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STATISTICAL ANALYSES OF SURFACE-WATER-QUALITY VARIABLES IN THE COAL AREA OF SOUTHEASTERN MONTANA

U.S. GEOLOGICAL SURVEY

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VARIABLES IN THE COAL AREA OF SOUTHEASTERN MONTANA

By J. R. Knapton and R. F. Ferreira

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METRIC CONVERSION TABLE

The following factors may be used to convert inch-pound units published herein to the International System (SI) of metric units.

Multiply inch-pound unit	By	To obtain SI unit
acre-foot (acre-ft)	1233	cubic meter (m^3)
acre	0.4047	hectare (ha)
cubic foot per second (ft^3/s)	28.32	liter per second (L/s)
foot (ft)	0.3048	meter (m)
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)
inch (in)	25.40	millimeter (mm)
mile (mi)	1.609	kilometer (km)
pound (lb)	453.6	gram (g)
ton (short) per day (ton/day)	0.9072	megagram per day (Mg/d)

temperature, degrees Celsius (^{o}C) = 0.556 (^{o}F-32)

STATISTICAL ANALYSES OF SURFACE-WATER-QUALITY VARIABLES IN THE COAL AREA OF SOUTHEASTERN MONTANA

By

J. R. Knapton and R. F. Ferreira

ABSTRACT

Since 1974 a network of water-quality stations has been operated in the coal area in southeastern Montana. This report updates a previous report with 2 years of additional data and presents descriptive statistics and regression equations for water-quality variables.

The most apparent finding of the study is the variability of water quality. Time-trend differences are most noticeable, with areal differences present but more subtle. The dominance of either the base-flow or the direct-runoff components of flow accounts for much of the variability in time. Areal differences are produced mostly by lithology, soil types, and land-use practices.

In comparing stations at the mouths of the five major drainages entering the Yellowstone River from the study area, water from the Powder River ranks near the middle of the group in dissolved-solids concentrations, but far exceeds the other drainages in suspended-sediment and total recoverable-constituent concentrations. The Powder River near Locate has a mean dissolved-solids concentration of 1,380 mg/L (milligrams per liter) and suspended-sediment concentrations that are often in excess of 10,000 mg/L.

The Tongue River generally has the best overall quality with respect to dissolved solids; extremes are moderated by mixing in the Tongue River Reservoir. The mean dissolved-solids concentration is 548 mg/L with a range of 234-912 mg/L. Water that is relatively free of sediment as it passes from the dam picks up sediment in transit downstream. Suspended-sediment concentration ranged from 5 to 4,360 mg/L at the mouth.

Rosebud Creek shows about a 50-percent average increase in dissolved-solids concentration from the most upstream station to the mouth, and a modification in the chemical character of the water. Mean dissolved-solids concentration at the mouth is 878 mg/L and mean suspended-sediment concentration is 572 mg/L.

Armells and Sarpy Creeks, smallest of the five drainages, have a pool-riffle configuration that influences both dissolved and suspended constituents. Pools permit greater evaporation and transpiration, thus increasing dissolved-constituent concentrations. Pools also act as sediment traps. Primarily as a result of the pools, these streams had the highest and lowest concentrations, respectively, for dissolved solids and suspended sediment.

Using the available data and statistical techniques, regression equations were developed for the physical and chemical water-quality variables. Regressions were used to simulate dissolved-solids loads for selected stations.

INTRODUCTION

Vast deposits of low sulfur coal that underlie much of southeastern Montana will likely serve as a means to satisfy part of the Nation's future energy demand. Recent and proposed land-use changes resulting from mining of the coal and related activities are thought by many to be a threat to the environment. Of special concern is the degradation of the quality of the water, both surface and subsurface.

