Protection Agency and the Montana Department of Fish and Game.

## FLUVIAL TRANSPORT OF CONSTITUENTS

The water in a stream is generally considered to consist of a base-flow component derived from ground water that infiltrates into a stream and a direct-runoff component that enters the drainage system soon after periods of precipitation or snowmelt (Hem, 1970). Because of the several lakes and other drainage conditions this concept may be an oversimplification of the hydrologic regime in the North Fork; however, to a large degree the concept explains many of the water-quality changes that occur during the annual flow cycle.

At various times of the year either or both the direct-runoff and base-flow components can dominate the character of water in the North Fork. Throughout the spring snowmelt period and at times of extended precipitation, direct runoff is the principal component even though the base-flow component is present. During autumn and throughout winter, after direct runoff has subsided, the base-flow component persists from ground water infiltrating the main stream and tributary streams. A modification in the above pattern occurs as lakes along the east drainage capture overland flow and contribute water to the river throughout the year. Thus, the base-flow component for the North Fork is a combination of ground-water inflow, lake outflow, and a certain quantity of snowmelt that is generally present during the summer and autumn low-flow period.

Water-quality conditions in the North Fork are influenced directly by whether the source of the water is predominantly base flow or direct runoff. Much of the water in the base-flow component has had a long residence time in consolidated and unconsolidated materials beneath the land surface. Its dissolved-solids concentration is relatively high, although streamflow volume due to base flow is relatively small. In contrast, the direct-runoff component has presumably had no residence time in the ground and only short contact with soil and vegetation. Thus, the dissolved-solids concentration of water in the North Fork during periods of high direct runoff is much less than during periods of low flow. The concentration of dissolved solids is therefore inversely related to streamflow discharge.

The relation of suspended-sediment concentration to stream discharge is opposite that of dissolved-solids concentration. Direct runoff carries materials from the land surface to the stream. Increased runoff results in bank erosion and channel scour, thus providing more suspended material to streams. When base flow predominates the North Fork is relatively free of suspended material.

Although historically the mode of transport of chemical constituents in a stream was thought to be primarily in the dissolved phase (considered here to be any substance passing through a 0.45 micrometer filter), more recent studies (U.S. Geological Survey, 1977) show that some constituents are transported as colloids that are often sorbed to sediment particles, especially clays and organic debris. These constituents apparently move to and from the sediment particles, depending upon a variety of determined and undetermined conditions in the stream environment. Only within the past few years has an effort been made to sample and analyze the suspended particles for constituents that may be sorbed to them.

## SAMPLING AND ANALYTICAL TECHNIQUES

Unlike dissolved constituents in most streams, suspended sediment is not evenly distributed throughout the vertical and horizontal dimensions of the stream cross section. To obtain accurate quantitative analytical results for constituents sorbed to sediment, a representative sample of the water-sediment mixture must be obtained. In this study a representative mixture sample was obtained by collecting and compositing depth-integrated samples at several verticals in the stream section using modified suspended-sediment samplers (Guy and Norman, 1970). A laboratory digestion process was used to liberate sorbed constituents to the native water, followed by analyses for particular constituents. The analytical result was the sum of the particular constituent transported in the dissolved and suspended phase. It is referred to as the total constituent concentration, such as "total iron."

To determine the concentration of a constituent in the dissolved phase, the water sample was passed through a 0.45 micrometer filter at streamside prior to laboratory analysis. The analytical difference between the total and dissolved concentration was that portion of the constituent transported by the sediment particles. Some constituents were analyzed as both total and dissolved; others were analyzed as either total or dissolved depending upon their common mode of transport.

Streamside measurements routinely made were for water discharge, specific conductance, dissolved oxygen, pH, water temperature, and bacteria of the fecal coliform and fecal streptococcus groups. Samples for daily conductivity and suspended sediment were collected by a paid observer. Temperature and streamflow were recorded continuously at the station. Various laboratory samples were processed at streamside prior to laboratory analysis. Samples for suspended sediment were analyzed in the Geological Survey sedimentation laboratory in Worland, Wyo., using methods described by Guy (1969). Biological samples were sent to the Geological Survey hydrobiological laboratory in Doraville, Ga., and analyzed according to procedures given by Slack, Averett, Greeson, and Lipscomb (1973). The remaining samples, which included most of the chemical constituents, were sent to the Survey central laboratory in Denver, Colo., and analyzed by methods described by Brown, Skougstad, and Fishman (1970).

Sampling and analytical methodology has recently been in a state of transition. The preceding discussion is given for the purpose of confirming methods used during the study.

## SUMMARY OF WATER-QUALITY DATA

Water-quality data for the two North Fork stations for the period of record through the 1977 water year are given in tables 1 and 2. Each water-quality variable measured is followed by a summary of data for the period of record. The mean values represent a time-weighted mean and in most instances differ somewhat from a discharge-weighted mean. With the exception of discharge, temperature, specific conductance, and suspended sediment, the variables were measured monthly or less frequently. Discharge and temperature are summarized for the period during which each was continuously monitored. Suspended sediment and specific conductance were once-daily measurements and thus have many more analyses than other constituents. Only the range of values is listed for specific conductance, suspended sediment, and temperature. Statistical values for discharge include only the mean and range.

Table 1.--Statistical summary of water-quality measurements for Flathead River at Flathead, B.C., for period of record

| Measurement | No. of analyses | Mean | Standard deviation | Range | Units |
|---|---|---|---|---|---|
| Discharge | -- | 975 | -- | 65-16,300 | $ft^3/s$ |
| Specific conductance (at 25 deg C) | 1,065 | -- | -- | 130-309 | mhos/cm |
| pH | 31 | 8.2 | 0.3 | 7.4-8.5 | units |
| Temperature, water | -- | -- | -- | .0-19.5 | deg C |
| Dissolved oxygen | 34 | 11.4 | 1.1 | 9.2-12.9 | mg/L |
| Percent saturation | 34 | 102 | 4 | 92-110 | percent |
| Coliform, fecal | 34 | 6 | 9 | 0-44 | col/100 mL |
| Streptococci, fecal | 34 | 17 | 34 | 0-170 | col/100 mL |
| Hardness, as $CaCO_3$ (Ca, Mg) | 34 | 132 | 20 | 86-160 | mg/L |
| Noncarbonate hardness | 34 | 5 | 4.3 | 0-16 | mg/L |
| Calcium, dissolved (Ca) | 34 | 39 | 5.9 | 25-46 | mg/L |
| Magnesium, dissolved (Mg) | 34 | 8.2 | 1.2 | 5.3-10 | mg/L |
| Sodium, dissolved (Na) | 34 | .7 | .2 | .3-1.1 | mg/L |
| Potassium, dissolved (K) | 34 | .3 | .1 | .1-.6 | mg/L |
| Bicarbonate ($HCO_3$) | 34 | 154 | 24 | 98-183 | mg/L |
| Carbonate ($CO_3$) | 28 | 0 | 0 | 0 | mg/L |
| Alkalinity, total as $CaCO_3$ | 34 | 126 | 20 | 80-150 | mg/L |
| Carbon dioxide | 31 | 2.0 | 1.5 | .7-7.1 | mg/L |
| Sulfate, dissolved ($SO_4$) | 34 | 5.6 | 1.5 | 2.8-9.7 | mg/L |
| Chloride, dissolved (Cl) | 34 | .5 | .4 | .0-1.6 | mg/L |
| Fluoride, dissolved (F) | 34 | .1 | .0 | .0-.2 | mg/L |
| Silica, dissolved ($SiO_2$) | 34 | 4.1 | .4 | 3.3-5.1 | mg/L |
| Dissolved solids, calculated | 34 | 134 | 20 | 88-158 | mg/L |
| Nitrite plus nitrate, total as N | 34 | .03 | .02 | .00-.08 | mg/L |

Table 1.--Statistical summary of water-quality measurements for Flathead River at Flathead, B. C., for period of record--continued

| Measurement | No. of analyses | Mean | Standard deviation | Range | Units |
|---|---|---|---|---|---|
| Nitrogen, ammonia, dissolved as N | 21 | .01 | .01 | .00-.03 | mg/L |
| Nitrogen, total kjeldahl as N | 34 | .15 | .15 | .00-.55 | mg/L |
| Phosphorus, total as P | 34 | .02 | .05 | .00-.25 | mg/L |
| Carbon, organic total as C | 5 | 5.1 | 2.6 | 1.3-8.3 | mg/L |
| Carbon, organic, dissolved as C | 6 | 2.1 | 1.3 | .8-4.2 | mg/L |
| Carbon, organic suspended as C | 7 | .4 | .6 | .0-1.6 | mg/L |
| Phytoplankton, total | 32 | 200 | 220 | 20-1,100 | cells/mL |
| Periphyton | | | | | |
| Ash weight | 14 | 3,310 | 3,970 | 78.7-14,700 | $mg/m^2$ |
| Dry weight | 14 | 4,140 | 4,490 | 315-17,200 | $mg/m^2$ |
| Suspended sediment | 904 | -- | -- | 1-1,310 | mg/L |

| Measurement | Dissolved: No. of analyses | Dissolved: Value of range | Total: No. of analyses | Total: Range | Units |
|---|---|---|---|---|---|
| Aluminum | 9 | 0-30 | 8 | 30-280 | µg/L |
| Arsenic | 11 | 0-2 | 11 | 0-3 | µg/L |
| Cadmium | 11 | 0-1 | 11 | 0-10 | µg/L |
| Chromium | 11 | 0-<10 | 11 | 0-20 | µg/L |
| Cobalt | 11 | 0-1 | 10 | 0-<50 | µg/L |
| Copper | 11 | 0-1 | 11 | 0-45 | µg/L |
| Iron | 11 | 0-170 | 11 | 0-2800 | µg/L |
| Lead | 11 | 0-3 | 11 | 0-<100 | µg/L |
| Manganese | 11 | 0-20 | 10 | 0-70 | µg/L |
| Mercury | 11 | .0-<.5 | 10 | .0-<.5 | µg/L |
| Selenium | 11 | 0 | 11 | 0-1 | µg/L |
| Zinc | 11 | 0-10 | 11 | 0-50 | µg/L |

Table 2.--Statistical summary of water-quality measurements for North Fork Flathead River near Columbia Falls, for period of record

| Measurement | No. of analyses | Mean | Standard deviation | Range | Units |
|---|---|---|---|---|---|
| Discharge | -- | 3010 | -- | 198-69,100 | $ft^3/s$ |
| Specific conductance (at 25 deg C) | 731 | -- | -- | 128-246 | µmhos/cm |
| pH | 24 | 8.1 | 0.2 | 7.7-8.5 | units |
| Temperature, water | -- | -- | -- | .0-19.0 | deg C |
| Dissolved oxygen | 24 | 11.3 | 1.3 | 9.1-13.0 | mg/L |
| Percent saturation | 24 | 102 | 3 | 96-109 | percent |
| Coliform, fecal | 24 | 4 | 7 | <1-33 | col/100 mL |
| Streptococci, fecal | 24 | 22 | 75 | <1-370 | col/100 mL |
| Hardness as $CaCo_3$ (Ca, Mg) | 24 | 99 | 16 | 69-120 | mg/L |
| Noncarbonate hardness | 24 | 6 | 3.5 | 0-14 | mg/L |
| Calcium, dissolved (Ca) | 24 | 28 | 4.2 | 20-34 | mg/L |
| Magnesium, dissolved (Mg) | 24 | 6.8 | 1.3 | 4.6-9.7 | mg/L |
| Sodium, dissolved (Na) | 24 | .9 | .2 | .5-1.7 | mg/L |
| Potassium, dissolved (K) | 24 | .3 | .1 | .2-.5 | mg/L |
| Bicarbonate ($HCO_3$) | 24 | 113 | 18 | 84-145 | mg/L |
| Carbonate ($CO_3$) | 24 | 0 | 0 | 0 | mg/L |
| Alkalinity, total as $CaCO_3$ | 24 | 93 | 15 | 69-119 | mg/L |
| Carbon dioxide | 24 | 1.5 | .8 | .5-3.3 | mg/L |
| Sulfate dissolved ($SO_4$) | 24 | 8.5 | 2.8 | 4.1-13 | mg/L |
| Chloride, dissolved (Cl) | 24 | .5 | .4 | .0-1.6 | mg/L |
| Fluoride, dissolved (F) | 24 | .1 | .0 | .1 | mg/L |
| Silica, dissolved ($SiO_2$) | 24 | 4.6 | .3 | 3.9-5.2 | mg/L |
| Dissolved solids, calculated | 24 | 106 | 17 | 77-135 | mg/L |
| Nitrite plus nitrate, total as N | 24 | .06 | .06 | .00-.29 | mg/L |
| Nitrogen, ammonia, dissolved as N | 20 | .01 | .01 | .00-.03 | mg/L |

Table 2.--Statistical summary of water-quality measurements for North Fork Flathead River near Columbia Falls, for period of record--continued

| Measurement | No. of analyses | Mean | Standard deviation | Range | Units |
|---|---|---|---|---|---|
| Nitrogen, total kjeldahl as N | 24 | .06 | .06 | .00-.22 | mg/L |
| Phosphorus, total as P | 24 | .01 | .02 | .00-.05 | mg/L |
| Carbon, organic, total as C | 2 | 2.2 | 2.4 | .5-3.9 | mg/L |
| Carbon, organic, dissolved as C | 7 | 3.0 | 2.0 | .8-5.8 | mg/L |
| Carbon, organic, suspended as C | 7 | .3 | .3 | .0-.7 | mg/L |
| Phytoplankton, total | 21 | 680 | 1,500 | 9-6,800 | cell/mL |
| Periphyton | | | | | |
| Ash weight | 9 | 5,360 | 5,510 | 154-18,500 | mg/m$^2$ |
| Dry weight | 9 | 6,220 | 6,140 | 462-20,700 | mg/m$^2$ |
| Suspended sediment | 731 | -- | -- | 1-931 | mg/L |

| Measurement | Dissolved | | Total | | Units |
|---|---|---|---|---|---|
| | No. of analyses | Value or range | No. of analyses | Value or range | |
| Aluminum | 9 | 0-20 | 8 | 30-230 | µg/L |
| Arsenic | 8 | 0-1 | 8 | 0-1 | µg/L |
| Cadmium | 8 | 0-1 | 8 | 0-<10 | µg/L |
| Chromium | 8 | 0-1 | 8 | 0-10 | µg/L |
| Cobalt | 8 | 0-2 | 8 | 1-<50 | µg/L |
| Copper | 8 | 0-1 | 8 | 0-10 | µg/L |
| Iron | 8 | 0-60 | 8 | 0-280 | µg/L |
| Lead | 8 | 0-2 | 8 | 0-<100 | µg/L |
| Manganese | 8 | 0-20 | 8 | 0-10 | µg/L |
| Mercury | 8 | 0-<.5 | 7 | 0-<.5 | µg/L |
| Selenium | 8 | 0 | 8 | 0 | µg/L |
| Zinc | 8 | 0-10 | 8 | 0-30 | µg/L |

In the tables constituents are given in terms of concentration. However, constituent loads are discussed throughout the text and much of the water-quality-data simulation involves the use of constituent loads. To convert from concentration to load, the following relationship is used:

$$C_L = QC_ik \tag{1}$$

where $C_L$ is constituent load in tons per day,

$Q$ is the water discharge in cubic feet per second,

$C_i$ is concentration in milligrams per liter, and

$$k = \frac{86{,}400 \text{ seconds per day x } 62.4 \text{ pounds per cubic feet}}{2{,}000 \text{ pounds per ton x } 1{,}000{,}000 \text{ mg per liter}} = 0.0027$$

## Physical measurements

### Water discharge

Available streamflow data include continuous records for both stations during the study period and historical records. Table 3 indicates that the 1975 and 1976 water years were periods of near-average flow and the 1977 water year was one of very low flow. Historical records show that average flows increased about threefold between the upstream and downstream stations. Maximum flows for the period of record were 16,300 $ft^3/s$ and 69,100 $ft^3/s$, at the upstream and downstream stations, respectively, in June 1964.

Table 3.—Mean daily flow at stream-gaging stations

| | Mean daily flow, in cubic feet per second | | | |
|---|---|---|---|---|
| | Water year | | | Period of record |
| | 1975 | 1976 | 1977 | |
| Flathead River at Flathead, B.C. | 1,020 | 1,110 | 398 | 975 |
| N.F. Flathead River near Columbia Falls | 3,050 | 3,520 | 1,560 | 3,010 |

Streamflow hydrographs for the 1976 water year (fig. 2) illustrate a pattern typical of an unregulated northern mountain stream in which meteorologic conditions are responsible for numerous fluctuations during the annual flow cycle. Precipitation in combination with thawing accounted for sharp rises in streamflow during late autumn and early winter. The abrupt declines in streamflow occurring in middle and late winter resulted from extreme cold

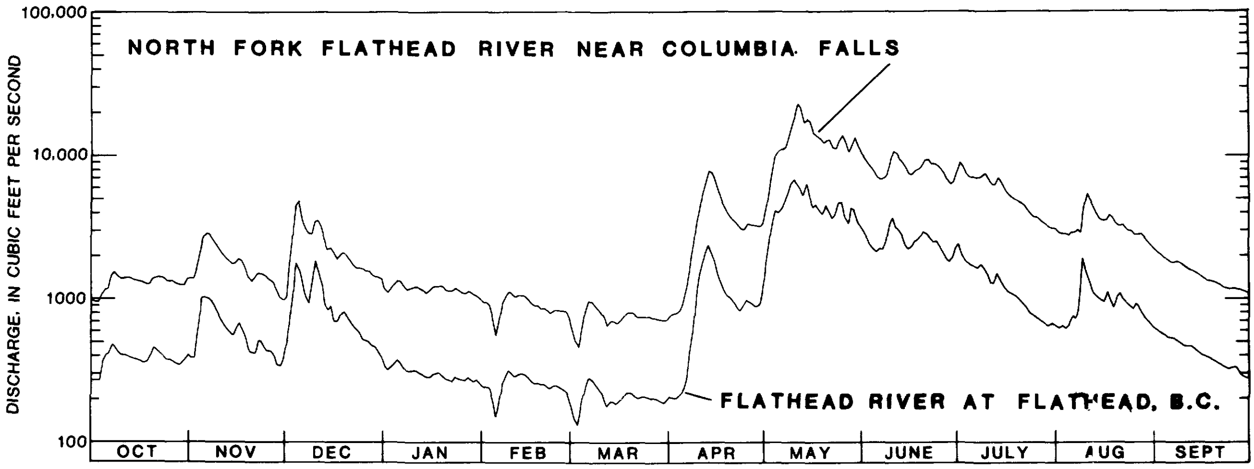


Figure 2.--Hydrographs of stream discharge at streamflow stations, 1976 water year.

temperatures that created ice and caused temporary storage due to backwater. Spring runoff began abruptly, peaked in mid-May, and gradually declined to base flow in late summer. The many secondary peaks during the year resulted from precipitation and temperature changes that caused snowmelt. Convergence of the hydrographs with respect to each other during peaks and divergence following the peaks are due to the buffering effect that the lakes have to inflow between the stations. The lakes influence discharge at the downstream station by reducing peak flows and releasing the water over an extended period of time.

Many water-quality values reach their extreme levels during periods of high and low flows. For this reason various streamflow summaries are often more meaningful when related to water-quality measurements than are the tables of daily values or the annual hydrographs. In sections that follow on water-quality properties, reference will frequently be made to specific streamflow conditions. Tables 4 and 5 each consist of four sets of statistical data that summarize streamflow conditions at the stations for the period of record.

The listing "monthly and annual mean discharges" in tables 4 and 5 gives the maximum mean, minimum mean, and mean discharges for each month as well as the annual summary for the period of record. The standard deviation and coefficient of variation are given for each mean discharge, followed by the average percentage of annual runoff contributed during each month.

Table 4.--Statistical summaries of streamflow record for
Flathead River at Flathead, B.C., through 1977

Monthly and annual mean discharges

| Month | Maximum ($ft^3/s$) | Minimum ($ft^3/s$) | Mean ($ft^3/s$) | Standard deviation ($ft^3/s$) | Coefficient of variation | Percent of annual runoff |
|---|---|---|---|---|---|---|
| October | 1,290 | 138 | 350 | 249 | 0.71 | 3.2 |
| November | 707 | 124 | 331 | 155 | .47 | 3.0 |
| December | 881 | 126 | 246 | 139 | .57 | 3.3 |
| January | 348 | 117 | 186 | 59 | .32 | 1.7 |
| February | 345 | 108 | 178 | 60 | .34 | 1.6 |
| March | 531 | 117 | 196 | 81 | .41 | 1.8 |
| April | 2,690 | 189 | 896 | 570 | .64 | 8.2 |
| May | 5,580 | 1,540 | 3,630 | 958 | .26 | 33.1 |
| June | 6,690 | 824 | 3,240 | 1,450 | .45 | 29.6 |
| July | 2,420 | 279 | 1,000 | 461 | .46 | 9.2 |
| August | 937 | 188 | 392 | 145 | .37 | 3.6 |
| September | 785 | 164 | 294 | 122 | .41 | 2.7 |
| Annual | 1,380 | 398 | 975 | 206 | .21 | 100 |

Duration of daily mean flow for period of record

Discharge, in $ft^3/s$, which was equaled or exceeded for indicated percent of time

| 1% | 5% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 95% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,380 | 4,640 | 3,000 | 1,280 | 608 | 406 | 310 | 250 | 210 | 184 | 150 | 130 | 102 |

Probability of annual low flows

| Non-exceedence probability, in percent | Lowest average flow, in cubic feet per second | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Consecutive days | | | | | |
| | 1 day | 3 | 7 | 14 | 30 | 60 | 90 |
| 1 | 65 | 71 | 73 | 79 | 89 | 98 | 104 |
| 2 | 68 | 74 | 78 | 84 | 94 | 104 | 110 |
| 5 | 72 | 79 | 84 | 92 | 103 | 113 | 120 |
| 10 | 76 | 83 | 91 | 100 | 111 | 121 | 129 |
| 20 | 82 | 90 | 100 | 110 | 121 | 133 | 142 |
| 50 | 98 | 106 | 119 | 131 | 143 | 156 | 169 |

Probability of annual high flows

| Exceedence probability, in percent | Highest average flow, in cubic feet per second | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Consecutive days | | | | | |
| | 1 day | 3 | 7 | 15 | 30 | 60 | 90 |
| 50 | 8,240 | 7,690 | 6,790 | 6,010 | 5,240 | 4,060 | 3,150 |
| 20 | 10,700 | 9,640 | 8,350 | 7,360 | 6,220 | 4,710 | 3,660 |
| 10 | 11,900 | 10,500 | 9,000 | 7,920 | 6,570 | 4,910 | 3,830 |
| 4 | 13,100 | 11,200 | 9,540 | 8,380 | 6,820 | 5,050 | 3,950 |
| 2 | 13,800 | 11,600 | 9,800 | 8,620 | 6,930 | 5,100 | 3,990 |
| 1 | 14,300 | 11,800 | 10,000 | 8,780 | 7,000 | 5,120 | 4,020 |

Table 5.--Statistical summaries of streamflow record for North Fork Flathead River near Columbia Falls through 1977

Monthly and annual mean discharges

| Month | Maximum ($ft^3/s$) | Minimum ($ft^3/s$) | Mean ($ft^3/s$) | Standard deviation ($ft^3/s$) | Coefficient of variation | Percent of annual runoff |
|---|---|---|---|---|---|---|
| October | 3,650 | 518 | 1,230 | 680 | 0.56 | 3.4 |
| November | 2,940 | 420 | 1,150 | 540 | .47 | 3.2 |
| December | 2,290 | 394 | 885 | 406 | .46 | 2.5 |
| January | 2,130 | 325 | 738 | 296 | .40 | 2.0 |
| February | 1,810 | 370 | 724 | 268 | .37 | 2.0 |
| March | 2,350 | 406 | 813 | 363 | .45 | 2.2 |
| April | 6,880 | 833 | 3,110 | 1,470 | .47 | 8.6 |
| May | 15,200 | 4,990 | 10,000 | 2,690 | .27 | 27.8 |
| June | 20,800 | 3,350 | 10,500 | 4,060 | .39 | 29.0 |
| July | 11,100 | 1,440 | 4,160 | 1,920 | .46 | 11.5 |
| August | 3,230 | 747 | 1,640 | 532 | .32 | 4.5 |
| September | 2,650 | 668 | 1,180 | 435 | .37 | 3.3 |
| Annual | 4,720 | 1,380 | 3,010 | 702 | .23 | 100 |

Duration of daily mean flow for period of record

Discharge, in $ft^3/s$, which was equaled or exceeded for indicated percent of time

| 1% | 5% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 95% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19,000 | 12,500 | 8,700 | 4,500 | 2,380 | 1,560 | 1,200 | 930 | 810 | 690 | 560 | 480 | 360 |

Probability of annual low flows

| Non-exceedence probability, in percent | Lowest average flow, in cubic feet per second | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 day | Consecutive days 3 | 7 | 14 | 30 | 60 | 90 |
| 1 | 247 | 266 | 284 | 305 | 335 | 376 | 377 |
| 2 | 256 | 277 | 299 | 323 | 355 | 392 | 398 |
| 5 | 273 | 295 | 324 | 353 | 389 | 421 | 435 |
| 10 | 291 | 314 | 349 | 383 | 422 | 450 | 473 |
| 20 | 316 | 340 | 382 | 422 | 466 | 493 | 525 |
| 50 | 379 | 405 | 459 | 512 | 564 | 602 | 650 |

Probability of annual high flows

| Exceedence probability, in percent | Highest average flow, in cubic feet per second | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 day | Consecutive days 3 | 7 | 15 | 30 | 60 | 90 |
| 50 | 18,900 | 18,200 | 16,500 | 14,800 | 13,200 | 10,700 | 8,750 |
| 20 | 26,100 | 24,200 | 21,600 | 19,200 | 16,500 | 13,200 | 10,600 |
| 10 | 30,600 | 27,700 | 24,400 | 21,600 | 18,200 | 14,300 | 11,500 |
| 4 | 36,100 | 31,400 | 27,200 | 24,100 | 19,800 | 15,300 | 12,300 |
| 2 | 40,000 | 33,900 | 29,000 | 25,600 | 20,700 | 15,800 | 12,700 |
| 1 | 43,700 | 36,100 | 30,500 | 26,900 | 21,400 | 16,200 | 13,000 |

The listing "duration of daily mean flow" in tables 4 and 5 gives the percentage of time in which streamflow exceeded a given discharge for the period of record. For example, for Flathead River at Flathead, B.C., 7,380 $ft^3/s$ was equaled or exceeded during 1 percent of the time and 102 $ft^3/s$ was equaled or exceeded during 99 percent of the time.

The adequacy of streamflow for many purposes, including that related to water-quality criteria, is commonly evaluated in terms of low-flow characteristics. Conversely, a need often exists to evaluate the characteristics of high flows for flood prediction and various water uses. The listings "probability" for annual low flow and annual high flow (tables 4 and 5) are designed to be used for the above purposes. As an example, the low-flow table for Flathead River at Flathead, B.C., indicates that for the annual 7-day low-flow period the probability is 5 percent that flow will be less than (non-exceedence probability) 84 $ft^3/s$ throughout the entire 7 days. The high-flow table is used in a similar manner, but with the exceedence probability rather than non-exceedence.

## Temperature

Temperature is a physical property of water that has a varying influence on almost all activities that occur in the stream. It is important to the water chemistry of the stream and to virtually all physical processes. Most important, water temperature controls the bacterial oxidation rate of organic matter and the growth and production rate of organisms.

The water temperature of the North Fork, like other streams, follows seasonal and diel cycles in response to meteorologic conditions. Figures 3 and 4 show the seasonal water temperature for both stations during the 1976 water year. The illustrations also show the maximum and minimum temperatures recorded for each week.

Inspection of the graphs reveals two major differences at the stations: (1) mean temperatures throughout the year tend to be higher at the downstream station and (2) ranges in weekly temperatures are greater at the upstream station. Condition 1 is largely a result of solar radiation and meteorologic differences between the stations. Solar radiation is responsible for accumulative heat gain as the water moves downstream. In addition the upstream station being more than 800 feet higher in elevation presumably has somewhat cooler air temperatures throughout the year, thus causing differences in equilibrium water temperatures for the stations.

The increased range in weekly temperature at the upstream station (condition 2) results from a reduction in thermal inertia, principally from the smaller volume of water in which the average stream depth is less than it is downstream. The smaller volume and less depth influence both heat gain and heat loss, primarily through radiation, and tend to maintain the water temperature more in accordance with changing air temperatures. The net result is a greater variance from the mean temperature.

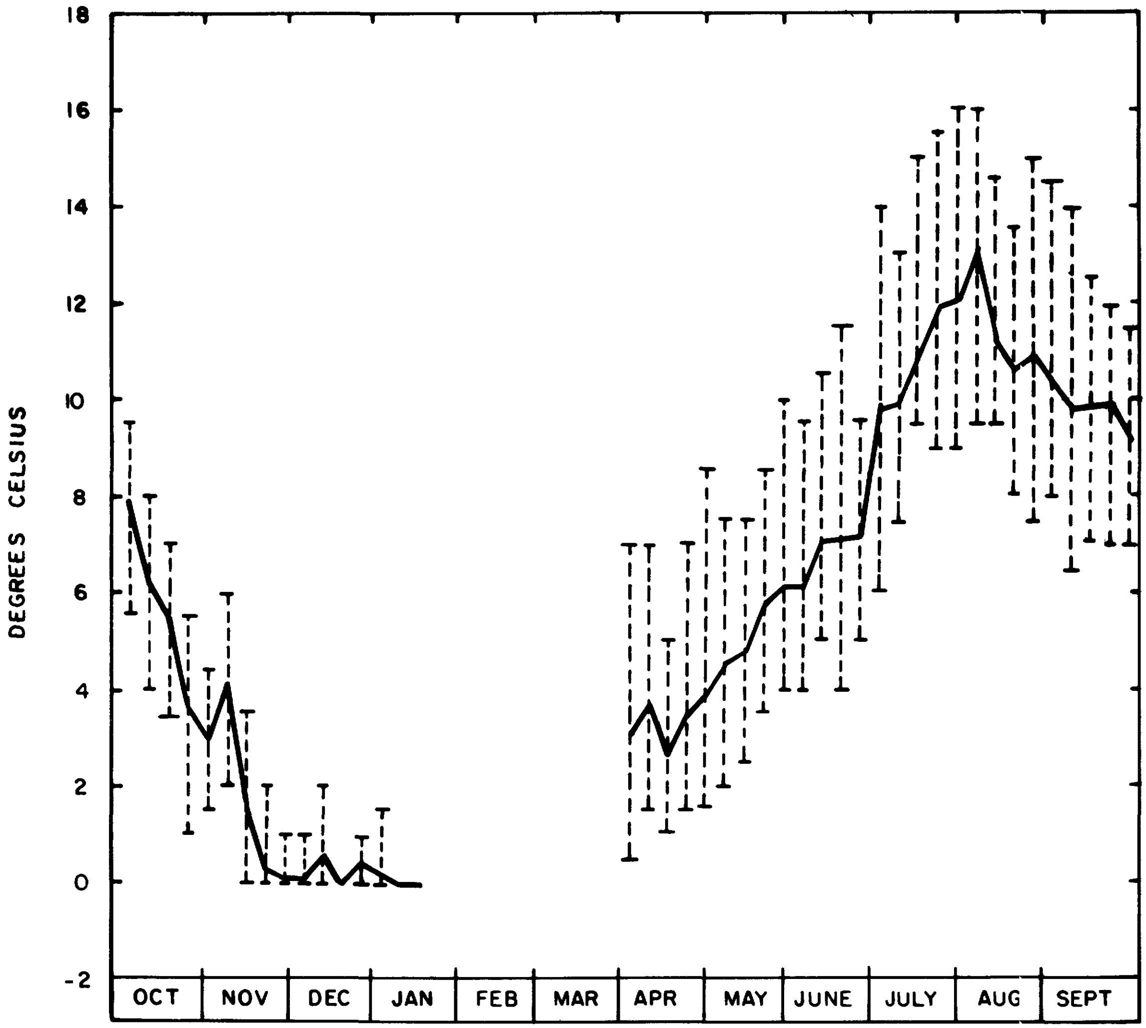


Figure 3.--Mean weekly water temperatures and water-temperature ranges for Flathead River at Flathead, B.C., 1976 water year.

Graphs of diel changes in temperature for selected days (fig. 5) further illustrate the above two conditions. Days were selected to show differing stream and weather conditions during the year. With the exception of ice cover on December 16 the graphs show higher mean daily temperatures downstream and larger daily ranges upstream. The maximum and minimum temperatures not only have a greater range at the upstream station, but they occur earlier in the day, and thus represent a reduced lag time to air temperature. The December 16 graph shows the coldest day or nearly the coldest day of the year when much of the river was under ice cover. The May 12 graph represents a warm day during peak runoff. Although the volume of water in the channel was large, a warm day and adjoining cool nights caused a large fluctuation in water temperature. The graph for July 26, which was nearly the hottest day of the year, shows the largest diel changes of all graphs. September 18 represents a typical autumn day during base-flow conditions.

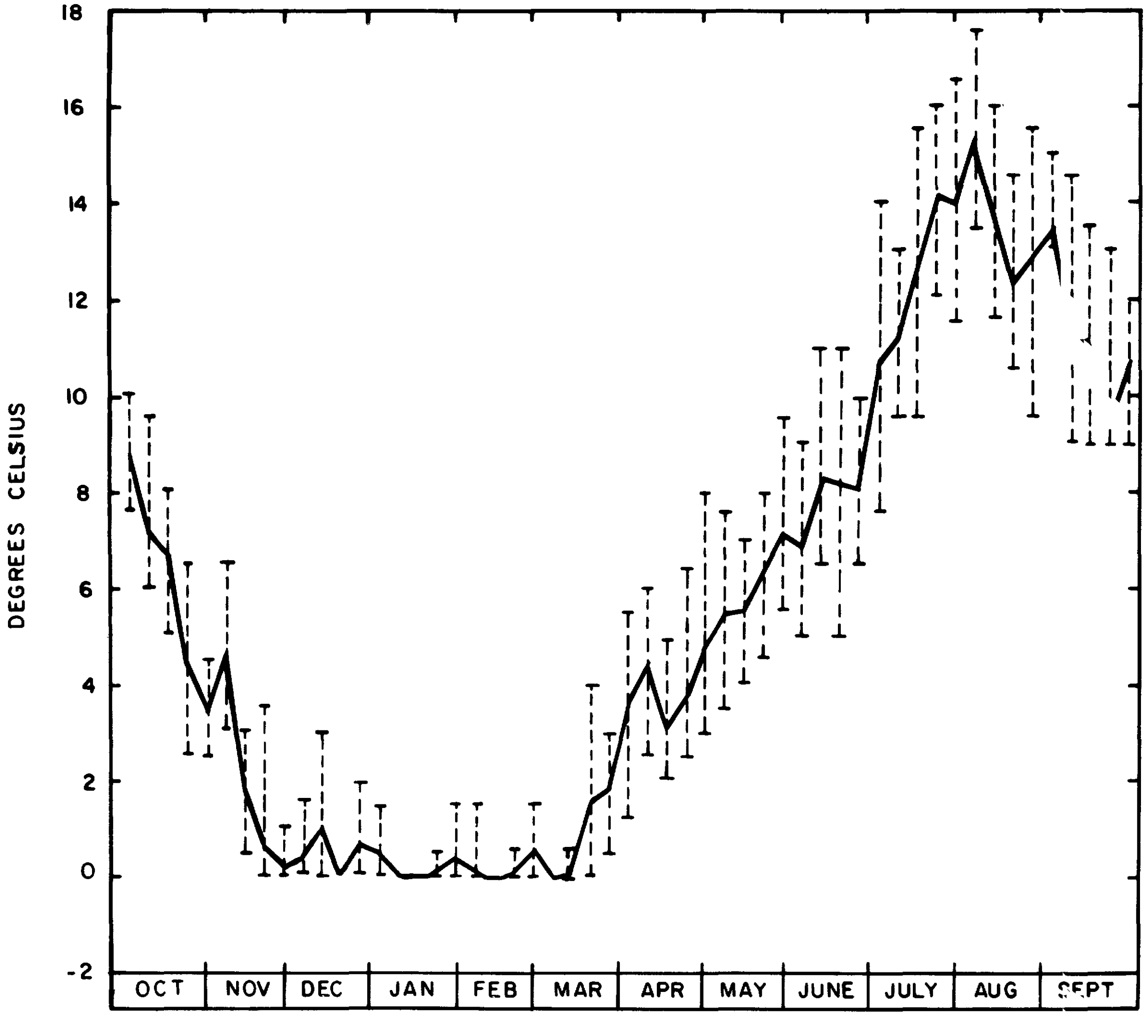


Figure 4.--Mean weekly water temperatures and water-temperature ranges for North Fork Flathead River near Columbia Falls, 1976 water year.

## Sediment

Fluvial sediment is the fragmented material derived primarily from the physical and chemical disintegration of rocks from the earth's crust. Depending on the size of each sediment particle, the stream transports the sediment by maintaining the particle in suspension with turbulent currents or by rolling or skipping the particle along the streambed. The fine sediment moves downstream at about the same velocity as the water, whereas the coarsest sediment moves only when the stream velocity is sufficient to set it in motion. Measurements in this study were made for those particles that were in suspension as they passed the sampling section. The measured sediment does not include that part of the transported load referred to as bed load. Results of the measurements are reported as concentration in milligrams per liter and as suspended-sediment discharge (load) in tons per day.

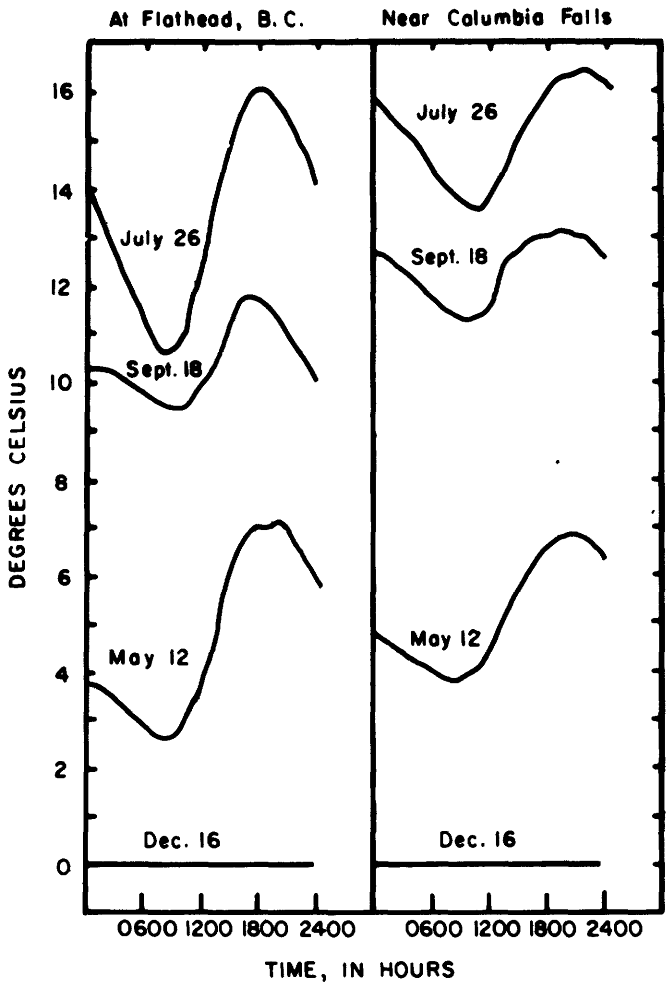


Figure 5.--Diel water temperatures at water-quality stations for selected days, 1976 water year.

Figure 6 shows sediment concentration as related to streamflow for the 1976 water year at Flathead River at Flathead, B.C. With the exception of some periods during the 1977 water year, the illustration is representative of trends at both stations for the period of record. Sediment concentrations were generally less than 10 mg/L (milligrams per liter) from mid-summer through early spring; the occasional rises occurred during storms and winter thaws. During spring runoff suspended sediment had a direct correlation to streamflow, with a gradual rise in concentration until streamflow peaked followed by a recession until mid-summer.

Suspended sediment in the North Fork is derived from a combination of channel erosion and soil erosion from overland flow. As flow increases the stream width becomes larger, thereby often accelerating bank erosion.

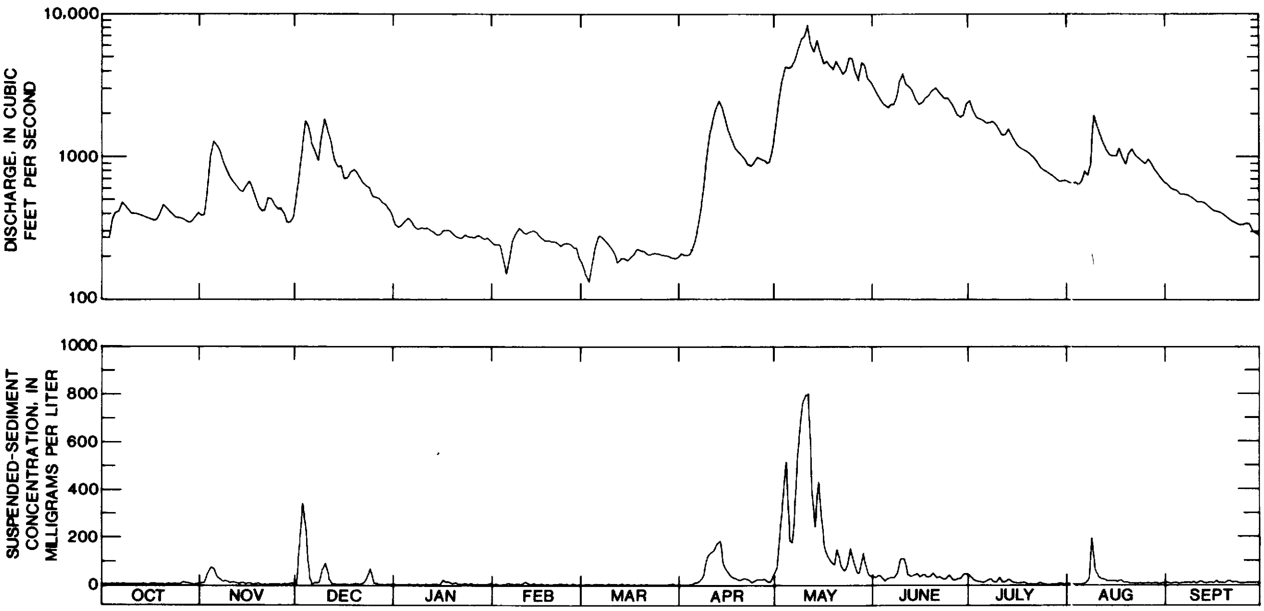


Figure 6.--Hydrographs of stream discharge and suspended-sediment concentration for Flathead River at Flathead, B.C., 1976 water year.

Greater water velocities associated with high streamflow provide increased energy for scouring the streambed and transporting the sediment. The high flows often result from overland flow, which furnishes additional sediment to the channel.

Selected suspended-sediment samples were analyzed to determine the percentage of material finer than 0.062 mm (millimeter), which is the size of silt and clay particles. Although the pattern is not well defined, the sediment samples collected during periods of high runoff, in addition to having much higher concentrations, generally had high percentages of fine sediment. Conversely, samples from lesser flows generally carried coarser material. The condition relates to sediment sources in which overland flow at times of high runoff makes fine sediment available. Diminishing flows flush much of the fine sediment from the channel and at reduced flows only the coarser material is available for transport.

A comparison of suspended sediment between stations generally showed somewhat higher concentrations at the upstream station. However, at reduced streamflow this condition was not always apparent and occasionally during high flows, concentrations were greater at the downstream station. The general downstream reduction in sediment concentration may be due largely to sediment entrapment by the lakes along the east drainage between the two stations. Much of the sediment flowing into the lakes presumably remains there and the outflow acts to dilute water in the main channel. A second condition that may account for greater sediment concentration in the upper drainage is the higher gradient of the stream courses, which provides additional energy for erosion and, thus, produces greater concentrations.

The annual suspended-sediment loads for the years of record at both stations are given in table 6. Sediment load, because it is additive from all sources, generally increases as water passes downstream as shown here. Annual variations are obviously apparent when comparing sediment load for a low-flow year (1977 water year) with a near-average year (1976 water year). A high-flow year would presumably have a notable increase in sediment load over an average year. During the 1976 water year the month of May accounted for about 85 percent of the total annual suspended-sediment load, and during the 8 days of highest flow about 50 percent of the sediment load passed the stations. This condition is probably typical of sediment movement in the North Fork, except that for most years peak runoff occurs during June.

Table 6.--Suspended-sediment load for water-quality stations

| Station | Sediment discharge, in tons per year | |
|---|---|---|
| | 1976 water year | 1977 water year |
| Flathead River at Flathead, B.C. | 136,000 | 7,760 |
| N.F. Flathead River near Columbia Falls | 331,000 | 32,800 |

## Chemical measurements

### Common ions and dissolved solids

By convention the major ions consist of the cations calcium, magnesium, sodium, and potassium and the anions bicarbonate, carbonate, chloride, fluoride, and sulfate. Silica ($SiO_2$) also is included in the common-ion-constituent category even though silica is nonionic at the pH of most natural waters (6.0-8.5). For graphic display in this report, constituents that are chemically similar are grouped such as sodium and potassium; chloride, fluoride, and nitrate; and bicarbonate and carbonate. The first two groups consist of ions that were found in small concentrations. Carbonate and bicarbonate are grouped because the ions revert from one to the other as a function of pH. On the North Fork bicarbonate was the dominant ion of the two, with only small concentrations of carbonate existing when the pH exceeded 8.3.

Dissolved-solids concentration, given in milligrams per liter, is the sum of all dissolved constituents in water and in reality is the total of the major ions in solution. Dissolved solids is related to specific conductance

(conductance) in a way that the latter is a semiquantitative measure of the first. Conductance of the water is dependent upon the ability of the total ions in solution to conduct an electrical current. Because it is a measurement that can readily be made at streamside or inexpensively in the laboratory, conductance has been used extensively in this study. For water on the North Fork the relationship shown later in the report on figure 20 was found to exist between conductance and dissolved-solids concentration.

Figures 7 and 8 are graphical summaries of the common ions (excluding silica) at both sites during typical periods of base flow and peak runoff. The vertical scale depicts concentration in milliequivalents per liter instead of milligrams per liter to make unit concentrations chemically equivalent. The composition of the cation and anion groups is shown by percentages for each ion. The dominant cations during all flow conditions were calcium followed by magnesium. Bicarbonate was by far the dominant anion. The cations and silica are most often derived directly from solution of minerals in rocks and soil. Anions to a larger degree are from nonlithologic sources. The abundant limestones ($CaCO_3$), dolomites ($CaMgCO_3$), and soils originating from these rock types are apparently the principal sources of calcium and magnesium. The same materials in combination with atmospheric carbon dioxide liberated to the soil could account for the bicarbonate. The major significance of the remaining cations and anions is the small concentrations in which they were detected. Silica concentration was generally about 4 mg/L but nevertheless the concentration was sufficient to support growth of diatoms. The average sulfate concentrations at the upstream and downstream stations were 5.6 and 8.5 mg/L, respectively--rather low for most natural water.

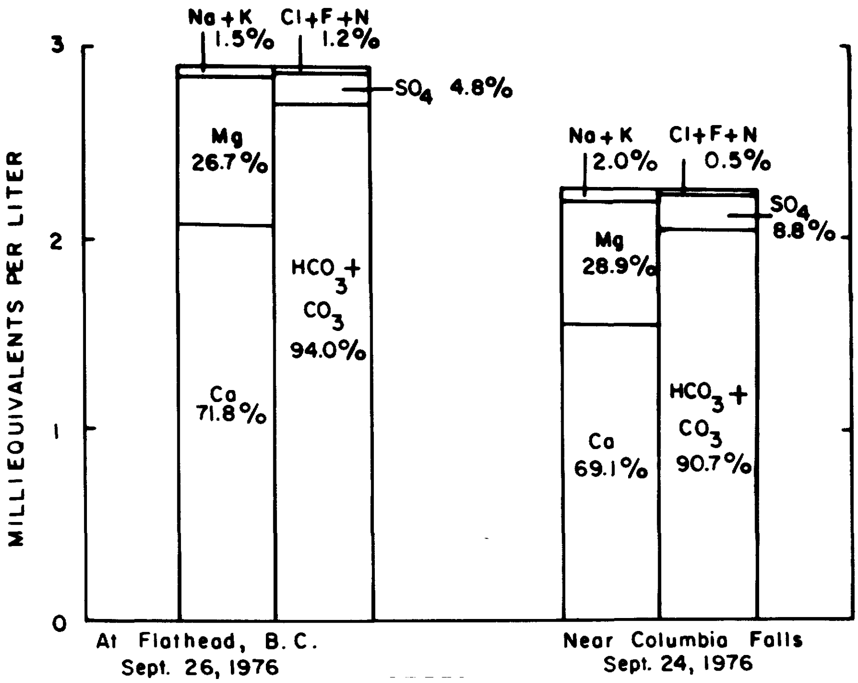


Figure 7.--Relationship of major ions at water-quality stations during base-flow conditions.

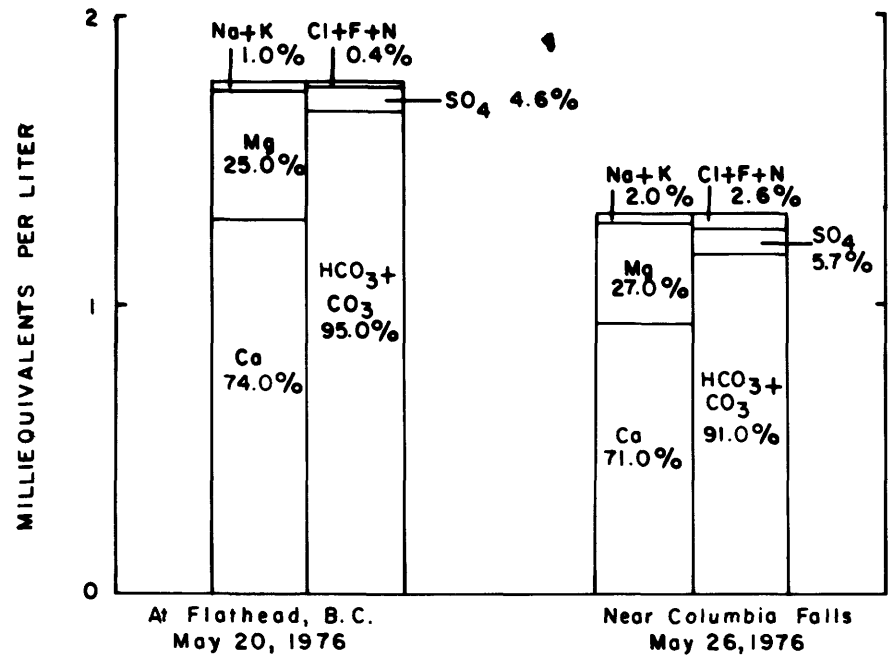


Figure 8.--Relationship of major ions at water-quality stations during peak runoff conditions.

Large concentrations of common ions in water account for many undesirable properties and are often used as limiting factors in classification schemes for various water uses. None of the concentrations of ions or dissolved solids observed during the study on the North Fork would be restrictive according to primary drinking water regulations (U.S. Environmental Protection Agency, 1975) or for most agricultural purposes. On the contrary, with respect to the common ions the water would be very good for both uses. During most of the annual flow cycle, concentrations of calcium and magnesium are responsible for the water being in the moderately hard to hard range (Durfor and Becker, 1964) at both stations. The relatively high amounts of bicarbonate caused the alkalinity to be in excess of recommended thresholds for some industrial uses (McKee and Wolf, 1971). On the other hand, because alkalinity is defined as the capacity of a solution to neutralize hydrogen ions (acids), it affords somewhat of a safeguard against low pH solutions often associated with coal-mining contamination.

The following water-quality conditions on the North Fork are evident from an examination of figures 7 and 8:

1. Ion ratios (percentages) change only slightly as water moves downstream. Small increases are noted in concentrations of magnesium, sodium, and sulfate. Small decreases occur in concentrations of calcium and carbonate. The slight modification in water type might result from differences in lithology between the upstream and downstream parts of the drainage.

2. Ion ratios (percentages) at individual stations change little from base-flow conditions to periods of high direct runoff. Even though direct runoff water is much more dilute and can cause only moderate changes when mixing, it apparently is of the same chemical character as that of the base-flow component. This situation is probably typical for much of the Flathead drainage but atypical of many other Montana streams.

3. Dissolved-solids concentrations decrease during periods of high direct runoff. This, of course, is a natural occurrence in which rain water or snowmelt has a rapid transit time to the river with little opportunity for solution to occur. The inverse relationship between dissolved-solids concentrations and streamflow discharge has previously been discussed.

4. Dissolved-solids concentrations decrease as water moves downstream. The condition prevails more or less during the entire annual flow cycle. Although not unique to the North Fork, the change in concentration is contrary to most streams where concentrations increase in passage downstream.

The downstream decrease in dissolved-solids concentrations (condition 4) is best illustrated in figure 9, which displays the results of daily specific conductance from both stations for the 1976 water year. The downstream decrease is simply a result of dilution in which most of the inflow water downstream from the boundary station has lower concentrations than that of the upper drainage. Causes of dilution may relate to changes in surface lithology and, for much of the year, to the lakes along the east drainage that contribute water to the river between the stations.

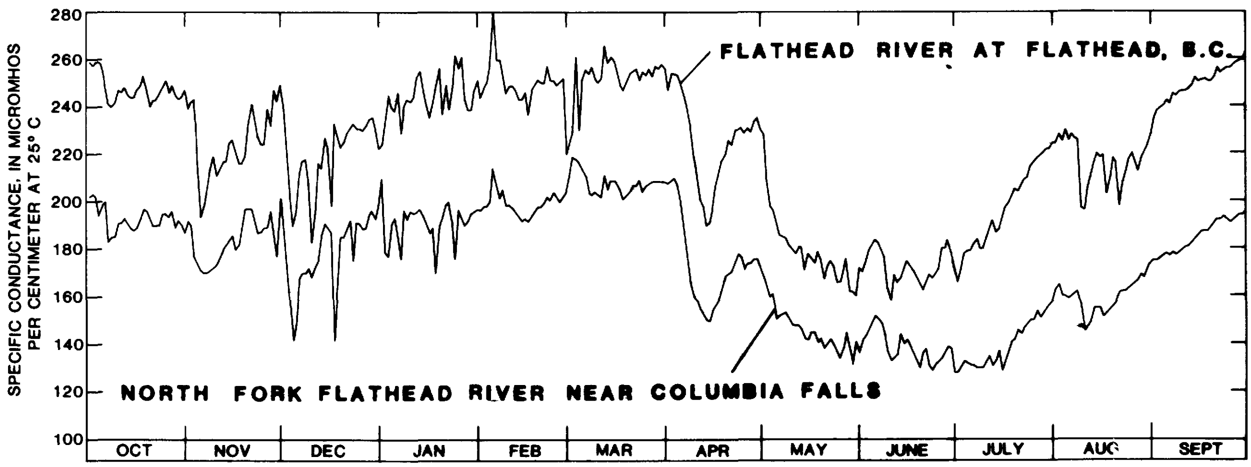


Figure 9.--Hydrograph of specific conductance at water-quality stations, 1976 water year.

Greater exposure of younger, more soluble rocks of Paleozoic and Mesozoic age north of the international boundary account for water in the upper drainage having higher concentrations of dissolved solids. Resistant Precambrian argillites, quartzites, and limestones are more extensive south of the international boundary. Direct runoff and ground water from these lithologic units are comparatively lower in dissolved-solids concentration.

Several lakes along the east drainage capture much of the spring runoff, which is low in dissolved-solids concentration, and release it gradually during the spring and autumn. Figure 9 shows that conductance is lowest during the peak runoff period (May and June). After the peak runoff period, conductance increases more abruptly at the upstream station compared to downstream. Thus, much of the resulting divergence between the two conductance hydrographs during summer, autumn, and winter can be attributed to outflow from the lakes.

Further evidence of dilution is shown on figure 10. The illustration represents conductance measurements made at the two stations and a number of

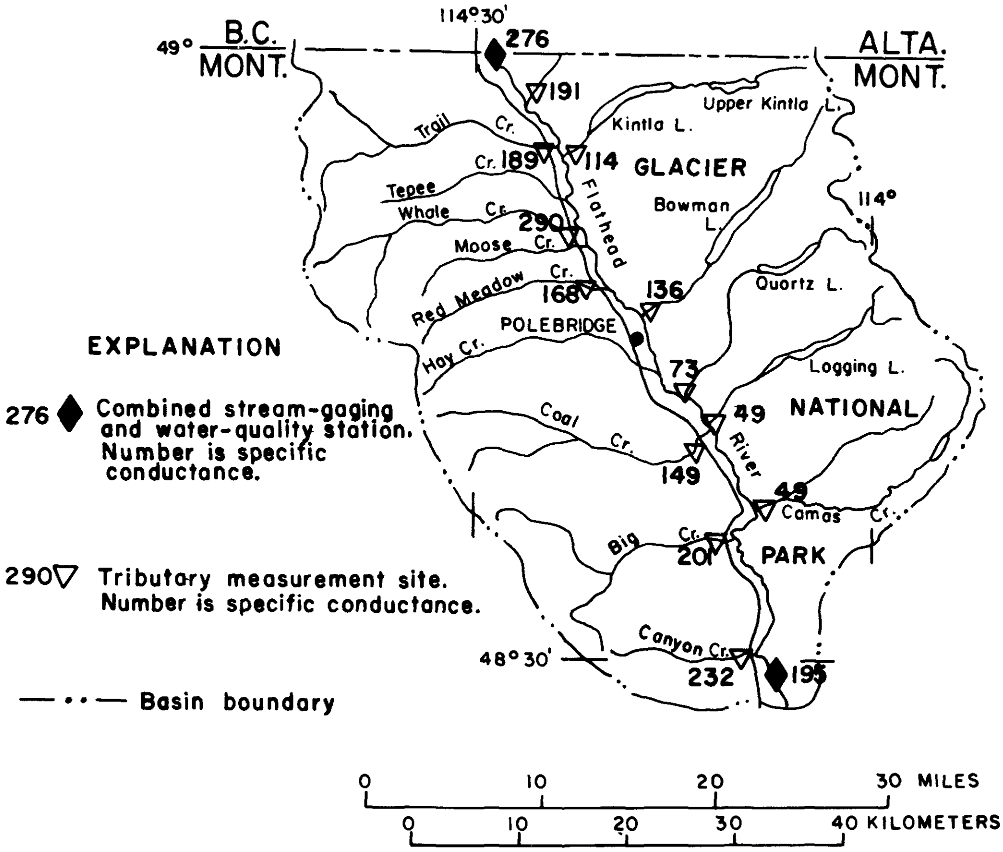


Figure 10.--Specific conductance at water-quality stations and on selected tributaries, August 19, 1977.

tributaries on August 19, 1977. Figure 10 indicates that water from the lake-fed streams on the east side of the drainage adds significantly to dilution during this period of the year. The rest of the streams south of the international boundary, with the exception of Whale Creek, also have reduced conductance values compared with water in the main channel at the boundary.

## Plant nutrients

Species of the nitrogen and phosphorus groups are commonly recognized as major plant nutrients, and in sufficient concentrations they can cause biological enrichment. Nitrogen occurs in forms as ammonia, nitrite, nitrate, and organic nitrogen. All forms can be found in the dissolved or suspended phase. Under oxidizing conditions such as found in water of the North Fork, much of the nitrogen reverts to nitrate through bacterial action (nitrification). In this study analyses of the water-sediment mixture were made for total nitrite plus nitrate and total kjeldahl nitrogen. Total kjeldahl nitrogen (the sum of total ammonia and total organic nitrogen) and total nitrite plus nitrate account for the total nitrogen in the stream transported in both the dissolved and suspended phases. Dissolved ammonia was also analyzed from filtered water; excessive concentrations are generally associated with septic pollution.

The form that phosphorus takes in natural water is somewhat uncertain, but most probable species appear to be the phosphate ion, complexes with metal ions, and colloidal particulate material (Hem, 1970). The latter form is thought to be of special significance to the Flathead drainage (Stanford, 1975). Phosphorus generally occurs in small concentrations in water and is thus more likely to be limiting to plants than is nitrogen. Some investigators have suggested this is true in Flathead Lake (Nunnallee and others, 1976). Total phosphorus, the only form analyzed for, was taken from samples of the water-sediment mixture; it is considered to be the sums of all forms, both suspended and dissolved.

Nutrient concentrations in the North Fork were generally low, often near the detectable limits, with moderate levels appearing during periods of peak runoff. Although these increases were associated with high flows, some evidence suggests that a high percentage of both nitrogen and phosphorus is transported by suspended sediment--especially sediment finer than 0.062 mm (probably clays). The higher streamflow acts as a means to move sediment particles that sorb much of the nitrogen and phosphorus. Sorption occurs either near the source of the sediment particle or in the stream as dissolved nutrients are stripped from the water.

The close relationship between phosphorus and suspended sediment is illustrated by figure 11. The graphs represent the simultaneous measurements of these two constituents at the upstream station during 3 years of sampling. A relationship between total nitrogen and suspended sediment was also present, but the correlation was not as good, which suggests that total nitrogen may not rely on sediment transport as much as does phosphorus.

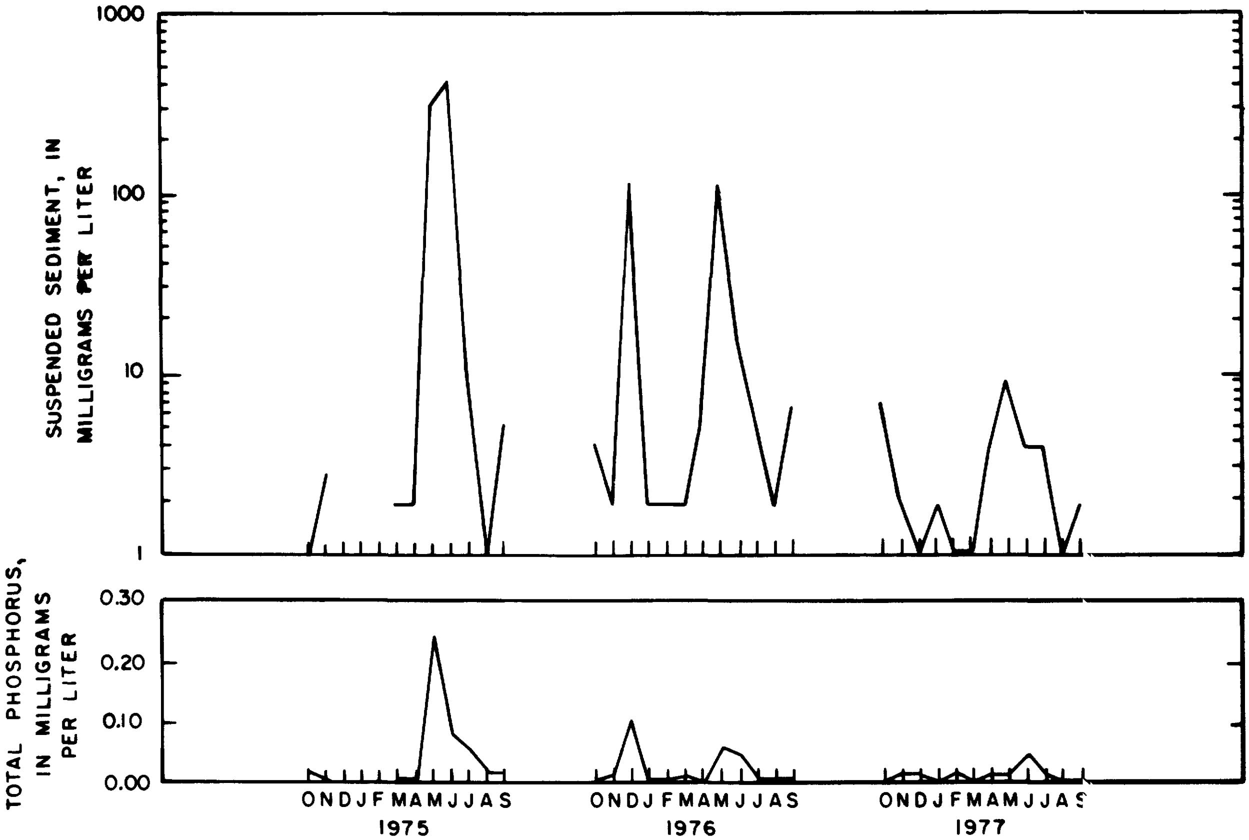


Figure 11.--Relationship of suspended-sediment concentration and total phosphorus for Flathead River at Flathead, B.C., for period of record. Breaks in line represent periods of no data.

Figure 11 suggests that sediment resulting from high runoff is responsible for much of the phosphorus that moves downstream. Without extensive sampling, especially during periods of high runoff, an accurate nutrient budget for this stream would be difficult to determine. Nunnallee, Botz, and Willems (1976) estimated that the North Fork near its mouth carries an average phosphorus load of 140 lb/day (430 lb/day as $PO_4$). Phosphorus loading at the two stations during times of peak runoff appears to be extremely high (table 7) compared to the above estimates; however, for most of the year little sediment is being moved and the nutrient loading is greatly reduced. The large majority of samples at the downstream station represented phosphorus loads that were calculated to be 0-50 lb/day. (It should be noted here that to this point in the study the routine analytical techniques used by the Geological Survey were not accurate to a degree necessary to detect the minute changes that might be significant to the biotic community of the drainage. More accurate analytical techniques have since been made available.)

Table 7.--Phosphorus loading at water-quality stations for selected days during peak runoff

| Date | | Time | Instantaneous discharge ($ft^3/s$) | Suspended sediment (mg/L) | Total phosphorus (P) (mg/L) | Phosphorus discharge (P) (lb/day) |
|---|---|---|---|---|---|---|
| | | | Flathead River at Flathead, B.C. | | | |
| 1975 | May 16... | 1030 | 5,590 | 363 | 0.25 | 7,540 |
| 1976 | May 20... | 1130 | 4,930 | 211 | .06 | 1,600 |
| | | | North Fork Flathead River near Columbia Falls | | | |
| 1976 | May 28... | 1330 | 11,700 | 84 | .05 | 3,160 |

As might be predicted, nutrient loads increased in a downstream manner simply because any inflow load was additive. Nutrient concentrations at times also increased downstream, but often were less at the downstream station. The latter condition was a result of both dilution that reduced the concentration of suspended sediment and dilution from inflow water having lower concentrations of nutrients in solution. Nutrients measured in the North Fork probably originate from a combination of natural and unnatural drainage conditions. The question of how much of the nutrients can be attributed to actions such as logging practices can only be answered by a study of the nutrient budget of the main North Fork and its logged and unlogged tributaries.

## Trace elements

Some constituents in water are grouped as trace elements because they generally occur in small concentrations compared to the major ions. The group is rather poorly defined but generally consists of the metals plus a few nonmetals. Although many trace elements can be toxic to the biological environment at high concentrations (National Academy of Sciences, National Academy of Engineering, 1972), some are essential to life in low concentrations. Unlike high concentrations sometimes found in industrial areas, low concentrations obtained on the North Fork seem to confirm a natural origin. Dissolution of rocks and in some instances atmospheric fallout are probably the major sources of trace elements detected in this study.

Some trace elements are only moderately soluble in water but sorb strongly to clay particles in a manner similar to the nutrients. Other trace elements are found in the reverse order or are present in both the dissolved and suspended phases. For this reason both the filtered water and the water-sediment mixture were analyzed to determine the dissolved and total concentrations, respectively. The purpose of the trace-elements phase of the study was (1) to obtain baseline information for future comparisons and (2) to determine whether the analyzed concentrations were beyond levels that might cause biological distress.

Baseline data are being accumulated for trace elements at both stations at a frequency of four analyses per year. The results show concentrations to be below values that would cause any known biological stress problems (McKee and Wolf, 1971). For some of the total trace elements, annual cyclical patterns appear to exist in which high concentrations are associated with high direct runoff and low concentrations with base flow. Like nutrients, the increases are related to sorption by suspended sediment that is moved with the direct runoff. Some of the element concentrations also showed a downstream reduction.

Total iron, total aluminum, and total zinc were elements having high values that correlated best with suspended sediment and streamflow. An anomalous value of 45 µg/L (micrograms per liter) total copper was found during an extreme low flow on April 10, 1975, at the upstream station. Possible explanations, in addition to natural occurrence, are sample contamination or laboratory error.

## Dissolved oxygen

Oxygen dissolved in natural waters sustains the life of most aquatic organisms and is the single most important constituent that allows a stream to purify itself of wastes. The major source of oxygen in water is the atmosphere, but some oxygen is contributed indirectly as a byproduct of photosynthesis. Concentrations of dissolved oxygen are influenced by many factors including biological productivity, water temperature, waste loads, water turbulence, and sunshine. Water bodies having much organic productivity often display wide fluctuations of dissolved oxygen in response to biological activity.

Dissolved-oxygen measurements on the North Fork were made at streamside using the "modified Winkler method" with the results reported in milligrams per liter. Oxygen values were also converted to percent of saturation, which is a function of water temperature and atmospheric pressure at the time of sampling.

No oxygen measurements were below 9.1 mg/L or above 13.0 mg/L at either station. This represented a narrow range of 92-110 percent of saturation. This range is indicative of a healthy stream in which organic wastes are not present in sufficient amounts to cause extensive oxygen depletion. The evidence also suggests that processes associated with primary productivity (photosynthesis and respiration) are subdued to a degree that little effect is noticeable. For the primary productivity-dissolved oxygen regime to be fully determined, diel oxygen measurements must be made at various times of the year. Although this was not done, some of the routine measurements were made at times of the day when maximum variations from the saturated values could be expected, thus giving an indication that large deviations from saturation are not likely.

### Hydrogen-ion concentration

The hydrogen-ion concentration, or more specifically the hydrogen-ion activity, is commonly referred to as pH. It is most conveniently expressed in logarithmic units, and represents the negative base-10 log of the hydrogen-ion activity in moles per liter. The pH of a neutral solution is 7 with deviations below and above being acidic and basic, respectively. Conditions of the atmosphere cause rain and snow to generally be slightly acidic. Water that has had extensive contact with carbonate rocks, either on the surface or in the subsurface, tends to be basic. A number of other stream conditions including photosynthesis have varying effects on pH.

The following conditions were evident from examination of the pH results. (1) Measurements of pH at both stations were always slightly basic with the majority of the values near 8 or above. Limestones and dolomites (carbonate rocks) prevalent in the drainage are responsible for the general basicity of the water. (2) Reductions in pH were associated with periods of direct runoff. The lower pH was caused by runoff water that had characteristics of rain and snow. (3) The range in pH values was somewhat more restricted at the downstream station compared to the upstream station. The reduced range probably resulted from the mixing of fresh runoff water in the lakes along the lower east drainage prior to release into the river. The mixing action would have a tendency to moderate the extreme values. Some of the highest pH measurements occurred during mid-summer; although only a speculation, the high pH could be associated with aquatic photosynthesis, which would be more prevalent during the long daylight hours.

## Biological measurements

### Bacteria

An important part of most stream-quality assessment programs is the determination of microbiological wastes in the form of bacteria and viruses. Tests for pathogenic organisms are difficult to make and dangerous. For these reasons simpler tests have been developed for other bacteria (indicator bacteria) that indicate the possible presence of pathogens. In this study determinations were made for bacteria of the fecal coliform and fecal streptococcus groups. Both groups originate in the intestines of warm-blooded animals, including humans, and find their way to the stream through fecal discharge. Even though both groups are present in humans and animals, the presence of fecal coliform is more indicative of human waste and fecal streptococcus of animal waste.

Although standards for drinking water (U.S. Environmental Protection Agency, 1975) are based on the total coliform group, this group is not always associated with fecal pollution as are the two groups analyzed here. Studies have been made relating indicator bacteria densities to the probability of pathogenic organisms being present (National Academy of Sciences, National Academy of Engineering, 1972). With one exception, the densities detected at the two stations were far below levels that would cause concern. Compared with bacteria densities for other Montana streams where routine bacteria measure ments are made, the densities for the North Fork are considered to be low.

Stream bacteria populations are often found to be extremely variable in time, and once-monthly measurements may be far from the maximum or minimum or even the mean values for the month. Over long periods of time, however, trends can be established from monthly samples. Figure 12 may provide a clue to seasonal trends on the North Fork. The figure shows that increases in fecal streptococci are more prevalent during winter storms, spring runoff, and summer months. Fecal coliform bacteria (not graphed) generally had slightly reduced counts but the same annual patterns. Storms and spring runoff are periods when overland flows flush the surface debris, including fecal materials, into the channel. The summer months are times of increased activities along the tributaries and main channel. Recreation, seasonal work, and livestock grazing are all factors that account for higher bacteria density during the summer. Background densities at other times of the year result from the permanent animal and human populace of the drainage.

## Phytoplankton

Phytoplankton consists of aquatic plants, primarily algae, either floating or suspended in water. The transient phytoplankton population of a stream is dependent upon continuous replacement by new production and replenishment from upstream. The population size and types respond to a number of chemical and physical conditions including nutrient availability, light intensity, channel and streamflow conditions, and water temperature. Heavy algal production may produce oxygen supersaturation in the daylight and depletion at night--an effect that can create unfavorable conditions for aquatic organisms. Phytoplankton collected in this study can be placed in the three major phyla: Chrysophyta (diatoms), Chlorophyta (green algae), and Cyanophyta (blue-green algae).

Chrysophyta composed the greatest percentage of the total cell counts at both stations. At the upstream station the genera *Gomphonema*, *Hannaea*, *Navicula*, and *Nitzschia* occurred most frequently. Other genera that occurred

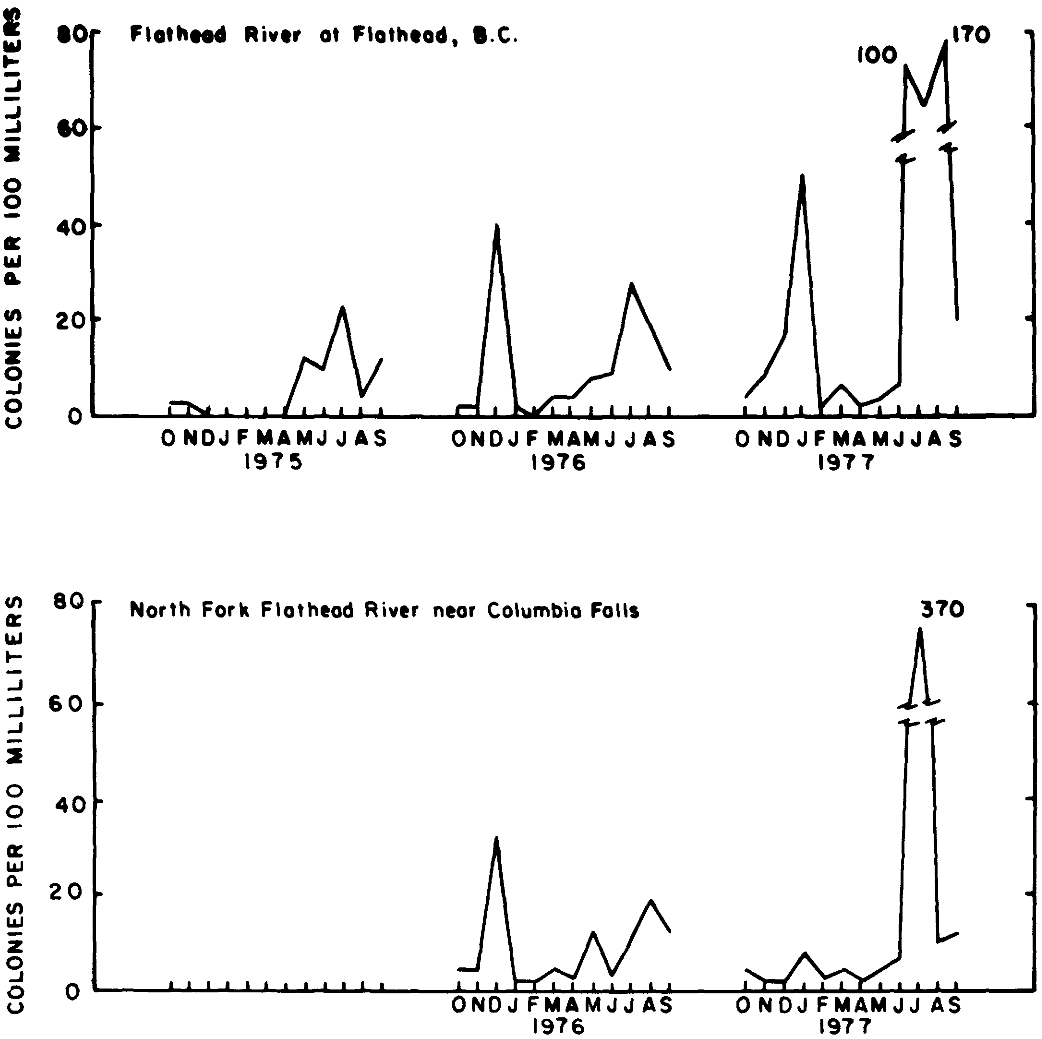


Figure 12.--Fecal streptococcus bacteria densities at water-quality stations for period of record.

with some regularity were Achanthes and Cocconeis. At the downstream site the genera were more diverse. Here Gomphonema, Achnanthes, and Nitzschia occurred most frequently, whereas Cocconeis, Cymbella, Hannaea and Navicula occurred with some regularity.

Chlorophyta occurred infrequently at both stations. At the upstream station the principal genera were Dictyosphaerium and Oedogonium. Genera at the downstream site showed a greater diversity with Scenedesmus, Ulothrix, Crucigenia, and Kirchneriella being dominant.

Cyanophyta, like the green algae, was found infrequently at both sites. The dominant genera were Anabaena and Oscillatoria.

Total phytoplankton cell counts at both the upstream and the downstream stations are shown in figure 13. Total cell counts are Chrysophyta counts, except during those times when Cyanophyta and Chlorophyta were present. Cell counts at both stations were generally less than 600 cells per milliliter although an anomalous count of 6,800 cells per milliliter, dominantly of the genus Oscillatoria, was measured May 19, 1977, at the downstream station. With this one exception the North Fork, compared to other Montana streams where phytoplankton measurements have been made (Knapton and Bochy, 1976), would be considered to have extremely small phytoplankton populations.

The limiting constituent to the phytoplankton population in the North Fork is possibly phosphorus, which frequently was near the limit of detection for the analytical procedure used. When the high counts occurred in December 1975 and August 1976, respectively, for the upstream and downstream stations, both discharge and nutrients were higher than for similar sampling periods of other years. Cyanophyta appeared most frequently during the summer period and the highest counts were found during the spring and early summer of 1977—an extremely low-flow year.

## Periphyton

Periphyton are microorganisms attached to or living upon submerged surfaces. These microorganisms consist of plants (algae) and animals (roundworms, rotifers, crustaceans, and insects). The animals live near the substrate surface or among the plants attached to the substrate. The diversity and abundance of periphyton are dependent on stream discharge, inorganic and organic compounds, temperature, and sediment.

In this study artificial substrates (polyethylene strips) were placed at both the upstream and downstream stations for selected periods of 1 month. Substrates at the upstream station were attached to a float located on the downstream side (south) of a bridge piling and relatively protected from debris and sediment scour. At the downstream station the substrates were attached to a float in the main flow, unprotected from debris and sediment. Substrates at both stations were about 6 inches below the water surface. The samples were analyzed for dry and ash biomass weight, as well as chlorophyll A and B weights.

Dry biomass weight at the upstream station ranged from 315-17,200 $mg/m^2$ (milligrams per square meter), with the two extremes being associated with the autumn season in different years. At this station some of the higher growths occurred during the peak runoff period even though suspended sediment was a factor in light reduction. Additional plant nutrients carried by the runoff may have accounted for the growth.

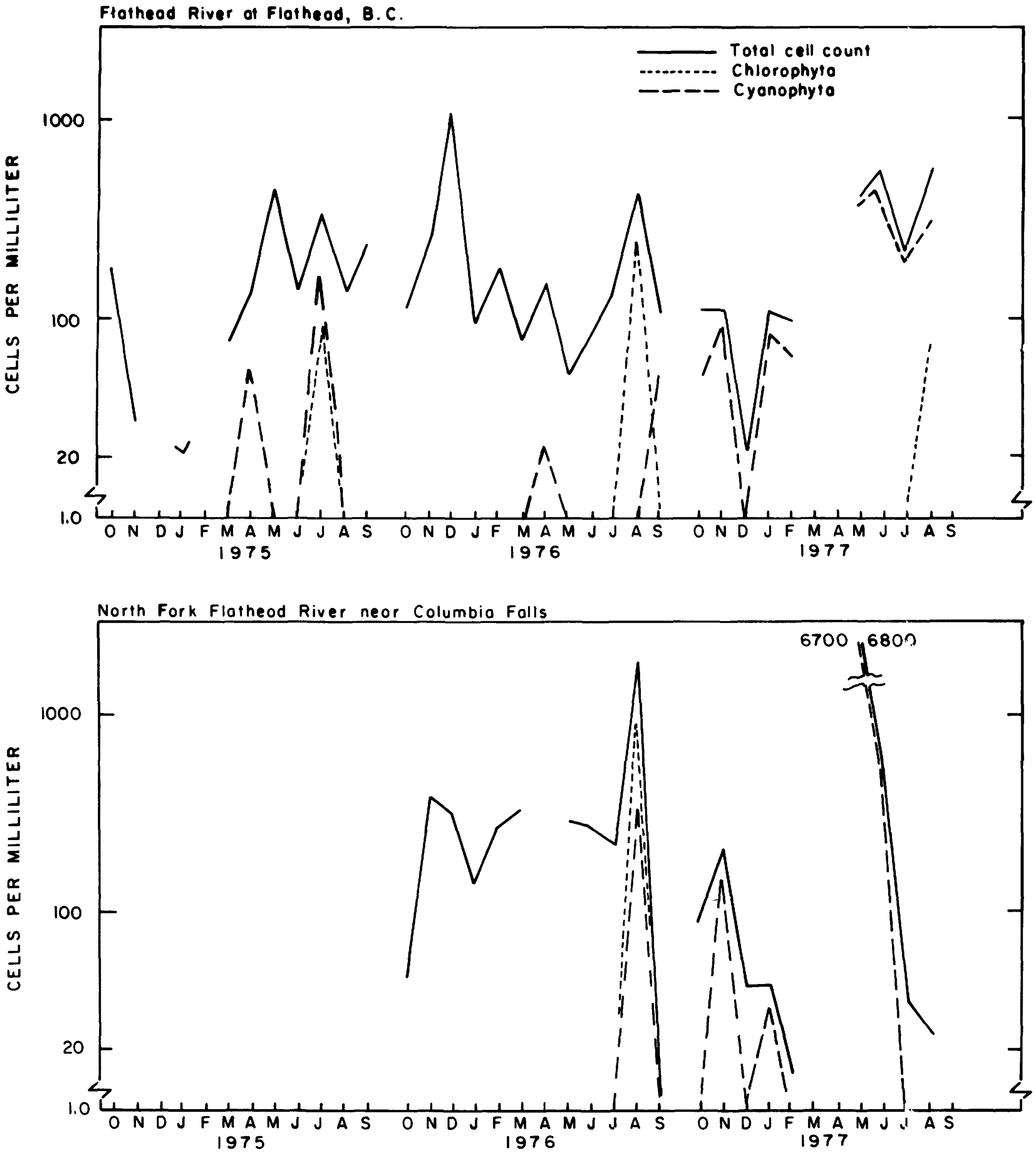


Figure 13. Monthly occurrence of phytoplankton at water-quality stations for period of record. Breaks in solid line represent periods of no data.

With 1 year less sampling, the downstream station had a range in dry biomass weight (462-20,700 $mg/m^2$) that was greater than upstream. The lowest value occurred during peak runoff and may have been influenced not only by reduced sunlight but by abrasion from debris and suspended sediment. No distinct patterns in the growth were observed for either station although winter-time samples were not collected because of ice interference. Patterns might have been more apparent had winter sampling been possible and organisms been classified.

## FUNCTIONAL RELATIONSHIPS BETWEEN WATER-QUALITY VARIABLES

Functional relationships often exist between certain constituents and the chemical or physical properties of a stream. Computer techniques provide a method of examining the historical data and determining the degree of correlation through statistical methods. With the verification of correlations, regression models can be developed and applied to various uses. Relationships that are most commonly used include (1) dissolved solids-specific conductance, (2) major ions-specific conductance, (3) specific conductance-water discharge, and (4) suspended sediment-water discharge.

Regression models have application to many water-quality studies. For the North Fork Flathead River the models might be useful in providing predictive capabilities that might eventually lead to reduced sampling, in simulating constituent loads, and in verifying large-scale land-use changes in the upstream drainage. The sections that follow show some of the relationships graphically and list equations and statistics of the regression models. Certain applications are made of the models. The suspended sediment-water discharge relationships are presented separately near the end of this section.

### Development of regressions

Experience from other studies has shown that concentration-conductance ($C_i$-K) relationships may be found where corresponding concentration-discharge ($C_i$-Q) relationships are much more ill-defined (Steele, 1970). Most of the relationships that follow are of the $C_i$-K type, with the only exceptions involving comparisons of specific conductance-water discharge (K-Q) and suspended sediment concentration-water discharge ($C_{sed}$-Q). Although not attempted, some $C_i$-Q relationships for the North Fork, especially at the upstream station, might be better defined than those found by Steele (1970). Characteristics such as the small drainage, absence of regulation, and similar water types during base flow and surface runoff would all tend to improve the $C_i$-Q correlation. The $C_i$-K relationship might be expected, because the conductance of natural water is a composite of the conductance of the cationic and anionic species.

The water-quality data collected at Flathead River at Flathead, B.C., represents about the minimum number of samples necessary for developing reliable regressions. The data for the downstream station, which has 1 year less record, probably falls short of the data needs. Regressions have been attempted at both stations; however, the reader should be mindful of the data shortcomings. Some of the most meaningful scatter diagrams with the regression plots are presented for the upstream station (figs. 14-20); the corresponding regression formulas, additional regression formulas, and basic statistics are listed in table 8. Only the tabular information (table 9) is given for the downstream station.

The linear model of the least-squares regression equation is of the form:

$$C_i = a_i + b_i K \tag{2a}$$

or

$$K = a_i + b_i Q \tag{2b}$$

or

$$\log K = a_i + b_i \log Q \tag{2c}$$

where $a_i$ and $b_i$ are regression parameters,

$C_i$ is constituent concentration,

$K$ is specific conductance, and

$Q$ is discharge.

Basic statistics listed with each regression equation in the tables include the correlation coefficient and the standard error of estimate. The correlation coefficient is a measure of the goodness of fit that the equation actually assumed to the data. A good correlation produces a coefficient approaching 1 (or -1 for inverse correlations) and a correlation coefficient near 0 means almost no linear correlation exists between variables. The standard error of estimate represents the mean-square deviation of the sample points from the regression line. Additional constituent statistics have previously been given in tables 1 and 2.

In general those constituents at both stations that compose the higher percentages of the cationic or anionic sums have good correlation with conductance--being nearly linear within the range of available data. Included in this group are carbonate-bicarbonate, calcium, magnesium, hardness, and dissolved solids. All have correlation coefficients greater than 0.90 (tables 8 and 9). Conversely, those constituents present in small concentrations show poor correlation--a result of their variations not being noticeable in specific conductance owing to obscuring from constituents in higher concentration. This latter group includes potassium, sodium, chloride, sulfate, and silica. The conductance-discharge correlation is rather poor at both stations when plotted on cartesian coordinates. The same relationship, however, shows considerable improvement when logarithmic coordinates are used. Some improvement in curvilinear fit for all the relationships might have been accomplished by partitioning and using a two-segment straight line, each with

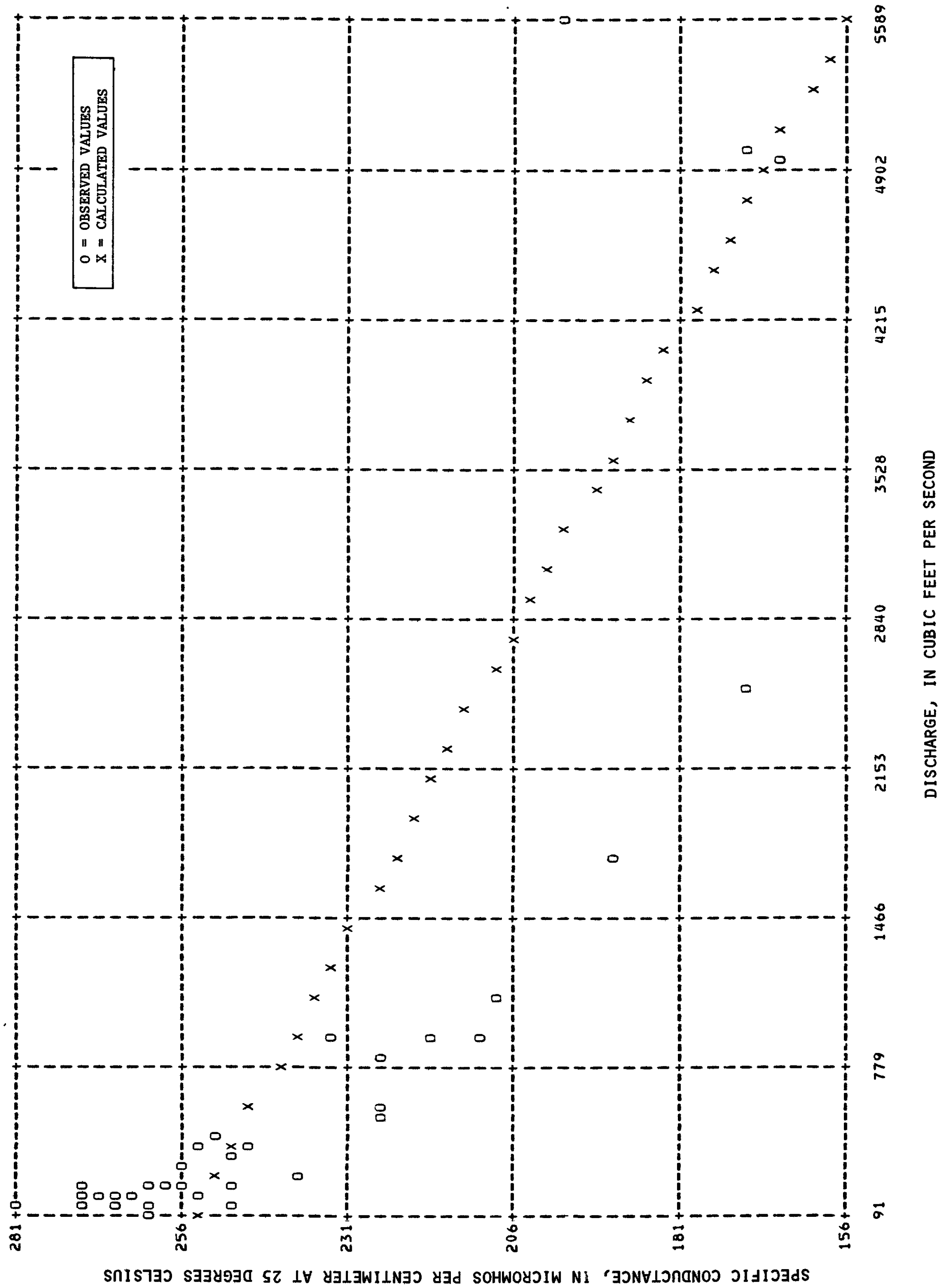


Figure 14.--Computer regression plot of specific conductance and water discharge for Flathead River at Flathead, B.C.

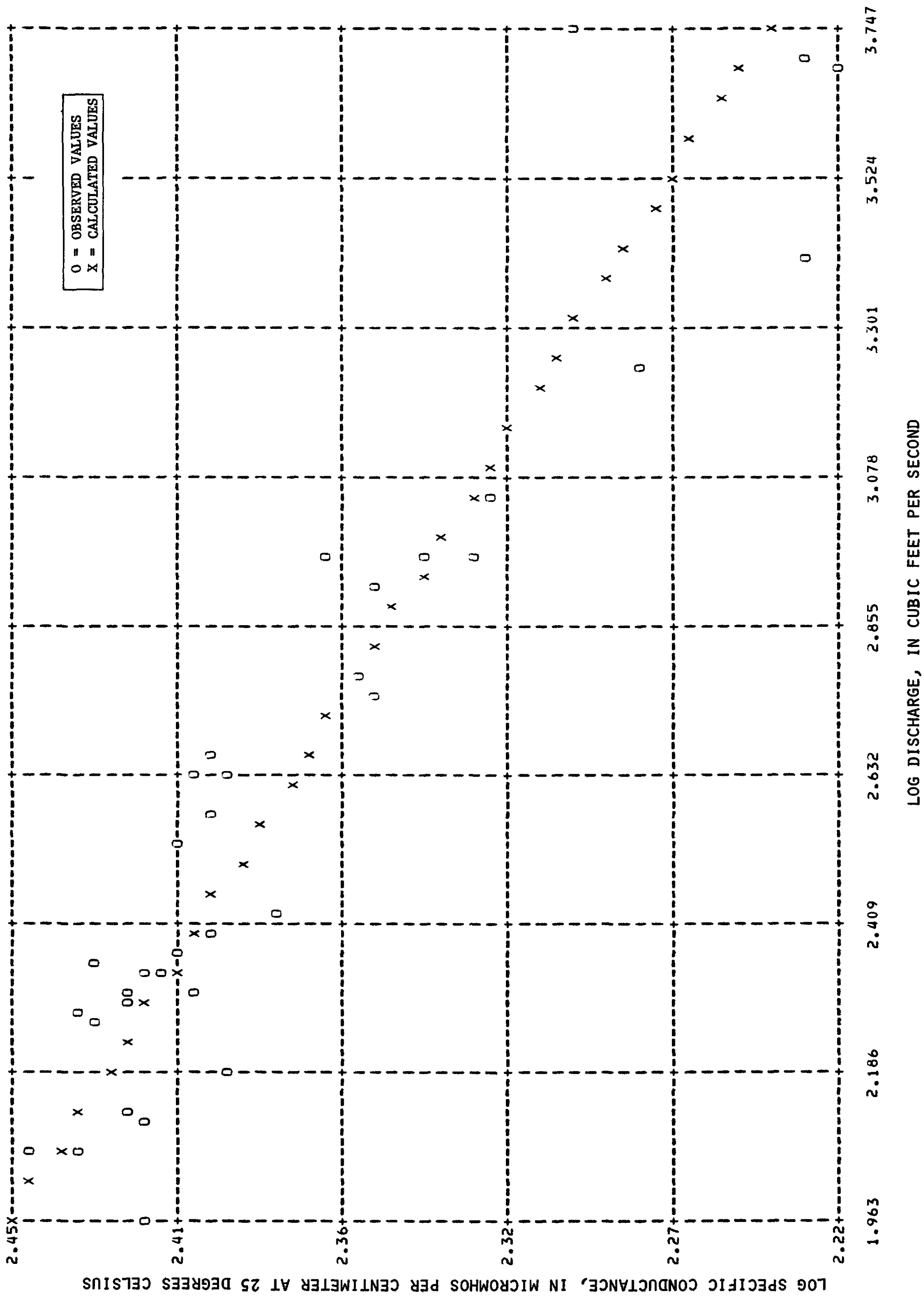


Figure 15.--Computer regression logarithmic plot of specific conductance and water discharge for Flathead River at Flathead, B.C.