Historically the major water use in the region has been for agriculture--predominantly for irrigation of croplands and for stock watering. Agricultural use of water is shown to be responsible for varying degrees of change in the quality and quantity of water (Bondurant, 1971). In this region hundreds of small and a few large impoundments and diversions of water for croplands give evidence that the quality and quantity of surface water have been subject to the influence of agriculture. Mining, which presently is accelerating, has had little measured affect on surface-water quality to date. However, at this time (1979), mining may be in its infancy.

This report is the second in a series of evaluations of data obtained from a surface-water-quality network (fig. 1) that was initiated in 1974. It provides an insight into water quality throughout the area of study and enables comparisons of values from stream locations to some of the important water-use standards. Funding for the network was provided by the U.S. Geological Survey, the U.S. Bureau of Land Management, and the U.S. Environmental Protection Agency.

Purpose and scope

The purpose of this report is to summarize and evaluate water-quality data acquired within the study area from October 1974 to September 1978. The report updates an initial report with information obtained from 2 years of additional data collection. The additional data enable a more comprehensive statistical evaluation, including development of regression equations between water-quality variables.

The network of stations consists of 43 stream sites at which routine sampling is done for about 60 different water-quality variables. Stations considered as primary sites are operated in conjunction with gaging stations and are planned to be semipermanent. The remaining stations are designated as secondary. These sites are generally in the upper parts of drainages or on small tributaries. Once a 2-3 year data base is acquired at secondary stations, they are subject to relocation.

Previous work

This report represents the second phase of evaluation of data from the Geological Survey water-quality network of southeastern Montana. The first phase of the evaluation culminated in a report (Knapton and McKinley, 1977)

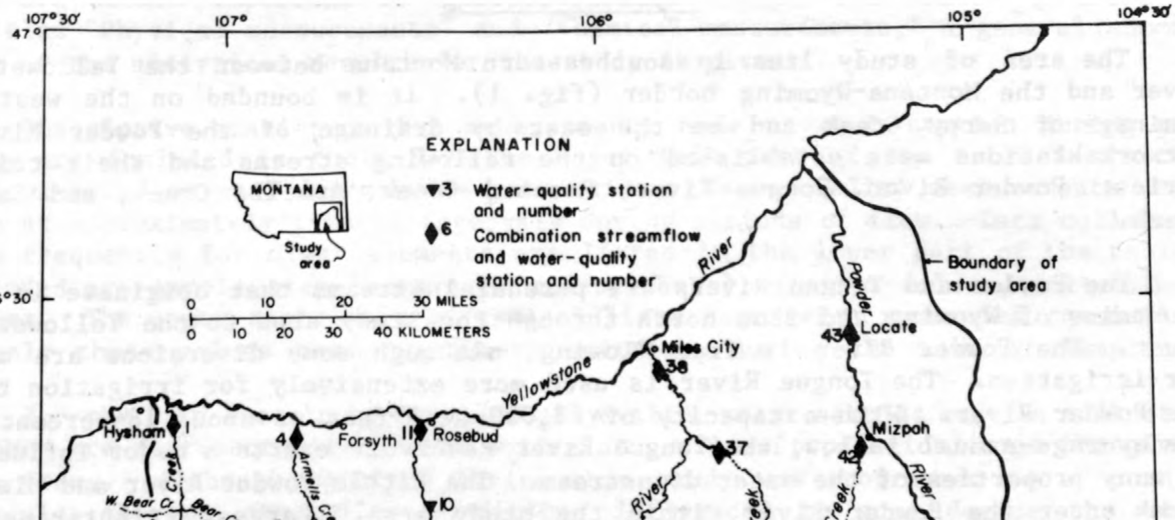

Figure 1.--Location of study area and water-quality stations.

that included a comprehensive description of water-quality conditions at each network site and a comparison of conditions at stations within each major drainage. The evaluation was done after the first 2 years of network operation, prior to the time that any stations had been relocated. The report gave much detail regarding physical descriptions of each drainage and conditions at individual stations. It also gave information regarding drainage, climate, geology, water-bearing characteristics, soils, and land use as well as comprehensive background of the physical and chemical properties that were measured.