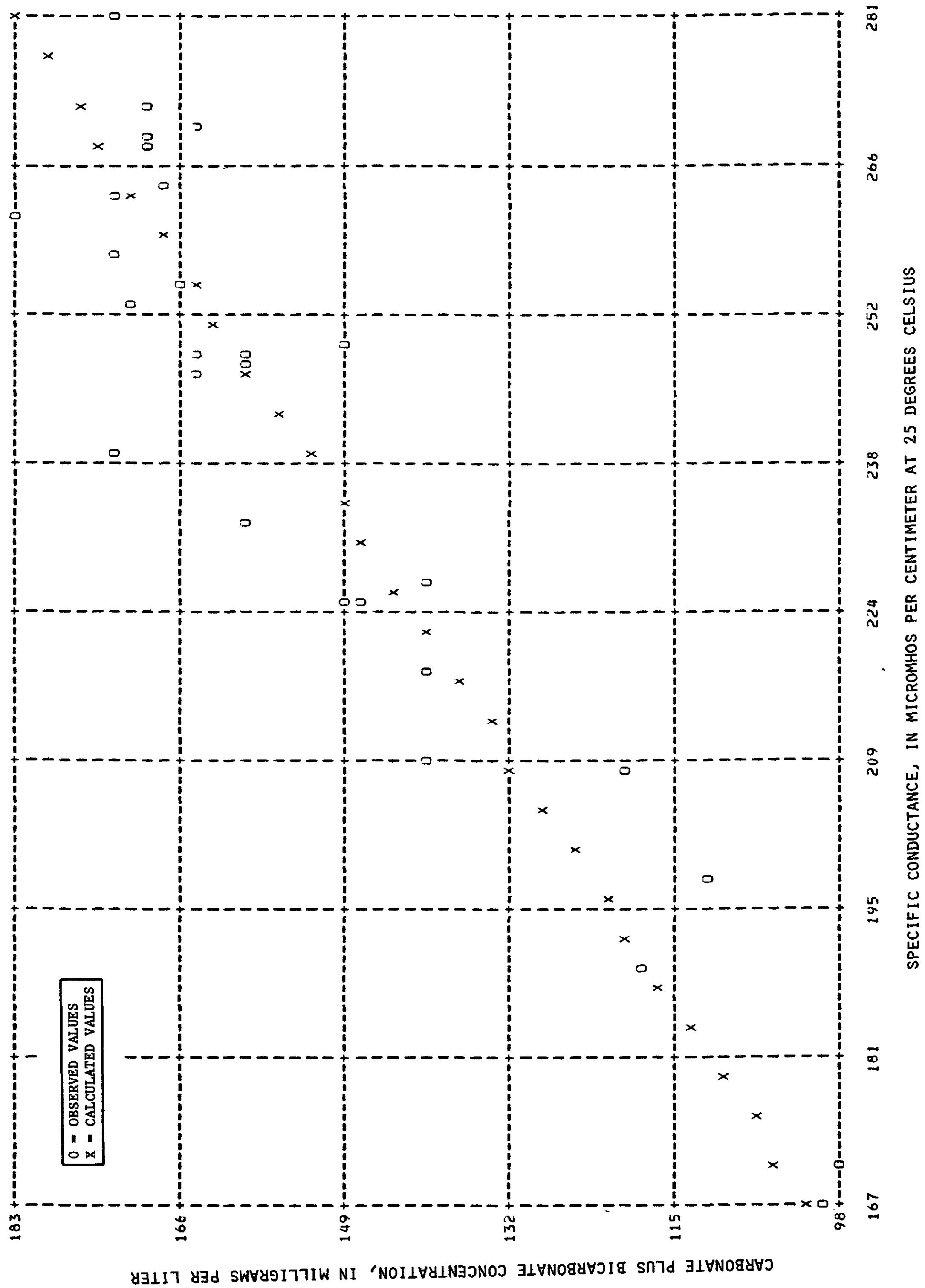


Figure 16.--Computer regression plot of carbonate plus bicarbonate and specific conductance for Flathead River at Flathead, B.C.

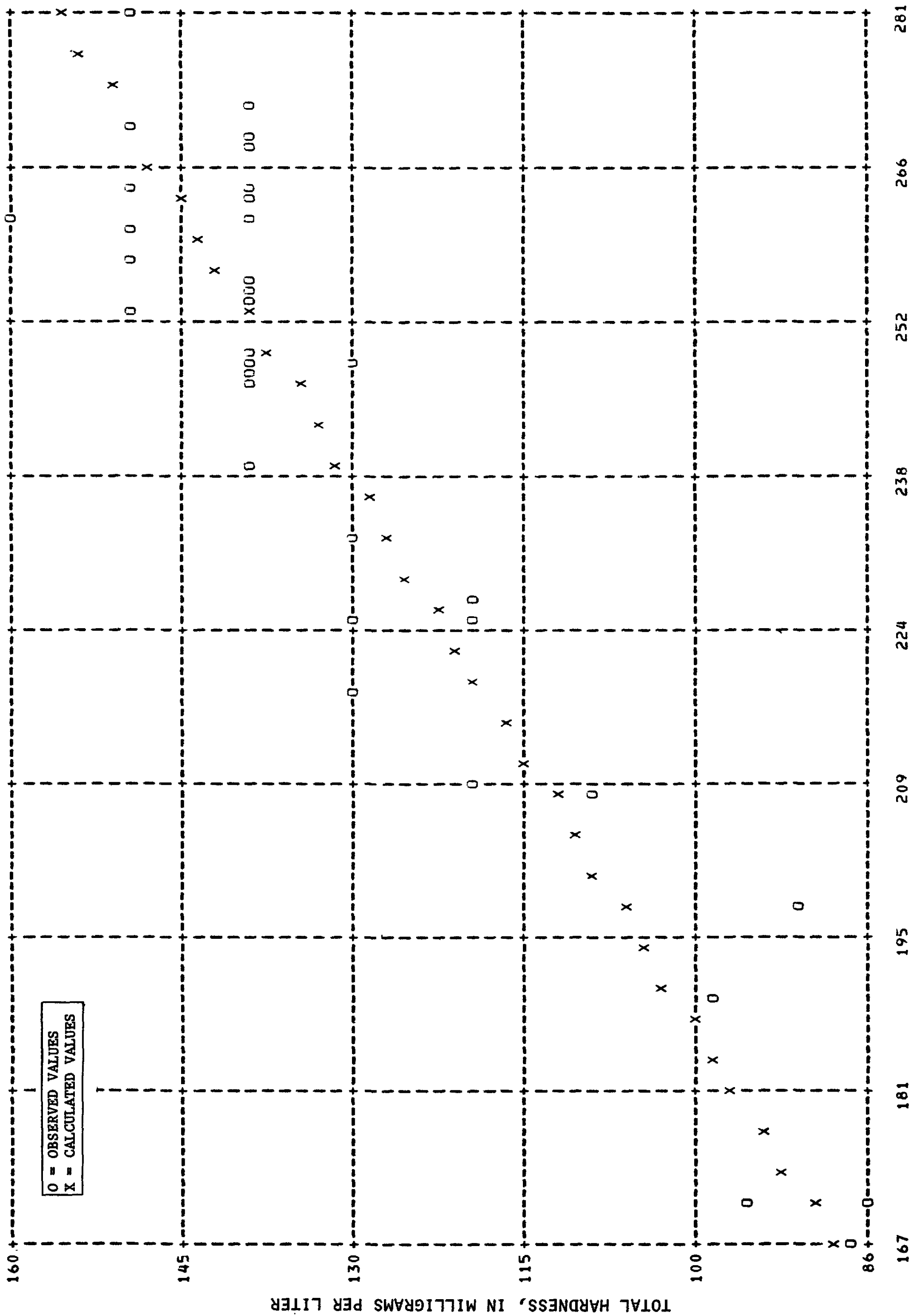


Figure 17.--Computer regression plot of total hardness and specific conductance for Flathead River at Flathead, B.C.

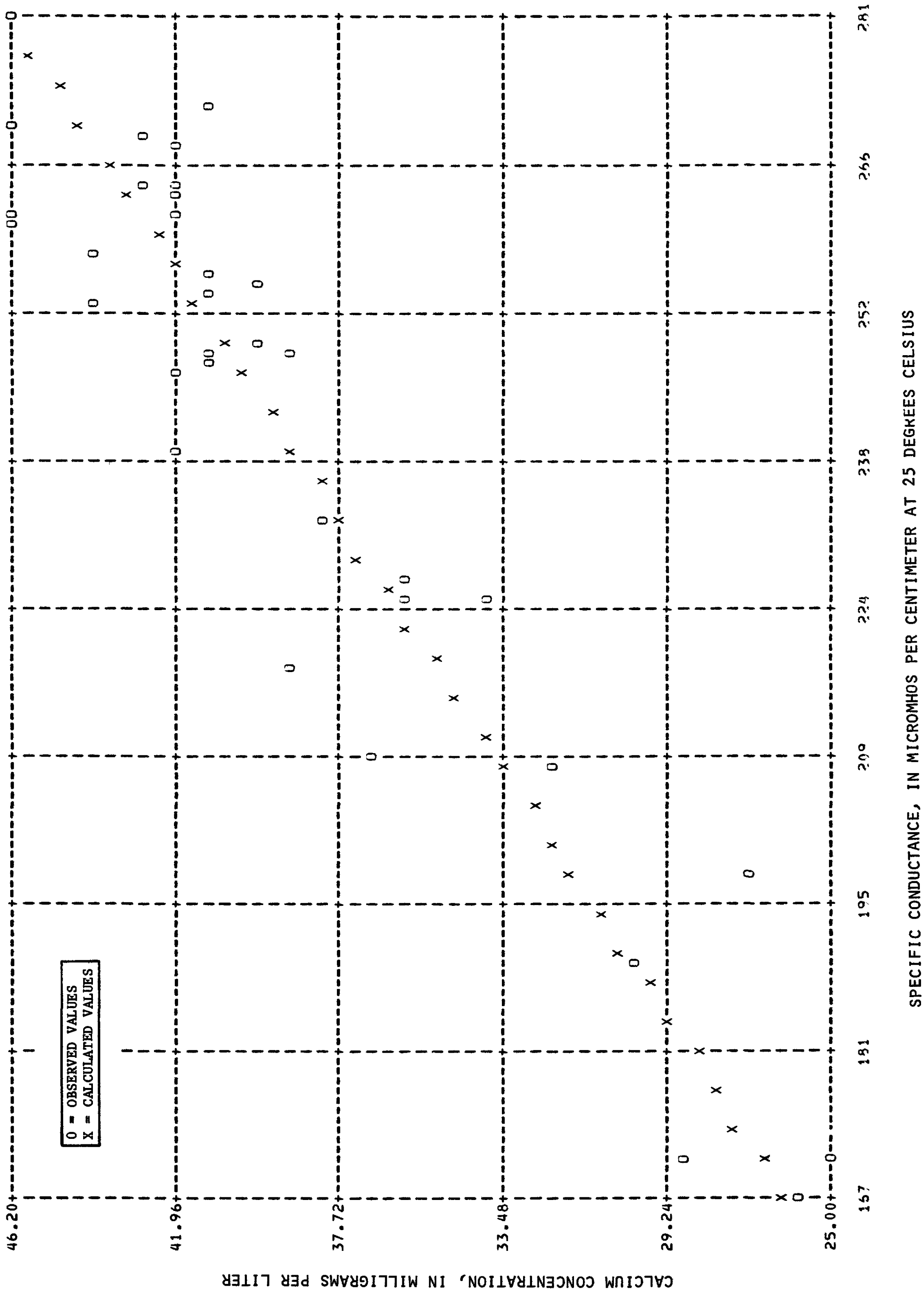


Figure 18.--Computer regression plot of calcium and specific conductance for Flathead River at Flathead, B.C.

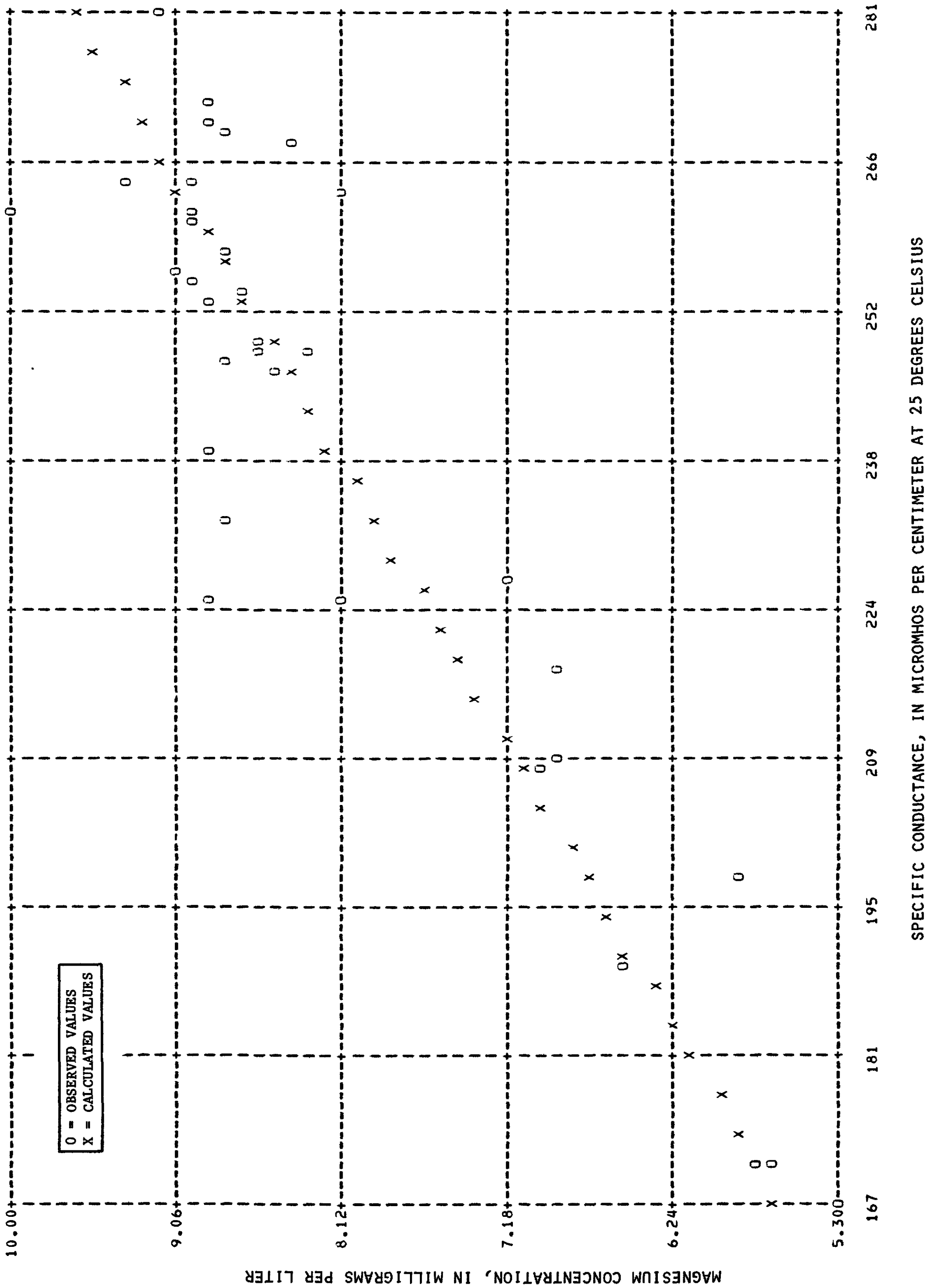


Figure 19.--Computer regression plot of magnesium and specific conductance for Flathead River at Flathead, B.C.

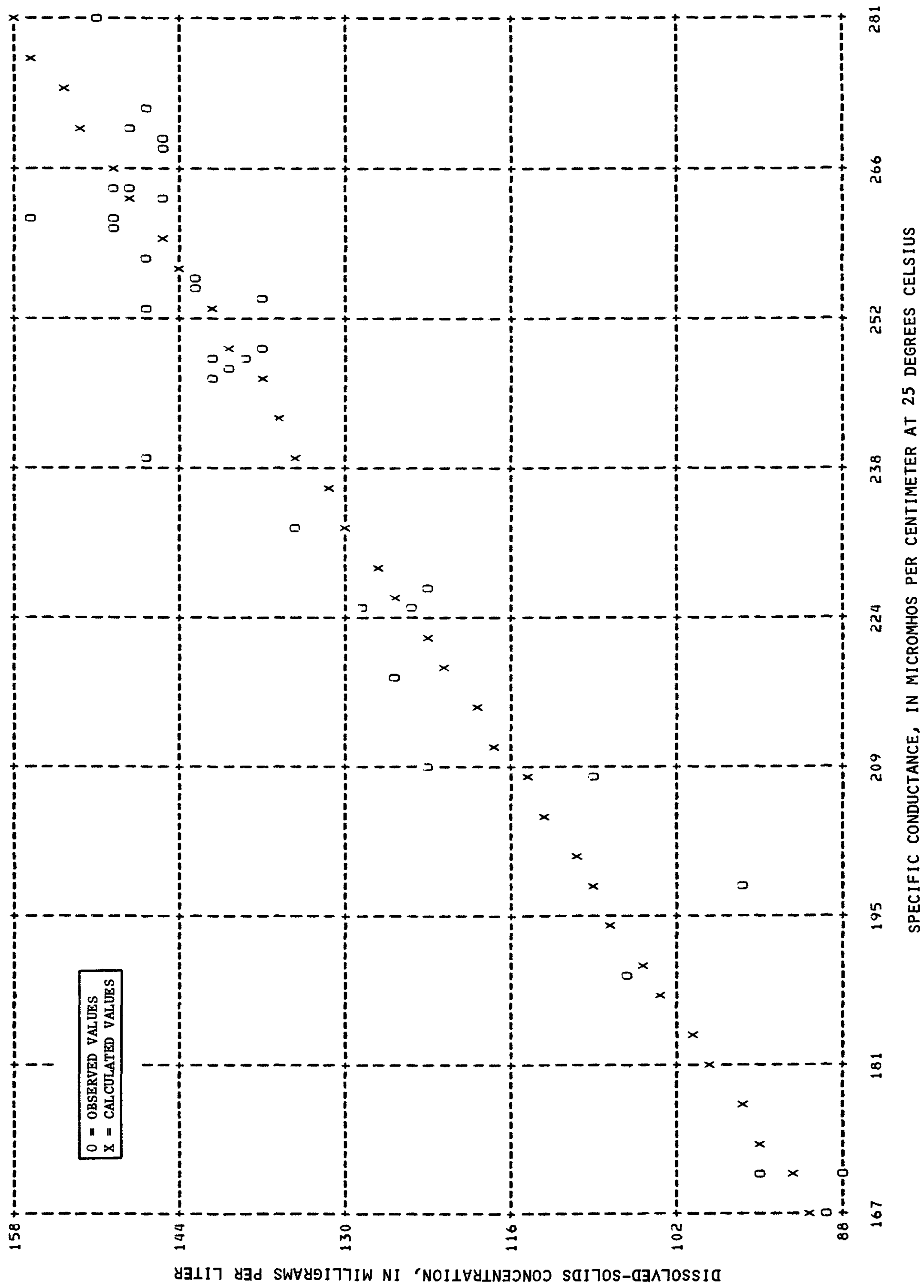


Figure 20.--Computer regression plot of dissolved solids and specific conductance for Flathead River at Flathead, B.C.

Table 8.--Regression equations and statistical summaries of stream variables for Flathead River at Flathead, B.C.

| Variable | | Regression equation | Correlation coefficient | Standard error of estimate |
|---|---|---|---|---|
| Dependent | Independent | | | |
| Conductance | Discharge | $K = 256 - 0.018Q$ | -0.82 | 18 |
| Log conductance | Log discharge | $\text{Log } K = 2.68 - 0.118 \log Q$ | -.93 | .02 |
| Total nitrogen | Conductance | $C_N = 0.45 - 0.001K$ | -.22 | .16 |
| Carbonate-bicarbonate | Conductance | $C_{HCO} = -19 + 0.722K$ | .94 | 8.2 |
| Hardness | Conductance | $C_H = -8.5 + 0.584K$ | .94 | 7.0 |
| Calcium | Conductance | $C_{Ca} = -3.2 + 0.176K$ | .94 | 2.1 |
| Magnesium | Conductance | $C_{Mg} = -0.22 + 0.035K$ | .91 | .51 |
| Potassium | Conductance | $C_K = 0.46 - 0.001K$ | -.16 | .11 |
| Sodium | Conductance | $C_{Na} = 0.20 + 0.002K$ | .33 | .20 |
| Chloride | Conductance | $C_{Cl} = 0.08 + 0.002K$ | .14 | .36 |
| Sulfate | Conductance | $C_{SO} = -1.1 + 0.028K$ | .57 | 1.3 |
| Silica | Conductance | $C_{SiO} = 3.0 + 0.005K$ | .37 | .38 |
| Dissolved solids | Conductance | $C_{DS} = -9.4 + 0.599K$ | .96 | 5.4 |

Table 9.--Regression equations and statistical summaries of stream variables for North Fork Flathead River near Columbia Falls

| Variable: Dependent | Variable: Independent | | Correlation coefficient | Standard error of estimate |
|---|---|---|---|---|
| Conductance | Discharge | $K = 206 - 0.008Q$ | -0.82 | 16 |
| Log conductance | Log discharge | $\log K = 2.77 - 0.158 \log Q$ | -.95 | .02 |
| Total nitrogen | Conductance | $C_N = 0.15 - 0.001K$ | -.05 | .09 |
| Carbonate-bicarbonate | Conductance | $C_{HCO} = -1.4 + 0.619K$ | .94 | 6.0 |
| Hardness | Conductance | $C_H = -2.2 + 0.548K$ | .94 | 5.6 |
| Calcium | Conductance | $C_{Ca} = 0.60 + 0.150K$ | .96 | 1.1 |
| Magnesium | Conductance | $C_{Mg} = -1.1 + 0.043K$ | .92 | .51 |
| Potassium | Conductance | $C_K = 0.15 + 0.001K$ | .35 | .06 |
| Sodium | Conductance | $C_{Na} = 0.034 + 0.005K$ | .55 | .20 |
| Chloride | Conductance | $C_{Cl} = 2.1 - 0.009K$ | -.58 | .34 |
| Sulfate | Conductance | $C_{SO} = -6.8 + 0.08K$ | .81 | 1.7 |
| Silica | Conductance | $C_{SiO} = 3.7 + 0.005K$ | .44 | .29 |
| Dissolved solids | Conductance | $C_{DS} = -1.7 + 0.582K$ | .95 | 5.0 |

a separate function rather than a single-segment function; additional samples may be necessary to show the need to partition. The data throughout the entire range of observed values may be more adequately described by higher order functions, rather than the first-order functions used here.

## Application of regression analyses

From the foregoing, only the dominant ions of calcium, magnesium, and carbonate-bicarbonate have meaningful correlations with specific conductance. Hardness, because it is attributable to calcium and magnesium, shows good correlation as does dissolved solids which is mostly a summation of the above dominant ions. Correlation between the logarithmic values of specific conductance and discharge also is good. Although not attempted, evidence from other correlations tends to indicate that a usable correlation might exist between dissolved solids and discharge.

Once regression formulas are verified by carrying sampling beyond the calibration period, the formulas can be used in various ways. With daily or continuous specific conductance, the mean daily, monthly, or annual constituent concentrations can be simulated. Then it is necessary to collect only periodic check samples to test the adequacy of the regression relationships.

Regressions in some instances have application to land-use changes. Deviation from established regression lines might be evidence of deterioration of chemical quality as a result of human activities. Large-scale land-use practices would no doubt be required to affect any of the above regressions noticeably, if detectable at all. However, regressions involving suspended sediment and water discharge as found in the following sections are probably much better indicators. Relationships between suspended sediment and constituents that are readily transported by sediment, such as phosphorus and certain minor elements, also might prove to have regressions that are sensitive to land-use changes.

In this study the application of regressions is used to demonstrate how dissolved-solids loads can be simulated at the two river stations for the 1976 and 1977 water years. A computer program has been developed for simulating chemical quality of streamflow. The program principally utilizes daily records of specific conductance and stream discharge in conjunction with the appropriate $C_i$-K regression equation. Use of the program enables daily solute concentration and loads to be simulated and weekly, monthly, and annual averages to be computed.

Mean daily-dissolved-solids concentrations ($C_i$) were computed using equation 2a in which the independent variable K is the mean daily conductivity. The concentrations in milligrams per liter, once simulated, were further transformed into a mean daily dissolved-solids load in tons per day using a relationship similar to that of equation 1. The program output is condensed in table 10 with simulated monthly and annual dissolved-solids loads given in tons for both stations for the 1976 and 1977 water years. Daily and weekly loads were omitted for the purpose of brevity. Additional program options allow for load computations of all major ions that have $C_i$-K correlations.

Table 10.--Simulated dissolved-solids loads passing the water-quality stations during water years 1976-77

| | Dissolved-solids load, in tons | | | |
|---|---|---|---|---|
| | Flathead River at Flathead, B.C. | | N.F. Flathead River near Columbia Falls | |
| Month | 1976 | 1977 | 1976 | 1977 |
| October | 4,470 | 2,910 | 11,900 | 8,710 |
| November | 6,100 | 2,750 | 14,700 | 7,190 |
| December | 8,740 | 1,490 | 19,200 | 5,720 |
| January | 3,410 | 1,400 | 10,600 | 5,350 |
| February | 2,740 | 1,180 | 7,840 | 4,770 |
| March | 2,440 | 1,540 | 7,230 | 5,250 |
| April | 9,720 | 7,460 | 26,600 | 18,700 |
| May | 36,600 | 13,700 | 88,900 | 38,800 |
| June | 19,200 | 7,750 | 51,600 | 26,400 |
| July | 11,000 | 3,410 | 35,700 | 12,500 |
| August | 9,320 | 2,440 | 24,500 | 9,770 |
| September | 4,800 | 2,720 | 12,400 | 10,200 |
| Annual | 119,000 | 48,800 | 311,000 | 153,000 |

## Suspended sediment and streamflow relationships

Relationships between suspended sediment and water discharge are apparent at the stations; however, some segregation of data is necessary to produce the most meaningful regression equations. The suspended-sediment-concentration and water-discharge data for the 1976 water year are plotted on figures 21 and 22. Only 1 year of data was plotted owing to congestion of points on the graph. Regression lines discussed later, however, relate to both 1976 and 1977 water years. This type of plot shows a greater sensitivity than does the more traditional sediment-rating curve developed from suspended-sediment-load and water-discharge data.

Both plots depict a wide scatter of points at the lower concentrations and discharges and a convergence at the higher values. Scatter throughout the diagram probably relates to availability of sediment for the river. In general for concentrations greater than 10 mg/L, those points to the left of the scatter are related to rising stage and those to the right are most frequently related to declining or steady stage. This relationship would seem to confirm previous observations that sediment is more available from overland runoff and channel scour at times of rising stage. The same condition may partly be responsible for scatter at lower concentrations; however, analytical and sampling errors are considerably magnified in these lower ranges, which creates an artificial scatter.

Using the entire data base for water years 1976-77 with no attempt to segregate on the basis of flows, regression equations for suspended-sediment concentration (Csed) versus discharge (Q) were computed for the upstream and downstream stations, respectively, as listed below (for statistical balance data from the 1975 partial year of sediment record were not used). Lines A-A' on the scatter diagrams are represented by the following equations:

$$\log Csed = -2.00 + 1.06 \log Q \qquad (3)$$

$$\log Csed = -2.40 + 0.961 \log Q \qquad (4)$$

The resulting correlation coefficients are 0.63 for equation 3 and 0.52 for equation 4. The mass of points representing lower discharges and concentrations has a major influence on the curves, resulting in overall correlations that must be considered poor.

A second attempt at correlation was made by using only the data from flows in excess of the 30-percent exceedence values. These discharges were 608 $ft^3/s$ and 2,380 $ft^3/s$, respectively, for the upstream and downstream stations (tables 4 and 5). The respective equations are as follows with lines B-B' representing the equations on the scatter diagrams:

$$\log Csed = -4.58 + 1.85 \log Q \qquad (5)$$

$$\log Csed = -6.82 + 2.16 \log Q \qquad (6)$$

Again, the lower sediment concentrations tended to influence the curve, but not to the extent of the first equations; thus, the correlation coefficient

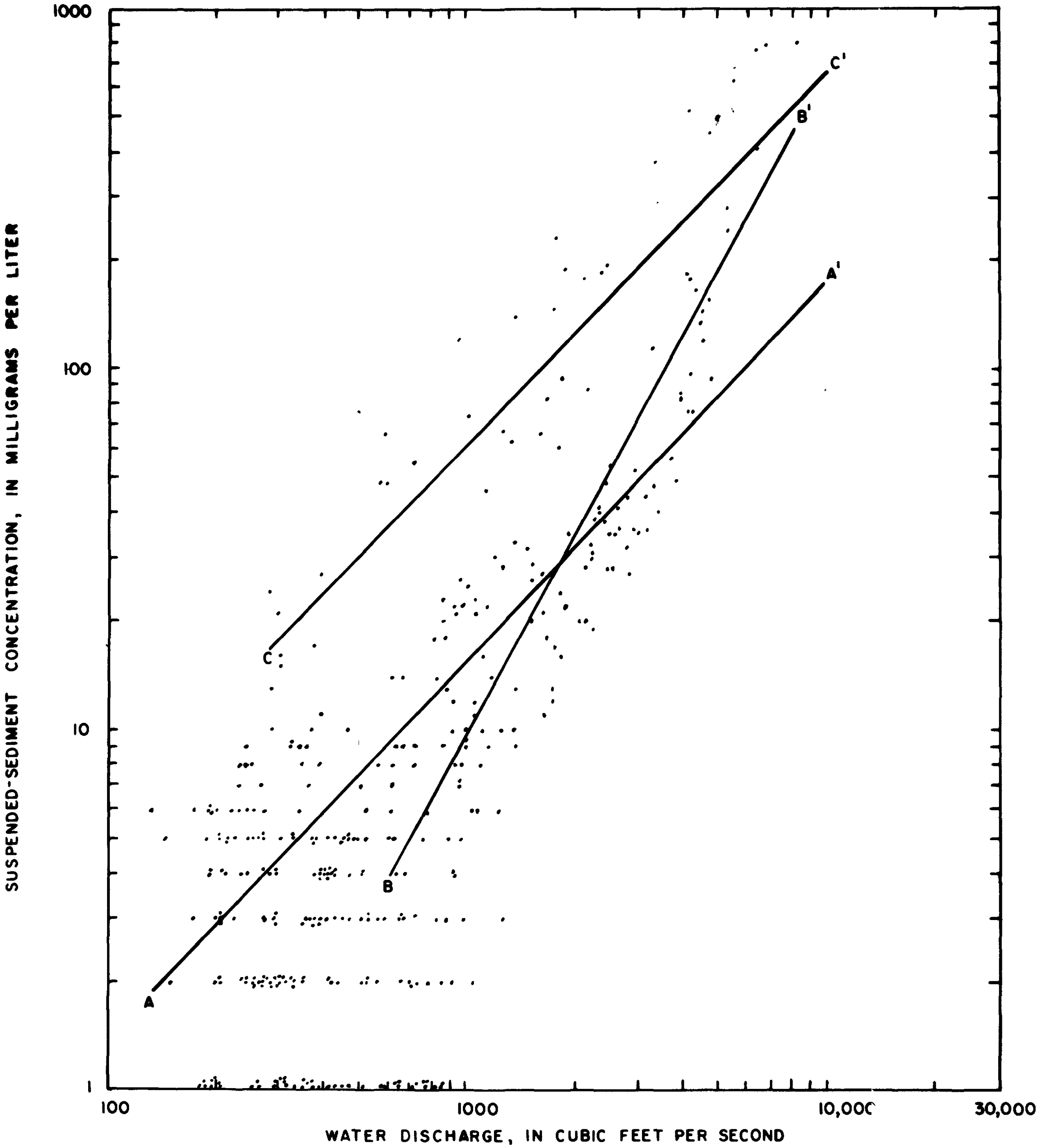


Figure 21.--Relationship of suspended-sediment concentration and water discharge for Flathead River at Flathead, B.C., 1976 water year. Regression lines were computed using data for water years 1976-77.

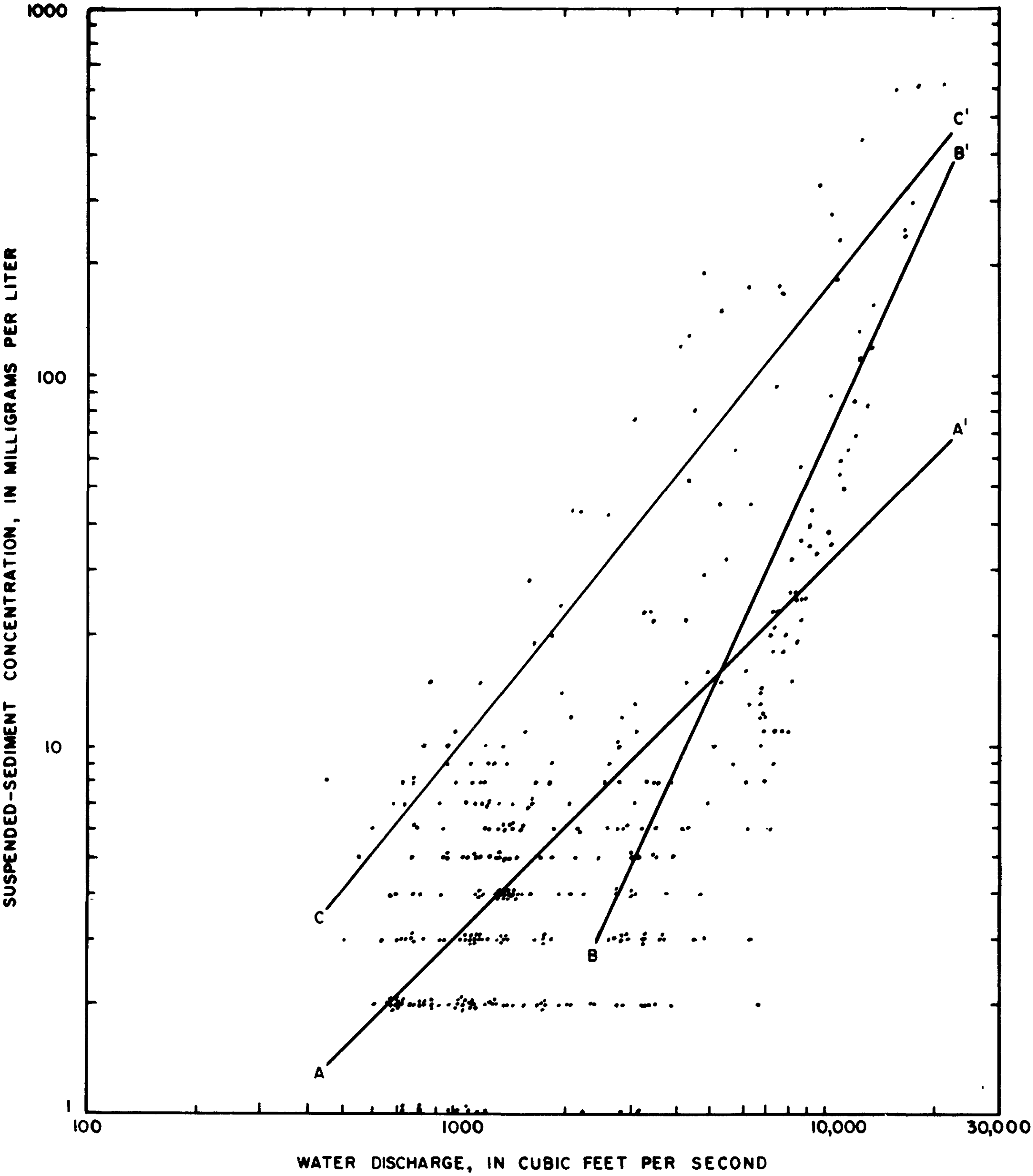


Figure 22.--Relationship of suspended-sediment concentration and water discharge for North Fork Flathead River near Columbia Falls, 1976 water year. Regression lines computed using data for water years 1976-77.

improved significantly--0.71 for equation 5 and 0.59 for equation 6. Under the above conditions the poorer correlation for the downstream station is probably caused by the lakes in the lower drainage passing only small amounts of sediment regardless of flow conditions.

The final regression equations were developed using only the data from the more intense rising stages. These are generally times when sediment is most available from both channel scour and overland runoff. The data are mostly represented by those points in the left of the scatter, although this was not always true where some rising stages had relatively low sediment concentrations. Nevertheless this type of data segregation produced the best regressions, which are represented by lines C-C' on the scatter diagrams. In equation form the regressions for the upstream and downstream stations are as follows:

$$\log Csed = -1.30 + 1.03 \log Q \quad (7)$$

$$\log Csed = -2.74 + 1.24 \log Q \quad (8)$$

The resulting correlation coefficients are 0.79 for equation 7 and 0.74 for equation 8.

Some of the regressions in their present state are usable with a limited degree of accuracy for predicting suspended-sediment concentrations from flow and thus suspended-sediment loads. Once a more suitable data base is acquired, it will be possible to refine the present correlations and develop others. Certain size fractions of the suspended-sediment concentrations and constituents that are readily sorbed to them such as phosphorus might produce good correlations. Further studies may show suspended-sediment regression equations to be sensitive to land-use practices in the drainage, thereby giving a measure of water-quality degradation.

## SUMMARY

This report is a compilation and discussion of water quality and streamflow measurements that have been made by the U.S. Geological Survey on the North Fork Flathead River. The study is part of a continuing environmental assessment of the Flathead drainage by several local, State, and Federal agencies.

About 60 different water-quality variables measured on a routine schedule at each station are summarized in the report. Some constituents, even though they may be only slightly soluble in water, tend to be sorbed by particulate matter in the water. This requires collecting representative samples of the water-sediment mixture and using analytical techniques to enable measurement of constituents in both the dissolved and suspended phases.

Some of the traditional stream concepts are applicable to the North Fork; however, this stream is unique in ways that often tend to modify the concepts.

The base-flow and direct-runoff components of flow are largely responsible for the difference in concentration of the many water-quality constituents throughout the year. Because the two streamflow components have water of a similar chemical character and differ only in concentration, the range in dissolved-constituent concentration is not as great as that in many other streams. The several lakes that contribute water throughout the middle and lower drainage have a dampening effect, not only on streamflow but on many of the constituent concentrations. Greater exposure of younger more soluble rocks north of the international boundary is at least partly responsible for water in the upper drainage naving higher dissolved-solids concentrations.

The characteristic water type for the North Fork Flathead River results from calcium and magnesium cations and the bicarbonate anion--a reflection of soils and lithology in the drainage. For most water uses the dissolved-solids concentration throughout the annual flow cycle is considered to be low, although the abundance of calcium and magnesium accounts for a moderately hard water much of the time. Low flows, as would be predicted, are generally characterized by higher dissolved constituents and lower concentrations of suspended sediment. High flows are associated with low dissolved-solids concentration, increased sediment, and a depressed pH.

The spring runoff accounts for the vast majority of sediment movement in the drainage. For the period of record, between 80 and 90 percent of the annual suspended-sediment load is transported during the nearly 4-week period of peak runoff. Generally, the sediment samples collected during high runoff, in addition to having higher concentrations, have high percentages of fine sediment. These fines are responsible through sorption for the transport of additional constituents, primarily the nitrogen and phosphorus nutrients and trace elements such as aluminum, iron, and zinc.

The mean water temperatures are higher at the downstream station, although ranges in water temperature are greater at the upstream station. All oxygen measurements are near the saturation value, which is indicative of a healthy stream in which neither organic waste nor primary productivity is abundant enough to cause depletion or extreme saturation. The water is slightly basic, caused by the abundant carbonate rocks throughout the drainage. Values of pH show reduced basicity only during periods of peak runoff when the effects of rainfall and fresh snowmelt have an influence.

Bacteria populations are low in comparison with other Montana streams. Increased densities generally correlate with winter thaws, spring runoff, and the summer season. Phytoplankton cell counts seldom exceed 600 cells per milliliter, with cells generally dominated by diatoms of the phylum Chrysophyta. Of the two stations, the downstream site more frequently has the greatest diversity of phytoplankton genera.

Attempts were made to find functional relationships between constituents in the water and physical or chemical properties of the river. Using the available data and computer techniques, regressions were developed between the dominant ions in solution and specific conductance. Generally those dissolved major ions that are present in small concentrations correlate poorly with specific conductance. Because hardness and dissolved solids are both responsive to the dominant ions, they in turn correlate well with specific conductance. Logarithm transformation of data for stream discharge and specific conductance enabled a reasonably good correlation between these two variables. The dissolved-solids regression equations at both stations were used along with daily values of specific conductance and stream discharge to make computer simulations of monthly and annual solute loads for the 1976 water year.

Correlations between water discharge and suspended sediment are rather poor when using the complete data base. However, when the data are segregated according to certain conditions of streamflow, improvements are found in the correlations. Some of the regression equations in their present state are usable with a limited degree of accuracy for simulating suspended-sediment concentrations and loads.

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WATER-QUALITY RECORDS

## WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C. FOR PERIOD OF RECORD

WATER QUALITY DATA

| DATE | TIME | INSTANTANEOUS DISCHARGE (CFS) | SPECIFIC CONDUCTANCE (MICROMHOS) | PH (UNITS) | AIR TEMPERATURE (DEG C) | TEMPERATURE (DEG C) | TURBIDITY (JTU) | DISSOLVED OXYGEN (MG/L) | PERCENT SATURATION | FECAL COLIFORM (COL. PER 100 ML) |
|---|---|---|---|---|---|---|---|---|---|---|
| OCT , 1974 | | | | | | | | | | |
| 22... | 1100 | 201 | 265 | 8.1 | 5.0 | 3.0 | 1 | 12.0 | 103 | 0 |
| NOV | | | | | | | | | | |
| 26... | 1130 | 216 | 261 | 8.2 | -5.0 | .5 | 0 | 12.9 | 105 | 0 |
| JAN , 1975 | | | | | | | | | | |
| 22... | 1100 | 130 | 262 | 8.0 | 2.0 | .0 | 1 | 12.3 | 97 | 2 |
| MAR | | | | | | | | | | |
| 13... | 1200 | 194 | 264 | 8.0 | 2.0 | .0 | 1 | 12.4 | 98 | 0 |
| APR | | | | | | | | | | |
| 10... | 1100 | 117 | 271 | 8.3 | 8.0 | .0 | 0 | 12.7 | 100 | 0 |
| MAY | | | | | | | | | | |
| 16... | 1030 | 5590 | 198 | 7.4 | 15.0 | 4.0 | 75 | 11.4 | 101 | 16 |
| JUN | | | | | | | | | | |
| 19... | 1100 | 4990 | 171 | 8.0 | 10.0 | 6.5 | 40 | 11.2 | 106 | 24 |
| JUL | | | | | | | | | | |
| 25... | 1245 | 828 | 225 | 8.3 | 28.0 | 12.5 | 6 | 9.2 | 100 | 2 |
| AUG | | | | | | | | | | |
| 21... | 1100 | 427 | 247 | 8.3 | 18.0 | 11.0 | 1 | 9.6 | 101 | 4 |
| SEP | | | | | | | | | | |
| 18... | 1030 | 430 | 254 | -- | 7.2 | 6.8 | 0 | 10.6 | 101 | 4 |
| OCT | | | | | | | | | | |
| 17... | 1430 | 378 | 249 | 8.3 | 16.0 | 8.5 | 0 | 10.4 | 103 | <1 |
| NOV | | | | | | | | | | |
| 14... | 1100 | 560 | 225 | 8.2 | 5.5 | 2.5 | 1 | 11.9 | 101 | <1 |
| DEC | | | | | | | | | | |
| 04... | 1100 | 1760 | 190 | 8.1 | 4.0 | 1.0 | 45 | 11.5 | 92 | 12 |
| JAN , 1976 | | | | | | | | | | |
| 22... | 1015 | 267 | 239 | 8.0 | -10.0 | .0 | 0 | 12.7 | 100 | 2 |
| FEB | | | | | | | | | | |
| 25... | 1100 | 244 | 249 | 8.3 | .0 | .0 | 1 | 12.6 | 99 | 2 |
| MAR | | | | | | | | | | |
| 25... | 1130 | 204 | 253 | 8.4 | 1.0 | 1.5 | 1 | 12.4 | 106 | 16 |
| APR | | | | | | | | | | |
| 28... | 1200 | 899 | 233 | 8.3 | 8.0 | 3.5 | 9 | 11.8 | 103 | <1 |
| MAY | | | | | | | | | | |
| 20... | 1130 | 4930 | 167 | 7.4 | 5.5 | 5.5 | 35 | 10.7 | 99 | 16 |
| JUN | | | | | | | | | | |
| 17... | 1130 | 2530 | 171 | -- | 12.0 | 6.5 | 6 | 10.8 | 102 | 44 |
| JUL | | | | | | | | | | |
| 23... | 1100 | 907 | 210 | 8.5 | 26.0 | 11.0 | 1 | 10.0 | 105 | <1 |
| AUG | | | | | | | | | | |
| 19... | 0915 | 900 | 218 | 8.3 | 12.0 | 8.5 | 1 | 10.2 | 101 | 5 |
| SEP | | | | | | | | | | |
| 23... | 1130 | 332 | 255 | 8.5 | 17.0 | 9.0 | 1 | 10.4 | 104 | <1 |
| OCT | | | | | | | | | | |
| 20... | 1230 | 214 | 258 | 8.0 | 8.0 | 3.5 | 1 | 11.8 | 103 | -- |
| NOV | | | | | | | | | | |
| 22... | 1100 | 220 | 256 | -- | -5.0 | .5 | 1 | 12.6 | 103 | -- |
| DEC | | | | | | | | | | |
| 20... | 1030 | 92 | 262 | 8.2 | -14.5 | .0 | 1 | 12.8 | 101 | -- |
| JAN , 1977 | | | | | | | | | | |
| 18... | 1230 | 152 | 248 | 8.0 | 2.0 | .0 | 1 | 12.6 | 99 | -- |
| FEB | | | | | | | | | | |
| 22... | 1100 | 133 | 265 | 8.1 | 1.5 | .0 | 2 | 11.9 | 94 | -- |
| MAR | | | | | | | | | | |
| 24... | 1100 | 118 | 281 | 8.3 | .0 | 2.0 | 1 | 12.0 | 100 | -- |
| APR | | | | | | | | | | |
| 20... | 1100 | 459 | 250 | 7.8 | 4.0 | 3.0 | 1 | 12.4 | 107 | -- |
| MAY | | | | | | | | | | |
| 20... | 1030 | 1090 | 209 | 8.4 | 10.0 | 5.5 | 2 | 12.0 | 110 | -- |
| JUN | | | | | | | | | | |
| 20... | 1100 | 604 | 227 | 8.2 | 23.0 | 10.0 | 1 | 10.1 | 104 | -- |
| JUL | | | | | | | | | | |
| 29... | 1130 | 221 | 270 | 8.4 | 14.0 | 11.0 | 0 | 9.7 | 102 | -- |
| AUG | | | | | | | | | | |
| 22... | 1130 | 178 | 269 | 8.5 | 15.0 | 13.5 | 1 | 9.4 | 104 | -- |
| SEP | | | | | | | | | | |
| 21... | 1100 | 186 | 272 | 8.4 | 13.5 | 8.0 | 0 | 10.5 | 103 | -- |

WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C., FOR PERIOD OF RECORD--CONTINUED

WATER QUALITY DATA

| DATE | FECAL COLI-FORM .7UM-MF (COL./100 ML) | FECAL STREP-TOCOCCI KF AGAR (COL. PER 100 ML) | HARD-NESS (CA,MG) (MG/L) | NON-CAR-BONATE HARD-NESS (MG/L) | TOTAL ACIDITY AS H+ (MG/L) | TOTAL ACIDITY AS CACO3 (MG/L) | DIS-SOLVED CAL-CIUM (CA) (MG/L) | DIS-SOLVED MAG-NE-SIUM (MG) (MG/L) | DIS-SOLVED SODIUM (NA) (MG/L) | SODIUM AD-SORP-TION RATIO | DIS-SOLVED PO-TAS-SIUM (K) (MG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OCT , 1974 | | | | | | | | | | | |
| 22... | -- | 2 | 140 | 0 | -- | -- | 42 | 9.0 | .9 | .0 | .5 |
| NOV | | | | | | | | | | | |
| 26... | -- | 2 | 150 | 12 | -- | -- | 46 | 9.0 | 1.1 | .0 | .1 |
| JAN , 1975 | | | | | | | | | | | |
| 22... | -- | 0 | 140 | 0 | -- | -- | 42 | 9.0 | .7 | .0 | .4 |
| MAR | | | | | | | | | | | |
| 13... | -- | 0 | 140 | 0 | -- | -- | 42 | 8.1 | .5 | .0 | .6 |
| APR | | | | | | | | | | | |
| 10... | -- | 0 | 150 | 16 | -- | -- | 46 | 8.9 | 1.0 | .0 | .2 |
| MAY | | | | | | | | | | | |
| 16... | -- | 12 | 92 | 0 | -- | -- | 27 | 5.9 | .5 | .0 | .6 |
| JUN | | | | | | | | | | | |
| 19... | -- | 10 | 86 | 6 | -- | -- | 25 | 5.7 | .9 | .0 | .5 |
| JUL | | | | | | | | | | | |
| 25... | -- | 25 | 130 | 4 | -- | -- | 36 | 8.9 | .9 | .0 | .5 |
| AUG | | | | | | | | | | | |
| 21... | -- | 4 | 140 | 5 | -- | -- | 42 | 8.5 | .9 | .0 | .3 |
| SEP | | | | | | | | | | | |
| 18... | -- | 12 | 140 | 8 | -- | -- | 41 | 8.7 | .4 | .0 | .3 |
| OCT | | | | | | | | | | | |
| 17... | -- | 1 | 130 | 0 | .0 | .0 | 39 | 8.3 | 1.0 | .0 | .4 |
| NOV | | | | | | | | | | | |
| 14... | -- | 1 | 120 | 0 | .1 | 5.0 | 34 | 8.1 | .3 | .0 | .3 |
| DEC | | | | | | | | | | | |
| 04... | -- | 40 | 100 | 5 | .1 | 5.0 | 30 | 6.5 | .8 | .0 | .4 |
| JAN , 1976 | | | | | | | | | | | |
| 22... | -- | 2 | 140 | 0 | .0 | .0 | 42 | 8.9 | 1.0 | .0 | .2 |
| FEB | | | | | | | | | | | |
| 25... | -- | <1 | 140 | 3 | .0 | .0 | 41 | 8.6 | .9 | .0 | .3 |
| MAR | | | | | | | | | | | |
| 25... | -- | 4 | 150 | 6 | .0 | .0 | 44 | 8.9 | 1.0 | .0 | .3 |
| APR | | | | | | | | | | | |
| 28... | -- | 4 | 130 | 1 | .1 | 5.0 | 38 | 8.8 | .5 | .0 | .3 |
| MAY | | | | | | | | | | | |
| 20... | -- | 8 | 87 | 5 | .1 | 5.0 | 26 | 5.3 | .4 | .0 | .2 |
| JUN | | | | | | | | | | | |
| 17... | -- | 9 | 96 | 9 | .0 | .0 | 29 | 5.8 | .4 | .0 | .3 |
| JUL | | | | | | | | | | | |
| 23... | -- | 28 | 120 | 6 | .0 | .0 | 37 | 6.9 | .6 | .0 | .3 |
| AUG | | | | | | | | | | | |
| 19... | -- | 17 | 130 | 10 | .0 | .0 | 39 | 6.9 | .5 | .0 | .3 |
| SEP | | | | | | | | | | | |
| 23... | -- | 8 | 140 | 0 | .0 | .0 | 40 | 9.0 | .7 | .0 | .4 |
| OCT | | | | | | | | | | | |
| 20... | <1 | 4 | 150 | 4 | .0 | .0 | 44 | 8.8 | .7 | .0 | .3 |
| NOV | | | | | | | | | | | |
| 22... | <1 | 8 | 140 | 2 | .0 | .0 | 41 | 9.1 | .6 | .0 | .3 |
| DEC | | | | | | | | | | | |
| 20... | <1 | 16 | 160 | 6 | .0 | .0 | 46 | 10 | .7 | .0 | .3 |
| JAN , 1977 | | | | | | | | | | | |
| 18... | 2 | 61 | 140 | 7 | .0 | .0 | 41 | 8.8 | .6 | .0 | .3 |
| FEB | | | | | | | | | | | |
| 22... | 4 | <1 | 150 | 7 | .0 | .0 | 43 | 9.3 | .7 | .0 | .3 |
| MAR | | | | | | | | | | | |
| 24... | 2 | 6 | 150 | 11 | .0 | .0 | 46 | 9.2 | .7 | .0 | .2 |
| APR | | | | | | | | | | | |
| 20... | <1 | 1 | 140 | 12 | .0 | .0 | 40 | 8.6 | .6 | .0 | .3 |
| MAY | | | | | | | | | | | |
| 20... | <1 | 2 | 110 | 10 | .0 | .0 | 32 | 7.0 | .6 | .0 | .2 |
| JUN | | | | | | | | | | | |
| 20... | 12 | 6 | 120 | 5 | .0 | .0 | 36 | 7.2 | .8 | .0 | .3 |
| JUL | | | | | | | | | | | |
| 29... | 10 | 100 | 140 | 4 | .0 | .0 | 43 | 8.8 | .7 | .0 | .3 |
| AUG | | | | | | | | | | | |
| 22... | 20 | 170 | 140 | 0 | .0 | .0 | 42 | 8.4 | .7 | .0 | .3 |
| SEP | | | | | | | | | | | |
| 21... | 1 | 20 | 140 | 0 | .0 | .0 | 41 | 8.9 | .8 | .0 | .3 |

WATER QUALITY DATA

| DATE | BICAR- BONATE (HCO3) (MG/L) | CAR- BONATE (CO3) (MG/L) | CARBON DIOXIDE (CO2) (MG/L) | DIS- SOLVED SULFATE (SO4) (MG/L) | DIS- SOLVED CHLO- RIDE (CL) (MG/L) | DIS- SOLVED FLUO- RIDE (F) (MG/L) | DIS- SOLVED SILICA (SIO2) (MG/L) | DIS- SOLVED SOLIDS (RESI- DUE AT 180 C) (MG/L) | DIS- SOLVED SOLIDS (SUM OF CONSTI- TUENTS) (MG/L) | DIS- SOLVED SOLIDS (TONS PER AC-FT) | DIS- SOLVED SOLIDS (TONS PER DAY) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OCT , 1974 | | | | | | | | | | | |
| 22... | 173 | -- | 2.2 | 5.3 | 1.0 | .1 | 4.8 | 150 | 149 | .20 | 81.4 |
| NOV | | | | | | | | | | | |
| 26... | 170 | -- | 1.7 | 5.4 | .6 | .1 | 4.3 | 142 | 150 | .19 | 82.8 |
| JAN , 1975 | | | | | | | | | | | |
| 22... | 173 | -- | 2.8 | 8.5 | .8 | .1 | 4.3 | 146 | 151 | .20 | 51.2 |
| MAR | | | | | | | | | | | |
| 13... | 173 | 0 | 2.8 | 6.1 | .3 | .1 | 3.5 | 157 | 146 | .21 | 82.2 |
| APR | | | | | | | | | | | |
| 10... | 165 | 0 | 1.3 | 7.2 | .5 | .1 | 4.0 | 147 | 149 | .20 | 46.4 |
| MAY | | | | | | | | | | | |
| 16... | 112 | 0 | 7.1 | 4.1 | .1 | .0 | 3.8 | 90 | 97 | .12 | 1360 |
| JUN | | | | | | | | | | | |
| 19... | 98 | 0 | 1.6 | 2.9 | .6 | .1 | 3.3 | 93 | 88 | .13 | 1250 |
| JUL | | | | | | | | | | | |
| 25... | 149 | 0 | 1.2 | 4.0 | .3 | .2 | 4.7 | 129 | 129 | .18 | 288 |
| AUG | | | | | | | | | | | |
| 21... | 164 | 0 | 1.3 | 4.7 | .3 | .1 | 4.7 | 134 | 142 | .18 | 154 |
| SEP | | | | | | | | | | | |
| 18... | 159 | -- | -- | 4.1 | 1.1 | .1 | 4.4 | 146 | 138 | .20 | 170 |
| OCT | | | | | | | | | | | |
| 17... | 160 | 0 | 1.3 | 5.8 | 1.6 | .2 | 4.0 | 139 | 139 | .19 | 142 |
| NOV | | | | | | | | | | | |
| 14... | 147 | 0 | 1.5 | 5.8 | .6 | .1 | 3.5 | 133 | 125 | .18 | 201 |
| DEC | | | | | | | | | | | |
| 04... | 118 | 0 | 1.5 | 5.4 | .9 | .1 | 4.0 | 104 | 106 | .14 | 494 |
| JAN 1976 | | | | | | | | | | | |
| 22... | 173 | 0 | 2.8 | 5.3 | .3 | .1 | 3.7 | 141 | 147 | .19 | 102 |
| FEB | | | | | | | | | | | |
| 25... | 164 | 0 | 1.3 | 5.8 | .8 | .1 | 3.9 | 139 | 142 | .19 | 91.6 |
| MAR | | | | | | | | | | | |
| 25... | 171 | 0 | 1.1 | 5.5 | .0 | .1 | 4.0 | 138 | 148 | .19 | 76.0 |
| APR | | | | | | | | | | | |
| 28... | 159 | 0 | 1.3 | 4.8 | .3 | .1 | 3.7 | 136 | 135 | .19 | 330 |
| MAY | | | | | | | | | | | |
| 20... | 100 | 0 | 6.4 | 3.8 | .0 | .1 | 4.1 | 88 | 89 | .12 | 1170 |
| JUN | | | | | | | | | | | |
| 17... | 106 | -- | -- | 2.8 | .1 | .1 | 4.1 | 94 | 95 | .13 | 642 |
| JUL | | | | | | | | | | | |
| 23... | 140 | 0 | .7 | 5.4 | .8 | .1 | 4.0 | 120 | 124 | .16 | 294 |
| AUG | | | | | | | | | | | |
| 19... | 141 | 0 | 1.1 | 5.2 | .5 | .1 | 4.0 | 117 | 126 | .16 | 284 |
| SEP | | | | | | | | | | | |
| 23... | 167 | 0 | .8 | 6.7 | 1.0 | .1 | 4.2 | 143 | 144 | .19 | 128 |
| OCT | | | | | | | | | | | |
| 20... | 173 | 0 | 2.8 | 3.9 | .2 | .1 | 4.1 | 147 | 147 | .20 | 84.9 |
| NOV | | | | | | | | | | | |
| 22... | 168 | -- | -- | 6.1 | .4 | .1 | 3.9 | 142 | 144 | .19 | 84.3 |
| DEC | | | | | | | | | | | |
| 20... | 183 | 0 | 1.8 | 6.7 | .2 | .1 | 4.2 | 176 | 158 | .24 | 43.7 |
| JAN , 1977 | | | | | | | | | | | |
| 18... | 160 | 0 | 2.6 | 7.1 | .3 | .1 | 4.2 | 150 | 141 | .20 | 61.6 |
| FEB | | | | | | | | | | | |
| 22... | 169 | 0 | 2.1 | 9.0 | .3 | .1 | 3.8 | 149 | 150 | .20 | 53.5 |
| MAR | | | | | | | | | | | |
| 24... | 173 | 0 | 1.4 | 5.8 | .3 | .1 | 4.0 | 146 | 152 | .20 | 46.5 |
| APR | | | | | | | | | | | |
| 20... | 150 | 0 | 3.8 | 9.7 | .3 | .2 | 4.1 | 139 | 138 | .19 | 172 |
| MAY | | | | | | | | | | | |
| 20... | 120 | 0 | .8 | 5.4 | .2 | .1 | 3.8 | 148 | 109 | .20 | 436 |
| JUN | | | | | | | | | | | |
| 20... | 140 | 0 | 1.4 | 5.5 | .2 | .1 | 4.5 | 130 | 124 | .18 | 212 |
| JUL | | | | | | | | | | | |
| 29... | 170 | 0 | 1.1 | 4.7 | .3 | .1 | 4.6 | 143 | 146 | .19 | 85.3 |
| AUG | | | | | | | | | | | |
| 22... | 170 | 0 | .9 | 5.9 | .3 | .1 | 4.7 | 137 | 146 | .19 | 65.8 |
| SEP | | | | | | | | | | | |
| 21... | 170 | 0 | 1.1 | 6.7 | .4 | .1 | 5.1 | 141 | 147 | .19 | 70.8 |

## WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C., FOR PERIOD OF RECORD--CONTINUED

WATER QUALITY DATA

| DATE | TOTAL NITRITE PLUS NITRATE (N) (MG/L) | TOTAL ORGANIC NITRO-GEN (N) (MG/L) | DIS-SOLVED AMMONIA NITRO-GEN (N) (MG/L) | TOTAL AMMONIA NITRO-GEN (N) (MG/L) | TOTAL KJEL-DAHL NITRO-GEN (N) (MG/L) | TOTAL NITRO-GEN (N) (MG/L) | TOTAL PHOS-PHORUS (P) (MG/L) | DIS-SOL-VED-PHOS-PHORUS (P) (MG/L) | TOTAL ORGANIC CARBON (C) (MG/L) | DIS-SOL-VED ORGANIC CARBON (C) (MG/L) | SUS-PENDED ORGANIC CARBON (C) (MG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OCT , 1974 | | | | | | | | | | | |
| 22... | .03 | .00 | -- | .00 | .04 | .07 | .02 | .00 | -- | -- | -- |
| NOV | | | | | | | | | | | |
| 26... | .03 | -- | -- | -- | .12 | .15 | .00 | -- | 8.3 | -- | -- |
| JAN , 1975 | | | | | | | | | | | |
| 22... | .03 | -- | -- | -- | .15 | .18 | .00 | -- | -- | -- | -- |
| MAR | | | | | | | | | | | |
| 13... | .02 | -- | -- | -- | .05 | .07 | .00 | -- | -- | -- | -- |
| APR | | | | | | | | | | | |
| 10... | .01 | -- | -- | -- | .05 | .06 | .00 | -- | 5.8 | -- | -- |
| MAY | | | | | | | | | | | |
| 16... | .07 | -- | -- | -- | .35 | .42 | .25 | -- | -- | -- | -- |
| JUN | | | | | | | | | | | |
| 19... | .01 | -- | -- | -- | .19 | .20 | .08 | -- | 5.6 | -- | -- |
| JUL | | | | | | | | | | | |
| 25... | .05 | -- | -- | -- | .12 | .17 | .05 | -- | -- | -- | -- |
| AUG | | | | | | | | | | | |
| 21... | .02 | -- | -- | -- | .02 | .04 | .01 | -- | -- | -- | -- |
| SEP | | | | | | | | | | | |
| 18... | .01 | -- | -- | -- | .16 | .17 | .01 | -- | -- | -- | -- |
| OCT | | | | | | | | | | | |
| 17... | .00 | -- | .00 | -- | .01 | .01 | .00 | -- | 4.3 | -- | -- |
| NOV | | | | | | | | | | | |
| 14... | .01 | -- | .01 | -- | .16 | .17 | .01 | -- | -- | -- | -- |
| DEC | | | | | | | | | | | |
| 04... | .07 | -- | .00 | -- | .47 | .54 | .11 | -- | -- | -- | -- |
| JAN , 1976 | | | | | | | | | | | |
| 22... | .01 | -- | .02 | -- | .21 | .22 | .00 | -- | -- | 1.9 | 1.6 |
| FEB | | | | | | | | | | | |
| 25... | .02 | -- | .00 | -- | .00 | .02 | .00 | -- | -- | -- | -- |
| MAR | | | | | | | | | | | |
| 25... | .01 | -- | .00 | -- | .08 | .09 | .01 | -- | -- | -- | -- |
| APR | | | | | | | | | | | |
| 28... | .04 | -- | .01 | -- | .05 | .09 | .00 | -- | -- | -- | .5 |
| MAY | | | | | | | | | | | |
| 20... | .05 | -- | .01 | -- | .25 | .30 | .06 | -- | -- | -- | -- |
| JUN | | | | | | | | | | | |
| 17... | .02 | -- | -- | -- | .10 | .12 | .04 | -- | -- | 4.2 | .5 |
| JUL | | | | | | | | | | | |
| 23... | .02 | -- | .03 | -- | .00 | .02 | .00 | -- | -- | -- | -- |
| AUG | | | | | | | | | | | |
| 19... | .03 | -- | .00 | -- | .00 | .03 | .00 | -- | -- | -- | -- |
| SEP | | | | | | | | | | | |
| 23... | .00 | -- | .00 | -- | .00 | .00 | .00 | -- | -- | -- | -- |
| OCT | | | | | | | | | | | |
| 20... | .00 | -- | -- | -- | .00 | .00 | .00 | -- | -- | .8 | .0 |
| NOV | | | | | | | | | | | |
| 22... | .06 | -- | .00 | -- | .00 | .06 | .01 | -- | -- | -- | -- |
| DEC | | | | | | | | | | | |
| 20... | .03 | -- | .06 | -- | .55 | .58 | .01 | -- | -- | -- | -- |
| JAN , 1977 | | | | | | | | | | | |
| 18... | .08 | -- | .01 | -- | .02 | .10 | .00 | -- | -- | 1.1 | .1 |
| FEB | | | | | | | | | | | |
| 22... | .03 | -- | .01 | -- | .11 | .14 | .01 | -- | -- | -- | -- |
| MAR | | | | | | | | | | | |
| 24... | .03 | -- | -- | -- | .22 | .25 | .00 | -- | -- | -- | -- |
| APR | | | | | | | | | | | |
| 20... | .03 | -- | .00 | -- | .27 | .30 | .01 | -- | -- | -- | -- |
| MAY | | | | | | | | | | | |
| 20... | .05 | -- | .01 | -- | .46 | .51 | .01 | -- | 1.3 | 1.4 | .2 |
| JUN | | | | | | | | | | | |
| 20... | .03 | -- | .01 | -- | .05 | .08 | .04 | -- | -- | -- | -- |
| JUL | | | | | | | | | | | |
| 29... | .00 | -- | .00 | -- | .14 | .14 | .01 | -- | -- | -- | -- |
| AUG | | | | | | | | | | | |
| 22... | .00 | -- | .00 | -- | .43 | .43 | .00 | -- | -- | -- | -- |
| SEP | | | | | | | | | | | |
| 21... | .05 | .16 | .00 | .04 | .20 | .25 | .00 | .00 | -- | 2.9 | .1 |

# WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C., FOR PERIOD OF RECORD--CONTINUED

WATER QUALITY DATA

| DATE | TIME | TOTAL ALUM-INUM (AL) (UG/L) | DIS-SOLVED ALUM-INUM (AL) (UG/L) | TOTAL ARSENIC (AS) (UG/L) | DIS-SOLVED ARSENIC (AS) (UG/L) | TOTAL BARIUM (BA) (UG/L) | DIS-SOLVED BARIUM (BA) (UG/L) | TOTAL CAD-MIUM (CD) (UG/L) | DIS-SOLVED CAD-MIUM (CD) (UG/L) | TOTAL CHRO-MIUM (CR) (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| NOV , 1974 | | | | | | | | | | |
| 26... | 1130 | -- | -- | 3 | 2 | -- | -- | <10 | 1 | <10 |
| APR , 1975 | | | | | | | | | | |
| 10... | 1100 | -- | -- | 0 | 1 | -- | -- | <10 | 0 | 0 |
| JUN | | | | | | | | | | |
| 19... | 1100 | -- | -- | 2 | 0 | -- | -- | <10 | 0 | 0 |
| OCT | | | | | | | | | | |
| 17... | 1430 | 60 | 10 | 0 | 0 | -- | -- | <10 | 0 | -- |
| DEC | | | | | | | | | | |
| 04... | 1100 | -- | 30 | -- | -- | -- | -- | -- | -- | -- |
| JAN , 1976 | | | | | | | | | | |
| 22... | 1015 | 30 | 0 | 0 | 0 | -- | -- | <10 | 0 | 0 |
| APR | | | | | | | | | | |
| 28... | 1200 | 270 | 0 | 0 | 0 | -- | -- | <10 | 0 | 0 |
| JUN | | | | | | | | | | |
| 17... | 1130 | 280 | 10 | 0 | 0 | -- | -- | 0 | 0 | 10 |
| OCT | | | | | | | | | | |
| 20... | 1230 | 50 | 20 | 0 | 0 | -- | -- | <10 | 0 | 0 |
| JAN , 1977 | | | | | | | | | | |
| 18... | 1230 | 40 | 0 | 1 | 0 | -- | -- | <10 | 0 | 0 |
| MAY | | | | | | | | | | |
| 20... | 1030 | 120 | 10 | 0 | 0 | -- | -- | <10 | 1 | 0 |
| SEP | | | | | | | | | | |
| 21... | 1100 | 30 | 0 | 0 | 1 | 200 | 0 | 10 | 0 | 20 |

| DATE | DIS-SOLVED CHRO-MIUM (CR) (UG/L) | TOTAL COBALT (CO) (UG/L) | DIS-SOLVED COBALT (CO) (UG/L) | TOTAL COPPER (CU) (UG/L) | DIS-SOLVED COPPER (CU) (UG/L) | TOTAL IRON (FE) (UG/L) | DIS-SOLVED IRON (FE) (UG/L) | TOTAL LEAD (PB) (UG/L) | DIS-SOLVED LEAD (PB) (UG/L) | TOTAL MAN-GANESE (MN) (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| NOV , 1974 | | | | | | | | | | |
| 26... | <10 | <50 | 0 | <10 | 1 | 80 | 10 | <100 | 0 | 30 |
| APR , 1975 | | | | | | | | | | |
| 10... | 0 | <50 | 0 | 45 | 0 | 0 | 10 | <100 | 0 | 0 |
| JUN | | | | | | | | | | |
| 19... | 0 | <50 | 1 | 10 | 0 | 2800 | 170 | <100 | 2 | -- |
| OCT | | | | | | | | | | |
| 17... | 0 | -- | 0 | 10 | 0 | 20 | 0 | <100 | 0 | 10 |
| DEC | | | | | | | | | | |
| 04... | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| JAN , 1976 | | | | | | | | | | |
| 22... | 0 | <50 | 0 | 10 | 0 | 20 | 0 | <100 | 2 | 10 |
| APR | | | | | | | | | | |
| 28... | 0 | <50 | 0 | <10 | 0 | 350 | 0 | <100 | 2 | 10 |
| JUN | | | | | | | | | | |
| 17... | <10 | 0 | 0 | 0 | 0 | 430 | 10 | 1 | 1 | 30 |
| OCT | | | | | | | | | | |
| 20... | 0 | <50 | 0 | <10 | 0 | 20 | 10 | <100 | 0 | 0 |
| JAN , 1977 | | | | | | | | | | |
| 18... | 0 | <50 | 0 | <10 | 0 | 150 | 0 | <100 | 2 | 70 |
| MAY | | | | | | | | | | |
| 20... | 0 | <50 | 0 | <10 | 1 | 190 | 20 | <100 | 3 | 0 |
| SEP | | | | | | | | | | |
| 21... | 0 | <50 | 0 | <10 | 0 | 20 | 20 | <100 | 0 | 0 |

WATER QUALITY DATA

| DATE | DIS-SOLVED MAN-GANESE (MN) (UG/L) | TOTAL MERCURY (HG) (UG/L) | DIS-SOLVED MERCURY (HG) (UG/L) | TOTAL SELE-NIUM (SE) (UG/L) | DIS-SOLVED SELE-NIUM (SE) (UG/L) | TOTAL SILVER (AG) (UG/L) | DIS-SOLVED SILVER (AG) (UG/L) | TOTAL ZINC (ZN) (UG/L) | DIS-SOLVED ZINC (ZN) (UG/L) |
|---|---|---|---|---|---|---|---|---|---|
| NOV , 1974 | | | | | | | | | |
| 26... | <10 | <.1 | <.1 | 0 | 0 | -- | -- | <10 | <10 |
| APR , 1975 | | | | | | | | | |
| 10... | 0 | .0 | .0 | 0 | 0 | -- | -- | 30 | 6 |
| JUN | | | | | | | | | |
| 19... | 20 | .0 | .0 | 0 | 0 | -- | -- | 50 | 0 |
| OCT | | | | | | | | | |
| 17... | 10 | -- | .0 | 0 | 0 | -- | -- | 20 | 10 |
| DEC | | | | | | | | | |
| 04... | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| JAN , 1976 | | | | | | | | | |
| 22... | 0 | .0 | .0 | 0 | 0 | -- | -- | 20 | 0 |
| APR | | | | | | | | | |
| 28... | 0 | .0 | .0 | 0 | 0 | -- | -- | 20 | 0 |
| JUN | | | | | | | | | |
| 17... | 0 | <.5 | <.5 | 0 | 0 | -- | -- | 10 | 10 |
| OCT | | | | | | | | | |
| 20... | 0 | .0 | .0 | 0 | 0 | -- | -- | 0 | 0 |
| JAN , 1977 | | | | | | | | | |
| 18... | 10 | .0 | .1 | 0 | 0 | -- | -- | 10 | 10 |
| MAY | | | | | | | | | |
| 20... | 0 | .0 | .0 | 1 | 0 | -- | -- | 7 | 8 |
| SEP | | | | | | | | | |
| 21... | 0 | .0 | .0 | 0 | 0 | <10 | 0 | 20 | 10 |

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1974 TO SEPTEMBER 1975
ONCE-DAILY

| DAY | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 262 | 266 | 268 | 279 | 256 | 258 | 255 | 178 | 184 | 226 | 240 |
| 2 | | 262 | 266 | 263 | 270 | 256 | 258 | 253 | 175 | 180 | 233 | 237 |
| 3 | | 262 | 255 | 259 | 277 | 258 | 267 | 249 | 174 | 174 | 235 | 238 |
| 4 | | 260 | 259 | 259 | 277 | 260 | 267 | 243 | 173 | 168 | 236 | 237 |
| 5 | | 264 | 255 | 261 | 277 | 282 | 290 | 241 | 173 | 168 | 236 | 239 |
| 6 | | 264 | 255 | 259 | 267 | 290 | 258 | 247 | 173 | 172 | 239 | 244 |
| 7 | | 257 | 257 | 262 | 281 | 278 | 275 | 243 | 176 | 175 | 240 | 246 |
| 8 | | 257 | 263 | 262 | 274 | 270 | 271 | 237 | 165 | 175 | 241 | 245 |
| 9 | | 261 | 261 | 264 | 267 | 264 | 271 | 217 | 170 | 183 | 241 | 244 |
| 10 | | 261 | 261 | 281 | 267 | 264 | 271 | 213 | 166 | 188 | 243 | 247 |
| 11 | | 261 | 255 | 269 | 264 | 264 | 271 | 208 | 164 | 188 | 245 | 249 |
| 12 | | 250 | 257 | 309 | 269 | 266 | 263 | 210 | 165 | 193 | 245 | 249 |
| 13 | | 262 | 260 | 264 | 262 | 264 | 257 | 202 | 166 | 198 | 247 | 253 |
| 14 | | 264 | 258 | 264 | 262 | 267 | 255 | 194 | 165 | 200 | 246 | 249 |
| 15 | | 262 | 268 | 264 | 262 | 264 | 261 | 192 | 165 | 203 | 246 | 257 |
| 16 | | 262 | 258 | 262 | 269 | 264 | 261 | 198 | 161 | 207 | --- | 254 |
| 17 | | 262 | 258 | 264 | 267 | 264 | 259 | 187 | 165 | 210 | --- | 250 |
| 18 | | 257 | 268 | 260 | 260 | 262 | 259 | 188 | 162 | 210 | 247 | 254 |
| 19 | | 264 | 250 | 262 | 260 | 262 | 261 | 189 | 171 | 211 | 245 | 251 |
| 20 | | 252 | 255 | 262 | 264 | 264 | 257 | 190 | 182 | 215 | 246 | 251 |
| 21 | | 254 | 255 | 262 | 264 | 262 | 257 | 195 | 176 | 218 | 247 | 251 |
| 22 | | 254 | 256 | 262 | 264 | 260 | 257 | 194 | 175 | 220 | 249 | 251 |
| 23 | | 254 | 273 | 264 | 264 | 260 | 257 | 194 | 175 | 220 | 248 | 251 |
| 24 | | 254 | --- | 260 | 264 | 264 | 261 | 197 | 175 | 223 | 237 | 256 |
| 25 | | 259 | 263 | 264 | 269 | 266 | 254 | 192 | 173 | 225 | 236 | 258 |
| 26 | | 261 | 265 | 267 | 269 | 263 | 256 | 198 | 173 | 230 | 234 | 258 |
| 27 | | 261 | 261 | 269 | 264 | 263 | 256 | 193 | 176 | 228 | 238 | 259 |
| 28 | | 270 | 261 | 309 | 264 | 283 | 256 | 188 | 177 | 230 | 240 | 256 |
| 29 | | 264 | 265 | 264 | --- | 263 | 256 | 189 | 181 | 230 | 238 | 257 |
| 30 | | 261 | 265 | 269 | --- | 266 | 256 | 177 | 191 | 221 | 237 | 257 |
| 31 | | --- | 269 | 284 | --- | 259 | --- | 183 | --- | 228 | 237 | --- |
| MONTH | | 260 | 261 | 267 | 268 | 265 | 262 | 208 | 172 | 202 | 241 | 250 |
| YEAR | MAX | 309 | MIN | 161 | MEAN | 241 | | | | | | |

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976
ONCE-DAILY

| DAY | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 259 | 239 | 240 | 224 | 243 | 225 | 247 | 228 | 170 | 166 | 229 | 235 |
| 2 | 257 | 242 | 226 | 234 | 248 | 231 | 254 | 209 | 173 | 171 | 229 | 238 |
| 3 | 259 | 243 | 201 | 245 | 250 | 261 | 254 | 198 | 179 | 178 | 225 | 239 |
| 4 | 259 | 216 | 190 | 240 | 268 | 230 | 253 | 196 | 181 | 179 | 239 | 240 |
| 5 | 257 | 194 | 196 | 238 | 284 | 251 | 250 | 191 | 184 | 179 | 225 | 242 |
| 6 | 248 | 199 | 212 | 246 | 260 | 256 | 246 | 186 | 183 | 182 | 229 | 241 |
| 7 | 241 | 204 | 217 | 229 | 260 | 253 | 239 | --- | 179 | 184 | 225 | 245 |
| 8 | 240 | 213 | 218 | 240 | 254 | 257 | 232 | 185 | 176 | 180 | 225 | 244 |
| 9 | 241 | 219 | 206 | 243 | 246 | 252 | 218 | 181 | 163 | 180 | 197 | 246 |
| 10 | 247 | 211 | 183 | 242 | 249 | 250 | 210 | 180 | 158 | 184 | 195 | 246 |
| 11 | 246 | 214 | 195 | 244 | 249 | 252 | 201 | 178 | 169 | 189 | 205 | 246 |
| 12 | 248 | 217 | 216 | 252 | 247 | 266 | 198 | 181 | 166 | 192 | 211 | 247 |
| 13 | 245 | 217 | 214 | 255 | 243 | 259 | 190 | 181 | 168 | 187 | 216 | 248 |
| 14 | 244 | 225 | 227 | 249 | 243 | 261 | 191 | 171 | 172 | 188 | 229 | 252 |
| 15 | 244 | 226 | 221 | 241 | 246 | 259 | 196 | 178 | 175 | 193 | 218 | 250 |
| 16 | 247 | 220 | 198 | 235 | 236 | 255 | 206 | 176 | 173 | 197 | 219 | 251 |
| 17 | 249 | 216 | 233 | 241 | 247 | 249 | 212 | 174 | 171 | 199 | 203 | 251 |
| 18 | 253 | 216 | 227 | 248 | 249 | 247 | 217 | 179 | 168 | 202 | 209 | 250 |
| 19 | 248 | 219 | 223 | 256 | 251 | 251 | 220 | 175 | 166 | 205 | 218 | 250 |
| 20 | 240 | 233 | 225 | 237 | 250 | 254 | 226 | 167 | 162 | 204 | 216 | 252 |
| 21 | 243 | 241 | 229 | 249 | 250 | 255 | 224 | 173 | 166 | 206 | 198 | 256 |
| 22 | 243 | 234 | 231 | 239 | 257 | 256 | 230 | 175 | 169 | 209 | 208 | 254 |
| 23 | 245 | 227 | 233 | 248 | 251 | 251 | 230 | 173 | 167 | 210 | 212 | 255 |
| 24 | 248 | 224 | 231 | 262 | 251 | 255 | 231 | 166 | 169 | 215 | 217 | 256 |
| 25 | 251 | 224 | 231 | 256 | 249 | 253 | 229 | 166 | 171 | 216 | 220 | 256 |
| 26 | 246 | 239 | 230 | 261 | 251 | 256 | 231 | 171 | 180 | 218 | 216 | 257 |
| 27 | 249 | 232 | 231 | 243 | 252 | 253 | 229 | 176 | 180 | 219 | 213 | 258 |
| 28 | 245 | 247 | 235 | 239 | 220 | 257 | 233 | 162 | 184 | 220 | 218 | 259 |
| 29 | 243 | 241 | 236 | 239 | 243 | 256 | 235 | 162 | 179 | 222 | 220 | 259 |
| 30 | .244 | 249 | 229 | 246 | --- | 258 | 230 | 160 | 172 | 222 | 223 | 262 |
| 31 | 247 | --- | 222 | 251 | --- | 256 | --- | 172 | --- | 225 | 228 | --- |
| MONTH | 248 | 225 | 220 | 244 | 250 | 252 | 225 | 179 | 172 | 197 | 217 | 250 |
| YEAR | MAX | 284 | MIN | 158 | MEAN | 223 | | | | | | |

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977
ONCE-DAILY

| DAY | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 258 | 246 | 245 | 267 | 265 | 278 | 280 | 182 | 212 | 244 | 271 | 269 |
| 2 | 256 | 244 | 241 | 269 | 269 | 277 | 279 | 188 | 196 | 249 | 273 | 274 |
| 3 | 255 | 247 | 249 | 272 | 268 | 275 | 278 | 185 | 194 | 250 | 274 | 272 |
| 4 | 257 | 250 | 250 | 270 | 266 | 278 | 279 | 181 | 196 | 251 | 270 | 270 |
| 5 | 257 | 252 | 255 | 268 | 268 | 281 | 272 | 194 | 191 | 250 | 272 | 262 |
| 6 | 258 | 253 | 251 | 263 | 270 | 279 | 269 | 202 | 189 | 254 | 273 | 264 |
| 7 | 259 | 256 | 248 | 258 | 269 | 278 | 265 | 212 | 189 | 252 | 270 | 269 |
| 8 | 259 | 252 | 242 | 258 | 264 | 277 | 255 | 207 | 189 | 252 | 274 | 267 |
| 9 | 257 | 252 | 244 | 259 | 264 | 275 | 237 | 192 | 187 | 257 | 281 | 268 |
| 10 | 256 | 253 | 246 | 257 | 265 | 273 | 229 | 179 | 198 | 255 | 276 | 270 |
| 11 | 254 | 256 | 243 | 255 | 262 | 271 | 231 | 180 | 207 | 259 | 281 | 268 |
| 12 | 256 | 257 | 252 | 253 | 259 | 276 | 239 | 182 | 209 | 259 | 276 | 272 |
| 13 | 257 | 258 | 256 | 249 | 255 | 280 | 240 | 192 | 213 | 250 | 274 | 272 |
| 14 | 259 | 257 | 256 | 250 | 269 | 284 | 240 | 195 | 221 | 257 | 270 | 272 |
| 15 | 260 | 259 | 254 | 251 | 263 | 287 | 241 | 190 | 220 | 265 | 272 | 273 |
| 16 | 258 | 256 | 250 | 253 | 262 | 284 | 241 | 191 | 218 | 263 | 273 | 273 |
| 17 | 256 | 256 | 252 | 255 | 261 | 281 | 240 | 196 | 219 | 263 | 274 | 268 |
| 18 | 258 | 243 | 252 | 248 | 262 | 281 | 246 | 200 | 225 | 261 | 280 | 272 |
| 19 | 257 | 246 | 257 | 238 | 264 | 281 | 248 | 204 | 226 | 262 | 276 | 273 |
| 20 | 258 | 251 | 262 | 244 | 266 | 281 | 250 | 209 | 227 | 264 | 277 | 272 |
| 21 | 260 | 260 | 259 | 250 | 268 | 280 | 254 | 208 | 227 | 264 | 278 | 272 |
| 22 | 262 | 256 | 269 | 251 | 265 | 280 | 255 | 204 | 230 | 265 | 269 | 272 |
| 23 | 261 | 256 | 261 | 253 | 262 | 281 | 245 | 191 | 232 | 264 | 278 | 274 |
| 24 | 261 | 258 | 255 | 255 | 266 | 281 | 228 | 195 | 234 | 266 | 278 | 272 |
| 25 | 258 | 248 | --- | 257 | 269 | 280 | 208 | 191 | 238 | 261 | 274 | 272 |
| 26 | 259 | 265 | 251 | 256 | 267 | 279 | 193 | 196 | 238 | 267 | 278 | 274 |
| 27 | 259 | 268 | --- | 254 | 265 | 278 | 187 | 197 | 241 | 273 | 275 | 274 |
| 28 | 261 | 268 | 259 | 257 | --- | 280 | 186 | 203 | 242 | 271 | 276 | 273 |
| 29 | 261 | 262 | --- | 261 | --- | 282 | 185 | 207 | 242 | 270 | 271 | 269 |
| 30 | 261 | 260 | 261 | 260 | --- | 282 | 184 | 209 | 246 | 269 | 271 | 272 |
| 31 | 261 | --- | --- | 260 | --- | 281 | --- | 210 | --- | 277 | 271 | --- |
| MONTH | 258 | 255 | 253 | 256 | 265 | 279 | 239 | 196 | 217 | 260 | 274 | 271 |
| YEAR | MAX | 287 | MIN | 179 | MEAN | 252 | | | | | | |

WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C., FOR PERIOD OF RECORD--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

| | OCTOBER | | | NOVEMBER | | | DECEMBER | | | JANUARY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN |
| 1 | 9.5 | 5.5 | 8.0 | 4.5 | 3.0 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 9.5 | 6.0 | 8.0 | 4.5 | 3.5 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 8.5 | 6.5 | 7.5 | 6.0 | 4.0 | 5.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 9.0 | 7.0 | 8.0 | 6.0 | 4.5 | 5.5 | 1.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| 5 | 8.0 | 5.5 | 7.0 | 5.0 | 3.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 8.0 | 7.0 | 7.5 | 4.5 | 3.5 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 7.0 | 5.5 | 6.0 | 3.5 | 2.5 | 3.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 6.0 | 4.5 | 5.5 | 3.0 | 2.0 | 2.5 | 1.5 | 0.5 | 1.0 | 0.0 | 0.0 | 0.0 |
| 9 | 5.5 | 4.0 | 5.0 | 2.0 | 1.0 | 1.5 | 2.5 | 1.5 | 2.0 | 0.0 | 0.0 | 0.0 |
| 10 | 6.0 | 4.5 | 5.5 | 1.0 | 0.5 | 1.0 | 2.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| 11 | 7.0 | 5.5 | 6.0 | 1.5 | 0.5 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 6.0 | 4.5 | 5.0 | 1.5 | 1.0 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 6.0 | 3.5 | 5.0 | 2.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 5.5 | 4.0 | 5.0 | 2.5 | 1.5 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | 7.0 | 4.0 | 6.0 | 3.5 | 2.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | 5.5 | 3.5 | 4.5 | 2.0 | 0.5 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 17 | 7.5 | 5.0 | 5.5 | 1.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 18 | 7.0 | 5.5 | 6.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | --- | --- | --- |
| 19 | 5.5 | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | --- | --- | --- |
| 20 | 5.0 | 3.5 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | --- | --- | --- |
| 21 | 4.5 | 3.5 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | --- | --- | --- |
| 22 | 4.5 | 3.5 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | --- | --- | --- |
| 23 | 4.0 | 3.0 | 3.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | --- | --- | --- |
| 24 | 3.5 | 2.0 | 3.0 | 1.0 | 0.5 | 0.5 | 0.5 | 0.0 | 0.0 | --- | --- | --- |
| 25 | 2.5 | 1.0 | 2.0 | 0.5 | 0.0 | 0.0 | 1.0 | 0.5 | 0.5 | --- | --- | --- |
| 26 | 3.0 | 1.5 | 2.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 1.0 | --- | --- | --- |
| 27 | 3.5 | 2.5 | 3.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.5 | 1.0 | --- | --- | --- |
| 28 | 3.5 | 2.5 | 3.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | --- | --- | --- |
| 29 | 3.0 | 2.0 | 2.5 | 0.0 | 0.0 | 0.0 | 1.5 | 0.0 | 0.5 | --- | --- | --- |
| 30 | 3.5 | 2.5 | 3.0 | 0.0 | 0.0 | 0.0 | 1.5 | 0.0 | 1.0 | --- | --- | --- |
| 31 | 3.5 | 3.0 | 3.0 | --- | --- | --- | 0.0 | 0.0 | 0.0 | --- | --- | --- |
| MONTH | 9.5 | 1.0 | 5.0 | 6.0 | 0.0 | 1.5 | 2.5 | 0.0 | 0.5 | --- | --- | --- |

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

| | FEBRUARY | | | MARCH | | | APRIL | | | MAY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN |
| 1 | --- | --- | --- | 0.0 | 0.0 | 0.0 | 4.0 | 1.0 | 2.5 | 8.5 | 3.0 | 5.5 |
| 2 | --- | --- | --- | 0.0 | 0.0 | 0.0 | 5.0 | 0.5 | 2.5 | 7.0 | 3.0 | 5.0 |
| 3 | --- | --- | --- | 0.0 | 0.0 | 0.0 | 7.0 | 2.0 | 4.5 | 7.5 | 3.0 | 5.0 |
| 4 | --- | --- | --- | 0.0 | 0.0 | 0.0 | 6.5 | 2.0 | 4.0 | 4.5 | 2.0 | 3.5 |
| 5 | --- | --- | --- | 0.0 | 0.0 | 0.0 | 7.0 | 2.0 | 4.5 | 4.5 | 3.0 | 3.5 |
| 6 | --- | --- | --- | --- | --- | --- | 6.5 | 2.0 | 4.5 | 7.0 | 2.5 | 4.5 |
| 7 | --- | --- | --- | --- | --- | --- | 6.5 | 2.0 | 4.0 | 7.5 | 3.0 | 5.0 |
| 8 | --- | --- | --- | --- | --- | --- | 5.5 | 1.5 | 3.5 | 7.5 | 3.0 | 5.0 |
| 9 | --- | --- | --- | --- | --- | --- | 4.0 | 1.5 | 2.5 | 7.5 | 2.5 | 5.0 |
| 10 | --- | --- | --- | --- | --- | --- | 4.5 | 1.5 | 3.0 | 7.5 | 3.0 | 5.0 |
| 11 | --- | --- | --- | --- | --- | --- | 5.0 | 1.0 | 3.0 | 5.5 | 3.5 | 4.0 |
| 12 | --- | --- | --- | --- | --- | --- | 4.5 | 1.0 | 3.0 | 7.0 | 2.5 | 4.5 |
| 13 | --- | --- | --- | --- | --- | --- | 3.5 | 1.5 | 2.5 | 7.0 | 4.0 | 5.5 |
| 14 | --- | --- | --- | --- | --- | --- | 3.0 | 1.5 | 2.0 | 5.5 | 3.5 | 4.5 |
| 15 | --- | --- | --- | --- | --- | --- | 4.0 | 1.0 | 2.5 | 7.0 | 2.5 | 5.0 |
| 16 | --- | --- | --- | --- | --- | --- | 4.0 | 1.5 | 3.0 | 8.0 | 3.5 | 5.5 |
| 17 | --- | --- | --- | --- | --- | --- | 3.5 | 2.0 | 2.5 | 7.5 | 4.5 | 6.0 |
| 18 | --- | --- | --- | --- | --- | --- | 4.0 | 1.5 | 2.5 | 8.0 | 3.5 | 5.5 |
| 19 | --- | --- | --- | --- | --- | --- | 4.5 | 1.5 | 3.0 | 8.5 | 3.5 | 6.0 |
| 20 | --- | --- | --- | --- | --- | --- | 4.0 | 2.0 | 3.0 | 7.0 | 4.0 | 5.0 |
| 21 | --- | --- | --- | --- | --- | --- | 4.0 | 2.0 | 3.0 | 8.0 | 3.5 | 5.5 |
| 22 | --- | --- | --- | --- | --- | --- | 5.0 | 2.0 | 3.5 | 8.5 | 4.0 | 6.5 |
| 23 | --- | --- | --- | --- | --- | --- | 7.0 | 3.0 | 5.0 | 8.5 | 5.5 | 6.5 |
| 24 | --- | --- | --- | --- | --- | --- | 5.5 | 3.5 | 4.5 | 8.0 | 5.5 | 6.5 |
| 25 | 0.5 | 0.0 | 0.5 | --- | --- | --- | 4.0 | 3.0 | 3.5 | 6.0 | 4.5 | 5.5 |
| 26 | 0.5 | 0.0 | 0.0 | 2.0 | 0.5 | 1.0 | 3.0 | 1.5 | 2.0 | 7.0 | 4.0 | 5.0 |
| 27 | 0.0 | 0.0 | 0.0 | 1.5 | 0.0 | 1.0 | 4.5 | 1.5 | 3.0 | 10.0 | 4.0 | 7.0 |
| 28 | 0.0 | 0.0 | 0.0 | 3.5 | 0.0 | 2.0 | 4.5 | 2.5 | 3.5 | 8.0 | 5.5 | 7.0 |
| 29 | 0.0 | 0.0 | 0.0 | 4.5 | 0.5 | 2.5 | 7.5 | 1.5 | 4.5 | 7.0 | 4.0 | 5.5 |
| 30 | --- | --- | --- | 5.5 | 2.0 | 3.5 | 8.5 | 2.5 | 5.5 | 7.5 | 4.0 | 6.0 |
| 31 | --- | --- | --- | 5.0 | 1.5 | 3.5 | --- | --- | --- | 7.5 | 5.0 | 6.0 |
| MONTH | --- | --- | --- | --- | --- | --- | 8.5 | 0.5 | 3.5 | 10.0 | 2.0 | 5.5 |