Physical setting

The area of study lies in southeastern Montana between the Yellowstone River and the Montana-Wyoming border (fig. 1). It is bounded on the west by drainage of Sarpy Creek and on the east by drainage of the Powder River. Network stations were established on the following streams and their tributaries: Powder River, Tongue River, Rosebud Creek, Armells Creek, and Sarpy Creek.

The Powder and Tongue Rivers are perennial streams that originate in the mountains of Wyoming and flow north through the study area to the Yellowstone River. The Powder River is free flowing, although some diversions are made for irrigation. The Tongue River is used more extensively for irrigation than the Powder River. With a capacity of 68,000 acre-feet or about 18 percent of the average annual inflow, the Tongue River Reservoir exerts a major influence on many properties of the water downstream. The Little Powder River and Mizpah Creek enter the Powder River within the study area. Largest tributaries to the Tongue River are Hanging Woman Creek, Otter Creek, and Pumpkin Creek.

Rosebud, Armells, and Sarpy Creeks originate in the study area and flow north to the Yellowstone River. Rosebud Creek has the largest drainage area of the three streams and flows perennially from the uplands to the mouth. Armells and Sarpy Creeks are intermittent in their upstream drainage and in dry years frequently have little or no flow at their mouths. These three streams, their tributaries, and the many small tributaries of the Powder and Tongue Rivers are dammed in numerous places. The small impoundments affect both the quantity and quality of the water.

Surface runoff in the area, most prevalent during late winter and spring months, results from snowmelt and rainstorms. Mean annual precipitation varies from 12 to 16 inches and snowfall varies from 35 to 50 inches. Early thaws cause many intermittent streams to flow. At times of high streamflow, the adjacent aquifers including stream alluvium are recharged. When the streamflow subsides to normal amounts, the aquifers discharge to the streams.

WATER QUALITY

Because of the large number of variables, no simple quantitative means is available to describe all aspects of water. By convention, water-quality variables are divided into categories of physical, chemical, and biological; and each category includes a large number of variables. Values of measurements are often compared to criteria that have been established to judge the suitability of water for various uses. Water that is suitable for a particular use may not necessarily meet the criteria for other uses.

In this study emphasis was placed on the physical and chemical aspects of water quality. Under each category, water-quality variables or variable groups are discussed. Each discussion includes a brief definition of the variable, and when appropriate, a reference to user criteria or water-quality standards that are deemed important to the study area. Under the following sections entitled "Physical measurements" and "Chemical measurements," a general summation of the analytical results for the study is given.

Descriptive statistics for measurements made at each station during the study are included in table 1. The upper left part of the table lists the variables and several descriptive statistics. Water-quality measurements were made at approximately 1-month intervals during periods of flow. Data collected less frequently for minor elements are listed in the lower part of the table; included are sample size (number of measurements), minimum values, and maximum values. The upper right part of table 1 lists regression summaries consisting of only those values that represent conditions during the time of sampling.

For the data base to be statistically valid, water samples must be collected so they are representative of the entire streamflow (population) over the given time frame. Although sampling during this study was programmed on a monthly schedule, extreme streamflow conditions influenced to some degree the time when samples were collected. Low flows were generally sampled during the routine schedule; however, disruption in monthly sampling sometimes occurred in attempts to sample high flows. Data users should be aware that some bias may exist owing to deviation from the programmed schedule.

Physical measurements

Physical measurements consist of instantaneous stream discharge, suspended sediment, and water temperature. Discharge at the time of sampling either was measured directly or was obtained indirectly from continuous-recording gages. A suspended-sediment sample was collected during each sampling and analyzed to determine concentration and percentage finer than 0.0625 mm. Although both stations on the Powder River and the two farthest-downstream stations on the Tongue River are also daily sediment stations, the data from daily observations were used in this report only to develop regression equations and are not included in other statistical measures. Water temperature was measured at each sampling.