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

| | JUNE | | | JULY | | | AUGUST | | | SEPTEMBER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN |
| 1 | 7.5 | 4.5 | 6.0 | 11.5 | 8.0 | 9.5 | 15.5 | 11.5 | 13.5 | 14.5 | 9.5 | 12.5 |
| 2 | 8.0 | 4.5 | 6.0 | 12.0 | 6.0 | 9.0 | 15.0 | 12.0 | 13.5 | 14.0 | 10.5 | 12.5 |
| 3 | 6.0 | 4.5 | 5.0 | 12.0 | 6.5 | 9.5 | 16.0 | 10.5 | 13.5 | 13.0 | 9.5 | 11.5 |
| 4 | 8.5 | 4.5 | 6.5 | 11.0 | 8.5 | 10.0 | 14.0 | 11.0 | 12.5 | 14.5 | 9.5 | 12.0 |
| 5 | 9.5 | 4.5 | 7.0 | 12.5 | 8.0 | 10.0 | 13.5 | 11.0 | 12.0 | 14.0 | 9.5 | 12.0 |
| 6 | 7.5 | 5.5 | 6.5 | 13.0 | 8.0 | 10.5 | 16.0 | 9.5 | 12.5 | 13.0 | 10.0 | 11.5 |
| 7 | 9.5 | 5.0 | 7.0 | 11.5 | 8.5 | 10.0 | 16.0 | 11.5 | 14.0 | 10.5 | 8.0 | 9.0 |
| 8 | 10.5 | 5.5 | 8.0 | 11.0 | 8.0 | 9.5 | 13.5 | 10.0 | 11.0 | 10.0 | 7.5 | 8.5 |
| 9 | 9.5 | 6.5 | 8.0 | 11.5 | 8.0 | 9.5 | 10.5 | 9.5 | 10.0 | 11.0 | 6.5 | 9.0 |
| 10 | 7.5 | 5.5 | 6.0 | 13.0 | 7.5 | 10.0 | 13.0 | 9.5 | 11.0 | 11.5 | 7.0 | 9.5 |
| 11 | 8.5 | 5.0 | 6.5 | 14.0 | 8.5 | 11.0 | 14.0 | 10.0 | 12.0 | 10.5 | 7.5 | 9.0 |
| 12 | 8.0 | 6.0 | 7.0 | 12.0 | 9.0 | 9.5 | 14.5 | 10.0 | 12.0 | 10.0 | 8.5 | 9.5 |
| 13 | 6.5 | 4.0 | 4.5 | 12.5 | 8.0 | 10.0 | 13.5 | 10.5 | 12.0 | 11.5 | 7.0 | 9.0 |
| 14 | 8.5 | 4.0 | 6.0 | 13.0 | 8.0 | 10.5 | 13.0 | 10.0 | 11.5 | 11.5 | 7.0 | 9.5 |
| 15 | 7.5 | 6.0 | 7.0 | 14.5 | 8.0 | 11.5 | 13.5 | 10.0 | 12.0 | 12.0 | 7.5 | 10.0 |
| 16 | 8.5 | 6.0 | 7.0 | 15.0 | 9.0 | 12.0 | 12.0 | 10.0 | 11.0 | 12.5 | 7.5 | 10.5 |
| 17 | 10.5 | 5.5 | 8.0 | 15.0 | 9.5 | 12.5 | 12.0 | 8.0 | 10.0 | 11.0 | 9.5 | 10.5 |
| 18 | 11.5 | 5.5 | 8.5 | 15.0 | 10.0 | 12.5 | 11.5 | 8.0 | 10.0 | 12.0 | 9.5 | 10.5 |
| 19 | 10.0 | 6.5 | 8.5 | 14.0 | 10.0 | 12.0 | 10.5 | 8.0 | 9.5 | 11.5 | 7.0 | 9.5 |
| 20 | 9.5 | 6.5 | 8.0 | 13.5 | 9.5 | 11.5 | 12.5 | 8.5 | 10.5 | 11.0 | 7.0 | 9.5 |
| 21 | 8.0 | 6.0 | 7.0 | 13.5 | 9.0 | 11.5 | 13.5 | 8.0 | 11.0 | 11.5 | 7.0 | 9.5 |
| 22 | 8.0 | 6.0 | 7.0 | 15.0 | 9.0 | 12.0 | 15.0 | 9.0 | 12.0 | 12.0 | 7.5 | 10.0 |
| 23 | 8.5 | 6.0 | 7.0 | 15.5 | 9.5 | 12.5 | 14.0 | 11.5 | 13.0 | 12.0 | 8.0 | 10.0 |
| 24 | 8.5 | 6.0 | 7.5 | 14.0 | 10.5 | 11.5 | 14.5 | 11.0 | 12.5 | 12.0 | 9.0 | 10.5 |
| 25 | 7.0 | 5.5 | 6.5 | 15.0 | 10.0 | 12.5 | 13.5 | 10.0 | 11.5 | 11.0 | 9.0 | 10.0 |
| 26 | 8.5 | 5.0 | 7.0 | 16.0 | 10.5 | 13.5 | 11.5 | 8.5 | 9.5 | 11.0 | 7.0 | 9.0 |
| 27 | 12.0 | 6.0 | 8.5 | 15.0 | 10.5 | 13.0 | 9.5 | 7.5 | 8.5 | 11.0 | 7.0 | 9.0 |
| 28 | 12.5 | 6.5 | 9.5 | 15.0 | 9.0 | 12.5 | 11.5 | 8.0 | 9.5 | 11.0 | 7.0 | 9.0 |
| 29 | 13.5 | 7.5 | 10.5 | 13.0 | 10.0 | 11.0 | 13.5 | 8.0 | 11.0 | 11.0 | 7.0 | 9.0 |
| 30 | 14.0 | 8.5 | 11.5 | 11.0 | 9.5 | 10.0 | 14.0 | 9.0 | 12.0 | 11.5 | 8.0 | 9.5 |
| 31 | --- | --- | --- | 15.5 | 9.0 | 12.0 | 14.5 | 9.5 | 12.0 | --- | --- | --- |
| MONTH | 14.0 | 4.0 | 7.5 | 16.0 | 6.0 | 11.0 | 16.0 | 7.5 | 11.5 | 14.5 | 6.5 | 10.0 |
| YEAR | 16.0 | 0.0 | 5.5 | | | | | | | | | |

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

| | OCTOBER | | | NOVEMBER | | | DECEMBER | | | JANUARY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN |
| 1 | 11.0 | 7.0 | 9.5 | 5.5 | 3.5 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 10.0 | 8.5 | 9.0 | 3.5 | 2.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 8.5 | 7.0 | 8.0 | 4.0 | 1.5 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 7.5 | 4.5 | 6.0 | 4.0 | 3.0 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 6.0 | 4.5 | 5.0 | 4.0 | 3.5 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 7.0 | 4.5 | 5.5 | 3.5 | 1.5 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 7.5 | 4.0 | 6.0 | 4.0 | 3.0 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 8.0 | 4.5 | 6.5 | 4.0 | 3.0 | 3.5 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 9 | 8.5 | 5.0 | 7.0 | 3.0 | 1.5 | 2.5 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| 10 | 8.0 | 5.5 | 7.0 | 2.5 | 1.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | 8.5 | 6.0 | 7.5 | 1.5 | 0.0 | 1.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 12 | 8.5 | 6.0 | 7.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 8.5 | 5.5 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 7.5 | 5.0 | 6.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | 6.0 | 3.5 | 4.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | 5.0 | 2.5 | 4.0 | 2.5 | 0.5 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 17 | 5.0 | 4.0 | 4.5 | 4.0 | 2.5 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 18 | 4.0 | 1.5 | 3.0 | 3.0 | 1.5 | 2.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 19 | 4.5 | 1.5 | 3.0 | 2.5 | 1.5 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 20 | 4.5 | 2.0 | 3.5 | 1.5 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 21 | 4.5 | 2.0 | 3.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 22 | 4.0 | 2.5 | 3.5 | 1.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 23 | 3.0 | 1.0 | 2.0 | 1.5 | 0.5 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 24 | 3.5 | 1.0 | 2.5 | 2.5 | 1.5 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25 | 5.0 | 3.5 | 4.5 | 2.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 26 | 4.5 | 2.5 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 4.5 | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 28 | 5.0 | 2.5 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 29 | 5.5 | 4.5 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 30 | 4.5 | 2.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 31 | 4.5 | 2.5 | 3.5 | --- | --- | --- | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MONTH | 11.0 | 1.0 | 5.0 | 5.5 | 0.0 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C., FOR PERIOD OF RECORD--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

| | FEBRUARY | | | MARCH | | | APRIL | | | MAY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN |
| 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 1.0 | 2.5 | 8.0 | 4.0 | 6.0 |
| 2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.5 | 0.5 | 2.0 | 7.0 | 4.0 | 5.5 |
| 3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 1.0 | 2.5 | 6.5 | 4.0 | 5.0 |
| 4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.0 | 1.5 | 4.5 | 6.5 | 3.5 | 5.0 |
| 5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.0 | 2.5 | 5.0 | 5.5 | 3.5 | 4.5 |
| 6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.0 | 2.5 | 4.5 | 5.0 | 2.5 | 4.0 |
| 7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.5 | 2.5 | 4.5 | 9.5 | 4.0 | 6.5 |
| 8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.5 | 2.0 | 4.0 | 9.0 | 5.0 | 7.5 |
| 9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.5 | 2.0 | 3.5 | 10.0 | 5.5 | 7.5 |
| 10 | 0.0 | 0.0 | 0.0 | 3.0 | 0.0 | 1.5 | 4.0 | 1.0 | 2.5 | 8.5 | 5.5 | 6.0 |
| 11 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 1.0 | 4.5 | 2.0 | 3.0 | 5.5 | 4.5 | 5.0 |
| 12 | 0.0 | 0.0 | 0.0 | 3.0 | 0.0 | 1.5 | 6.5 | 1.0 | 4.0 | 7.5 | 2.5 | 5.0 |
| 13 | 0.0 | 0.0 | 0.0 | 2.5 | 1.0 | 2.0 | 6.0 | 2.5 | 4.0 | 8.0 | 5.0 | 6.5 |
| 14 | 0.0 | 0.0 | 0.0 | 1.5 | 0.0 | 0.5 | 4.5 | 2.0 | 3.5 | 7.5 | 5.0 | 6.0 |
| 15 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 1.0 | 6.0 | 2.0 | 3.5 | 7.0 | 5.0 | 6.0 |
| 16 | 0.0 | 0.0 | 0.0 | 1.5 | 0.0 | 0.5 | 5.0 | 3.5 | 4.0 | 7.0 | 4.5 | 6.0 |
| 17 | 0.0 | 0.0 | 0.0 | 2.5 | 0.0 | 1.0 | 6.5 | 1.5 | 4.0 | 6.5 | 4.5 | 5.5 |
| 18 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 1.0 | 4.0 | 1.5 | 3.0 | 5.5 | 4.0 | 4.5 |
| 19 | 0.0 | 0.0 | 0.0 | 1.5 | 0.0 | 0.5 | 5.5 | 1.0 | 3.0 | 7.5 | 3.5 | 5.5 |
| 20 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 5.5 | 2.5 | 4.0 | 8.5 | 4.0 | 6.5 |
| 21 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.5 | 4.5 | 2.0 | 3.5 | 7.5 | 5.0 | 6.5 |
| 22 | 0.0 | 0.0 | 0.0 | 4.0 | 0.0 | 2.0 | 9.5 | 3.0 | 6.0 | 9.5 | 5.5 | 7.0 |
| 23 | 0.0 | 0.0 | 0.0 | 3.5 | 1.0 | 2.5 | 9.5 | 3.5 | 6.5 | 8.0 | 5.0 | 6.5 |
| 24 | 0.0 | 0.0 | 0.0 | 4.5 | 2.0 | 3.0 | 9.0 | 3.5 | 6.0 | 9.0 | 5.5 | 7.0 |
| 25 | 0.0 | 0.0 | 0.0 | 4.0 | 1.0 | 2.5 | 8.5 | 3.0 | 5.5 | 10.5 | 4.5 | 7.5 |
| 26 | 0.0 | 0.0 | 0.0 | 3.0 | 1.5 | 2.5 | 7.0 | 3.0 | 5.0 | 8.5 | 5.0 | 7.0 |
| 27 | 0.0 | 0.0 | 0.0 | 4.0 | 1.0 | 2.5 | 7.5 | 3.0 | 5.0 | 8.5 | 5.0 | 7.0 |
| 28 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 1.0 | 8.0 | 3.0 | 5.5 | 7.0 | 4.5 | 6.0 |
| 29 | --- | --- | --- | 2.5 | 0.0 | 1.0 | 7.0 | 3.5 | 5.0 | 7.5 | 4.5 | 5.5 |
| 30 | --- | --- | --- | 3.5 | 0.0 | 1.5 | 8.5 | 3.5 | 6.0 | 10.5 | 4.5 | 7.5 |
| 31 | --- | --- | --- | 3.0 | 1.0 | 2.0 | --- | --- | --- | 11.0 | 7.0 | 9.0 |
| MONTH | 0.0 | 0.0 | 0.0 | 4.5 | 0.0 | 1.0 | 9.5 | 0.5 | 4.0 | 11.0 | 2.5 | 6.0 |

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

| | JUNE | | | JULY | | | AUGUST | | | SEPTEMBER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN |
| 1 | 0.0 | 7.0 | 9.5 | 16.5 | 10.5 | 13.5 | 18.5 | 11.0 | 15.0 | 12.0 | 7.0 | 9.5 |
| 2 | 0.0 | 7.0 | 9.0 | 16.5 | 11.0 | 13.5 | 19.5 | 12.5 | 16.0 | 12.0 | 8.5 | 10.5 |
| 3 | 0.0 | 5.5 | 7.0 | 13.0 | 9.0 | 11.5 | 16.0 | 12.0 | 13.5 | 13.0 | 10.0 | 11.0 |
| 4 | 0.0 | 6.5 | 8.0 | 12.0 | 8.0 | 10.5 | 12.0 | 11.0 | 11.5 | 11.5 | 10.0 | 11.0 |
| 5 | 0.0 | 6.0 | 9.5 | 12.0 | 9.0 | 10.5 | 17.0 | 9.5 | 13.0 | 13.5 | 9.5 | 11.5 |
| 6 | 0.0 | 8.0 | 10.5 | 13.0 | 8.0 | 10.0 | 15.0 | 10.5 | 13.5 | 13.5 | 8.5 | 11.5 |
| 7 | 0.0 | 8.5 | 10.0 | 14.5 | 9.0 | 12.0 | 17.5 | 10.5 | 14.0 | 12.0 | 8.5 | 10.5 |
| 8 | 0.0 | 9.0 | 11.0 | 15.5 | 9.5 | 13.0 | 16.5 | 11.5 | 14.0 | 12.5 | 8.5 | 10.5 |
| 9 | 0.0 | 7.5 | 10.5 | 16.0 | 11.0 | 13.5 | 14.5 | 11.5 | 13.0 | 12.0 | 7.5 | 10.0 |
| 10 | 0.0 | 7.5 | 9.5 | 14.0 | 10.5 | 12.5 | 16.5 | 9.0 | 13.0 | 12.5 | 8.0 | 10.5 |
| 11 | 0.0 | 6.5 | 8.5 | 14.0 | 9.5 | 12.0 | 17.5 | 10.5 | 14.0 | 11.5 | 8.5 | 10.0 |
| 12 | 0.0 | 7.0 | 9.5 | 16.0 | 10.5 | 13.5 | 17.5 | 11.5 | 15.0 | 12.5 | 7.0 | 9.5 |
| 13 | 0.0 | 7.5 | 10.0 | 14.0 | 10.5 | 11.5 | 15.5 | 13.0 | 14.0 | 13.0 | 8.0 | 10.5 |
| 14 | 0.0 | 7.0 | 10.0 | 15.0 | 9.0 | 12.0 | 13.0 | 10.5 | 12.0 | 12.5 | 8.5 | 10.5 |
| 15 | 0.0 | 8.5 | 10.5 | 17.5 | 10.0 | 14.0 | 16.0 | 10.0 | 13.0 | 13.0 | 9.0 | 11.0 |
| 16 | 0.0 | 8.5 | 10.0 | 17.5 | 11.0 | 14.5 | 17.5 | 10.5 | 14.0 | 10.0 | 8.5 | 9.0 |
| 17 | 0.0 | 7.5 | 11.0 | 15.0 | 12.5 | 13.5 | 18.0 | 11.0 | 15.0 | 10.5 | 8.0 | 9.0 |
| 18 | 0.0 | 9.0 | 12.0 | 15.0 | 10.5 | 13.0 | 18.5 | 12.0 | 15.5 | 9.5 | 7.0 | 8.5 |
| 19 | 0.0 | 9.0 | 12.5 | 13.5 | 9.5 | 11.5 | 19.0 | 13.0 | 16.0 | 9.5 | 7.0 | 8.5 |
| 20 | 0.0 | 10.0 | 11.0 | 16.5 | 8.5 | 12.5 | 18.5 | 13.0 | 16.0 | 11.0 | 8.5 | 9.5 |
| 21 | 0.0 | 9.0 | 12.0 | 16.5 | 11.5 | 14.0 | 17.5 | 13.0 | 15.5 | 10.0 | 7.5 | 8.5 |
| 22 | 0.0 | 9.5 | 12.5 | 19.0 | 12.0 | 15.5 | 17.5 | 13.5 | 15.0 | 8.5 | 5.0 | 7.0 |
| 23 | 0.0 | 9.5 | 12.5 | 19.0 | 12.0 | 16.0 | 15.5 | 11.0 | 13.5 | 10.0 | 6.5 | 8.0 |
| 24 | 0.0 | 9.5 | 13.0 | 17.5 | 13.5 | 16.0 | 14.0 | 11.5 | 12.5 | 9.0 | 7.5 | 8.5 |
| 25 | 0.0 | 11.0 | 14.0 | 15.5 | 13.0 | 13.5 | 13.0 | 9.5 | 11.5 | 8.5 | 7.0 | 8.0 |
| 26 | 0.0 | 11.0 | 14.0 | 13.5 | 11.5 | 12.5 | 11.5 | 8.5 | 10.0 | 9.0 | 6.0 | 7.0 |
| 27 | 0.0 | 11.0 | 13.0 | 18.5 | 11.0 | 14.5 | 13.5 | 10.0 | 11.5 | 9.0 | 6.0 | 7.5 |
| 28 | 0.0 | 9.5 | 12.5 | 16.5 | 11.5 | 14.5 | 12.0 | 9.5 | 10.0 | 8.0 | 7.0 | 7.5 |
| 29 | 0.0 | 10.5 | 12.5 | 15.0 | 11.5 | 13.5 | 12.5 | 8.5 | 10.0 | 8.0 | 6.5 | 7.5 |
| 30 | 0.0 | 9.5 | 13.0 | 16.0 | 9.5 | 13.0 | 11.5 | 8.0 | 10.0 | 7.5 | 6.5 | 7.0 |
| 31 | --- | --- | --- | 16.0 | 10.5 | 13.5 | 11.5 | 8.5 | 10.0 | --- | --- | --- |
| MONTH | 0.0 | 5.5 | 11.0 | 19.0 | 8.0 | 13.0 | 19.5 | 8.0 | 13.0 | 13.5 | 5.0 | 9.5 |
| YEAR | 19.5 | 0.0 | 5.5 | | | | | | | | | |

# WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C., FOR PERIOD OF RECORD--CONTINUED

SUSPENDED-SEDIMENT DISCHARGE (TONS/DAY), WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | OCTOBER | | | NOVEMBER | | | DECEMBER | |
| 1 | 276 | 3 | 2.2 | 390 | 8 | 8.4 | 512 | 2 | 2.8 |
| 2 | 274 | 2 | 1.5 | 397 | 11 | 12 | 738 | 55 | 110 |
| 3 | 273 | 2 | 1.5 | 589 | 48 | 76 | 1180 | 343 | 1090 |
| 4 | 365 | 3 | 3.0 | 1010 | 74 | 202 | 1780 | 230 | 1110 |
| 5 | 414 | 4 | 4.5 | 1280 | 67 | 232 | 1610 | 27 | 117 |
| 6 | 418 | 4 | 4.5 | 1200 | 30 | 97 | 1220 | 6 | 20 |
| 7 | 482 | 5 | 6.5 | 1080 | 21 | 61 | 1060 | 12 | 34 |
| 8 | 460 | 5 | 6.2 | 921 | 14 | 35 | 938 | 12 | 30 |
| 9 | 427 | 5 | 5.8 | 823 | 18 | 40 | 1350 | 63 | 230 |
| 10 | 404 | 4 | 4.4 | 731 | 9 | 18 | 1840 | 94 | 467 |
| 11 | 405 | 4 | 4.4 | 675 | 14 | 26 | 1520 | 26 | 107 |
| 12 | 399 | 3 | 3.2 | 630 | 8 | 14 | 1270 | 3 | 10 |
| 13 | 390 | 3 | 3.2 | 586 | 3 | 4.7 | 941 | 4 | 10 |
| 14 | 384 | 5 | 5.2 | 567 | 8 | 12 | 850 | 1 | 2.3 |
| 15 | 377 | 4 | 4.1 | 622 | 6 | 10 | 869 | 1 | 2.3 |
| 16 | 369 | 3 | 3.0 | 675 | 9 | 16 | 700 | 2 | 3.8 |
| 17 | 360 | 3 | 2.9 | 614 | 5 | 8.3 | 702 | 2 | 3.8 |
| 18 | 365 | 7 | 6.9 | 535 | 3 | 4.3 | 779 | 1 | 2.1 |
| 19 | 402 | 4 | 4.3 | 449 | 5 | 6.1 | 811 | 1 | 2.2 |
| 20 | 463 | 5 | 6.3 | 418 | 2 | 2.3 | 776 | 1 | 2.1 |
| 21 | 444 | 3 | 3.6 | 425 | 4 | 4.6 | 703 | 1 | 1.9 |
| 22 | 419 | 5 | 5.7 | 511 | 4 | 5.5 | 650 | 1 | 1.8 |
| 23 | 398 | 4 | 4.3 | 510 | 1 | 1.4 | 619 | 14 | 23 |
| 24 | 379 | 5 | 5.1 | 464 | 7 | 8.8 | 599 | 66 | 107 |
| 25 | 376 | 1 | 1.0 | 430 | 1 | 1.2 | 525 | 2 | 2.8 |
| 26 | 371 | 10 | 10 | 434 | 2 | 2.3 | 514 | 3 | 4.2 |
| 27 | 360 | 9 | 8.7 | 404 | 3 | 3.3 | 506 | 7 | 9.6 |
| 28 | 349 | 8 | 7.5 | 348 | 1 | .94 | 475 | 4 | 5.1 |
| 29 | 357 | 3 | 2.9 | 348 | 2 | 1.9 | 462 | 1 | 1.2 |
| 30 | 379 | 5 | 5.1 | 376 | 3 | 3.0 | 425 | 5 | 5.7 |
| 31 | 410 | 4 | 4.4 | --- | --- | --- | 395 | 1 | 1.1 |
| TOTAL | 11949 | --- | 141.9 | 18442 | --- | 918.04 | 27319 | --- | 3519.8 |
| | | JANUARY | | | FEBRUARY | | | MARCH | |
| 1 | 334 | 1 | .90 | 242 | 2 | 1.3 | 174 | 6 | 2.8 |
| 2 | 319 | 2 | 1.7 | 242 | 9 | 5.9 | 145 | 5 | 2.0 |
| 3 | 330 | 2 | 1.8 | 239 | 2 | 1.3 | 131 | 6 | 2.1 |
| 4 | 350 | 2 | 1.9 | 195 | 1 | .53 | 174 | 3 | 1.4 |
| 5 | 370 | 1 | 1.0 | 150 | 2 | .81 | 232 | 7 | 4.4 |
| 6 | 354 | 1 | .96 | 189 | 1 | .51 | 273 | 4 | 2.9 |
| 7 | 324 | 2 | 1.7 | 258 | 2 | 1.4 | 273 | 5 | 3.7 |
| 8 | 311 | 2 | 1.7 | 288 | 3 | 2.3 | 257 | 2 | 1.4 |
| 9 | 316 | 1 | .85 | 315 | 1 | .85 | 242 | 2 | 1.3 |
| 10 | 312 | 1 | .84 | 302 | 5 | 4.1 | 226 | 5 | 3.1 |
| 11 | 315 | 1 | .85 | 286 | 13 | 10 | 209 | 3 | 1.7 |
| 12 | 304 | 2 | 1.6 | 294 | 1 | .79 | 180 | 1 | .49 |
| 13 | 296 | 4 | 3.2 | 302 | 2 | 1.6 | 192 | 6 | 3.1 |
| 14 | 283 | 1 | .76 | 299 | 2 | 1.6 | 192 | 4 | 2.1 |
| 15 | 283 | 3 | 2.3 | 283 | 2 | 1.5 | 186 | 1 | .50 |
| 16 | 300 | 21 | 17 | 268 | 2 | 1.4 | 194 | 1 | .52 |
| 17 | 303 | 16 | 13 | 257 | 5 | 3.5 | 205 | 2 | 1.1 |
| 18 | 305 | 15 | 12 | 257 | 2 | 1.4 | 223 | 6 | 3.6 |
| 19 | 290 | 3 | 2.3 | 253 | 1 | .68 | 219 | 5 | 3.0 |
| 20 | 276 | 10 | 7.5 | 253 | 8 | 5.5 | 217 | 5 | 2.9 |
| 21 | 269 | 7 | 5.1 | 246 | 5 | 3.3 | 209 | 3 | 1.7 |
| 22 | 267 | 2 | 1.4 | 234 | 4 | 2.5 | 203 | 6 | 3.3 |
| 23 | 281 | 2 | 1.5 | 244 | 4 | 2.6 | 207 | 3 | 1.7 |
| 24 | 274 | 4 | 3.0 | 245 | 6 | 4.0 | 207 | 4 | 2.2 |
| 25 | 273 | 2 | 1.5 | 242 | 8 | 5.2 | 206 | 1 | .56 |
| 26 | 268 | 1 | .72 | 231 | 6 | 3.7 | 202 | 3 | 1.6 |
| 27 | 278 | 2 | 1.5 | 226 | 3 | 1.8 | 200 | 2 | 1.1 |
| 28 | 273 | 5 | 3.7 | 191 | 6 | 3.1 | 198 | 1 | .53 |
| 29 | 263 | 1 | .71 | 211 | 4 | 2.3 | 193 | 4 | 2.1 |
| 30 | 268 | 5 | 3.6 | --- | --- | --- | 190 | 5 | 2.6 |
| 31 | 256 | 6 | 4.1 | --- | --- | --- | 195 | 6 | 3.2 |
| TOTAL | 9245 | --- | 100.69 | 7242 | --- | 75.47 | 6354 | --- | 64.70 |

SUSPENDED-SEDIMENT DISCHARGE (TONS/DAY), WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCENTRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCENTRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCENTRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | APRIL | | | MAY | | | JUNE | |
| 1 | 206 | 5 | 2.8 | 1680 | 83 | 376 | 2920 | 36 | 284 |
| 2 | 202 | 1 | .55 | 2450 | 192 | 1270 | 2630 | 41 | 291 |
| 3 | 201 | 2 | 1.1 | 3340 | 374 | 3370 | 2400 | 39 | 253 |
| 4 | 208 | 5 | 2.8 | 4160 | 519 | 5830 | 2250 | 19 | 115 |
| 5 | 237 | 8 | 5.1 | 4070 | 182 | 2000 | 2160 | 28 | 163 |
| 6 | 286 | 24 | 19 | 4180 | 179 | 2020 | 2230 | 33 | 199 |
| 7 | 396 | 27 | 29 | 4660 | 449 | 5650 | 2230 | 30 | 181 |
| 8 | 579 | 48 | 75 | 5490 | 630 | 9340 | 2510 | 54 | 366 |
| 9 | 955 | 120 | 309 | 6450 | 757 | 13200 | 3310 | 112 | 1000 |
| 10 | 1370 | 139 | 514 | 6820 | 792 | 14600 | 3730 | 110 | 1110 |
| 11 | 1740 | 146 | 686 | 8220 | 800 | 17800 | 3140 | 44 | 373 |
| 12 | 2120 | 177 | 1010 | 5980 | 390 | 6300 | 3010 | 35 | 284 |
| 13 | 2390 | 183 | 1180 | 5290 | 241 | 3440 | 2800 | 44 | 333 |
| 14 | 2190 | 87 | 514 | 6420 | 415 | 7190 | 2440 | 48 | 316 |
| 15 | 1800 | 60 | 292 | 5230 | 280 | 3950 | 2260 | 31 | 189 |
| 16 | 1490 | 32 | 129 | 4380 | 164 | 1940 | 2320 | 41 | 257 |
| 17 | 1280 | 28 | 97 | 4560 | 119 | 1470 | 2500 | 35 | 236 |
| 18 | 1140 | 22 | 68 | 4200 | 96 | 1090 | 2590 | 35 | 245 |
| 19 | 1060 | 23 | 66 | 3960 | 82 | 877 | 2800 | 32 | 242 |
| 20 | 1010 | 25 | 68 | 4550 | 143 | 1760 | 2940 | 52 | 413 |
| 21 | 952 | 26 | 67 | 4110 | 76 | 843 | 2840 | 27 | 207 |
| 22 | 864 | 20 | 47 | 3680 | 56 | 556 | 2670 | 36 | 260 |
| 23 | 837 | 14 | 32 | 3920 | 85 | 900 | 2490 | 28 | 188 |
| 24 | 882 | 18 | 43 | 4730 | 155 | 1980 | 2510 | 28 | 190 |
| 25 | 979 | 22 | 56 | 4770 | 93 | 1200 | 2330 | 40 | 252 |
| 26 | 949 | 21 | 54 | 3800 | 49 | 503 | 2150 | 20 | 116 |
| 27 | 930 | 22 | 55 | 3320 | 47 | 421 | 1900 | 22 | 113 |
| 28 | 882 | 13 | 31 | 4430 | 133 | 1590 | 1830 | 24 | 119 |
| 29 | 909 | 10 | 25 | 4220 | 76 | 866 | 1910 | 35 | 180 |
| 30 | 1140 | 46 | 142 | 3410 | 40 | 368 | 2270 | 38 | 233 |
| 31 | --- | --- | --- | 3200 | 36 | 311 | --- | --- | --- |
| TOTAL | 30184 | --- | 5622.35 | 139680 | --- | 113011 | 76070 | --- | 8708 |

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCENTRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCENTRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCENTRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | JULY | | | AUGUST | | | SEPTEMBER | |
| 1 | 2410 | 38 | 247 | 643 | 4 | 6.9 | 626 | 7 | 12 |
| 2 | 2050 | 20 | 111 | 627 | 5 | 8.5 | 589 | 1 | 1.6 |
| 3 | 1840 | 16 | 79 | 643 | 9 | 16 | 571 | 3 | 4.6 |
| 4 | 1780 | 17 | 82 | 618 | 4 | 6.7 | 562 | 2 | 3.0 |
| 5 | 1750 | 12 | 57 | 656 | 1 | 1.8 | 535 | 3 | 4.3 |
| 6 | 1680 | 18 | 82 | 763 | 1 | 2.1 | 528 | 2 | 2.9 |
| 7 | 1670 | 21 | 95 | 721 | 8 | 16 | 526 | 6 | 8.5 |
| 8 | 1710 | 13 | 60 | 861 | 23 | 53 | 515 | 4 | 5.6 |
| 9 | 1650 | 11 | 49 | 1890 | 189 | 964 | 498 | 5 | 6.7 |
| 10 | 1510 | 29 | 118 | 1600 | 66 | 285 | 478 | 5 | 6.5 |
| 11 | 1380 | 9 | 34 | 1370 | 33 | 122 | 466 | 10 | 13 |
| 12 | 1380 | 13 | 48 | 1190 | 14 | 45 | 467 | 3 | 3.8 |
| 13 | 1520 | 20 | 82 | 1070 | 11 | 32 | 456 | 1 | 1.2 |
| 14 | 1370 | 10 | 37 | 1000 | 9 | 24 | 436 | 4 | 4.7 |
| 15 | 1250 | 10 | 34 | 986 | 8 | 21 | 417 | 1 | 1.1 |
| 16 | 1160 | 9 | 28 | 975 | 5 | 13 | 406 | 2 | 2.2 |
| 17 | 1110 | 10 | 30 | 1110 | 16 | 48 | 399 | 4 | 4.3 |
| 18 | 1080 | 6 | 17 | 947 | 8 | 20 | 392 | 4 | 4.2 |
| 19 | 1050 | 6 | 17 | 860 | 9 | 21 | 378 | 17 | 17 |
| 20 | 1000 | 10 | 27 | 1030 | 2 | 5.6 | 363 | 1 | .98 |
| 21 | 953 | 7 | 18 | 1100 | 8 | 24 | 350 | 9 | 8.5 |
| 22 | 898 | 5 | 12 | 990 | 3 | 8.0 | 340 | 6 | 5.5 |
| 23 | 824 | 3 | 6.7 | 953 | 7 | 18 | 332 | 5 | 4.5 |
| 24 | 786 | 6 | 13 | 910 | 2 | 4.9 | 324 | 9 | 7.9 |
| 25 | 760 | 5 | 10 | 864 | 2 | 4.7 | 326 | 9 | 7.9 |
| 26 | 738 | 1 | 2.0 | 933 | 4 | 10 | 331 | 5 | 4.5 |
| 27 | 709 | 3 | 5.7 | 880 | 3 | 7.1 | 328 | 2 | 1.8 |
| 28 | 679 | 3 | 5.5 | 789 | 2 | 4.3 | 294 | 4 | 3.2 |
| 29 | 651 | 3 | 5.3 | 737 | 2 | 4.0 | 282 | 4 | 3.0 |
| 30 | 659 | 3 | 5.3 | 686 | 4 | 7.4 | 274 | 6 | 4.4 |
| 31 | 662 | 2 | 3.6 | 649 | 1 | 1.8 | --- | --- | --- |
| TOTAL | 38669 | --- | 1421.1 | 29051 | --- | 1805.8 | 12789 | --- | 159.38 |
| YEAR | 406994 | | 135548.2 | | | | | | |

## WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C., FOR PERIOD OF RECORD--CONTINUED

SUSPENDED-SEDIMENT DISCHARGE (TONS/DAY), WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | OCTOBER | | | NOVEMBER | | | DECEMBER | |
| 1 | 275 | 5 | 3.7 | 349 | 7 | 6.6 | 230 | 5 | 3.1 |
| 2 | 289 | 4 | 3.1 | 362 | 8 | 7.8 | 190 | 4 | 2.1 |
| 3 | 299 | 2 | 1.6 | 312 | 5 | 4.2 | 150 | 6 | 2.4 |
| 4 | 300 | 7 | 5.7 | 295 | 4 | 3.2 | 158 | 4 | 1.7 |
| 5 | 293 | 4 | 3.2 | 271 | 4 | 2.9 | 170 | 5 | 2.3 |
| 6 | 287 | 5 | 3.9 | 258 | 3 | 2.1 | 178 | 5 | 2.4 |
| 7 | 284 | 5 | 3.8 | 250 | 5 | 3.4 | 183 | 5 | 2.5 |
| 8 | 271 | 4 | 2.9 | 238 | 3 | 1.9 | 160 | 3 | 1.3 |
| 9 | 261 | 2 | 1.4 | 239 | 1 | .65 | 155 | 1 | .42 |
| 10 | 257 | 4 | 2.8 | 258 | 4 | 2.6 | 150 | 4 | 1.6 |
| 11 | 253 | 4 | 2.7 | 218 | 2 | 1.2 | 154 | 2 | .83 |
| 12 | 244 | 4 | 2.6 | 210 | 7 | 4.0 | 142 | 1 | .38 |
| 13 | 238 | 2 | 1.3 | 201 | 3 | 1.6 | 132 | 4 | 1.4 |
| 14 | 233 | 3 | 1.9 | 179 | 4 | 1.9 | 130 | 4 | 1.4 |
| 15 | 227 | 2 | 1.2 | 169 | 4 | 2.0 | 130 | 3 | 1.1 |
| 16 | 227 | 3 | 1.8 | 195 | 4 | 2.1 | 137 | 5 | 1.8 |
| 17 | 230 | 6 | 3.7 | 206 | 10 | 5.6 | 128 | 3 | 1.0 |
| 18 | 223 | 6 | 3.6 | 289 | 11 | 8.6 | 122 | 4 | 1.3 |
| 19 | 214 | 4 | 2.3 | 291 | 3 | 2.4 | 105 | 3 | .85 |
| 20 | 214 | 7 | 4.0 | 250 | 5 | 3.4 | 92 | 1 | .25 |
| 21 | 216 | 2 | 1.2 | 238 | 7 | 4.5 | 88 | 1 | .24 |
| 22 | 214 | 2 | 1.2 | 221 | 5 | 3.0 | 78 | 1 | .21 |
| 23 | 211 | 1 | .57 | 214 | 2 | 1.2 | 80 | 1 | .22 |
| 24 | 208 | 2 | 1.1 | 220 | 3 | 1.8 | 82 | 1 | .22 |
| 25 | 211 | 5 | 2.8 | 232 | 4 | 2.5 | 84 | 1 | .23 |
| 26 | 206 | 5 | 2.8 | 198 | 3 | 1.6 | 86 | 1 | .23 |
| 27 | 206 | 6 | 3.3 | 140 | 3 | 1.1 | 86 | 1 | .23 |
| 28 | 202 | 3 | 1.6 | 170 | 1 | .46 | 85 | 1 | .23 |
| 29 | 202 | 4 | 2.2 | 200 | 8 | 4.3 | 82 | 1 | .22 |
| 30 | 205 | 3 | 1.7 | 268 | 1 | .72 | 79 | 1 | .21 |
| 31 | 218 | 6 | 3.5 | --- | --- | --- | 76 | 1 | .21 |
| TOTAL | 7418 | --- | 79.17 | 7141 | --- | 89.33 | 3902 | --- | 32.58 |

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | JANUARY | | | FEBRUARY | | | MARCH | |
| 1 | 70 | 1 | .19 | 86 | 1 | .23 | 112 | 3 | .91 |
| 2 | 62 | 1 | .17 | 84 | 1 | .23 | 115 | 2 | .62 |
| 3 | 69 | 1 | .19 | 82 | 1 | .22 | 107 | 2 | .58 |
| 4 | 76 | 1 | .21 | 86 | 2 | .46 | 106 | 2 | .57 |
| 5 | 70 | 1 | .19 | 86 | 2 | .46 | 104 | 3 | .84 |
| 6 | 77 | 1 | .21 | 86 | 2 | .46 | 104 | 2 | .56 |
| 7 | 84 | 1 | .23 | 86 | 1 | .23 | 106 | 1 | .29 |
| 8 | 94 | 1 | .25 | 86 | 1 | .23 | 118 | 1 | .32 |
| 9 | 101 | 1 | .27 | 99 | 1 | .27 | 120 | 1 | .32 |
| 10 | 113 | 4 | 1.2 | 101 | 1 | .27 | 123 | 1 | .33 |
| 11 | 120 | 2 | .65 | 101 | 2 | .55 | 120 | 2 | .65 |
| 12 | 125 | 1 | .34 | 108 | 2 | .58 | 124 | 2 | .67 |
| 13 | 135 | 1 | .36 | 110 | 6 | 1.8 | 123 | 2 | .66 |
| 14 | 140 | 1 | .38 | 114 | 4 | 1.2 | 124 | 1 | .33 |
| 15 | 145 | 1 | .39 | 122 | 2 | .66 | 122 | 1 | .33 |
| 16 | 150 | 1 | .41 | 121 | 1 | .33 | 122 | 1 | .33 |
| 17 | 150 | 1 | .41 | 120 | 1 | .32 | 119 | 1 | .32 |
| 18 | 152 | 2 | .82 | 125 | 1 | .34 | 118 | 1 | .32 |
| 19 | 160 | 1 | .43 | 122 | 1 | .33 | 122 | 1 | .33 |
| 20 | 168 | 1 | .45 | 121 | 1 | .33 | 118 | 2 | .64 |
| 21 | 165 | 1 | .45 | 120 | 1 | .32 | 119 | 2 | .64 |
| 22 | 154 | 1 | .42 | 133 | 1 | .36 | 118 | 1 | .32 |
| 23 | 149 | 1 | .40 | 130 | 2 | .70 | 118 | 1 | .32 |
| 24 | 138 | 1 | .37 | 127 | 1 | .34 | 118 | 1 | .32 |
| 25 | 128 | 1 | .35 | 120 | 1 | .32 | 119 | 1 | .32 |
| 26 | 122 | 1 | .33 | 121 | 1 | .33 | 118 | 1 | .32 |
| 27 | 122 | 1 | .33 | 120 | 2 | .65 | 117 | 1 | .32 |
| 28 | 106 | 1 | .29 | 112 | 2 | .60 | 117 | 1 | .32 |
| 29 | 104 | 1 | .28 | --- | --- | --- | 117 | 1 | .32 |
| 30 | 95 | 2 | .51 | --- | --- | --- | 114 | 1 | .31 |
| 31 | 88 | 2 | .48 | --- | --- | --- | 116 | 1 | .31 |
| TOTAL | 3632 | --- | 11.96 | 3029 | --- | 13.12 | 3618 | --- | 13.74 |

SUSPENDED-SEDIMENT DISCHARGE (TONS/DAY), WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCENTRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCENTRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCENTRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | APRIL | | | MAY | | | JUNE | |
| 1 | 116 | 1 | .31 | 2220 | 59 | 354 | 1090 | 5 | 15 |
| 2 | 117 | 1 | .32 | 2260 | 51 | 311 | 1340 | 9 | 33 |
| 3 | 115 | 2 | .62 | 2400 | 53 | 343 | 1240 | 4 | 13 |
| 4 | 115 | 1 | .31 | 2130 | 46 | 265 | 1120 | 5 | 15 |
| 5 | 128 | 1 | .35 | 1670 | 30 | 135 | 1250 | 7 | 24 |
| 6 | 156 | 3 | 1.3 | 1330 | 14 | 50 | 1260 | 8 | 27 |
| 7 | 205 | 6 | 3.3 | 1190 | 13 | 42 | 1310 | 8 | 28 |
| 8 | 312 | 15 | 13 | 1300 | 15 | 53 | 1360 | 8 | 29 |
| 9 | 572 | 36 | 56 | 1600 | 28 | 121 | 1280 | 7 | 24 |
| 10 | 694 | 27 | 51 | 2120 | 46 | 263 | 1110 | 5 | 15 |
| 11 | 647 | 12 | 21 | 2750 | 76 | 564 | 975 | 7 | 18 |
| 12 | 574 | 8 | 12 | 2220 | 42 | 252 | 879 | 6 | 14 |
| 13 | 611 | 9 | 15 | 1880 | 22 | 112 | 829 | 5 | 11 |
| 14 | 627 | 7 | 12 | 1810 | 23 | 112 | 799 | 5 | 11 |
| 15 | 592 | 4 | 6.4 | 1700 | 25 | 115 | 764 | 4 | 8.3 |
| 16 | 608 | 8 | 13 | 1530 | 17 | 70 | 746 | 7 | 14 |
| 17 | 630 | 8 | 14 | 1380 | 9 | 34 | 718 | 7 | 14 |
| 18 | 595 | 6 | 9.6 | 1250 | 8 | 27 | 666 | 5 | 9.0 |
| 19 | 531 | 3 | 4.3 | 1120 | 10 | 30 | 628 | 5 | 8.5 |
| 20 | 495 | 4 | 5.3 | 1050 | 9 | 26 | 604 | 4 | 6.5 |
| 21 | 468 | 3 | 3.8 | 1080 | 7 | 20 | 580 | 4 | 6.3 |
| 22 | 464 | 3 | 3.8 | 1180 | 9 | 29 | 546 | 5 | 7.4 |
| 23 | 617 | 16 | 27 | 1250 | 7 | 24 | 528 | 6 | 8.6 |
| 24 | 991 | 97 | 260 | 1380 | 11 | 41 | 496 | 5 | 6.7 |
| 25 | 1630 | 151 | 665 | 1310 | 14 | 50 | 470 | 5 | 6.3 |
| 26 | 2210 | 164 | 979 | 1260 | 7 | 24 | 453 | 4 | 4.9 |
| 27 | 2220 | 76 | 456 | 1210 | 5 | 16 | 441 | 4 | 4.8 |
| 28 | 2030 | 55 | 301 | 1100 | 4 | 12 | 426 | 5 | 5.8 |
| 29 | 2000 | 44 | 238 | 1050 | 10 | 28 | 418 | 4 | 4.5 |
| 30 | 2050 | 46 | 255 | 1010 | 5 | 14 | 394 | 10 | 11 |
| 31 | --- | --- | --- | 1010 | 5 | 14 | --- | --- | --- |
| TOTAL | 23120 | --- | 3427.71 | 47750 | --- | 3551 | 24720 | --- | 403.6 |
| | | JULY | | | AUGUST | | | SEPTEMBER | |
| 1 | 375 | 4 | 4.1 | 194 | 3 | 1.6 | 253 | 2 | 1.4 |
| 2 | 363 | 3 | 2.9 | 185 | 3 | 1.5 | 237 | 4 | 2.6 |
| 3 | 357 | 3 | 2.9 | 184 | 5 | 2.5 | 223 | 2 | 1.2 |
| 4 | 349 | 2 | 1.9 | 187 | 2 | 1.0 | 238 | 3 | 1.9 |
| 5 | 362 | 4 | 3.9 | 187 | 1 | .50 | 313 | 3 | 2.5 |
| 6 | 347 | 3 | 2.8 | 179 | 2 | .97 | 302 | 4 | 3.3 |
| 7 | 331 | 2 | 1.8 | 188 | 5 | 2.5 | 283 | 2 | 1.5 |
| 8 | 317 | 3 | 2.6 | 177 | 1 | .48 | 268 | 2 | 1.4 |
| 9 | 303 | 5 | 4.1 | 174 | 5 | 2.3 | 255 | 1 | .69 |
| 10 | 299 | 4 | 3.2 | 171 | 1 | .46 | 244 | 2 | 1.3 |
| 11 | 295 | 4 | 3.2 | 167 | 1 | .45 | 230 | 2 | 1.2 |
| 12 | 301 | 2 | 1.6 | 163 | 2 | .88 | 223 | 1 | .60 |
| 13 | 318 | 3 | 2.6 | 165 | 1 | .45 | 213 | 1 | .58 |
| 14 | 316 | 2 | 1.7 | 190 | 2 | 1.0 | 204 | 2 | 1.1 |
| 15 | 291 | 2 | 1.6 | 192 | 2 | 1.0 | 198 | 1 | .53 |
| 16 | 275 | 3 | 2.2 | 179 | 2 | .97 | 192 | 1 | .52 |
| 17 | 267 | 3 | 2.2 | 169 | 2 | .91 | 205 | 3 | 1.7 |
| 18 | 264 | 2 | 1.4 | 163 | 3 | 1.3 | 204 | 1 | .55 |
| 19 | 257 | 4 | 2.8 | 159 | 3 | 1.3 | 197 | 1 | .53 |
| 20 | 252 | 2 | 1.4 | 152 | 1 | .41 | 191 | 2 | 1.0 |
| 21 | 238 | 4 | 2.6 | 151 | 2 | .82 | 186 | 2 | 1.0 |
| 22 | 225 | 2 | 1.2 | 178 | 1 | .48 | 186 | 1 | .50 |
| 23 | 217 | 3 | 1.8 | 177 | 3 | 1.4 | 180 | 1 | .49 |
| 24 | 209 | 3 | 1.7 | 179 | 1 | .48 | 182 | 1 | .49 |
| 25 | 217 | 3 | 1.8 | 203 | 1 | .55 | 190 | 1 | .51 |
| 26 | 232 | 3 | 1.9 | 214 | 1 | .58 | 191 | 1 | .52 |
| 27 | 236 | 2 | 1.3 | 205 | 1 | .55 | 191 | 1 | .52 |
| 28 | 224 | 4 | 2.4 | 209 | 2 | 1.1 | 193 | 1 | .52 |
| 29 | 214 | 4 | 2.3 | 252 | 2 | 1.4 | 215 | 2 | 1.2 |
| 30 | 204 | 2 | 1.1 | 267 | 2 | 1.4 | 214 | 1 | .58 |
| 31 | 200 | 3 | 1.6 | 270 | 2 | 1.5 | --- | --- | --- |
| TOTAL | 8655 | --- | 70.6 | 5830 | --- | 32.74 | 6601 | --- | 32.43 |
| YEAR | 145416.0 | | 7757.98 | | | | | | |

WATER QUALITY DATA

| DATE | TIME | TEMPER-ATURE (DEG C) | INSTAN-TANEOUS DIS-CHARGE (CFS) | SUS-PENDED SEDI-MENT (MG/L) | SUS-PENDED SEDI-MENT DIS-CHARGE (T/DAY) | SUS. SED. SIEVE DIAM. % FINER THAN .062 MM | SUS. SED. FALL DIAM. % FINER THAN .004 MM |
|---|---|---|---|---|---|---|---|
| OCT , 1974 | | | | | | | |
| 22... | 1100 | 3.0 | 201 | 1 | .54 | 48 | -- |
| NOV | | | | | | | |
| 26... | 1130 | .5 | 216 | 3 | 1.8 | 65 | -- |
| JAN , 1975 | | | | | | | |
| 22... | 1100 | .0 | 130 | 1 | .35 | 57 | -- |
| MAR | | | | | | | |
| 13... | 1200 | .0 | 194 | 2 | 1.1 | 80 | -- |
| MAY | | | | | | | |
| 16... | 1030 | 4.0 | 5590 | 363 | 5480 | -- | 15 |
| JUN | | | | | | | |
| 19... | 1100 | 6.5 | 4990 | 249 | 3350 | -- | 16 |
| 20... | 1000 | 5.5 | 11100 | 1610 | 48300 | -- | 28 |
| DEC | | | | | | | |
| 04... | 1100 | 1.0 | 1760 | 280 | 1330 | -- | 20 |
| MAY , 1976 | | | | | | | |
| 10... | 1130 | 5.0 | 7040 | 474 | 9010 | -- | 24 |
| 20... | 1130 | 5.5 | 4930 | 211 | 2810 | -- | 37 |
| JUN , 1977 | | | | | | | |
| 20... | 1100 | 10.0 | 604 | 2 | 3.3 | 71 | -- |
| JUL | | | | | | | |
| 29... | 1130 | 11.0 | 221 | 2 | 1.2 | 75 | -- |
| AUG | | | | | | | |
| 22... | 1130 | 13.5 | 178 | 2 | .96 | 80 | -- |
| SEP | | | | | | | |
| 21... | 1100 | 8.0 | 186 | 2 | 1.0 | 70 | -- |

| DATE | SUS. SED. FALL DIAM. % FINER THAN .016 MM | SUS. SED. FALL DIAM. % FINER THAN .062 MM | SUS. SED. FALL DIAM. % FINER THAN .125 MM | SUS. SED. FALL DIAM. % FINER THAN .250 MM | SUS. SED. FALL DIAM. % FINER THAN .500 MM | SUS. SED. FALL DIAM. % FINER THAN 1.00 MM |
|---|---|---|---|---|---|---|
| OCT , 1974 | | | | | | |
| 22... | -- | -- | -- | -- | -- | -- |
| NOV | | | | | | |
| 26... | -- | -- | -- | -- | -- | -- |
| JAN , 1975 | | | | | | |
| 22... | -- | -- | -- | -- | -- | -- |
| MAR | | | | | | |
| 13... | -- | -- | -- | -- | -- | -- |
| MAY | | | | | | |
| 16... | 33 | 67 | 86 | 97 | 100 | -- |
| JUN | | | | | | |
| 19... | 36 | 74 | 86 | 95 | 99 | 100 |
| 20... | 53 | 81 | 69 | 97 | 100 | -- |
| DEC | | | | | | |
| 04... | 42 | 79 | 92 | 99 | 100 | -- |
| MAY , 1976 | | | | | | |
| 10... | 50 | 81 | 89 | 96 | 99 | 100 |
| 20... | 42 | 77 | 89 | 97 | 99 | 100 |
| JUN , 1977 | | | | | | |
| 20... | -- | -- | -- | -- | -- | -- |
| JUL | | | | | | |
| 29... | -- | -- | -- | -- | -- | -- |
| AUG | | | | | | |
| 22... | -- | -- | -- | -- | -- | -- |
| SEP | | | | | | |
| 21... | -- | -- | -- | -- | -- | -- |

## WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C., FOR PERIOD OF RECORD--CONTINUED

### PERIPHYTON ANALYSES (NOV. 74 - SEPT. 77)

| DATE | LENGTH OF EXPOSURE (DAYS) | BIOMASS WEIGHT (MG/M²) DRY | BIOMASS WEIGHT (MG/M²) ASH | BIOMASS PIGMENT RATIO | BIOMASS CHLOROPHYLL RATIO | SPECTROPHOTOMETRIC UNCORRECTED (MG/M²) CHLORO A | SPECTROPHOTOMETRIC UNCORRECTED (MG/M²) CHLORO B | SPECTROPHOTOMETRIC CHROMATOGRAPHIC (MG/M²) CHLORO A | SPECTROPHOTOMETRIC CHROMATOGRAPHIC (MG/M²) CHLORO B | CHROMATOGRAPHIC FLUOROMETRIC (MG/M²) CHLORO A | CHROMATOGRAPHIC FLUOROMETRIC (MG/M²) CHLORO B |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1974 NOV 26 | 35 | 2300 | 800 | 854 | -- | 1.80 | 1.00 | -- | -- | -- | -- |
| 1975 APR 10 | 28 | 500 | 500 | 0.0 | -- | 0.100 | 0.100 | -- | -- | -- | -- |
| AUG 21 | 27 | 4800 | 4200 | 1200 | -- | 0.500 | 0.100 | -- | -- | -- | -- |
| OCT 17 | 29 | 800 | 200 | 660 | -- | 0.900 | 0.000 | -- | -- | -- | -- |
| 1976 APR 28 | 34 | 6000 | 5690 | 110 | -- | 2.74 | 0.202 | -- | -- | -- | -- |
| MAY 20 | 22 | 7080 | 6310 | 96 | -- | 8.01 | 0.000 | -- | -- | -- | -- |
| JUNE 17 | 28 | 6690 | 5540 | 500 | -- | 2.28 | 0.000 | -- | -- | -- | -- |
| JULY 23 | 36 | 4770 | 3080 | 1200 | -- | 1.43 | 0.197 | -- | -- | -- | -- |
| AUG 19 | 27 | 4540 | 3150 | 590 | -- | 2.34 | 0.264 | -- | -- | -- | -- |
| SEP 23 | 35 | 1380 | 923 | 300 | -- | 1.54 | 0.042 | -- | -- | -- | -- |
| OCT 20 | 27 | 17200 | 14700 | -- | 16100 | -- | -- | 0.153 | 0.045 | -- | -- |
| 1977 JUNE 20 | 31 | -- | -- | -- | -- | -- | -- | -- | -- | 0.019 | 0.001 |
| JULY 29 | 39 | 1180 | 866 | -- | 39300 | -- | -- | -- | -- | 0.008 | 0.003 |
| AUG 22 | 24 | 472 | 315 | -- | 1170 | -- | -- | -- | -- | 0.134 | 0.114 |
| SEP 21 | 30 | 315 | 78.7 | -- | 5630 | -- | -- | -- | -- | 0.042 | 0.022 |

## WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C., FOR PERIOD OF RECORD--CONTINUED

PHYTOPLANKTON ANALYSES (OCT,1974 - DEC,1975)

| DATE | OCT 22,74 | | JAN 22,75 | | MAR 13,75 | | APR 10,75 | | MAY 16,75 | | JUN 19,75 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TIME | 1100 | | 1100 | | 1200 | | 1100 | | 1030 | | 1100 | |
| TOTAL CELLS/ML | 170 | | 21 | | 77 | | 130 | | 470 | | 140 | |
| DIVERSITY: DIVISION | 0.0 | | 0.0 | | 0.0 | | 1.0 | | 0.0 | | 0.0 | |
| .CLASS | 0.0 | | 0.0 | | 0.0 | | 1.0 | | 0.0 | | 0.0 | |
| ..ORDER | 0.0 | | 0.0 | | 0.0 | | 1.4 | | 0.0 | | 0.0 | |
| ...FAMILY | 1.9 | | 1.6 | | 2.2 | | 2.4 | | 2.5 | | 2.2 | |
| ....GENUS | 1.9 | | 1.6 | | 2.2 | | 2.4 | | 2.7 | | 2.2 | |
| ORGANISM | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT |
| CHRYSOPHYTA | | | | | | | | | | | | |
| .BACILLARIOPHYCEAE | | | | | | | | | | | | |
| ..CENTRALES | | | | | | | | | | | | |
| ...COSCINODISCACEAE | | | | | | | | | | | | |
| ....CYCLOTELLA | -- | - | -- | - | -- | - | 18 | 14 | -- | - | -- | - |
| ..PENNALES | | | | | | | | | | | | |
| ...ACHNANTHACEAE | | | | | | | | | | | | |
| ....ACHNANTHES | 19 | 11 | -- | - | -- | - | -- | - | 88# | 19 | 13 | 9 |
| ....COCCONEIS | -- | - | -- | - | 6 | 8 | 9 | 7 | 29 | 6 | -- | - |
| ...CYMBELLACEAE | | | | | | | | | | | | |
| ....CYMBELLA | -- | - | -- | - | 6 | 8 | -- | - | 29 | 6 | -- | - |
| ...DIATOMACEAE | | | | | | | | | | | | |
| ....DIATOMA | -- | - | -- | - | -- | - | -- | - | 29 | 6 | 13 | 9 |
| ...EUNOTIACEAE | | | | | | | | | | | | |
| ....EUNOTIA | -- | - | -- | - | -- | - | 18 | 14 | -- | - | -- | - |
| ...FRAGILARIACEAE | | | | | | | | | | | | |
| ....HANNAEA | -- | - | -- | - | -- | - | -- | - | 88# | 19 | 26# | 18 |
| .....H.ARCUS | -- | - | -- | - | 6 | 8 | -- | - | -- | - | -- | - |
| ....SYNEDRA | 19 | 11 | 7# | 33 | -- | - | -- | - | -- | - | -- | - |
| ...GOMPHONEMATACEAE | | | | | | | | | | | | |
| ....GOMPHONEMA | 19 | 11 | 7# | 33 | 19# | 25 | 9 | 7 | 150# | 31 | 65# | 45 |
| ...MERIDIONACEAE | | | | | | | | | | | | |
| ....MERIDION | -- | - | -- | - | -- | - | -- | - | -- | - | 13 | 9 |
| ...NAVICULACEAE | | | | | | | | | | | | |
| ....GYROSIGMA | -- | - | -- | - | -- | - | 9 | 7 | -- | - | -- | - |
| ....NAVICULA | 19 | 11 | -- | - | 32# | 42 | -- | - | 29 | 6 | -- | - |
| ...NITZSCHIACEAE | | | | | | | | | | | | |
| ....NITZSCHIA | 96# | 56 | 7# | 33 | 6 | 8 | 9 | 7 | 29 | 6 | 13 | 9 |
| CYANOPHYTA (BLUE-GREEN ALGAE) | | | | | | | | | | | | |
| .CYANOPHYCEAE | | | | | | | | | | | | |
| ..HORMOGONALES | | | | | | | | | | | | |
| ...NOSTOCACEAE | | | | | | | | | | | | |
| ....ANABAENA | -- | - | -- | - | -- | - | 55# | 43 | -- | - | -- | - |

| DATE | JUL 25,75 | | AUG 21,75 | | SEP 18,75 | | OCT 17,75 | | NOV 14,75 | | DEC 4,75 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TIME | 1245 | | 1100 | | 1030 | | 1430 | | 1100 | | 1100 | |
| TOTAL CELLS/ML | 330 | | 140 | | 250 | | 64 | | 250 | | 1100 | |
| DIVERSITY: DIVISION | 1.5 | | 0.0 | | 0.2 | | 0.0 | | 0.0 | | 0.0 | |
| .CLASS | 1.5 | | 0.0 | | 0.2 | | 0.0 | | 0.0 | | 0.0 | |
| ..ORDER | 1.5 | | 0.0 | | 0.2 | | 0.0 | | 0.0 | | 0.0 | |
| ...FAMILY | 1.8 | | 2.5 | | 2.5 | | 1.9 | | 2.3 | | 1.8 | |
| ....GENUS | 1.9 | | 2.9 | | 2.7 | | 2.3 | | 2.7 | | 2.2 | |
| ORGANISM | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT |
| CHLOROPHYTA (GREEN ALGAE) | | | | | | | | | | | | |
| .CHLOROPHYCEAE | | | | | | | | | | | | |
| ..OEDOGONIALES | | | | | | | | | | | | |
| ...OEDOGONIACEAE | | | | | | | | | | | | |
| ....OEDOGONIUM | 98# | 30 | -- | - | -- | - | -- | - | -- | - | -- | - |
| ..VOLVOCALES | | | | | | | | | | | | |
| ...CHLAMYDOMONADACEAE | | | | | | | | | | | | |
| ....CHLAMYDOMONAS | -- | - | -- | - | 9 | 3 | -- | - | -- | - | -- | - |

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

PHYTOPLANKTON ANALYSES (JUL,1975 - DEC,1975)

| DATE | JUL 25,75 | | AUG 21,75 | | SEP 18,75 | | OCT 17,75 | | NOV 14,75 | | DEC 4,75 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TIME | 1245 | | 1100 | | 1030 | | 1430 | | 1100 | | 1100 | |
| ORGANISM | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT |
| CHRYSOPHYTA | | | | | | | | | | | | |
| .BACILLARIOPHYCEAE | | | | | | | | | | | | |
| ..CENTRALES | | | | | | | | | | | | |
| ...COSCINODISCACEAE | | | | | | | | | | | | |
| ....MELOSIRA | -- | - | * | 0 | -- | - | -- | - | -- | - | -- | - |
| ..PENNALES | | | | | | | | | | | | |
| ...ACHNANTHACEAE | | | | | | | | | | | | |
| ....ACHNANTHES | 5 | 1 | 9 | 6 | 9 | 3 | -- | - | 27 | 11 | -- | - |
| ....COCCONEIS | -- | - | 21# | 16 | 26 | 10 | 13# | 20 | 16 | 7 | * | 0 |
| ...CYMBELLACEAE | | | | | | | | | | | | |
| ....CYMBELLA | * | 0 | 17 | 13 | 9 | 3 | * | 0 | * | 0 | * | 0 |
| ....EPITHEMIA | -- | - | 4 | 3 | -- | - | -- | - | -- | - | * | 0 |
| ...DIATOMACEAE | | | | | | | | | | | | |
| ....DIATOMA | -- | - | -- | - | -- | - | -- | - | * | 0 | * | 0 |
| ...FRAGILARIACEAE | | | | | | | | | | | | |
| ....HANNAEA | 23 | 7 | 9 | 6 | 43# | 17 | 13# | 20 | -- | - | 200# | 19 |
| .....H.ARCUS | -- | - | -- | - | -- | - | -- | - | 77# | 30 | -- | - |
| ....SYNEDRA | 19 | 6 | 17 | 13 | -- | - | 13# | 20 | 11 | 4 | 200# | 19 |
| ...GOMPHONEMATACEAE | | | | | | | | | | | | |
| ....GOMPHONEMA | 14 | 4 | 9 | 6 | 43# | 17 | 13# | 20 | 60# | 24 | 330# | 31 |
| ...MERIDIONACEAE | | | | | | | | | | | | |
| ....MERIDION | -- | - | -- | - | -- | - | -- | - | 11 | 4 | -- | - |
| ...NAVICULACEAE | | | | | | | | | | | | |
| ....NAVICULA | 5 | 1 | 17 | 13 | 26 | 10 | * | 0 | 22 | 9 | 270# | 25 |
| ....STAURONEIS | -- | - | -- | - | 9 | 3 | -- | - | -- | - | -- | - |
| ...NITZSCHIACEAE | | | | | | | | | | | | |
| ....NITZSCHIA | -- | - | 34# | 25 | 77# | 31 | 13# | 20 | 27 | 11 | 67 | 6 |
| CYANOPHYTA (BLUE-GREEN ALGAE) | | | | | | | | | | | | |
| .CYANOPHYCEAE | | | | | | | | | | | | |
| ..HORMOGONALES | | | | | | | | | | | | |
| ...NOSTOCACEAE | | | | | | | | | | | | |
| ....ANABAENA | -- | - | -- | - | -- | - | -- | - | -- | - | * | 0 |
| ...OSCILLATORIACEAE | | | | | | | | | | | | |
| ....LYNGBYA | -- | - | -- | - | -- | - | -- | - | -- | - | * | 0 |
| ....OSCILLATORIA | 170# | 51 | -- | - | -- | - | * | 0 | -- | - | -- | - |

PHYTOPLANKTON ANALYSES (JAN,1976 - JUN,1976)

| DATE | JAN 22,76 | | FEB 25,76 | | MAR 25,76 | | APR 28,76 | | MAY 20,76 | | JUN 17,76 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TIME | 1015 | | 1100 | | 1130 | | 1200 | | 1130 | | 1130 | |
| TOTAL CELLS/ML | 96 | | 180 | | 75 | | 150 | | 52 | | 81 | |
| DIVERSITY: DIVISION | 0.0 | | 0.0 | | 0.0 | | 0.6 | | 0.0 | | 0.3 | |
| .CLASS | 0.0 | | 0.0 | | 0.0 | | 0.6 | | 0.0 | | 0.3 | |
| ..ORDER | 0.0 | | 0.0 | | 0.0 | | 1.0 | | 0.0 | | 0.5 | |
| ...FAMILY | 1.8 | | 2.1 | | 1.7 | | 2.3 | | 2.4 | | 2.7 | |
| ....GENUS | 1.9 | | 2.2 | | 2.0 | | 2.5 | | 2.4 | | 2.8 | |
| ORGANISM | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT |
| CHLOROPHYTA (GREEN ALGAE) | | | | | | | | | | | | |
| .CHLOROPHYCEAE | | | | | | | | | | | | |
| ..CHLOROCOCCALES | | | | | | | | | | | | |
| ...OOCYSTACEAE | | | | | | | | | | | | |
| ....TETRAEDRON | -- | - | -- | - | -- | - | -- | - | -- | - | 4 | 5 |
| CHRYSOPHYTA | | | | | | | | | | | | |
| .BACILLARIOPHYCEAE | | | | | | | | | | | | |
| ..CENTRALES | | | | | | | | | | | | |
| ...COSCINODISCACEAE | | | | | | | | | | | | |
| ....CYCLOTELLA | -- | - | -- | - | -- | - | 12 | 8 | -- | - | -- | - |
| ....MELOSIRA | -- | - | -- | - | -- | - | -- | - | -- | - | 4 | 5 |
| ..PENNALES | | | | | | | | | | | | |
| ...ACHNANTHACEAE | | | | | | | | | | | | |
| ....ACHNANTHES | 4 | 4 | 11 | 6 | 5 | 6 | 12 | 8 | -- | - | 12 | 14 |
| ....COCCONEIS | 8 | 8 | 11 | 6 | 19# | 25 | 23# | 15 | -- | - | 4 | 5 |
| ...CYMBELLACEAE | | | | | | | | | | | | |
| ....CYMBELLA | -- | - | 11 | 6 | 14# | 19 | 18 | 12 | 10# | 20 | 12 | 14 |
| ...FRAGILARIACEAE | | | | | | | | | | | | |
| ....FRAGILARIA | -- | - | -- | - | 5 | 6 | -- | - | -- | - | -- | - |
| ....HANNAEA | 20# | 21 | 11 | 6 | * | 0 | -- | - | 5 | 10 | 19# | 24 |
| ...GOMPHONEMATACEAE | | | | | | | | | | | | |
| ....GOMPHONEMA | 48# | 50 | 85# | 47 | 33# | 44 | 58# | 38 | 10# | 20 | 4 | 5 |
| ...MERIDIONACEAE | | | | | | | | | | | | |
| ....MERIDION | -- | - | -- | - | -- | - | -- | - | 5 | 10 | * | 0 |
| ...NAVICULACEAE | | | | | | | | | | | | |
| ....NAVICULA | 16# | 17 | 11 | 6 | -- | - | 6 | 4 | 16# | 30 | 4 | 5 |
| ...NITZSCHIACEAE | | | | | | | | | | | | |
| ....NITZSCHIA | -- | - | 42# | 24 | -- | - | -- | - | 5 | 10 | 19# | 24 |
| CYANOPHYTA (BLUE-GREEN ALGAE) | | | | | | | | | | | | |
| .CYANOPHYCEAE | | | | | | | | | | | | |
| ..HORMOGONALES | | | | | | | | | | | | |
| ...OSCILLATORIACEAE | | | | | | | | | | | | |
| ....OSCILLATORIA | -- | - | -- | - | -- | - | 23# | 15 | -- | - | -- | - |

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

WATER-QUALITY RECORDS FOR FLATHEAD RIVER AT FLATHEAD, B.C., FOR PERIOD OF RECORD--CONTINUED

PHYTOPLANKTON ANALYSES (JUL,1976 - DEC,1976)

| | JUL 23,76 | AUG 19,76 | SEP 23,76 | OCT 20,76 | NOV 23,76 | DEC 20,76 |
|---|---|---|---|---|---|---|
| DATE | JUL 23,76 | AUG 19,76 | SEP 23,76 | OCT 20,76 | NOV 23,76 | DEC 20,76 |
| TIME | 1100 | 0915 | 1130 | 1230 | 1100 | 1030 |
| TOTAL CELLS/ML | 150 | 420 | 110 | 120 | 120 | 20 |
| DIVERSITY: DIVISION | 0.2 | 1.0 | 1.0 | 1.3 | 0.7 | 0.0 |
| .CLASS | 0.2 | 1.0 | 1.0 | 1.3 | 0.7 | 0.0 |
| ..ORDER | 0.2 | 1.4 | 1.0 | 1.8 | 0.7 | 0.0 |
| ...FAMILY | 2.4 | 1.7 | 2.1 | 2.7 | 1.9 | 1.9 |
| ....GENUS | 2.6 | 1.8 | 2.1 | 2.7 | 1.9 | 2.2 |

| ORGANISM | JUL CELLS /ML | JUL PER-CENT | AUG CELLS /ML | AUG PER-CENT | SEP CELLS /ML | SEP PER-CENT | OCT CELLS /ML | OCT PER-CENT | NOV CELLS /ML | NOV PER-CENT | DEC CELLS /ML | DEC PER-CENT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHLOROPHYTA (GREEN ALGAE) | | | | | | | | | | | | |
| .CHLOROPHYCEAE | | | | | | | | | | | | |
| ..CHLOROCOCCALES | | | | | | | | | | | | |
| ...OOCYSTACEAE | | | | | | | | | | | | |
| ....ANKISTRODESMUS | -- | - | -- | - | -- | - | 8 | 7 | -- | - | -- | - |
| ....DICTYOSPHAERIUM | -- | - | 250# | 61 | -- | - | -- | - | -- | - | -- | - |
| CHRYSOPHYTA | | | | | | | | | | | | |
| .BACILLARIOPHYCEAE | | | | | | | | | | | | |
| ..CENTRALES | | | | | | | | | | | | |
| ...COSCINODISCACEAE | | | | | | | | | | | | |
| ....CYCLOTELLA | -- | - | 7 | 2 | -- | - | -- | - | -- | - | -- | - |
| ....MELOSIRA | -- | - | 89# | 21 | -- | - | -- | - | -- | - | -- | - |
| ..PENNALES | | | | | | | | | | | | |
| ...ACHNANTHACEAE | | | | | | | | | | | | |
| ....ACHNANTHES | 9 | 6 | 27 | 7 | -- | - | -- | - | * | 0 | -- | - |
| ....COCCONEIS | 14 | 9 | -- | - | 19# | 17 | 4 | 4 | 5 | 4 | -- | - |
| ...CYMBELLACEAE | | | | | | | | | | | | |
| ....AMPHORA | -- | - | 7 | 2 | 3 | 2 | -- | - | -- | - | -- | - |
| ....CYMBELLA | -- | - | -- | - | 3 | 2 | 4 | 4 | 2 | 2 | -- | - |
| ...FRAGILARIACEAE | | | | | | | | | | | | |
| ....HANNAEA | 27# | 19 | 20 | 5 | -- | - | -- | - | * | 0 | -- | - |
| ....SYNEDRA | 5 | 3 | -- | - | 3 | 2 | -- | - | 9 | 8 | 4# | 22 |
| ...GOMPHONEMATACEAE | | | | | | | | | | | | |
| ....GOMPHONEMA | 32# | 22 | 7 | 2 | 5 | 5 | 17 | 14 | 2 | 2 | 7# | 33 |
| ...NAVICULACEAE | | | | | | | | | | | | |
| ....AMPHIPLEURA | -- | - | -- | - | -- | - | -- | - | -- | - | 2 | 11 |
| ....NAVICULA | 14 | 9 | -- | - | 3 | 2 | 21# | 18 | * | 0 | 4# | 22 |
| ...NITZSCHIACEAE | | | | | | | | | | | | |
| ....NITZSCHIA | 41# | 28 | 7 | 2 | 19# | 17 | 8 | 7 | 2 | 2 | 2 | 11 |
| CYANOPHYTA (BLUE-GREEN ALGAE) | | | | | | | | | | | | |
| .CYANOPHYCEAE | | | | | | | | | | | | |
| ..CHROOCOCCALES | | | | | | | | | | | | |
| ...CHROOCOCCACEAE | | | | | | | | | | | | |
| ....ANACYSTIS | -- | - | -- | - | -- | - | 25# | 21 | -- | - | -- | - |
| ..HORMOGONALES | | | | | | | | | | | | |
| ...NOSTOCACEAE | | | | | | | | | | | | |
| ....ANABAENA | -- | - | -- | - | 55# | 50 | 30# | 25 | 49# | 42 | -- | - |
| ...OSCILLATORIACEAE | | | | | | | | | | | | |
| ....OSCILLATORIA | -- | - | -- | - | -- | - | -- | - | 47# | 40 | -- | - |
| EUGLENOPHYTA (EUGLENOIDS) | | | | | | | | | | | | |
| .EUGLENOPHYCEAE | | | | | | | | | | | | |
| ..EUGLENALES | | | | | | | | | | | | |
| ...EUGLENACEAE | | | | | | | | | | | | |
| ....TRACHELOMONAS | 5 | 3 | -- | - | -- | - | -- | - | -- | - | -- | - |

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

PHYTOPLANKTON ANALYSES (JAN,1977 - AUG,1977)

| | | | | | | |
|---|---|---|---|---|---|---|
| DATE | JAN 18,77 | FEB 22,77 | MAY 20,77 | JUN 20,77 | JUL 29,77 | AUG 22,77 |
| TIME | 1230 | 1100 | 1030 | 1100 | 1130 | 1130 |
| TOTAL CELLS/ML | 110 | 99 | 380 | 530 | 210 | 540 |
| DIVERSITY: DIVISION | 0.8 | 1.2 | 0.3 | 0.5 | 0.7 | 1.5 |
| .CLASS | 0.8 | 1.2 | 0.3 | 0.5 | 0.7 | 1.5 |
| ..ORDER | 1.2 | 1.2 | 0.3 | 0.5 | 0.7 | 1.8 |
| ...FAMILY | 1.2 | 1.7 | 1.0 | 0.7 | 1.0 | 2.5 |
| ....GENUS | 1.7 | 1.8 | 1.0 | 0.8 | 1.0 | 2.6 |

| ORGANISM | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHLOROPHYTA (GREEN ALGAE) | | | | | | | | | | | | |
| .CHLOROPHYCEAE | | | | | | | | | | | | |
| ..CHLOROCOCCALES | | | | | | | | | | | | |
| ...COELASTRACEAE | | | | | | | | | | | | |
| ....COELASTRUM | -- | - | -- | - | -- | - | -- | - | -- | - | 73 | 14 |
| ...OOCYSTACEAE | | | | | | | | | | | | |
| ....TETRAEDRON | -- | - | 8 | 8 | -- | - | -- | - | -- | - | -- | - |
| ..VOLVOCALES | | | | | | | | | | | | |
| ...CHLAMYDOMONADACEAE | | | | | | | | | | | | |
| ....CHLAMYDOMONAS | 8 | 7 | -- | - | -- | - | -- | - | -- | - | 9 | 2 |
| ..ZYGNEMATALES | | | | | | | | | | | | |
| ...DESMIDIACEAE | | | | | | | | | | | | |
| ....COSMARIUM | -- | - | -- | - | -- | - | -- | - | -- | - | 5 | 1 |
| CHRYSOPHYTA | | | | | | | | | | | | |
| .BACILLARIOPHYCEAE | | | | | | | | | | | | |
| ..CENTRALES | | | | | | | | | | | | |
| ...COSCINODISCACEAE | | | | | | | | | | | | |
| ....MELOSIRA | -- | - | -- | - | -- | - | -- | - | -- | - | 18 | 3 |
| ..PENNALES | | | | | | | | | | | | |
| ...ACHNANTHACEAE | | | | | | | | | | | | |
| ....ACHNANTHES | -- | - | -- | - | 3 | 1 | -- | - | 11 | 5 | 41 | 8 |
| ....COCCONEIS | -- | - | 3 | 3 | -- | - | 6 | 1 | -- | - | -- | - |
| ...CYMBELLACEAE | | | | | | | | | | | | |
| ....CYMBELLA | -- | - | 3 | 3 | 3 | 1 | 12 | 2 | -- | - | 36 | 7 |
| ...DIATOMACEAE | | | | | | | | | | | | |
| ....DIATOMA | -- | - | -- | - | -- | - | 3 | 1 | -- | - | -- | - |
| ...FRAGILARIACEAE | | | | | | | | | | | | |
| ....HANNAEA | -- | - | -- | - | 3 | 1 | 9 | 2 | -- | - | 14 | 3 |
| ....SYNEDRA | -- | - | -- | - | -- | - | 3 | 1 | -- | - | 18 | 3 |
| ...GOMPHONEMATACEAE | | | | | | | | | | | | |
| ....GOMPHONEMA | -- | - | 8 | 8 | -- | - | 3 | 1 | 11 | 5 | 27 | 5 |
| ...NAVICULACEAE | | | | | | | | | | | | |
| ....DIPLONEIS | -- | - | 3 | 3 | -- | - | -- | - | -- | - | -- | - |
| ....NAVICULA | -- | - | 3 | 3 | -- | - | 6 | 1 | -- | - | 9 | 2 |
| ....NEIDIUM | -- | - | -- | - | -- | - | 3 | 1 | -- | - | -- | - |
| ...NITZSCHIACEAE | | | | | | | | | | | | |
| ....NITZSCHIA | 11 | 10 | 5 | 5 | 7 | 2 | 3 | 1 | 21 | 10 | 5 | 1 |
| ...TABELLARIACEAE | | | | | | | | | | | | |
| ....TABELLARIA | -- | - | -- | - | -- | - | -- | - | -- | - | 5 | 1 |
| CYANOPHYTA (BLUE-GREEN ALGAE) | | | | | | | | | | | | |
| .CYANOPHYCEAE | | | | | | | | | | | | |
| ..CHROCOCCALES | | | | | | | | | | | | |
| ...CHROCOCCACEAE | | | | | | | | | | | | |
| ....AGMENELLUM | -- | - | -- | - | -- | - | -- | - | 170# | 80 | -- | - |
| ....ANACYSTIS | 8 | 7 | -- | - | -- | - | -- | - | -- | - | 270# | 51 |
| ..HOPMOGONALES | | | | | | | | | | | | |
| ...NOSTOCACEAE | | | | | | | | | | | | |
| ....ANABAENA | -- | - | 67# | 68 | 290# | 78 | -- | - | -- | - | -- | - |
| ...OSCILLATORIACEAE | | | | | | | | | | | | |
| ....LYNGBYA | 13 | 13 | -- | - | -- | - | -- | - | -- | - | -- | - |
| ....OSCILLATORIA | 66# | 63 | -- | - | 66# | 18 | 480# | 90 | -- | - | -- | - |
| EUGLENOPHYTA (EUGLENOIDS) | | | | | | | | | | | | |
| .CRYPTOPHYCEAE | | | | | | | | | | | | |
| ..CRYPTOMONIDALES | | | | | | | | | | | | |
| ...CRYPTOCHRYSIDACEAE | | | | | | | | | | | | |
| ....CHROOMONAS | -- | - | -- | - | -- | - | -- | - | -- | - | 5 | 1 |
| PYRRHOPHYTA (FIRE ALGAE) | | | | | | | | | | | | |
| .DINOPHYCEAE | | | | | | | | | | | | |
| ..PERIDINIALES | | | | | | | | | | | | |
| ...GLENODINIACEAE | | | | | | | | | | | | |
| ....GLENODINIUM | -- | - | -- | - | -- | - | 3 | 1 | -- | - | -- | - |

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

## WATER-QUALITY RECORDS FOR NORTH FORK FLATHEAD RIVER NEAR COLUMBIA FALLS FOR PERIOD OF RECORD

### WATER QUALITY DATA

| DATE | TIME | INSTANTANEOUS DISCHARGE (CFS) | SPECIFIC CONDUCTANCE (MICROMHOS) | PH (UNITS) | AIR TEMPERATURE (DEG C) | TEMPERATURE (DEG C) | TURBIDITY (JTU) | DISSOLVED OXYGEN (MG/L) | PERCENT SATURATION | FECAL COLIFORM (COL. PER 100 ML) |
|---|---|---|---|---|---|---|---|---|---|---|
| OCT., 1975 | | | | | | | | | | |
| 10... | 1100 | 1350 | 191 | 8.2 | 9.0 | 6.5 | 1 | 10.9 | 100 | <1 |
| NOV | | | | | | | | | | |
| 07... | 1030 | 2800 | 170 | 8.0 | 5.0 | 4.0 | 2 | 11.5 | 102 | <1 |
| DEC | | | | | | | | | | |
| 10... | 1330 | 3800 | 169 | 7.7 | 7.0 | 3.0 | 10 | 11.5 | 99 | 8 |
| JAN , 1976 | | | | | | | | | | |
| 26... | 1300 | 1000 | 194 | 8.1 | -5.0 | .0 | 1 | 13.0 | 102 | <1 |
| FEB | | | | | | | | | | |
| 24... | 1300 | 800 | 204 | 7.8 | 1.0 | 1.0 | 0 | 12.4 | 101 | <1 |
| MAR | | | | | | | | | | |
| 26... | 1100 | 738 | 208 | 8.1 | 4.0 | 2.0 | 1 | 12.4 | 103 | 4 |
| APR | | | | | | | | | | |
| 27... | 1300 | 3250 | 174 | 8.2 | 11.0 | 3.5 | 5 | 11.8 | 103 | <1 |
| MAY | | | | | | | | | | |
| 28... | 1330 | 11700 | 139 | 8.2 | 7.0 | 7.5 | 20 | 10.4 | 101 | 16 |
| JUN | | | | | | | | | | |
| 18... | 1130 | 8100 | 133 | 8.2 | 15.0 | 8.5 | 5 | 10.4 | 102 | 3 |
| JUL | | | | | | | | | | |
| 23... | 1700 | 4020 | 149 | 8.5 | 29.0 | 15.0 | 1 | 9.4 | 108 | <1 |
| AUG | | | | | | | | | | |
| 19... | 1500 | 3170 | 156 | 8.3 | 18.5 | 11.5 | 1 | 9.6 | 102 | 2 |
| SEP | | | | | | | | | | |
| 24... | 1030 | 1350 | 192 | 8.4 | 12.0 | 11.0 | 1 | 10.0 | 100 | <1 |
| OCT | | | | | | | | | | |
| 21... | 1130 | 793 | 217 | 7.9 | -6.0 | 3.0 | 1 | 11.6 | 100 | -- |
| NOV | | | | | | | | | | |
| 23... | 1000 | 701 | 208 | 7.9 | -2.0 | 1.0 | 1 | 12.8 | 104 | -- |
| DEC | | | | | | | | | | |
| 21... | 1130 | 444 | 223 | 8.1 | -6.0 | .0 | 1 | 13.0 | 99 | -- |
| JAN , 1977 | | | | | | | | | | |
| 20... | 1300 | 672 | 218 | 8.0 | -4.0 | .0 | 1 | 12.8 | 101 | -- |
| FEB | | | | | | | | | | |
| 23... | 1100 | 497 | 227 | 8.2 | 1.0 | .0 | 1 | 12.5 | 96 | -- |
| MAR | | | | | | | | | | |
| 25... | 1100 | 484 | 211 | 8.2 | .0 | 2.0 | 0 | 12.0 | 100 | -- |
| APR | | | | | | | | | | |
| 19... | 1100 | 1600 | 192 | 8.1 | 3.0 | 4.0 | 1 | 12.3 | 109 | -- |
| MAY | | | | | | | | | | |
| 19... | 1030 | 4330 | 159 | 8.0 | 6.0 | 5.5 | 2 | 11.9 | 109 | -- |
| JUN | | | | | | | | | | |
| 21... | 1000 | 2890 | 162 | 8.2 | 18.0 | 12.0 | 1 | 9.9 | 102 | -- |
| JUL | | | | | | | | | | |
| 28... | 1000 | 1500 | 171 | 8.2 | 23.0 | 15.5 | 2 | 9.2 | 103 | -- |
| AUG | | | | | | | | | | |
| 23... | 1130 | 972 | 184 | 8.3 | 13.0 | 14.5 | 0 | 9.1 | 99 | -- |
| SEP | | | | | | | | | | |
| 22... | 1100 | 942 | 198 | 8.1 | 9.5 | 8.5 | 1 | 10.5 | 101 | -- |

WATER QUALITY DATA

| DATE | FECAL COLI-FORM .7UM-MF (COL./ 100 ML) | FECAL STREP-TOCOCCI KF AGAR (COL. PER 100 ML) | HARD-NESS (CA,MG) (MG/L) | NON-CAR-BONATE HARD-NESS (MG/L) | TOTAL ACIDITY AS H+ (MG/L) | TOTAL ACIDITY AS CACO3 (MG/L) | DIS-SOLVED CAL-CIUM (CA) (MG/L) | DIS-SOLVED MAG-NE-SIUM (MG) (MG/L) | DIS-SOLVED SODIUM (NA) (MG/L) | SODIUM AD-SORP-TION RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| OCT , 1975 | | | | | | | | | | |
| 10... | -- | 4 | 100 | 7 | .0 | .0 | 30 | 7.1 | 1.0 | .0 |
| NOV | | | | | | | | | | |
| 07... | -- | 4 | 88 | 2 | .1 | 5.0 | 25 | 6.1 | .9 | .0 |
| DEC | | | | | | | | | | |
| 10... | -- | 32 | 88 | 4 | .1 | 5.0 | 26 | 5.7 | .9 | .0 |
| JAN , 1976 | | | | | | | | | | |
| 26... | -- | <1 | 110 | 4 | .0 | .0 | 31 | 7.6 | 1.2 | .1 |
| FEB | | | | | | | | | | |
| 24... | -- | <1 | 120 | 10 | .0 | .0 | 33 | 8.0 | 1.7 | .1 |
| MAR | | | | | | | | | | |
| 26... | -- | 4 | 110 | 1 | .1 | 5.0 | 31 | 7.7 | 1.3 | .1 |
| APR | | | | | | | | | | |
| 27... | -- | 2 | 95 | 3 | .1 | 5.0 | 26 | 7.2 | .9 | .0 |
| MAY | | | | | | | | | | |
| 28... | -- | 12 | 69 | 0 | .1 | 5.0 | 20 | 4.6 | .5 | .0 |
| JUN | | | | | | | | | | |
| 18... | -- | 3 | 73 | 4 | .1 | 5.0 | 21 | 4.9 | .7 | .0 |
| JUL | | | | | | | | | | |
| 23... | -- | 10 | 79 | 1 | .0 | .0 | 23 | 5.3 | .6 | .0 |
| AUG | | | | | | | | | | |
| 19... | -- | 17 | 89 | 9 | .0 | .0 | 27 | 5.2 | .7 | .0 |
| SEP | | | | | | | | | | |
| 24... | -- | 13 | 110 | 4 | .0 | .0 | 30 | 7.6 | .8 | .0 |
| OCT | | | | | | | | | | |
| 21... | 1 | 4 | 120 | 12 | .0 | .0 | 33 | 7.9 | 1.0 | .0 |
| NOV | | | | | | | | | | |
| 23... | <1 | <1 | 120 | 4 | .0 | .0 | 33 | 8.1 | 1.0 | .0 |
| DEC | | | | | | | | | | |
| 21... | <1 | 1 | 120 | 6 | .0 | .0 | 34 | 9.7 | 1.0 | .0 |
| JAN , 1977 | | | | | | | | | | |
| 20... | 1 | 8 | 110 | 5 | .0 | .0 | 33 | 7.5 | .9 | .0 |
| FEB | | | | | | | | | | |
| 23... | <1 | 2 | 110 | 7 | .0 | .0 | 33 | 7.6 | .9 | .0 |
| MAR | | | | | | | | | | |
| 25... | <1 | 4 | 120 | 8 | .0 | .0 | 33 | 8.1 | .9 | .0 |
| APR | | | | | | | | | | |
| 19... | <1 | <1 | 98 | 7 | .1 | 5.0 | 28 | 6.7 | .9 | .0 |
| MAY | | | | | | | | | | |
| 19... | <1 | 4 | 83 | 9 | .0 | .0 | 23 | 6.1 | .8 | .0 |
| JUN | | | | | | | | | | |
| 21... | 3 | 6 | 84 | 6 | .0 | .0 | 25 | 5.3 | 1.0 | .0 |
| JUL | | | | | | | | | | |
| 28... | 33 | 370 | 90 | 8 | .0 | .0 | 26 | 6.1 | .9 | .0 |
| AUG | | | | | | | | | | |
| 23... | 8 | 10 | 97 | 7 | .0 | .0 | 28 | 6.6 | .9 | .0 |
| SEP | | | | | | | | | | |
| 22... | <1 | 12 | 100 | 14 | .0 | .0 | 30 | 7.1 | .8 | .0 |

## WATER-QUALITY RECORDS FOR NORTH FORK FLATHEAD RIVER NEAR COLUMBIA FALLS FOR PERIOD OF RECORD--CONTINUED

WATER QUALITY DATA

| DATE | DIS-SOLVED PO-TAS-SIUM (K) (MG/L) | BICAR-BONATE (HCO3) (MG/L) | CAR-BONATE (CO3) (MG/L) | CARBON DIOXIDE (CO2) (MG/L) | DIS-SOLVED SULFATE (SO4) (MG/L) | DIS-SOLVED CHLO-RIDE (CL) (MG/L) | DIS-SOLVED FLUO-RIDE (F) (MG/L) | DIS-SOLVED SILICA (SIO2) (MG/L) | DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L) | DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| OCT , 1975 | | | | | | | | | | |
| 10... | .4 | 118 | 0 | 1.2 | 7.6 | .2 | .1 | 4.5 | 108 | 109 |
| NOV | | | | | | | | | | |
| 07... | .3 | 104 | 0 | 1.7 | 4.4 | .6 | .1 | 4.4 | 95 | 93 |
| DEC | | | | | | | | | | |
| 10... | .3 | 103 | 0 | 3.3 | 5.9 | .1 | .1 | 4.8 | 98 | 95 |
| JAN , 1976 | | | | | | | | | | |
| 26... | .3 | 128 | 0 | 1.6 | 10 | .7 | .1 | 4.6 | 116 | 119 |
| FEB | | | | | | | | | | |
| 24... | .5 | 128 | 0 | 3.2 | 9.4 | .9 | .1 | 4.4 | 125 | 121 |
| MAR | | | | | | | | | | |
| 26... | .3 | 132 | 0 | 1.7 | 11 | .0 | .1 | 4.8 | 128 | 121 |
| APR | | | | | | | | | | |
| 27... | .4 | 112 | 0 | 1.1 | 5.4 | .3 | .1 | 5.2 | 101 | 101 |
| MAY | | | | | | | | | | |
| 28... | .2 | 84 | 0 | .8 | 4.1 | 1.1 | .1 | 4.7 | 83 | 77 |
| JUN | | | | | | | | | | |
| 18... | .3 | 84 | 0 | .8 | 6.6 | 1.6 | .1 | 4.5 | 79 | 81 |
| JUL | | | | | | | | | | |
| 23... | .3 | 95 | 0 | .5 | 7.2 | 1.5 | .1 | 3.9 | 85 | 89 |
| AUG | | | | | | | | | | |
| 19... | .3 | 97 | 0 | .8 | 6.6 | .6 | .1 | 4.0 | 87 | 92 |
| SEP | | | | | | | | | | |
| 24... | .3 | 125 | 0 | .8 | 9.5 | .2 | .1 | 4.4 | 105 | 115 |
| OCT | | | | | | | | | | |
| 21... | .3 | 126 | 0 | 2.5 | 12 | .3 | .1 | 4.6 | 119 | 121 |
| NOV | | | | | | | | | | |
| 23... | .3 | 136 | 0 | 2.7 | 13 | .4 | .1 | 4.7 | 125 | 128 |
| DEC | | | | | | | | | | |
| 21... | .3 | 145 | 0 | 1.8 | 13 | .3 | .1 | 4.9 | 130 | 135 |
| JAN , 1977 | | | | | | | | | | |
| 20... | .3 | 132 | 0 | 2.1 | 9.6 | .3 | .1 | 5.0 | 118 | 122 |
| FEB | | | | | | | | | | |
| 23... | .3 | 130 | 0 | 1.3 | 12 | .3 | .1 | 4.5 | 123 | 123 |
| MAR | | | | | | | | | | |
| 25... | .3 | 131 | 0 | 1.3 | 12 | .3 | .1 | 5.1 | 122 | 124 |
| APR | | | | | | | | | | |
| 19... | .3 | 110 | 0 | 1.4 | 11 | .3 | .1 | 4.9 | 110 | 107 |
| MAY | | | | | | | | | | |
| 19... | .2 | 90 | 0 | 1.4 | 7.8 | .3 | .1 | 4.2 | 114 | 87 |
| JUN | | | | | | | | | | |
| 21... | .2 | 93 | 0 | .9 | 6.4 | .3 | .1 | 4.6 | 90 | 89 |
| JUL | | | | | | | | | | |
| 28... | .3 | 100 | 0 | 1.0 | 5.9 | .2 | .1 | 4.6 | 94 | 93 |
| AUG | | | | | | | | | | |
| 23... | .3 | 110 | 0 | .9 | 7.8 | .4 | .1 | 4.7 | 100 | 103 |
| SEP | | | | | | | | | | |
| 22... | .4 | 110 | 0 | 1.4 | 6.1 | .3 | .1 | 4.8 | 103 | 104 |

## Water-quality records for North Fork Flathead River near Columbia Falls for period of record--Continued

WATER QUALITY DATA

| DATE | DIS-SOLVED SOLIDS (TONS PER AC-FT) | DIS-SOLVED SOLIDS (TONS PER DAY) | TOTAL NITRITE PLUS NITRATE (N) (MG/L) | DIS-SOLVED AMMONIA NITRO-GEN (N) (MG/L) | TOTAL KJEL-DAHL NITRO-GEN (N) (MG/L) | TOTAL NITRO-GEN (N) (MG/L) | TOTAL PHOS-PHORUS (P) (MG/L) | TOTAL ORGANIC CARBON (C) (MG/L) | DIS-SOL-VED ORGANIC CARBON (C) (MG/L) | SUS-PENDED ORGANIC CARBON (C) (MG/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| OCT 1975 | | | | | | | | | | |
| 10... | .15 | 394 | .01 | -- | .12 | .13 | .01 | 3.9 | -- | -- |
| NOV | | | | | | | | | | |
| 07... | .13 | 718 | .02 | .00 | .05 | .07 | .01 | -- | -- | -- |
| DEC | | | | | | | | | | |
| 10... | .13 | 1010 | .09 | .03 | .20 | .29 | .02 | -- | -- | -- |
| JAN 1976 | | | | | | | | | | |
| 26... | .16 | 313 | .06 | .01 | .11 | .17 | .00 | -- | 5.8 | .7 |
| FEB | | | | | | | | | | |
| 24... | .17 | 270 | .07 | .02 | .22 | .29 | .00 | -- | -- | -- |
| MAR | | | | | | | | | | |
| 26... | .17 | 255 | .07 | .01 | .09 | .16 | .00 | -- | -- | -- |
| APR | | | | | | | | | | |
| 27... | .14 | 886 | .04 | -- | .04 | .08 | .03 | -- | 4.8 | .4 |
| MAY | | | | | | | | | | |
| 28... | .11 | 2620 | .05 | .01 | .15 | .20 | .05 | -- | -- | -- |
| JUN | | | | | | | | | | |
| 18... | .11 | 1730 | .05 | -- | .08 | .13 | .04 | -- | 4.6 | .5 |
| JUL | | | | | | | | | | |
| 23... | .12 | 923 | .04 | .01 | .00 | .04 | .00 | -- | -- | -- |
| AUG | | | | | | | | | | |
| 19... | .12 | 745 | .29 | .00 | .00 | .29 | .00 | -- | -- | -- |
| SEP | | | | | | | | | | |
| 24... | .14 | 363 | .11 | .00 | .00 | .11 | .00 | -- | -- | -- |
| OCT | | | | | | | | | | |
| 21... | .16 | 255 | .00 | -- | .12 | .12 | .04 | -- | 2.0 | .0 |
| NOV | | | | | | | | | | |
| 23... | .17 | 237 | .04 | .01 | .01 | .05 | .00 | -- | -- | -- |
| DEC | | | | | | | | | | |
| 21... | .18 | 156 | .04 | .02 | .04 | .08 | .00 | -- | -- | -- |
| JAN , 1977 | | | | | | | | | | |
| 20... | .16 | 214 | .12 | .00 | .12 | .24 | .01 | .5 | .8 | .1 |
| FEB | | | | | | | | | | |
| 23... | .17 | 165 | .04 | .00 | .03 | .07 | .01 | -- | -- | -- |
| MAR | | | | | | | | | | |
| 25... | .17 | 159 | .08 | .01 | .00 | .08 | .00 | -- | -- | -- |
| APR | | | | | | | | | | |
| 19... | .15 | 535 | .07 | .00 | .00 | .07 | .01 | -- | -- | -- |
| MAY | | | | | | | | | | |
| 19... | .16 | 1330 | .05 | .01 | .01 | .06 | .00 | -- | 2.0 | .1 |
| JUN | | | | | | | | | | |
| 21... | .12 | 702 | .02 | .00 | .01 | .03 | .03 | -- | -- | -- |
| JUL | | | | | | | | | | |
| 28... | .13 | 381 | .01 | .01 | .06 | .07 | .01 | -- | -- | -- |
| AUG | | | | | | | | | | |
| 23... | .14 | 262 | .00 | .00 | .05 | .05 | .00 | -- | -- | -- |
| SEP | | | | | | | | | | |
| 22... | .14 | 262 | .02 | .00 | .03 | .05 | .00 | -- | 1.1 | .1 |

WATER QUALITY DATA

| DATE | TIME | TOTAL ALUMINUM (AL) (UG/L) | DISSOLVED ALUMINUM (AL) (UG/L) | TOTAL ARSENIC (AS) (UG/L) | DISSOLVED ARSENIC (AS) (UG/L) | TOTAL BARIUM (BA) (UG/L) | DISSOLVED BARIUM (BA) (UG/L) | TOTAL CADMIUM (CD) (UG/L) | DISSOLVED CADMIUM (CD) (UG/L) | TOTAL CHROMIUM (CR) (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| OCT , 1975 | | | | | | | | | | |
| 10... | 1100 | 60 | 20 | 1 | 1 | -- | -- | 0 | 0 | 10 |
| NOV | | | | | | | | | | |
| 07... | 1030 | -- | 20 | -- | -- | -- | -- | -- | -- | -- |
| JAN , 1976 | | | | | | | | | | |
| 26... | 1300 | 30 | 20 | 0 | 0 | -- | -- | <10 | 0 | 0 |
| APR | | | | | | | | | | |
| 27... | 1300 | 220 | 10 | 1 | 1 | -- | -- | <10 | 0 | 10 |
| JUN | | | | | | | | | | |
| 18... | 1130 | 230 | 10 | 0 | 0 | -- | -- | 1 | 0 | 10 |
| OCT | | | | | | | | | | |
| 21... | 1130 | 40 | 10 | 1 | 1 | -- | -- | <10 | 0 | 0 |
| JAN , 1977 | | | | | | | | | | |
| 20... | 1300 | 40 | 0 | 0 | 0 | -- | -- | <10 | 0 | 0 |
| MAY | | | | | | | | | | |
| 19... | 1030 | 110 | 0 | 0 | 0 | -- | -- | <10 | 1 | 0 |
| SEP | | | | | | | | | | |
| 22... | 1100 | 30 | 10 | 0 | 0 | 100 | 0 | <10 | 1 | 10 |

| DATE | DISSOLVED CHROMIUM (CR) (UG/L) | TOTAL COBALT (CO) (UG/L) | DISSOLVED COBALT (CO) (UG/L) | TOTAL COPPER (CU) (UG/L) | DISSOLVED COPPER (CU) (UG/L) | TOTAL IRON (FE) (UG/L) | DISSOLVED IRON (FE) (UG/L) | TOTAL LEAD (PB) (UG/L) | DISSOLVED LEAD (PB) (UG/L) | TOTAL MANGANESE (MN) (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| OCT , 1975 | | | | | | | | | | |
| 10... | 10 | <50 | 1 | 0 | 1 | 0 | 10 | 0 | 0 | 10 |
| NOV | | | | | | | | | | |
| 07... | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| JAN , 1976 | | | | | | | | | | |
| 26... | 0 | <50 | 0 | 10 | 0 | 0 | 10 | <100 | 0 | 0 |
| APR | | | | | | | | | | |
| 27... | 0 | <50 | 0 | 10 | 1 | 210 | 60 | <100 | 0 | 10 |
| JUN | | | | | | | | | | |
| 18... | <10 | 1 | 0 | 0 | 0 | 280 | 20 | 3 | 1 | 10 |
| OCT | | | | | | | | | | |
| 21... | 10 | <50 | 2 | <10 | 0 | 40 | 20 | <100 | 0 | 0 |
| JAN , 1977 | | | | | | | | | | |
| 20... | 0 | <50 | 0 | <10 | 0 | 90 | 0 | <100 | 2 | 0 |
| MAY | | | | | | | | | | |
| 19... | 0 | <50 | 0 | <10 | 1 | 260 | 30 | <100 | 2 | 0 |
| SEP | | | | | | | | | | |
| 22... | 0 | <50 | 0 | <10 | 0 | 0 | 20 | <100 | 1 | 0 |

| DATE | DISSOLVED MANGANESE (MN) (UG/L) | TOTAL MERCURY (HG) (UG/L) | DISSOLVED MERCURY (HG) (UG/L) | TOTAL SELENIUM (SE) (UG/L) | DISSOLVED SELENIUM (SE) (UG/L) | TOTAL SILVER (AG) (UG/L) | DISSOLVED SILVER (AG) (UG/L) | TOTAL ZINC (ZN) (UG/L) | DISSOLVED ZINC (ZN) (UG/L) |
|---|---|---|---|---|---|---|---|---|---|
| OCT , 1975 | | | | | | | | | |
| 10... | 10 | -- | .0 | 0 | 0 | -- | -- | 10 | 10 |
| NOV | | | | | | | | | |
| 07... | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| JAN , 1976 | | | | | | | | | |
| 26... | 0 | .0 | .0 | 0 | 0 | -- | -- | 10 | 0 |
| APR | | | | | | | | | |
| 27... | 0 | .0 | .0 | 0 | 0 | -- | -- | 0 | 0 |
| JUN | | | | | | | | | |
| 18... | 1 | <.5 | <.5 | 0 | 0 | -- | -- | 20 | 1 |
| OCT | | | | | | | | | |
| 21... | 0 | .0 | .0 | 0 | 0 | -- | -- | 10 | 10 |
| JAN , 1977 | | | | | | | | | |
| 20... | 20 | .1 | .0 | 0 | 0 | -- | -- | 0 | 0 |
| MAY | | | | | | | | | |
| 19... | 10 | .0 | .0 | 0 | 0 | -- | -- | 30 | 8 |
| SEP | | | | | | | | | |
| 22... | 0 | .0 | .0 | 0 | 0 | <10 | 0 | 20 | 10 |

WATER-QUALITY RECORDS FOR NORTH FORK FLATHEAD RIVER NEAR COLUMBIA FALLS FOR PERIOD OF RECORD--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976
ONCE-DAILY

| DAY | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 202 | 192 | 190 | 210 | 197 | --- | 208 | 169 | 142 | 128 | 163 | 175 |
| 2 | 203 | 190 | 174 | 179 | 198 | 219 | --- | --- | 143 | --- | 165 | 175 |
| 3 | 202 | 177 | 160 | 177 | 198 | 218 | 210 | 160 | 146 | 133 | 169 | --- |
| 4 | 194 | 175 | 142 | 191 | 200 | 217 | 207 | 161 | --- | 132 | 169 | 177 |
| 5 | 198 | 171 | 157 | 193 | 214 | --- | 200 | 151 | 152 | 131 | 159 | 178 |
| 6 | 200 | 170 | 168 | --- | --- | 210 | --- | 152 | 151 | 131 | --- | 177 |
| 7 | 183 | 170 | 170 | 175 | 201 | 204 | 178 | --- | 149 | 130 | 161 | 178 |
| 8 | 185 | 171 | 170 | 197 | 205 | 203 | 167 | 153 | 145 | --- | 162 | 177 |
| 9 | 185 | 172 | 172 | 193 | 199 | 204 | 161 | 151 | 137 | 130 | 156 | 178 |
| 10 | 191 | 173 | 169 | 196 | 199 | --- | 159 | 148 | 133 | --- | 145 | --- |
| 11 | 191 | 176 | 173 | 195 | 198 | 202 | 155 | 148 | --- | 135 | 147 | 181 |
| 12 | 193 | 180 | 175 | --- | 196 | 211 | 153 | 148 | 136 | 131 | 149 | 181 |
| 13 | 192 | 182 | 186 | 197 | --- | 205 | 150 | 147 | 144 | 133 | 155 | --- |
| 14 | 189 | 184 | 191 | 194 | 192 | 209 | 150 | 142 | 140 | 137 | --- | 184 |
| 15 | 188 | 186 | --- | 191 | 193 | 209 | 155 | 142 | 142 | 129 | 155 | 186 |
| 16 | 189 | 180 | 187 | 187 | 192 | 208 | --- | 145 | 139 | --- | 151 | 187 |
| 17 | 192 | 182 | 142 | 189 | 193 | 205 | 159 | 145 | --- | --- | --- | --- |
| 18 | 197 | --- | 163 | 169 | --- | 201 | --- | 141 | --- | 141 | --- | 187 |
| 19 | 196 | 197 | 185 | 190 | 198 | --- | 169 | 142 | 130 | 142 | --- | 189 |
| 20 | --- | --- | 185 | 194 | 198 | 204 | --- | 138 | 136 | 146 | 157 | 191 |
| 21 | 190 | 197 | 186 | 199 | 199 | 207 | 171 | --- | 137 | 144 | 162 | 192 |
| 22 | 190 | 192 | 192 | 200 | 202 | 207 | --- | 142 | 131 | 147 | 162 | 192 |
| 23 | 190 | 187 | 175 | 193 | 201 | 209 | 178 | 140 | 129 | --- | 162 | 193 |
| 24 | 195 | 187 | 191 | 176 | 204 | 204 | 177 | 136 | 131 | 150 | 163 | --- |
| 25 | 195 | 189 | 191 | 197 | 202 | 207 | 172 | 134 | --- | 150 | --- | 191 |
| 26 | 194 | 189 | 189 | --- | 201 | --- | 174 | 138 | 134 | 154 | --- | 192 |
| 27 | 195 | 196 | 189 | 190 | --- | 209 | 174 | 145 | --- | 151 | 166 | --- |
| 28 | 189 | --- | 194 | 192 | 204 | --- | 176 | --- | 139 | 153 | 169 | 194 |
| 29 | 192 | 177 | 196 | 195 | 203 | 209 | 176 | 132 | 138 | 155 | 168 | 194 |
| 30 | 191 | 201 | 193 | --- | --- | 209 | --- | 141 | 128 | --- | 172 | 195 |
| 31 | 187 | --- | --- | 197 | --- | --- | --- | 136 | --- | 158 | 174 | --- |
| MONTH | 193 | 183 | 178 | 191 | 199 | --- | --- | 145 | 139 | --- | --- | 185 |
| YEAR | MAX | 219 | MIN | 128 | MEAN | 175 | | | | | | |

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977
ONCE-DAILY

| DAY | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 204 | 208 | 213 | 245 | 237 | 231 | 229 | 151 | 160 | 173 | 186 | 186 |
| 2 | 205 | 209 | 212 | 243 | 236 | 231 | 231 | 143 | 158 | 179 | 183 | 182 |
| 3 | 205 | 210 | 213 | 242 | 236 | 231 | 232 | 149 | 147 | 179 | 184 | 180 |
| 4 | 205 | 213 | 215 | 241 | 236 | 229 | 228 | 142 | 148 | 180 | 183 | 179 |
| 5 | 204 | 213 | 209 | 235 | 237 | 226 | 223 | 145 | 147 | 180 | 187 | 178 |
| 6 | 206 | 214 | 219 | 229 | 237 | 218 | 218 | 153 | 141 | 182 | 189 | 177 |
| 7 | 207 | 215 | 212 | 227 | 237 | 219 | 213 | 157 | 139 | 189 | 189 | 176 |
| 8 | 208 | 210 | 215 | 225 | 235 | 221 | [illegible] | 160 | 137 | 184 | 191 | 172 |
| 9 | 210 | 208 | 210 | 223 | 234 | 224 | 193 | 156 | 140 | 187 | 192 | 173 |
| 10 | 208 | 207 | 211 | 220 | 230 | 226 | 182 | 149 | 138 | 188 | 192 | 176 |
| 11 | 209 | 212 | 212 | 218 | 227 | 227 | 187 | 146 | 146 | 188 | 196 | 179 |
| 12 | 208 | 216 | 213 | 217 | 225 | 228 | 186 | 145 | 149 | 186 | 197 | 182 |
| 13 | 211 | 219 | 219 | 186 | 223 | 228 | 191 | 145 | 152 | 183 | 191 | 185 |
| 14 | 213 | 227 | 219 | 154 | 226 | 229 | 194 | 148 | 155 | 187 | 190 | 188 |
| 15 | 215 | 209 | 218 | 182 | 230 | 231 | 192 | 147 | 155 | 189 | 190 | 189 |
| 16 | 216 | 209 | 218 | 209 | 230 | 232 | 189 | 148 | 153 | 186 | 192 | 190 |
| 17 | 213 | 216 | 217 | 209 | 229 | 230 | 188 | 160 | 156 | 188 | 193 | 190 |
| 18 | 215 | 216 | 217 | 210 | 229 | 229 | 191 | 156 | 158 | 186 | 192 | 190 |
| 19 | 215 | 216 | 219 | 214 | 229 | 232 | 192 | 159 | 160 | 184 | 195 | 193 |
| 20 | 216 | 216 | 221 | 218 | 228 | 234 | 194 | 162 | 169 | 183 | 195 | 194 |
| 21 | 217 | 213 | 223 | 220 | 228 | 234 | 196 | 161 | 162 | 184 | 196 | 196 |
| 22 | 218 | 211 | 224 | 222 | 228 | 234 | 191 | 160 | 164 | 185 | 190 | 198 |
| 23 | 218 | 208 | 225 | 225 | 227 | 231 | 185 | 163 | 167 | 187 | 184 | 199 |
| 24 | 218 | 204 | 223 | 227 | 229 | 228 | 180 | 149 | 168 | 186 | 193 | 198 |
| 25 | 218 | 199 | 221 | 228 | 231 | 211 | 168 | 150 | 169 | 180 | 194 | 200 |
| 26 | 218 | 202 | 221 | 229 | 230 | 194 | 159 | 150 | 171 | 174 | 195 | 200 |
| 27 | 217 | 205 | 221 | 230 | 231 | 215 | 156 | 153 | 170 | 172 | 195 | 201 |
| 28 | 216 | 208 | 223 | 230 | --- | 221 | 154 | 156 | 172 | 171 | 192 | 201 |
| 29 | 216 | 211 | 226 | 231 | --- | 226 | 155 | 157 | 173 | 176 | 188 | 193 |
| 30 | 217 | 212 | 236 | 232 | --- | 226 | 153 | 160 | 175 | 176 | 184 | 192 |
| 31 | 221 | --- | 246 | 232 | --- | 227 | --- | 161 | --- | 175 | 183 | --- |
| MONTH | 212 | 211 | 219 | 221 | 231 | 226 | 192 | 153 | 157 | 182 | 190 | 188 |
| YEAR | MAX | 246 | MIN | 137 | MEAN | 198 | | | | | | |

## Water-quality records for North Fork Flathead River near Columbia Falls for period of record--Continued

### TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

| | OCTOBER | | | NOVEMBER | | | DECEMBER | | | JANUARY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN |
| 1 | 10.0 | 7.5 | 9.0 | 4.5 | 3.5 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 9.5 | 8.0 | 8.5 | 5.5 | 4.5 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 10.0 | 8.5 | 9.0 | 6.5 | 5.5 | 5.5 | 1.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 4 | 9.5 | 7.5 | 8.5 | 6.5 | 5.5 | 6.0 | 1.5 | 0.5 | 1.5 | 0.0 | 0.0 | 0.0 |
| 5 | 9.5 | 8.5 | 9.0 | 5.5 | 4.5 | 5.0 | 1.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 6 | 8.5 | 7.0 | 7.5 | 5.0 | 4.5 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 7.5 | 6.0 | 7.0 | 4.5 | 3.5 | 4.0 | 1.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 8 | 7.0 | 6.0 | 6.5 | 3.5 | 3.0 | 3.0 | 2.0 | 1.0 | 1.5 | 0.0 | 0.0 | 0.0 |
| 9 | 7.0 | 6.5 | 6.5 | 3.0 | 2.0 | 2.5 | 3.0 | 2.0 | 2.5 | 0.0 | 0.0 | 0.0 |
| 10 | 7.0 | 6.5 | 7.0 | 2.0 | 1.0 | 1.5 | 3.0 | 2.0 | 2.5 | 0.0 | 0.0 | 0.0 |
| 11 | 7.5 | 6.5 | 7.0 | 1.5 | 1.0 | 1.0 | 1.5 | 0.5 | 0.5 | 0.0 | 0.0 | 0.0 |
| 12 | 8.0 | 7.0 | 7.5 | 2.0 | 1.5 | 1.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 7.5 | 6.0 | 7.0 | 1.5 | 0.5 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 6.5 | 5.5 | 6.0 | 2.5 | 1.0 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | 7.0 | 6.0 | 6.5 | 3.5 | 2.5 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | 6.5 | 5.0 | 6.0 | 3.5 | 2.5 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 17 | 7.5 | 6.0 | 7.0 | 2.5 | 1.5 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 18 | 7.5 | 6.5 | 7.0 | 1.5 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.5 |
| 19 | 6.5 | 6.0 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 |
| 20 | 6.0 | 5.5 | 5.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 21 | 5.5 | 5.0 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 22 | 5.0 | 4.5 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 23 | 5.0 | 3.5 | 4.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 24 | 3.5 | 3.5 | 3.5 | 1.0 | 0.0 | 0.5 | 1.0 | 0.5 | 0.5 | 0.0 | 0.0 | 0.0 |
| 25 | 3.5 | 2.5 | 3.0 | 1.0 | 0.5 | 1.0 | 1.5 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| 26 | 3.5 | 2.5 | 3.0 | 0.5 | 0.0 | 0.0 | 2.0 | 1.5 | 1.5 | 0.0 | 0.0 | 0.0 |
| 27 | 4.0 | 3.0 | 3.5 | 0.0 | 0.0 | 0.0 | 2.0 | 1.5 | 1.5 | 0.0 | 0.0 | 0.0 |
| 28 | 4.0 | 3.0 | 3.5 | 0.0 | 0.0 | 0.0 | 1.5 | 0.5 | 1.0 | 0.5 | 0.0 | 0.0 |
| 29 | 4.0 | 3.5 | 3.5 | 0.0 | 0.0 | 0.0 | 1.5 | 0.5 | 1.0 | 1.5 | 0.5 | 1.0 |
| 30 | 4.0 | 3.5 | 4.0 | 0.0 | 0.0 | 0.0 | 1.5 | 1.0 | 1.5 | 1.5 | 1.0 | 1.0 |
| 31 | 4.0 | 4.0 | 4.0 | --- | --- | --- | 1.0 | 0.0 | 0.0 | 1.0 | 0.5 | 0.5 |
| MONTH | 10.0 | 2.5 | 6.0 | 6.5 | 0.0 | 2.0 | 3.0 | 0.0 | 0.5 | 1.5 | 0.0 | 0.0 |

### TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

| | FEBRUARY | | | MARCH | | | APRIL | | | MAY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN |
| 1 | 1.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 5.0 | 4.0 | 4.5 | 8.0 | 5.0 | 6.5 |
| 2 | 0.5 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 4.5 | 3.0 | 3.5 | 7.5 | 5.0 | 6.5 |
| 3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 2.5 | 4.0 | 7.5 | 5.0 | 6.0 |
| 4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 3.5 | 5.0 | 6.0 | 4.0 | 4.5 |
| 5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 3.5 | 5.0 | 5.0 | 4.0 | 4.5 |
| 6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 3.5 | 5.0 | 6.5 | 3.5 | 5.0 |
| 7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.5 | 3.5 | 4.5 | 7.0 | 4.5 | 6.0 |
| 8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 2.5 | 4.0 | 7.0 | 5.0 | 6.0 |
| 9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 2.5 | 3.5 | 7.0 | 5.0 | 6.0 |
| 10 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.5 | 5.0 | 2.5 | 3.5 | 6.5 | 5.0 | 6.0 |
| 11 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.5 | 5.0 | 2.0 | 3.5 | 6.5 | 5.0 | 5.0 |
| 12 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.5 | 2.5 | 3.5 | 7.0 | 4.0 | 5.0 |
| 13 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 2.5 | 3.0 | 7.5 | 5.0 | 6.0 |
| 14 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 3.0 | 2.5 | 2.5 | 6.5 | 5.0 | 5.5 |
| 15 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.5 | 3.5 | 2.5 | 3.0 | 7.0 | 4.0 | 5.5 |
| 16 | 0.0 | 0.0 | 0.0 | 3.0 | 1.0 | 2.0 | 4.0 | 2.5 | 3.0 | 8.0 | 5.0 | 6.5 |
| 17 | 0.0 | 0.0 | 0.0 | 4.0 | 2.5 | 3.0 | 4.0 | 3.0 | 3.5 | 8.0 | 6.0 | 7.0 |
| 18 | 0.0 | 0.0 | 0.0 | 3.5 | 2.5 | 2.5 | 4.0 | 2.5 | 3.0 | 7.5 | 4.5 | 6.0 |
| 19 | 0.0 | 0.0 | 0.0 | 3.0 | 1.5 | 2.5 | 5.0 | 2.5 | 3.5 | 8.0 | 5.0 | 6.5 |
| 20 | 0.5 | 0.0 | 0.0 | 2.5 | 0.5 | 1.0 | 4.5 | 2.5 | 3.5 | 7.5 | 5.0 | 6.5 |
| 21 | 0.5 | 0.0 | 0.5 | 2.0 | 1.0 | 1.5 | 4.0 | 2.5 | 3.5 | 8.0 | 4.5 | 6.0 |
| 22 | 0.5 | 0.0 | 0.0 | 3.0 | 1.5 | 2.5 | 4.0 | 3.0 | 3.5 | 8.0 | 6.0 | 7.0 |
| 23 | 1.0 | 0.0 | 0.5 | 3.0 | 2.0 | 2.5 | 5.0 | 3.0 | 4.5 | 8.0 | 7.0 | 7.5 |
| 24 | 1.5 | 1.0 | 1.0 | 2.5 | 0.5 | 1.5 | 6.5 | 4.0 | 5.0 | 8.0 | 7.0 | 7.5 |
| 25 | 1.5 | 1.0 | 1.5 | 1.5 | 1.0 | 1.5 | 5.5 | 4.0 | 4.5 | 7.5 | 6.0 | 6.5 |
| 26 | 1.0 | 0.5 | 0.5 | 2.5 | 1.5 | 2.0 | 4.0 | 3.0 | 3.5 | 7.5 | 5.0 | 6.0 |
| 27 | 1.0 | 0.0 | 0.5 | 2.5 | 1.5 | 2.0 | 4.5 | 3.0 | 3.5 | 9.5 | 5.5 | 7.5 |
| 28 | 0.0 | 0.0 | 0.0 | 3.5 | 1.0 | 2.0 | 5.5 | 3.5 | 4.5 | 9.0 | 7.0 | 8.0 |
| 29 | 0.0 | 0.0 | 0.0 | 3.5 | 2.0 | 3.0 | 6.5 | 3.0 | 5.0 | 7.5 | 5.5 | 6.5 |
| 30 | --- | --- | --- | 5.5 | 3.0 | 4.0 | 8.0 | 4.5 | 6.0 | 7.0 | 6.0 | 6.5 |
| 31 | --- | --- | --- | 5.5 | 3.0 | 4.5 | --- | --- | --- | 8.0 | 6.5 | 7.0 |
| MONTH | 1.5 | 0.0 | 0.0 | 5.5 | 0.0 | 1.5 | 8.0 | 2.0 | 4.0 | 9.5 | 3.5 | 6.0 |

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

| DAY | JUNE MAX | JUNE MIN | JUNE MEAN | JULY MAX | JULY MIN | JULY MEAN | AUGUST MAX | AUGUST MIN | AUGUST MEAN | SEPTEMBER MAX | SEPTEMBER MIN | SEPTEMBER MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7.5 | 6.0 | 7.0 | 13.5 | 10.5 | 11.0 | 16.0 | 14.5 | 15.0 | 15.0 | 12.5 | 14.0 |
| 2 | 8.0 | 6.0 | 7.0 | 11.0 | 8.0 | 9.5 | 17.5 | 14.5 | 16.0 | 15.0 | 13.0 | 14.0 |
| 3 | 7.5 | 6.0 | 6.5 | 12.0 | 9.0 | 10.5 | 16.5 | 14.5 | 15.5 | 14.0 | 12.0 | 13.5 |
| 4 | 8.0 | 5.0 | 6.5 | 12.0 | 10.0 | 11.0 | 16.0 | 14.5 | 15.0 | 14.5 | 11.5 | 13.0 |
| 5 | 9.0 | 6.0 | 7.5 | 12.5 | 9.5 | 11.0 | 15.5 | 13.5 | 14.5 | 14.5 | 12.0 | 13.5 |
| 6 | 9.0 | 7.5 | 8.0 | 13.0 | 10.5 | 12.0 | 16.5 | 13.5 | 15.0 | 14.5 | 11.5 | 13.0 |
| 7 | 10.0 | 6.5 | 7.5 | 13.0 | 11.0 | 12.0 | 16.0 | 14.0 | 15.5 | 11.5 | 10.0 | 10.5 |
| 8 | 11.0 | 8.0 | 9.5 | 12.0 | 10.0 | 11.0 | 15.5 | 13.0 | 14.0 | 11.0 | 9.0 | 10.0 |
| 9 | 10.5 | 8.5 | 9.5 | 11.5 | 10.0 | 10.5 | 12.5 | 11.5 | 12.0 | 11.5 | 9.0 | 10.0 |
| 10 | 9.5 | 7.5 | 8.0 | 12.5 | 9.5 | 11.0 | 14.0 | 11.5 | 12.5 | 12.0 | 9.0 | 10.5 |
| 11 | 8.0 | 6.5 | 7.5 | 14.5 | 10.5 | 12.0 | 15.0 | 12.5 | 13.5 | 11.5 | 10.0 | 10.5 |
| 12 | 9.0 | 7.5 | 8.0 | 14.0 | 11.0 | 12.0 | 15.5 | 13.0 | 14.0 | 11.0 | 10.0 | 10.5 |
| 13 | 8.0 | 6.0 | 6.5 | 12.5 | 9.5 | 11.0 | 16.0 | 13.5 | 15.0 | 11.0 | 9.0 | 10.0 |
| 14 | 8.5 | 5.0 | 6.5 | 13.0 | 10.0 | 11.5 | 15.5 | 13.0 | 14.0 | 11.5 | 9.0 | 10.5 |
| 15 | 8.5 | 7.5 | 8.0 | 14.5 | 10.5 | 12.5 | 14.5 | 13.5 | 14.0 | 12.0 | 9.5 | 11.0 |
| 16 | 9.0 | 7.0 | 8.0 | 15.5 | 11.5 | 13.5 | 14.0 | 12.5 | 13.0 | 12.5 | 10.0 | 11.0 |
| 17 | 10.5 | 7.5 | 9.0 | 15.5 | 12.5 | 14.0 | 12.5 | 10.5 | 11.5 | 13.5 | 11.5 | 12.5 |
| 18 | 11.0 | 8.0 | 9.5 | 15.5 | 13.0 | 14.5 | 13.0 | 10.5 | 11.5 | 13.0 | 11.5 | 12.5 |
| 19 | 11.0 | 8.5 | 10.0 | 16.0 | 13.0 | 14.5 | 12.5 | 10.5 | 11.5 | 12.5 | 9.5 | 11.0 |
| 20 | 10.0 | 8.5 | 9.5 | 15.5 | 13.0 | 14.5 | 13.5 | 11.0 | 12.0 | 11.5 | 9.0 | 10.5 |
| 21 | 9.0 | 7.5 | 8.0 | 15.0 | 13.0 | 14.0 | 14.0 | 11.5 | 12.5 | 11.5 | 9.0 | 10.5 |
| 22 | 8.5 | 7.5 | 8.0 | 15.0 | 12.0 | 13.5 | 15.0 | 12.0 | 13.5 | 12.0 | 9.5 | 11.0 |
| 23 | 8.5 | 7.5 | 8.0 | 16.0 | 12.5 | 14.0 | 15.0 | 14.0 | 14.5 | 12.5 | 10.0 | 11.5 |
| 24 | 8.5 | 7.5 | 8.0 | 16.0 | 13.0 | 14.0 | 15.5 | 13.0 | 14.5 | 13.0 | 11.0 | 12.0 |
| 25 | 8.5 | 7.0 | 7.5 | 16.0 | 11.5 | 13.5 | 15.0 | 13.0 | 14.0 | 13.0 | 11.0 | 12.0 |
| 26 | 9.0 | 6.5 | 7.5 | 16.5 | 13.5 | 15.0 | 14.0 | 11.0 | 12.0 | 12.0 | 10.5 | 11.5 |
| 27 | 11.5 | 7.5 | 9.0 | 16.0 | 13.5 | 15.0 | 11.0 | 9.5 | 10.0 | 11.0 | 9.5 | 10.5 |
| 28 | 12.5 | 8.5 | 10.5 | 15.5 | 12.5 | 14.0 | 13.0 | 10.5 | 11.5 | 11.0 | 9.0 | 10.0 |
| 29 | 13.0 | 9.5 | 11.5 | 15.0 | 12.5 | 13.5 | 14.0 | 10.5 | 12.5 | 11.5 | 9.0 | 10.5 |
| 30 | 14.0 | 11.0 | 12.5 | 13.5 | 11.5 | 12.5 | 15.0 | 12.0 | 13.5 | 11.5 | 9.5 | 10.5 |
| 31 | --- | --- | --- | 16.0 | 12.0 | 13.5 | 15.0 | 12.5 | 14.0 | --- | --- | --- |
| MONTH | 14.0 | 5.0 | 8.5 | 16.5 | 8.0 | 12.5 | 17.5 | 9.5 | 13.5 | 15.0 | 9.0 | 11.5 |
| YEAR | 17.5 | 0.0 | 5.5 | | | | | | | | | |

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

| DAY | OCTOBER MAX | OCTOBER MIN | OCTOBER MEAN | NOVEMBER MAX | NOVEMBER MIN | NOVEMBER MEAN | DECEMBER MAX | DECEMBER MIN | DECEMBER MEAN | JANUARY MAX | JANUARY MIN | JANUARY MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11.5 | 9.5 | 10.5 | 6.0 | 4.5 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 11.0 | 10.0 | 10.5 | 5.0 | 3.5 | 4.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 10.0 | 8.5 | 9.5 | 3.5 | 3.0 | 3.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 8.5 | 6.5 | 7.5 | 4.5 | 3.5 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 7.0 | 6.0 | 6.0 | 5.0 | 4.5 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 7.5 | 5.5 | 6.5 | 4.5 | 4.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 7.5 | 6.0 | 7.0 | 4.5 | 4.0 | 4.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 7.5 | 6.0 | 7.0 | 5.5 | 4.5 | 5.0 | 1.5 | 0.5 | 1.5 | 0.0 | 0.0 | 0.0 |
| 9 | 8.0 | 6.0 | 7.5 | 4.5 | 3.5 | 4.0 | 1.5 | 0.5 | 1.5 | 0.0 | 0.0 | 0.0 |
| 10 | 8.5 | 7.0 | 8.0 | 3.5 | 2.5 | 3.0 | 0.5 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 11 | 8.5 | 7.5 | 8.0 | 2.5 | 1.0 | 1.5 | 1.0 | 0.5 | 0.5 | 0.0 | 0.0 | 0.0 |
| 12 | 9.0 | 7.0 | 8.0 | 1.0 | 0.0 | 0.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 9.0 | 7.0 | 8.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 8.0 | 6.5 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | 6.5 | 5.0 | 6.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | 5.5 | 4.0 | 5.0 | 1.5 | 0.0 | 0.5 | 1.5 | 0.5 | 1.0 | 0.0 | 0.0 | 0.0 |
| 17 | 5.0 | 4.0 | 4.5 | 3.5 | 2.0 | 2.5 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 18 | 4.0 | 3.0 | 3.5 | 4.0 | 3.0 | 3.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 19 | 4.0 | 2.5 | 3.5 | 3.0 | 2.5 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 20 | 4.0 | 2.5 | 3.5 | 2.5 | 1.0 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 21 | 4.0 | 2.5 | 3.5 | 1.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 22 | 4.0 | 3.0 | 3.5 | 1.5 | 0.5 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 23 | 3.5 | 2.0 | 3.0 | 1.5 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 24 | 3.5 | 2.5 | 3.0 | 2.0 | 1.0 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25 | 4.5 | 3.5 | 4.0 | 2.0 | 0.5 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 26 | 4.0 | 4.0 | 4.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 4.5 | 4.0 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 28 | 4.5 | 3.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 29 | 6.0 | 4.5 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 30 | 4.5 | 3.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 31 | 4.5 | 3.5 | 4.0 | --- | --- | --- | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MONTH | 11.5 | 2.0 | 6.0 | 6.0 | 0.0 | 2.0 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

| | FEBRUARY | | | MARCH | | | APRIL | | | MAY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN |
| 1 | 0.0 | 0.0 | 0.0 | --- | --- | --- | 4.5 | 1.5 | 3.0 | 8.5 | 6.0 | 7.0 |
| 2 | 0.0 | 0.0 | 0.0 | --- | --- | --- | 3.5 | 1.5 | 2.5 | 7.5 | 6.0 | 6.5 |
| 3 | 0.0 | 0.0 | 0.0 | --- | --- | --- | 4.5 | 2.0 | 3.5 | 6.5 | 5.0 | 6.0 |
| 4 | 0.0 | 0.0 | 0.0 | 2.0 | 1.5 | 1.5 | 6.5 | 3.0 | 5.0 | 7.0 | 5.0 | 6.0 |
| 5 | 0.0 | 0.0 | 0.0 | 1.5 | 1.0 | 1.0 | 7.5 | 4.5 | 6.0 | 6.5 | 4.5 | 5.5 |
| 6 | 0.0 | 0.0 | 0.0 | 3.0 | 1.0 | 2.0 | 7.0 | 4.5 | 6.0 | 5.0 | 3.5 | 4.5 |
| 7 | 0.0 | 0.0 | 0.0 | 3.0 | 2.0 | 2.5 | 6.5 | 4.5 | 5.5 | 9.0 | 4.5 | 6.5 |
| 8 | 0.0 | 0.0 | 0.0 | 2.5 | 1.5 | 2.0 | 5.5 | 4.0 | 5.0 | 10.0 | 7.0 | 8.5 |
| 9 | 0.0 | 0.0 | 0.0 | 2.5 | 1.5 | 2.0 | 5.5 | 4.0 | 5.0 | 10.0 | 7.0 | 8.5 |
| 10 | 0.0 | 0.0 | 0.0 | 3.0 | 1.5 | 2.0 | 4.5 | 3.0 | 3.5 | 9.0 | 7.0 | 8.0 |
| 11 | --- | --- | --- | 3.0 | 1.5 | 2.0 | 4.5 | 2.5 | 3.5 | 7.0 | 6.0 | 6.5 |
| 12 | --- | --- | --- | 3.5 | 1.5 | 2.5 | 6.0 | 2.5 | 4.5 | 7.5 | 4.5 | 6.0 |
| 13 | --- | --- | --- | 3.5 | 2.0 | 3.0 | 5.5 | 4.0 | 4.5 | 8.0 | 6.0 | 7.5 |
| 14 | --- | --- | --- | 2.0 | 0.5 | 1.5 | 5.0 | 3.5 | 4.5 | 7.5 | 6.5 | 7.0 |
| 15 | --- | --- | --- | 2.0 | 0.5 | 1.5 | 5.0 | 3.0 | 4.5 | 7.5 | 6.5 | 7.0 |
| 16 | --- | --- | --- | 3.0 | 1.5 | 2.5 | 5.0 | 4.0 | 4.5 | 7.5 | 5.5 | 6.5 |
| 17 | --- | --- | --- | 3.0 | 1.5 | 2.5 | 6.0 | 3.0 | 4.5 | 7.0 | 6.0 | 6.5 |
| 18 | --- | --- | --- | 2.5 | 1.0 | 2.0 | 5.0 | 3.0 | 4.0 | 7.0 | 5.5 | 6.0 |
| 19 | --- | --- | --- | 2.0 | 0.5 | 1.5 | 4.5 | 3.0 | 4.0 | 8.0 | 5.0 | 6.5 |
| 20 | --- | --- | --- | 1.5 | 0.0 | 0.5 | 5.5 | 4.0 | 4.5 | 8.5 | 6.5 | 7.5 |
| 21 | --- | --- | --- | 1.0 | 0.0 | 0.5 | 5.5 | 4.0 | 5.0 | 8.0 | 6.5 | 7.0 |
| 22 | --- | --- | --- | 3.5 | 1.0 | 2.0 | 8.5 | 4.5 | 6.5 | 9.0 | 7.0 | 8.0 |
| 23 | --- | --- | --- | 3.0 | 2.5 | 3.0 | 9.0 | 6.0 | 8.0 | 9.0 | 7.0 | 8.0 |
| 24 | --- | --- | --- | 3.0 | 2.0 | 3.0 | 9.0 | 6.5 | 8.0 | 9.0 | 7.0 | 8.0 |
| 25 | --- | --- | --- | 4.5 | 2.0 | 3.0 | 9.0 | 6.0 | 7.5 | 9.0 | 7.0 | 8.0 |
| 26 | --- | --- | --- | 3.5 | 2.0 | 2.5 | 7.5 | 5.5 | 6.5 | 9.0 | 7.0 | 8.0 |
| 27 | --- | --- | --- | 4.0 | 2.0 | 3.0 | 7.5 | 4.5 | 6.0 | 8.5 | 6.5 | 7.5 |
| 28 | --- | --- | --- | 3.0 | 1.0 | 2.0 | 8.0 | 5.0 | 6.5 | 8.0 | 6.5 | 7.0 |
| 29 | --- | --- | --- | 2.5 | 0.5 | 1.5 | 7.0 | 5.0 | 6.0 | 7.0 | 6.0 | 6.5 |
| 30 | --- | --- | --- | 3.5 | 0.5 | 2.0 | 8.5 | 5.0 | 6.5 | 10.0 | 6.0 | 8.0 |
| 31 | --- | --- | --- | 3.0 | 1.5 | 2.5 | --- | --- | --- | 11.5 | 9.0 | 10.0 |
| MONTH | --- | --- | --- | 4.5 | 0.0 | 2.0 | 9.0 | 1.5 | 5.0 | 11.5 | 3.5 | 7.0 |

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

| | JUNE | | | JULY | | | AUGUST | | | SEPTEMBER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN | MAX | MIN | MEAN |
| 1 | 11.5 | 9.0 | 10.5 | 16.0 | 13.5 | 15.0 | 17.5 | 14.0 | 16.0 | 12.5 | 10.5 | 11.5 |
| 2 | 11.5 | 9.5 | 10.5 | 16.0 | 14.0 | 15.0 | 18.5 | 15.5 | 17.0 | 12.5 | 10.5 | 11.5 |
| 3 | 10.5 | 8.0 | 9.0 | 14.0 | 12.5 | 13.0 | 18.0 | 16.0 | 17.0 | 13.5 | 12.0 | 12.5 |
| 4 | 9.5 | 8.0 | 9.0 | 13.0 | 11.5 | 12.5 | 16.0 | 14.5 | 15.0 | 13.5 | 12.5 | 12.5 |
| 5 | 13.0 | 8.5 | 10.5 | 13.0 | 11.0 | 12.0 | 16.0 | 13.0 | 14.5 | 14.5 | 12.5 | 13.5 |
| 6 | 13.5 | 10.0 | 12.0 | 12.5 | 11.0 | 12.0 | 17.0 | 14.0 | 15.5 | 14.0 | 12.0 | 13.0 |
| 7 | 13.0 | 11.0 | 11.5 | 15.5 | 10.5 | 13.0 | 17.0 | 14.0 | 16.0 | 13.5 | 11.5 | 13.0 |
| 8 | 12.5 | 10.0 | 11.0 | 16.0 | 12.5 | 14.5 | 17.0 | 14.5 | 16.0 | 13.0 | 11.5 | 12.0 |
| 9 | 13.0 | 9.5 | 11.0 | 15.5 | 14.0 | 14.5 | 17.0 | 14.0 | 15.0 | 12.5 | 10.5 | 11.5 |
| 10 | 12.0 | 9.5 | 11.0 | 15.0 | 13.0 | 14.0 | 16.0 | 12.0 | 14.5 | 13.0 | 10.5 | 11.5 |
| 11 | 11.0 | 9.0 | 10.0 | 15.5 | 12.5 | 14.0 | 17.0 | 13.5 | 15.5 | 12.5 | 11.0 | 11.5 |
| 12 | 12.5 | 9.0 | 10.5 | 15.5 | 13.0 | 14.5 | 18.0 | 14.0 | 16.5 | 12.5 | 10.0 | 11.5 |
| 13 | 12.5 | 10.0 | 11.5 | 14.5 | 13.0 | 13.5 | 17.0 | 15.0 | 16.0 | 13.0 | 10.5 | 12.0 |
| 14 | 12.5 | 10.0 | 11.5 | 15.5 | 11.0 | 13.5 | 16.0 | 13.0 | 14.5 | 13.0 | 11.0 | 12.0 |
| 15 | 13.0 | 11.0 | 12.0 | 17.0 | 12.5 | 14.5 | 15.5 | 12.0 | 13.5 | 13.0 | 11.0 | 12.5 |
| 16 | 12.5 | 10.5 | 11.5 | 17.5 | 14.5 | 16.0 | 17.0 | 13.5 | 15.5 | 12.0 | 11.0 | 11.5 |
| 17 | 14.5 | 10.5 | 12.5 | 17.0 | 13.5 | 15.0 | 17.5 | 14.5 | 16.5 | 11.0 | 10.5 | 10.5 |
| 18 | 15.0 | 11.5 | 13.5 | 14.5 | 12.5 | 13.5 | 18.0 | 15.0 | 17.0 | 11.0 | 9.5 | 10.0 |
| 19 | 16.0 | 12.0 | 14.0 | 15.0 | 12.5 | 14.0 | 18.5 | 15.5 | 17.5 | 11.0 | 9.5 | 10.5 |
| 20 | 15.5 | 13.0 | 13.5 | 15.5 | 12.0 | 14.0 | 18.5 | 15.5 | 17.5 | 11.0 | 10.0 | 10.5 |
| 21 | 14.5 | 11.5 | 13.0 | 17.5 | 14.0 | 15.5 | 18.0 | 15.5 | 17.0 | 11.0 | 9.0 | 10.0 |
| 22 | 14.0 | 12.0 | 13.0 | 19.0 | 15.0 | 17.0 | 17.5 | 15.5 | 16.5 | 9.5 | 8.0 | 9.0 |
| 23 | 15.0 | 12.0 | 13.5 | 19.0 | 15.5 | 17.5 | 16.0 | 14.0 | 15.5 | 9.5 | 8.0 | 9.0 |
| 24 | 15.5 | 12.5 | 14.0 | 18.0 | 16.0 | 17.5 | 15.0 | 13.5 | 14.5 | 9.5 | 9.0 | 9.0 |
| 25 | 16.0 | 13.5 | 15.0 | 17.5 | 15.0 | 16.0 | 13.5 | 12.0 | 12.5 | 10.5 | 8.5 | 9.5 |
| 26 | 16.5 | 13.5 | 15.0 | 15.0 | 14.0 | 14.5 | 12.5 | 11.5 | 12.0 | 9.5 | 8.5 | 9.0 |
| 27 | 15.5 | 13.5 | 15.0 | 18.0 | 14.0 | 16.0 | 12.0 | 11.0 | 11.5 | 9.5 | 7.5 | 8.5 |
| 28 | 15.5 | 12.5 | 14.0 | 18.0 | 15.0 | 17.0 | 12.0 | 11.5 | 11.5 | 9.0 | 8.0 | 8.5 |
| 29 | 14.5 | 13.0 | 14.0 | 17.0 | 15.0 | 15.5 | 13.0 | 11.0 | 12.0 | 8.5 | 8.0 | 8.0 |
| 30 | 15.5 | 12.0 | 14.0 | 16.0 | 13.0 | 14.5 | 13.0 | 11.0 | 11.5 | 8.5 | 8.0 | 8.0 |
| 31 | --- | --- | --- | 17.0 | 13.5 | 15.5 | 13.0 | 10.5 | 11.5 | --- | --- | --- |
| MONTH | 16.5 | 8.0 | 12.0 | 19.0 | 10.5 | 14.5 | 18.5 | 10.5 | 15.0 | 14.5 | 7.5 | 11.0 |
| YEAR | 19.0 | 0.0 | 6.5 | | | | | | | | | |

SUSPENDED-SEDIMENT DISCHARGE (TONS/DAY), WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | OCTOBER | | | NOVEMBER | | | DECEMBER | |
| 1 | 977 | 5 | 13 | 1380 | 2 | 7.5 | 1010 | 11 | 30 |
| 2 | 959 | 5 | 13 | 1380 | 3 | 11 | 1680 | 19 | 86 |
| 3 | 950 | 3 | 7.7 | 1690 | 8 | 37 | 2650 | 42 | 301 |
| 4 | 1080 | 5 | 15 | 2130 | 5 | 29 | 4380 | 129 | 1530 |
| 5 | 1160 | 3 | 9.4 | 2660 | 9 | 65 | 4800 | 190 | 2460 |
| 6 | 1170 | 4 | 13 | 2870 | 12 | 93 | 3540 | 80 | 765 |
| 7 | 1440 | 4 | 16 | 2800 | 8 | 66 | 3080 | 13 | 108 |
| 8 | 1530 | 4 | 17 | 2600 | 6 | 42 | 2830 | 10 | 76 |
| 9 | 1440 | 4 | 16 | 2380 | 2 | 13 | 2800 | 10 | 76 |
| 10 | 1380 | 10 | 37 | 2210 | 1 | 6.0 | 3430 | 23 | 213 |
| 11 | 1380 | 3 | 11 | 2040 | 4 | 22 | 3500 | 22 | 208 |
| 12 | 1400 | 5 | 19 | 1930 | 2 | 10 | 3130 | 11 | 93 |
| 13 | 1380 | 4 | 15 | 1830 | 8 | 40 | 2570 | 8 | 56 |
| 14 | 1350 | 3 | 11 | 1750 | 2 | 9.5 | 2200 | 6 | 36 |
| 15 | 1330 | 5 | 18 | 1770 | 3 | 14 | 2260 | 4 | 24 |
| 16 | 1320 | 6 | 21 | 1890 | 6 | 31 | 2070 | 7 | 39 |
| 17 | 1300 | 4 | 14 | 1830 | 3 | 15 | 1870 | 20 | 101 |
| 18 | 1260 | 5 | 17 | 1660 | 3 | 13 | 1990 | 24 | 129 |
| 19 | 1270 | 9 | 31 | 1410 | 4 | 15 | 2080 | 12 | 67 |
| 20 | 1370 | 6 | 22 | 1320 | 4 | 14 | 1990 | 14 | 75 |
| 21 | 1410 | 4 | 15 | 1400 | 4 | 15 | 1850 | 9 | 45 |
| 22 | 1410 | 6 | 23 | 1490 | 5 | 20 | 1710 | 5 | 23 |
| 23 | 1390 | 9 | 34 | 1480 | 4 | 16 | 1630 | 7 | 31 |
| 24 | 1350 | 3 | 11 | 1450 | 7 | 27 | 1620 | 4 | 17 |
| 25 | 1320 | 4 | 14 | 1400 | 3 | 11 | 1600 | 7 | 30 |
| 26 | 1330 | 5 | 18 | 1330 | 4 | 14 | 1550 | 6 | 25 |
| 27 | 1290 | 2 | 7.0 | 1280 | 9 | 31 | 1550 | 6 | 25 |
| 28 | 1260 | 7 | 24 | 1120 | 9 | 27 | 1450 | 2 | 7.8 |
| 29 | 1240 | 2 | 6.7 | 1010 | 8 | 22 | 1410 | 6 | 23 |
| 30 | 1240 | 7 | 23 | 977 | 9 | 24 | 1390 | 5 | 19 |
| 31 | 1380 | 6 | 22 | --- | --- | --- | 1360 | 4 | 15 |
| TOTAL | 40066 | --- | 533.8 | 52467 | --- | 754.0 | 70980 | --- | 6733.8 |
| | | JANUARY | | | FEBRUARY | | | MARCH | |
| 1 | 1150 | 3 | 9.3 | 932 | 7 | 18 | 600 | 2 | 3.2 |
| 2 | 1100 | 1 | 3.0 | 932 | 3 | 7.5 | 500 | 3 | 4.1 |
| 3 | 1180 | 8 | 25 | 887 | 2 | 4.8 | 450 | 8 | 9.7 |
| 4 | 1250 | 6 | 20 | 724 | 3 | 5.9 | 600 | 6 | 9.7 |
| 5 | 1320 | 7 | 25 | 550 | 5 | 7.4 | 800 | 6 | 13 |
| 6 | 1310 | 5 | 18 | 700 | 4 | 7.6 | 941 | 5 | 13 |
| 7 | 1200 | 4 | 13 | 923 | 4 | 10 | 941 | 6 | 15 |
| 8 | 1150 | 3 | 9.3 | 1030 | 2 | 5.6 | 887 | 15 | 36 |
| 9 | 1170 | 4 | 13 | 1110 | 3 | 9.0 | 836 | 10 | 23 |
| 10 | 1200 | 3 | 9.7 | 1070 | 2 | 5.8 | 780 | 8 | 17 |
| 11 | 1210 | 7 | 23 | 1020 | 2 | 5.5 | 748 | 7 | 14 |
| 12 | 1170 | 5 | 16 | 1050 | 2 | 5.7 | 644 | 3 | 5.2 |
| 13 | 1140 | 2 | 6.2 | 1040 | 2 | 5.6 | 686 | 2 | 3.7 |
| 14 | 1090 | 3 | 8.8 | 1030 | 1 | 2.8 | 686 | 4 | 7.4 |
| 15 | 1130 | 3 | 9.2 | 977 | 1 | 2.6 | 665 | 2 | 3.6 |
| 16 | 1200 | 8 | 26 | 923 | 2 | 5.0 | 693 | 7 | 13 |
| 17 | 1210 | 6 | 20 | 887 | 2 | 4.8 | 732 | 8 | 16 |
| 18 | 1220 | 10 | 33 | 887 | 2 | 4.8 | 780 | 8 | 17 |
| 19 | 1210 | 1 | 3.3 | 844 | 2 | 4.6 | 796 | 6 | 13 |
| 20 | 1150 | 2 | 6.2 | 844 | 2 | 4.6 | 788 | 4 | 8.5 |
| 21 | 1120 | 2 | 6.0 | 820 | 1 | 2.2 | 756 | 2 | 4.1 |
| 22 | 1120 | 2 | 6.0 | 780 | 5 | 11 | 732 | 1 | 2.0 |
| 23 | 1170 | 3 | 9.5 | 812 | 2 | 4.4 | 732 | 2 | 4.0 |
| 24 | 1140 | 5 | 15 | 820 | 4 | 8.9 | 732 | 1 | 2.0 |
| 25 | 1090 | 1 | 2.9 | 812 | 2 | 4.4 | 740 | 2 | 4.0 |
| 26 | 1070 | 5 | 14 | 804 | 1 | 2.2 | 724 | 2 | 3.9 |
| 27 | 1110 | 8 | 24 | 796 | 2 | 4.3 | 716 | 2 | 3.9 |
| 28 | 1090 | 3 | 8.8 | 740 | 3 | 6.0 | 708 | 2 | 3.8 |
| 29 | 1050 | 3 | 8.5 | 679 | 2 | 3.7 | 700 | 2 | 3.8 |
| 30 | 1030 | 2 | 5.6 | --- | --- | --- | 693 | 2 | 3.7 |
| 31 | 986 | 2 | 5.3 | --- | --- | --- | 708 | 3 | 5.7 |
| TOTAL | 35736 | --- | 402.6 | 25423 | --- | 174.7 | 22494 | --- | 286.0 |

WATER-QUALITY RECORDS FOR NORTH FORK FLATHEAD RIVER NEAR COLUMBIA FALLS FOR PERIOD OF RECORD--CONTINUED

SUSPENDED-SEDIMENT DISCHARGE (TONS/DAY), WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | APRIL | | | MAY | | | JUNE | |
| 1 | 764 | 3 | 6.2 | 4280 | 22 | 254 | 9540 | 33 | 850 |
| 2 | 780 | 3 | 6.3 | 5780 | 63 | 983 | 8730 | 25 | 589 |
| 3 | 788 | 3 | 6.4 | 7880 | 167 | 3550 | 8180 | 15 | 331 |
| 4 | 836 | 3 | 6.8 | 9990 | 328 | 8850 | 7650 | 11 | 227 |
| 5 | 959 | 10 | 26 | 10700 | 273 | 7890 | 6940 | 12 | 225 |
| 6 | 1190 | 15 | 48 | 11000 | 181 | 5380 | 6770 | 13 | 238 |
| 7 | 1600 | 28 | 121 | 11300 | 233 | 7110 | 6890 | 11 | 205 |
| 8 | 2230 | 43 | 259 | 12900 | 435 | 15200 | 7180 | 20 | 388 |
| 9 | 3100 | 77 | 644 | 15600 | 591 | 24900 | 8670 | 57 | 1330 |
| 10 | 4140 | 120 | 1340 | 18100 | 612 | 29900 | 10500 | 88 | 2490 |
| 11 | 5340 | 150 | 2160 | 22600 | 931 | 56800 | 10300 | 67 | 1860 |
| 12 | 6380 | 173 | 2980 | 21200 | 614 | 35100 | 9360 | 43 | 1090 |
| 13 | 7700 | 173 | 3600 | 16800 | 240 | 10900 | 8880 | 25 | 599 |
| 14 | 7500 | 93 | 1880 | 17600 | 297 | 14100 | 8180 | 26 | 574 |
| 15 | 6480 | 45 | 787 | 16900 | 248 | 11300 | 7350 | 21 | 417 |
| 16 | 5480 | 32 | 473 | 14100 | 135 | 5140 | 7330 | 18 | 356 |
| 17 | 4820 | 29 | 377 | 13500 | 119 | 4340 | 7730 | 18 | 376 |
| 18 | 4260 | 15 | 173 | 13100 | 116 | 4100 | 7980 | 20 | 431 |
| 19 | 3900 | 8 | 84 | 12200 | 85 | 2800 | 8400 | 26 | 590 |
| 20 | 3640 | 8 | 79 | 12600 | 131 | 4460 | 9120 | 39 | 960 |
| 21 | 3460 | 2 | 19 | 12700 | 104 | 3570 | 9300 | 35 | 879 |
| 22 | 3230 | 2 | 17 | 11200 | 59 | 1780 | 8670 | 22 | 515 |
| 23 | 3050 | 4 | 33 | 11100 | 54 | 1620 | 8640 | 25 | 583 |
| 24 | 3020 | 5 | 41 | 12600 | 112 | 3810 | 8430 | 19 | 432 |
| 25 | 3290 | 23 | 204 | 13700 | 156 | 5770 | 8000 | 11 | 238 |
| 26 | 3250 | 3 | 26 | 12400 | 69 | 2310 | 7400 | 9 | 180 |
| 27 | 3220 | 6 | 52 | 10500 | 35 | 992 | 6650 | 2 | 36 |
| 28 | 3170 | 5 | 43 | 11800 | 63 | 2010 | 6230 | 6 | 101 |
| 29 | 3140 | 5 | 42 | 13200 | 83 | 2960 | 6440 | 13 | 226 |
| 30 | 3350 | 8 | 72 | 11400 | 49 | 1510 | 7450 | 23 | 463 |
| 31 | --- | --- | --- | 10200 | 38 | 1050 | --- | --- | --- |
| TOTAL | 104067 | --- | 15605.7 | 398930 | --- | 280439 | 242890 | --- | 17779 |
| | | JULY | | | AUGUST | | | SEPTEMBER | |
| 1 | 8790 | 36 | 854 | 2870 | 3 | 23 | 2090 | 2 | 11 |
| 2 | 8230 | 32 | 711 | 2790 | 1 | 7.5 | 2010 | 2 | 11 |
| 3 | 7350 | 23 | 456 | 2790 | 6 | 45 | 1910 | 4 | 21 |
| 4 | 6990 | 12 | 226 | 2750 | 2 | 15 | 1850 | 5 | 25 |
| 5 | 6990 | 8 | 151 | 2870 | 2 | 15 | 1780 | 2 | 9.6 |
| 6 | 6890 | 14 | 260 | 2880 | 3 | 23 | 1750 | 3 | 14 |
| 7 | 6870 | 12 | 223 | 2980 | 3 | 24 | 1780 | 2 | 9.6 |
| 8 | 7200 | 6 | 117 | 2880 | 6 | 47 | 1760 | 2 | 9.5 |
| 9 | 7400 | 11 | 220 | 4370 | 52 | 614 | 1690 | 2 | 9.1 |
| 10 | 6820 | 10 | 184 | 5320 | 45 | 646 | 1620 | 7 | 31 |
| 11 | 6230 | 8 | 135 | 4860 | 16 | 211 | 1560 | 11 | 46 |
| 12 | 6160 | 16 | 266 | 4310 | 6 | 70 | 1540 | 2 | 8.3 |
| 13 | 6870 | 14 | 260 | 3860 | 2 | 21 | 1500 | 4 | 16 |
| 14 | 6390 | 3 | 52 | 3550 | 5 | 48 | 1450 | 6 | 23 |
| 15 | 5770 | 9 | 140 | 3480 | 8 | 75 | 1400 | 2 | 7.6 |
| 16 | 5320 | 15 | 215 | 3490 | 5 | 47 | 1350 | 4 | 15 |
| 17 | 5040 | 10 | 136 | 3780 | 4 | 41 | 1310 | 3 | 11 |
| 18 | 4900 | 7 | 93 | 3640 | 3 | 29 | 1300 | 2 | 7.0 |
| 19 | 4770 | 3 | 39 | 3320 | 2 | 18 | 1280 | 2 | 6.9 |
| 20 | 4610 | 4 | 50 | 3190 | 1 | 8.6 | 1250 | 3 | 10 |
| 21 | 4470 | 3 | 36 | 3250 | 3 | 26 | 1220 | 2 | 6.6 |
| 22 | 4180 | 6 | 68 | 3080 | 7 | 58 | 1180 | 5 | 16 |
| 23 | 3900 | 5 | 53 | 2960 | 6 | 48 | 1160 | 7 | 22 |
| 24 | 3710 | 3 | 30 | 2910 | 3 | 24 | 1150 | 4 | 12 |
| 25 | 3690 | 3 | 30 | 2770 | 3 | 22 | 1160 | 1 | 3.1 |
| 26 | 3530 | 6 | 57 | 2790 | 4 | 30 | 1140 | 2 | 6.2 |
| 27 | 3370 | 2 | 18 | 2790 | 4 | 30 | 1130 | 3 | 9.2 |
| 28 | 3250 | 3 | 26 | 2640 | 3 | 21 | 1110 | 3 | 9.0 |
| 29 | 3100 | 4 | 33 | 2480 | 5 | 33 | 1090 | 7 | 21 |
| 30 | 3060 | 4 | 33 | 2330 | 2 | 13 | 1060 | 2 | 5.7 |
| 31 | 3030 | 5 | 41 | 2190 | 6 | 35 | --- | --- | --- |
| TOTAL | 168900 | --- | 5213 | 100190 | --- | 2368.1 | 43580 | --- | 412.4 |
| YEAR | 1305723 | | 330702.1 | | | | | | |

SUSPENDED-SEDIMENT DISCHARGE (TONS/DAY), WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | OCTOBER | | | NOVEMBER | | | DECEMBER | |
| 1 | 1040 | 5 | 14 | 790 | 6 | 13 | 730 | 6 | 12 |
| 2 | 1030 | 8 | 22 | 897 | 2 | 4.8 | 680 | 6 | 11 |
| 3 | 1040 | 6 | 17 | 870 | 3 | 7.0 | 659 | 6 | 11 |
| 4 | 1040 | 5 | 14 | 830 | 3 | 6.7 | 619 | 7 | 12 |
| 5 | 1020 | 3 | 8.3 | 814 | 4 | 8.8 | 593 | 2 | 3.2 |
| 6 | 1010 | 4 | 11 | 790 | 4 | 8.5 | 613 | 2 | 3.3 |
| 7 | 990 | 6 | 16 | 775 | 2 | 4.2 | 645 | 6 | 10 |
| 8 | 970 | 5 | 13 | 760 | 3 | 6.2 | 687 | 5 | 9.3 |
| 9 | 940 | 3 | 7.6 | 753 | 3 | 6.1 | 666 | 8 | 14 |
| 10 | 920 | 5 | 12 | 738 | 3 | 6.0 | 626 | 9 | 15 |
| 11 | 910 | 5 | 12 | 715 | 6 | 12 | 606 | 10 | 16 |
| 12 | 897 | 2 | 4.8 | 673 | 7 | 13 | 587 | 10 | 16 |
| 13 | 879 | 2 | 4.7 | 632 | 9 | 15 | 568 | 11 | 17 |
| 14 | 854 | 1 | 2.3 | 632 | 8 | 14 | 568 | 2 | 3.1 |
| 15 | 838 | 1 | 2.3 | 666 | 19 | 34 | 556 | 7 | 11 |
| 16 | 830 | 2 | 4.5 | 673 | 2 | 3.6 | 587 | 7 | 11 |
| 17 | 822 | 5 | 11 | 687 | 2 | 3.7 | 613 | 7 | 12 |
| 18 | 814 | 2 | 4.4 | 738 | 2 | 4.0 | 587 | 3 | 4.8 |
| 19 | 798 | 2 | 4.3 | 768 | 2 | 4.1 | 568 | 7 | 11 |
| 20 | 783 | 2 | 4.2 | 745 | 2 | 4.0 | 520 | 6 | 8.4 |
| 21 | 768 | 3 | 6.2 | 680 | 11 | 20 | 450 | 4 | 4.9 |
| 22 | 760 | 3 | 6.2 | 701 | 15 | 28 | 400 | 4 | 4.3 |
| 23 | 753 | 3 | 6.1 | 701 | 5 | 9.5 | 410 | 5 | 5.5 |
| 24 | 745 | 2 | 4.0 | 708 | 4 | 7.6 | 420 | 6 | 6.8 |
| 25 | 745 | 2 | 4.0 | 768 | 2 | 4.1 | 430 | 6 | 7.0 |
| 26 | 745 | 3 | 6.0 | 701 | 3 | 5.7 | 450 | 3 | 3.6 |
| 27 | 738 | 5 | 10 | 600 | 2 | 3.2 | 470 | 1 | 1.3 |
| 28 | 723 | 8 | 16 | 659 | 3 | 5.3 | 450 | 2 | 2.4 |
| 29 | 715 | 5 | 9.7 | 760 | 8 | 16 | 420 | 3 | 3.4 |
| 30 | 715 | 3 | 5.8 | 768 | 7 | 15 | 390 | 3 | 3.2 |
| 31 | 708 | 11 | 21 | --- | --- | --- | 370 | 4 | 4.0 |
| TOTAL | 26540 | --- | 264.4 | 21992 | --- | 293.1 | 16938 | --- | 257.5 |

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | JANUARY | | | FEBRUARY | | | MARCH | |
| 1 | 340 | 4 | 3.7 | 480 | 2 | 2.6 | 487 | 1 | 1.3 |
| 2 | 300 | 3 | 2.4 | 470 | 2 | 2.5 | 498 | 2 | 2.7 |
| 3 | 330 | 2 | 1.8 | 460 | 1 | 1.2 | 487 | 2 | 2.6 |
| 4 | 360 | 2 | 1.9 | 450 | 1 | 1.2 | 482 | 1 | 1.3 |
| 5 | 320 | 2 | 1.7 | 450 | 1 | 1.2 | 471 | 2 | 2.5 |
| 6 | 350 | 2 | 1.9 | 450 | 1 | 1.2 | 471 | 3 | 3.8 |
| 7 | 380 | 2 | 2.1 | 460 | 1 | 1.2 | 493 | 3 | 4.0 |
| 8 | 410 | 3 | 3.3 | 460 | 1 | 1.2 | 568 | 2 | 3.1 |
| 9 | 440 | 4 | 4.8 | 470 | 2 | 2.5 | 556 | 2 | 3.0 |
| 10 | 470 | 4 | 5.1 | 480 | 2 | 2.6 | 526 | 2 | 2.8 |
| 11 | 500 | 4 | 5.4 | 480 | 1 | 1.3 | 504 | 2 | 2.7 |
| 12 | 520 | 4 | 5.6 | 490 | 2 | 2.6 | 487 | 2 | 2.6 |
| 13 | 540 | 4 | 5.8 | 500 | 4 | 5.4 | 487 | 2 | 2.6 |
| 14 | 560 | 3 | 4.5 | 520 | 3 | 4.2 | 487 | 2 | 2.6 |
| 15 | 580 | 3 | 4.7 | 532 | 2 | 2.9 | 476 | 1 | 1.3 |
| 16 | 580 | 3 | 4.7 | 526 | 2 | 2.8 | 471 | 1 | 1.3 |
| 17 | 580 | 3 | 4.7 | 520 | 3 | 4.2 | 465 | 1 | 1.3 |
| 18 | 590 | 2 | 3.2 | 520 | 2 | 2.8 | 465 | 1 | 1.3 |
| 19 | 620 | 2 | 3.3 | 509 | 1 | 1.4 | 460 | 1 | 1.2 |
| 20 | 670 | 2 | 3.6 | 504 | 2 | 2.7 | 430 | 1 | 1.2 |
| 21 | 660 | 2 | 3.6 | 520 | 3 | 4.2 | 440 | 1 | 1.2 |
| 22 | 640 | 2 | 3.5 | 532 | 3 | 4.3 | 450 | 2 | 2.4 |
| 23 | 620 | 2 | 3.3 | 520 | 3 | 4.2 | 460 | 2 | 2.5 |
| 24 | 600 | 2 | 3.2 | 509 | 2 | 2.7 | 470 | 2 | 2.5 |
| 25 | 580 | 2 | 3.1 | 498 | 2 | 2.7 | 487 | 2 | 2.6 |
| 26 | 580 | 2 | 3.1 | 504 | 2 | 2.7 | 487 | 3 | 3.9 |
| 27 | 580 | 3 | 4.7 | 498 | 1 | 1.3 | 493 | 3 | 4.0 |
| 28 | 530 | 4 | 5.7 | 487 | 1 | 1.3 | 498 | 3 | 4.0 |
| 29 | 510 | 4 | 5.5 | --- | --- | --- | 493 | 2 | 2.7 |
| 30 | 500 | 4 | 5.4 | --- | --- | --- | 465 | 1 | 1.3 |
| 31 | 490 | 3 | 4.0 | --- | --- | --- | 471 | 1 | 1.3 |
| TOTAL | 15730 | --- | 119.3 | 13799 | --- | 71.1 | 14985 | --- | 73.6 |

WATER-QUALITY RECORDS FOR NORTH FORK FLATHEAD RIVER NEAR COLUMBIA FALLS FOR PERIOD OF RECORD--CONTINUED

SUSPENDED-SEDIMENT DISCHARGE (TONS/DAY), WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

| DAY | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) | MEAN DISCHARGE (CFS) | MEAN CONCEN-TRATION (MG/L) | SEDIMENT DISCHARGE (TONS/DAY) |
|---|---|---|---|---|---|---|---|---|---|
| | | APRIL | | | MAY | | | JUNE | |
| 1 | 476 | 2 | 2.6 | 6370 | 72 | 1240 | 3640 | 6 | 59 |
| 2 | 465 | 2 | 2.5 | 7010 | 126 | 2380 | 4330 | 8 | 94 |
| 3 | 460 | 2 | 2.5 | 7930 | 107 | 2290 | 4810 | 10 | 130 |
| 4 | 460 | 3 | 3.7 | 7680 | 70 | 1450 | 4550 | 9 | 111 |
| 5 | 509 | 4 | 5.5 | 6530 | 36 | 635 | 4650 | 12 | 151 |
| 6 | 600 | 8 | 13 | 5550 | 19 | 285 | 5130 | 21 | 291 |
| 7 | 738 | 15 | 30 | 4880 | 13 | 171 | 5550 | 33 | 495 |
| 8 | 1000 | 21 | 57 | 4590 | 10 | 124 | 5960 | 47 | 756 |
| 9 | 1620 | 29 | 127 | 4940 | 16 | 213 | 6000 | 43 | 697 |
| 10 | 2090 | 32 | 181 | 5930 | 33 | 528 | 5510 | 27 | 402 |
| 11 | 2080 | 16 | 90 | 7750 | 113 | 2360 | 4850 | 17 | 223 |
| 12 | 1940 | 10 | 52 | 7930 | 109 | 2330 | 4330 | 11 | 129 |
| 13 | 1920 | 13 | 67 | 6820 | 31 | 571 | 3970 | 9 | 96 |
| 14 | 1960 | 5 | 26 | 6320 | 17 | 290 | 3730 | 8 | 81 |
| 15 | 1890 | 6 | 31 | 6050 | 15 | 245 | 3580 | 20 | 193 |
| 16 | 1890 | 8 | 41 | 5640 | 10 | 152 | 3580 | 11 | 106 |
| 17 | 2030 | 5 | 27 | 5130 | 9 | 125 | 3510 | 4 | 38 |
| 18 | 1980 | 5 | 27 | 4710 | 7 | 89 | 3320 | 3 | 27 |
| 19 | 1870 | 5 | 25 | 4290 | 8 | 93 | 3170 | 3 | 26 |
| 20 | 1750 | 3 | 14 | 3950 | 5 | 53 | 3020 | 2 | 16 |
| 21 | 1650 | 3 | 13 | 3780 | 4 | 41 | 2930 | 4 | 32 |
| 22 | 1600 | 3 | 13 | 3840 | 4 | 41 | 2820 | 5 | 38 |
| 23 | 1820 | 9 | 44 | 4050 | 4 | 44 | 2710 | 4 | 29 |
| 24 | 2480 | 12 | 80 | 4570 | 10 | 123 | 2580 | 4 | 28 |
| 25 | 3880 | 87 | 978 | 4810 | 9 | 117 | 2460 | 3 | 20 |
| 26 | 5510 | 198 | 2950 | 4610 | 8 | 100 | 2370 | 3 | 19 |
| 27 | 6230 | 172 | 2890 | 4550 | 8 | 98 | 2310 | 3 | 19 |
| 28 | 6070 | 66 | 1080 | 4280 | 6 | 69 | 2210 | 2 | 12 |
| 29 | 5980 | 45 | 727 | 4030 | 4 | 44 | 2090 | 2 | 11 |
| 30 | 6000 | 43 | 697 | 3780 | 6 | 61 | 1990 | 2 | 11 |
| 31 | --- | --- | --- | 3570 | 4 | 39 | --- | --- | --- |
| TOTAL | 68948 | --- | 10296.8 | 165870 | --- | 16401 | 111660 | --- | 4340 |
| | | JULY | | | AUGUST | | | SEPTEMBER | |
| 1 | 1880 | 2 | 10 | 1330 | 1 | 3.6 | 1340 | 2 | 7.2 |
| 2 | 1780 | 2 | 9.6 | 1250 | 1 | 3.4 | 1300 | 2 | 7.0 |
| 3 | 1710 | 3 | 14 | 1200 | 4 | 13 | 1260 | 2 | 6.8 |
| 4 | 1690 | 4 | 18 | 1230 | 2 | 6.6 | 1260 | 2 | 6.8 |
| 5 | 1670 | 3 | 14 | 1190 | 2 | 6.4 | 1480 | 2 | 8.0 |
| 6 | 1610 | 4 | 17 | 1140 | 2 | 6.2 | 1700 | 2 | 9.2 |
| 7 | 1560 | 3 | 13 | 1100 | 2 | 5.9 | 1690 | 2 | 9.1 |
| 8 | 1460 | 2 | 7.9 | 1070 | 1 | 2.9 | 1630 | 2 | 8.8 |
| 9 | 1390 | 4 | 15 | 1040 | 2 | 5.6 | 1570 | 1 | 4.2 |
| 10 | 1360 | 2 | 7.3 | 1010 | 3 | 8.2 | 1460 | 2 | 7.9 |
| 11 | 1340 | 3 | 11 | 970 | 2 | 5.2 | 1370 | 2 | 7.4 |
| 12 | 1310 | 3 | 11 | 942 | 1 | 2.5 | 1290 | 2 | 7.0 |
| 13 | 1370 | 4 | 15 | 951 | 1 | 2.6 | 1220 | 2 | 6.6 |
| 14 | 1460 | 4 | 16 | 1040 | 1 | 2.8 | 1150 | 2 | 6.2 |
| 15 | 1400 | 2 | 7.6 | 1140 | 2 | 6.2 | 1100 | 1 | 3.0 |
| 16 | 1340 | 2 | 7.2 | 1090 | 1 | 2.9 | 1050 | 1 | 2.8 |
| 17 | 1300 | 4 | 14 | 1040 | 1 | 2.8 | 1090 | 1 | 2.9 |
| 18 | 1350 | 3 | 11 | 1000 | 1 | 2.7 | 1070 | 1 | 2.9 |
| 19 | 1360 | 3 | 11 | 960 | 1 | 2.6 | 1030 | 2 | 5.6 |
| 20 | 1340 | 3 | 11 | 933 | 1 | 2.5 | 990 | 2 | 5.3 |
| 21 | 1300 | 2 | 7.0 | 924 | 2 | 5.0 | 970 | 2 | 5.2 |
| 22 | 1270 | 2 | 6.9 | 924 | 2 | 5.0 | 942 | 2 | 5.1 |
| 23 | 1230 | 3 | 10 | 960 | 2 | 5.2 | 915 | 1 | 2.5 |
| 24 | 1190 | 1 | 3.2 | 951 | 2 | 5.1 | 888 | 2 | 4.8 |
| 25 | 1200 | 1 | 3.2 | 990 | 2 | 5.3 | 897 | 2 | 4.8 |
| 26 | 1390 | 1 | 3.8 | 1030 | 2 | 5.6 | 888 | 1 | 2.4 |
| 27 | 1450 | 5 | 20 | 1040 | 2 | 5.6 | 879 | 1 | 2.4 |
| 28 | 1500 | 4 | 16 | 1050 | 2 | 5.7 | 879 | 2 | 4.7 |
| 29 | 1490 | 1 | 4.0 | 1140 | 2 | 6.2 | 980 | 2 | 5.3 |
| 30 | 1440 | 1 | 3.9 | 1280 | 2 | 6.9 | 1040 | 2 | 5.6 |
| 31 | 1380 | 1 | 3.7 | 1340 | 2 | 7.2 | --- | --- | --- |
| TOTAL | 44520 | --- | 322.3 | 33255 | --- | 157.4 | 35328 | --- | 167.5 |
| YEAR | 569565 | | 32784.0 | | | | | | |

WATER-QUALITY RECORDS FOR NORTH FORK FLATHEAD RIVER NEAR COLUMBIA FALLS FOR PERIOD OF RECORD--CONTINUED

WATER QUALITY DATA

| DATE | TIME | TEMPER-ATURE (DEG C) | INSTAN-TANEOUS DIS-CHARGE (CFS) | SUS-PENDED SEDI-MENT (MG/L) | SUS-PENDED SEDI-MENT DIS-CHARGE (T/DAY) | SUS. SED. SIEVE DIAM. % FINER THAN .062 MM | SUS. SED. FALL DIAM. % FINER THAN .004 MM | SUS. SED. FALL DIAM. % FINER THAN .016 MM | SUS. SED. FALL DIAM. % FINER THAN .062 MM | SUS. SED. FALL DIAM. % FINER THAN .125 MM | SUS. SED. FALL DIAM. % FINER THAN .250 MM | SUS. SED. FALL DIAM. % FINER THAN .500 MM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAY , 1976 | | | | | | | | | | | | |
| 10... | 1800 | 7.0 | 18700 | 524 | 26500 | -- | 22 | 41 | 80 | 92 | 97 | 100 |
| JUN , 1977 | | | | | | | | | | | | |
| 21... | 1000 | 12.0 | 2890 | 2 | 16 | 80 | -- | -- | -- | -- | -- | -- |
| JUL | | | | | | | | | | | | |
| 28... | 1000 | 15.5 | 1500 | 3 | 12 | 56 | -- | -- | -- | -- | -- | -- |
| AUG | | | | | | | | | | | | |
| 23... | 1130 | 14.5 | 972 | 4 | 10 | 79 | -- | -- | -- | -- | -- | -- |
| SEP | | | | | | | | | | | | |
| 22... | 1100 | 8.5 | 942 | 2 | 5.1 | 20 | -- | -- | -- | -- | -- | -- |

PERIPHYTON ANALYSES (NOV. 75 - SEPT. 77)

| DATE | LENGTH OF EXPOS-SURE (DAYS) | BIOMASS WEIGHT DRY ($MG/M^2$) | BIOMASS WEIGHT ASH ($MG/M^2$) | BIOMASS PIGMENT RATIO | BIOMASS CHLOROPHYLL RATIO | SPECTROPHOTOMETRIC UNCORRECTED CHLORO A ($MG/M^2$) | SPECTROPHOTOMETRIC UNCORRECTED CHLORO B ($MG/M^2$) | SPECTROPHOTOMETRIC CHROMATOGRAPHIC CHLORO A ($MG/M^2$) | SPECTROPHOTOMETRIC CHROMATOGRAPHIC CHLORO B ($MG/M^2$) | CHROMATOGRAPHIC FLUOROMETRIC CHLORO A ($MG/M^2$) | CHROMATOGRAPHIC FLUOROMETRIC CHLORO B ($MG/M^2$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1975 NOV 7 | 28 | 1500 | 1400 | 1600 | -- | 0.000 | 0.000 | -- | -- | -- | -- |
| 1976 APR 27 | 32 | 8230 | 6850 | 10 | -- | 0.000 | 0.000 | -- | -- | -- | -- |
| MAY 28 | 31 | 462 | 154 | 10 | -- | 0.000 | 0.000 | -- | -- | -- | -- |
| JUL 23 | 35 | 6460 | 5230 | 960 | -- | 1.28 | 0.098 | -- | -- | -- | -- |
| AUG 19 | 27 | 20700 | 18500 | 610 | -- | 3.65 | 0.000 | -- | -- | -- | -- |
| SEP 24 | 36 | 8690 | 7620 | 740 | -- | 1.47 | 0.070 | -- | -- | -- | -- |
| OCT 21 | 27 | 2770 | 2310 | -- | 5180 | -- | -- | 0.089 | 0.038 | -- | -- |
| 1977 JUNE 21 | 33 | -- | -- | -- | -- | -- | -- | -- | -- | 0.023 | 0.002 |
| JULY 28 | 37 | 3940 | 3310 | -- | 4770 | -- | -- | -- | -- | 0.132 | 0.110 |
| SEP 22 | 30 | 3230 | 2830 | -- | 1240 | -- | -- | -- | -- | 0.324 | 0.038 |

PHYTOPLANKTON ANALYSES (OCT,1975 - AUG,1976)

| DATE | OCT 10,75 | | NOV 7,75 | | DEC 10,75 | | JAN 26,76 | | FEB 24,76 | |
|---|---|---|---|---|---|---|---|---|---|---|
| TIME | 1100 | | 1030 | | 1330 | | 1300 | | 1300 | |
| TOTAL CELLS/ML | 46 | | 380 | | 310 | | 140 | | 270 | |
| DIVERSITY: DIVISION | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| .CLASS | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| ..ORDER | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| ...FAMILY | 1.4 | | 2.3 | | 1.7 | | 1.6 | | 2.0 | |
| ....GENUS | 1.4 | | 2.6 | | 1.9 | | 1.6 | | 2.0 | |
| ORGANISM | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT |
| CHRYSOPHYTA | | | | | | | | | | |
| .BACILLARIOPHYCEAE | | | | | | | | | | |
| ..CENTRALES | | | | | | | | | | |
| ...COSCINODISCACEAE | | | | | | | | | | |
| ....CYCLOTELLA | -- | - | * | 0 | -- | - | -- | - | -- | - |
| ....MELOSIRA | -- | - | * | 0 | -- | - | -- | - | -- | - |
| ..PENNALES | | | | | | | | | | |
| ...ACHNANTHACEAE | | | | | | | | | | |
| ....ACHNANTHES | -- | - | 130# | 33 | 61# | 20 | 72# | 50 | 43# | 16 |
| ....COCCONEIS | -- | - | 16 | 4 | 15 | 5 | -- | - | -- | - |
| ...CYMBELLACEAE | | | | | | | | | | |
| ....CYMBELLA | 9# | 20 | 31 | 8 | 31 | 10 | * | 0 | 11 | 4 |
| ...DIATOMACEAE | | | | | | | | | | |
| ....DIATOMA | -- | - | -- | - | 15 | 5 | -- | - | -- | - |
| ...FRAGILARIACEAE | | | | | | | | | | |
| ....HANNAEA | -- | - | 16 | 4 | * | 0 | * | 0 | -- | - |
| .....H.ARCUS | -- | - | -- | - | -- | - | -- | - | 11 | 4 |
| ....SYNEDRA | * | 0 | 16 | 4 | * | 0 | -- | - | -- | - |
| ...GOMPHONEMATACEAE | | | | | | | | | | |
| ....GOMPHONEMA | 9# | 20 | 78# | 21 | 170# | 55 | 48# | 33 | 140# | 52 |
| ...MERIDIONACEAE | | | | | | | | | | |
| ....MERIDION | -- | - | * | 0 | -- | - | -- | - | -- | - |
| ...NAVICULACEAE | | | | | | | | | | |
| ....NAVICULA | -- | - | 47 | 13 | -- | - | 12 | 8 | 22 | 8 |
| ...NITZSCHIACEAE | | | | | | | | | | |
| ....NITZSCHIA | 28# | 60 | 47 | 13 | 15 | 5 | 12 | 8 | 43# | 16 |

| DATE | MAR 26,76 | | MAY 28,76 | | JUN 18,76 | | JUL 23,76 | | AUG 19,76 | |
|---|---|---|---|---|---|---|---|---|---|---|
| TIME | 1100 | | 1330 | | 1130 | | 1700 | | 1500 | |
| TOTAL CELLS/ML | 340 | | 280 | | 270 | | 220 | | 1800 | |
| DIVERSITY: DIVISION | 0.4 | | 0.9 | | 0.0 | | 0.0 | | 1.5 | |
| .CLASS | 0.4 | | 1.2 | | 0.3 | | 0.2 | | 1.5 | |
| ..ORDER | 0.5 | | 1.3 | | 0.8 | | 0.2 | | 1.6 | |
| ...FAMILY | 2.3 | | 2.0 | | 2.6 | | 2.0 | | 2.7 | |
| ....GENUS | 2.3 | | 2.1 | | 2.7 | | 2.8 | | 3.1 | |
| ORGANISM | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT |
| CHLOROPHYTA (GREEN ALGAE) | | | | | | | | | | |
| .CHLOROPHYCEAE | | | | | | | | | | |
| ..CHLOROCOCCALES | | | | | | | | | | |
| ...OOCYSTACEAE | | | | | | | | | | |
| ....ANKISTRODESMUS | -- | - | -- | - | -- | - | -- | - | 96 | 5 |
| ....KIRCHNERIELLA | -- | - | -- | - | -- | - | -- | - | 130 | 7 |
| ....OOCYSTIS | -- | - | 4 | 1 | -- | - | -- | - | -- | - |
| ...SCENEDESMACEAE | | | | | | | | | | |
| ....CRUCIGENIA | -- | - | -- | - | -- | - | -- | - | 130 | 7 |
| ....SCENEDESMUS | -- | - | -- | - | -- | - | -- | - | 540# | 30 |
| ..TETRASPORALES | | | | | | | | | | |
| ...COCCOMYXACEAE | | | | | | | | | | |
| ....ELAKATOTHRIX | -- | - | -- | - | -- | - | * | 0 | -- | - |
| ..ULOTRICHALES | | | | | | | | | | |
| ...ULOTRICHACEAE | | | | | | | | | | |
| ....ULOTHRIX | -- | - | 180# | 63 | -- | - | -- | - | -- | - |
| ..VOLVOCALES | | | | | | | | | | |
| ...CHLAMYDOMONADACEAE | | | | | | | | | | |
| ....CHLAMYDOMONAS | 18 | 5 | -- | - | -- | - | -- | - | -- | - |
| ..ZYGNEMATALES | | | | | | | | | | |
| ...DESMIDIACEAE | | | | | | | | | | |
| ....CLOSTERIUM | 9 | 3 | -- | - | -- | - | -- | - | -- | - |

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

PHYTOPLANKTON ANALYSES (MAR,1976 - AUG,1976)

| DATE | MAR 26,76 | | MAY 28,76 | | JUN 18,76 | | JUL 23,76 | | AUG 19,76 | |
|---|---|---|---|---|---|---|---|---|---|---|
| TIME | 1100 | | 1330 | | 1130 | | 1700 | | 1500 | |
| ORGANISM | CELLS /ML | PER- ENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT |
| CHRYSOPHYTA | | | | | | | | | | |
| .BACILLARIOPHYCEAE | | | | | | | | | | |
| ..CENTRALES | | | | | | | | | | |
| ...COSCINODISCACEAE | | | | | | | | | | |
| ....CYCLOTELLA | -- | - | -- | - | 16 | 6 | -- | - | 32 | 2 |
| ....MELOSIRA | -- | - | -- | - | 8 | 3 | -- | - | -- | - |
| ..PENNALES | | | | | | | | | | |
| ...ACHNANTHACEAE | | | | | | | | | | |
| ....ACHNANTHES | 46 | 14 | 8 | 3 | 16 | 6 | 24 | 11 | 64 | 4 |
| ....COCCONEIS | * | 0 | -- | - | -- | - | 6 | 3 | 32 | 2 |
| ...CYMBELLACEAE | | | | | | | | | | |
| ....CYMBELLA | 64# | 19 | 4 | 1 | 8 | 3 | 18 | 8 | -- | - |
| ...DIATOMACEAE | | | | | | | | | | |
| ....DIATOMA | 9 | 3 | -- | - | * | 0 | -- | - | 32 | 2 |
| ...EUNOTIACEAE | | | | | | | | | | |
| ....EUNOTIA | -- | - | 4 | 1 | -- | - | -- | - | -- | - |
| ...FRAGILARIACEAE | | | | | | | | | | |
| ....ASTERIONELLA | -- | - | * | 0 | -- | - | -- | - | -- | - |
| ....FRAGILARIA | -- | - | 20 | 7 | -- | - | 36# | 16 | -- | - |
| ....HANNAEA | -- | - | 4 | 1 | 16 | 6 | 24 | 11 | -- | - |
| ....SYNEDRA | -- | - | 4 | 1 | -- | - | 42# | 19 | 96 | 5 |
| ...GOMPHONEMATACEAE | | | | | | | | | | |
| ....GOMPHONEMA | 130# | 38 | 20 | 7 | 65# | 24 | 61# | 27 | 130 | 7 |
| ...MERIDIONACEAE | | | | | | | | | | |
| ....MERIDION | 64# | 19 | 4 | 1 | -- | - | -- | - | -- | - |
| ...NAVICULACEAE | | | | | | | | | | |
| ....NAVICULA | -- | - | -- | - | 40# | 15 | -- | - | 64 | 4 |
| ...NITZSCHIACEAE | | | | | | | | | | |
| ....NITZSCHIA | -- | - | 16 | 6 | 81# | 30 | -- | - | 130 | 7 |
| ...TABELLARIACEAE | | | | | | | | | | |
| ....TABELLARIA | -- | - | -- | - | -- | - | 6 | 3 | -- | - |
| .CHRYSOPHYCEAE | | | | | | | | | | |
| ..CHRYSOMONADALES | | | | | | | | | | |
| ...OCHROMONADACEAE | | | | | | | | | | |
| ....DINOBRYON | -- | - | 16 | 6 | 16 | 6 | 6 | 3 | -- | - |
| CYANOPHYTA (BLUE-GREEN ALGAE) | | | | | | | | | | |
| .CYANOPHYCEAE | | | | | | | | | | |
| ..CHROCCOCCALES | | | | | | | | | | |
| ...CHROCOCCACEAE | | | | | | | | | | |
| ....ANACYSTIS | -- | - | -- | - | -- | - | -- | - | 350# | 19 |
| ..HORMOGONALES | | | | | | | | | | |
| ...NOSTOCACEAE | | | | | | | | | | |
| ....ANABAENA | -- | - | -- | - | * | 0 | -- | - | -- | - |

PHYTOPLANKTON ANALYSES (SEP,1976 - JAN,1977)

| DATE | SEP 24,76 | | OCT 21,76 | | NOV 23,76 | | DEC 21,76 | | JAN 20,77 | |
|---|---|---|---|---|---|---|---|---|---|---|
| TIME | 1030 | | 1130 | | 1000 | | 1130 | | 1300 | |
| TOTAL CELLS/ML | 9 | | 89 | | 210 | | 42 | | 41 | |
| DIVERSITY: DIVISION | 0.0 | | 0.0 | | 1.0 | | 0.0 | | 0.7 | |
| .CLASS | 0.0 | | 0.0 | | 1.0 | | 0.0 | | 0.7 | |
| ..ORDER | 0.0 | | 0.0 | | 1.0 | | 0.8 | | 1.7 | |
| ...FAMILY | 2.2 | | 2.3 | | 1.6 | | 1.8 | | 1.7 | |
| ....GENUS | 2.3 | | 2.6 | | 1.7 | | 1.8 | | 1.7 | |
| ORGANISM | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT | CELLS /ML | PER- CENT |
| CHLOROPHYTA (GREEN ALGAE) | | | | | | | | | | |
| .CHLOROPHYCEAE | | | | | | | | | | |
| ..ZYGNEMATALES | | | | | | | | | | |
| ...ZYGNEMATACEAE | | | | | | | | | | |
| ....MOUGEOTIA | -- | - | -- | - | 2 | 1 | -- | - | -- | - |
| CHRYSOPHYTA | | | | | | | | | | |
| .BACILLARIOPHYCEAE | | | | | | | | | | |
| ..CENTRALES | | | | | | | | | | |
| ...COSCINODISCACEAE | | | | | | | | | | |
| ....CYCLOTELLA | -- | - | -- | - | -- | - | 10# | 24 | -- | - |
| ....MELOSIRA | -- | - | -- | - | -- | - | -- | - | 5 | 13 |
| ..PENNALES | | | | | | | | | | |
| ...ACHNANTHACEAE | | | | | | | | | | |
| ....ACHNANTHES | 1 | 11 | 16# | 18 | 20 | 9 | -- | - | -- | - |
| ....COCCONEIS | 0 | 3 | 4 | 5 | 2 | 1 | -- | - | -- | - |
| ...CYMBELLACEAE | | | | | | | | | | |
| ....AMPHORA | -- | - | * | 0 | -- | - | -- | - | -- | - |
| ....CYMBELLA | 1 | 8 | 6 | 9 | 2 | 1 | -- | - | -- | - |
| ...DIATOMACEAE | | | | | | | | | | |
| ....DIATOMA | 0 | 3 | 4 | 5 | -- | - | 5 | 12 | -- | - |
| ...FRAGILARIACEAE | | | | | | | | | | |
| ....HANNAEA | * | 0 | 4 | 5 | 2 | 1 | -- | - | -- | - |
| ....SYNEDRA | 1 | 14 | 8 | 9 | 17 | 8 | 7# | 18 | -- | - |
| ...GOMPHONEMATACEAE | | | | | | | | | | |
| ....GOMPHONEMA | 5# | 49 | 36# | 41 | 17 | 8 | 20# | 47 | -- | - |
| ...NAVICULACEAE | | | | | | | | | | |
| ....NAVICULA | 1 | 8 | 4 | 5 | -- | - | -- | - | -- | - |
| ...NITZSCHIACEAE | | | | | | | | | | |
| ....NITZSCHIA | 0 | 5 | 4 | 5 | 2 | 1 | -- | - | 3 | 7 |
| CYANOPHYTA (BLUE-GREEN ALGAE) | | | | | | | | | | |
| .CYANOPHYCEAE | | | | | | | | | | |
| ..CHROOCOCCALES | | | | | | | | | | |
| ...CHROOCOCCACEAE | | | | | | | | | | |
| ....ANACYSTIS | -- | - | -- | - | -- | - | -- | - | 19# | 47 |
| ..HORMOGONALES | | | | | | | | | | |
| ...NOSTOCACEAE | | | | | | | | | | |
| ....ANABAENA | -- | - | -- | - | -- | - | -- | - | 14# | 33 |
| ...OSCILLATORIACEAE | | | | | | | | | | |
| ....OSCILLATORIA | * | 0 | -- | - | 150# | 69 | -- | - | -- | - |

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

PHYTOPLANKTON ANALYSES (FEB,1977 - AUG,1977)

| DATE | FEB 23,77 | MAY 19,77 | JUN 21,77 | JUL 28,77 | AUG 23,77 |
|---|---|---|---|---|---|
| TIME | 1100 | 1030 | 1000 | 1000 | 1130 |
| TOTAL CELLS/ML | 14 | 6800 | 550 | 54 | 23 |
| DIVERSITY: DIVISION | 0.0 | 0.1 | 0.3 | 0.4 | 0.0 |
| .CLASS | 0.0 | 0.1 | 0.3 | 0.4 | 0.0 |
| ..ORDER | 0.0 | 0.1 | 0.3 | 0.4 | 0.0 |
| ...FAMILY | 1.0 | 0.2 | 0.4 | 2.2 | 1.0 |
| ....GENUS | 1.0 | 0.2 | 0.4 | 2.2 | 1.0 |

| ORGANISM | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT | CELLS /ML | PER-CENT |
|---|---|---|---|---|---|---|---|---|---|---|
| CHLOROPHYTA (GREEN ALGAE) | | | | | | | | | | |
| .CHLOROPHYCEAE | | | | | | | | | | |
| ..CHLOROCOCCALES | | | | | | | | | | |
| ...SCENEDESMACEAE | | | | | | | | | | |
| ....ACTINASTRUM | -- | - | -- | - | * | 0 | -- | - | -- | - |
| ..ZYGNEMATALES | | | | | | | | | | |
| ...DESMIDIACEAE | | | | | | | | | | |
| ....STAURASTRUM | -- | - | -- | - | * | 0 | -- | - | -- | - |
| CHRYSOPHYTA | | | | | | | | | | |
| .BACILLARIOPHYCEAE | | | | | | | | | | |
| ..CENTRALES | | | | | | | | | | |
| ...COSCINODISCACEAE | | | | | | | | | | |
| ....MELOSIRA | -- | - | -- | - | * | 0 | -- | - | -- | - |
| ..PENNALES | | | | | | | | | | |
| ...ACHNANTHACEAE | | | | | | | | | | |
| ....ACHNANTHES | -- | - | 63 | 1 | -- | - | 8# | 15 | -- | - |
| ....COCCONEIS | -- | - | * | 0 | 3 | 1 | -- | - | -- | - |
| ...CYMBELLACEAE | | | | | | | | | | |
| ....CYMBELLA | 6# | 40 | * | 0 | 6 | 1 | * | 0 | -- | - |
| ...DIATOMACEAE | | | | | | | | | | |
| ....DIATOMA | -- | - | -- | - | * | 0 | -- | - | -- | - |
| ...FRAGILARIACEAE | | | | | | | | | | |
| ....ASTERIONELLA | -- | - | * | 0 | -- | - | -- | - | -- | - |
| ....FRAGILARIA | -- | - | -- | - | -- | - | 25# | 46 | -- | - |
| ....HANNAEA | -- | - | * | 0 | 3 | 1 | -- | - | -- | - |
| ....SYNEDRA | -- | - | * | 0 | -- | - | * | 0 | -- | - |
| ...GOMPHONEMATACEAE | | | | | | | | | | |
| ....GOMPHONEMA | 8# | 60 | * | 0 | 3 | 1 | 8# | 15 | -- | - |
| ...MERIDIONACEAE | | | | | | | | | | |
| ....MERIDION | -- | - | * | 0 | 3 | 1 | -- | - | -- | - |
| ...NAVICULACEAE | | | | | | | | | | |
| ....NAVICULA | -- | - | * | 0 | 9 | 2 | 4 | 8 | 12# | 50 |
| ...NITZSCHIACEAE | | | | | | | | | | |
| ....NITZSCHIA | -- | - | -- | - | -- | - | 4 | 8 | 12# | 50 |
| .CHRYSOPHYCEAE | | | | | | | | | | |
| ..CHRYSOMONADALES | | | | | | | | | | |
| ...OCHROMONADACEAE | | | | | | | | | | |
| ....DINOBRYON | -- | - | * | 0 | -- | - | -- | - | -- | - |
| CYANOPHYTA (BLUE-GREEN ALGAE) | | | | | | | | | | |
| .CYANOPHYCEAE | | | | | | | | | | |
| ..CHROCOCCALES | | | | | | | | | | |
| ...CHROCOCCACEAE | | | | | | | | | | |
| ....ANACYSTIS | -- | - | * | 0 | -- | - | -- | - | -- | - |
| ..HORMOGONALES | | | | | | | | | | |
| ...OSCILLATORIACEAE | | | | | | | | | | |
| ....OSCILLATORIA | -- | - | 6700# | 98 | 520# | 95 | -- | - | -- | - |
| ....SPIRULINA | -- | - | -- | - | * | 0 | -- | - | -- | - |
| EUGLENOPHYTA (EUGLENOIDS) | | | | | | | | | | |
| .CRYPTOPHYCEAE | | | | | | | | | | |
| ..CRYPTOMONIDALES | | | | | | | | | | |
| ...CRYPTOMONODACEAE | | | | | | | | | | |
| ....CRYPTOMONAS | -- | - | -- | - | * | 0 | -- | - | -- | - |
| .EUGLENOPHYCEAE | | | | | | | | | | |
| ..EUGLENALES | | | | | | | | | | |
| ...EUGLENACEAE | | | | | | | | | | |
| ....EUGLENA | -- | - | -- | - | -- | - | 4 | 8 | -- | - |

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%