Streamflow

Streamflow hydrographs indicate typical prairie streams having conditions of near base flow, or at times no flow, from late summer through winter. Rainstorms or snowmelt occasionally causes sharp rises in streamflow. Prairie runoff generally occurs in late winter or early spring. The Tongue River and frequently the Powder River have a second period of runoff, often of a greater magnitude, that is caused by snowmelt in the high mountains of Wyoming. Perennial streamflow is common only to the larger drainages. The natural streamflow characteristics of the Tongue River and many smaller streams have been altered by irrigation diversions and impoundments for irrigation and stock watering.

An estimate of the surface-water yield for drainages, or those parts of drainages within the study area, is possible using records from gaging stations at strategic locations. The following table lists the average annual yields for drainages or parts of drainages in the study area.

Drainage	Average annual water yield (acre-feet)
Sarpy Creek (5 years of record)	6,100
Armells Creek (4 years of record)	6,700 (approx)
Rosebud Creek (4 years of record)	54,000 (approx)
Tongue River within study area (34 years of record)	-15,000
Powder River within study area (39 years of record)	115,000

Water yields for Sarpy, Armells, and Rosebud drainages, which have short periods of record at gaging stations near their mouths, may not be indicative of long-term conditions. Long-term records for the Tongue River show nearly a 5-percent loss between gaging stations below the Tongue River Dam and the mouth, even though there are more than 3,600 mi^2 of contributing drainage and evidence of ground-water inflows within the reach. The overall loss is largely attributable to evapotranspiration associated with the irrigation network between the dam and the mouth. The Powder River, with much less irrigation, shows a 35-percent increase in water yield for the area when records at streamflow stations near the mouth and at Moorhead are compared. The Little Powder River, which enters the study area from Wyoming (fig. 1), accounts for some of this gain.

Suspended sediment

Suspended sediment in streams within the study area is derived from a combination of channel erosion and soil erosion from overland flow. The particles that were in suspension as they passed the sampling station were measured as suspended sediment. This measurement does not include that part of the transported load that moves along the streambed.

Although standards are lacking for suspended sediment, high concentrations are detrimental to most water uses and hazardous to many forms of aquatic life. Sediment causes problems in abrasion and clogging when water is pumped for use in sprinkler irrigation. Suspended sediment can affect aquatic organisms by abrasive injury, by obstructing respiratory passages of flora and fauna, and by blanketing the habitat of benthic organisms and spawning beds of fish. By means of adsorption and absorption, suspended sediment also acts as a transporting mechanism for chemical constituents such as phosphorus, nitrogen, carbon, and many of the minor elements.

Concentrations of suspended sediment less than 20 mg/L (milligrams per liter) were infrequently measured at most stations. The majority of concentrations were within the 20-100 mg/L range and only in a few instances did measurements exceed 5,000 mg/L. Daily stations on the Powder River, however, often had concentrations in excess of 10,000 mg/L; the highest concentration for the Powder River at Moorhead was 49,700 mg/L.

Maximum concentrations occurred at times of direct runoff from thawed surfaces, when both channel scour and overland flow contributed sediment to the streams. Most of the lower concentrations were from periods of base flow or near base flow. The smaller streams are generally of a pool-riffle nature. Maximum and minimum sediment concentrations in the smaller streams are affected by pools which act as sediment traps at lower flows and are flushed at times of rising stream stages. Sediment samples collected on the large streams during periods of maximum runoff, in addition to having much higher concentrations, generally had higher percentages of fine material. Conversely, samples from lower flows often carried a higher percentage of coarse material. Overland flow at times of high flow makes sediment fines available. As flows diminish, availability of fine sediment from overland flow decreases, leaving only coarse material in the channel available for transport.

Because the Tongue River Reservoir acts as a sediment trap, the river downstream from the dam is relatively free of suspended sediment. Sediment concentrations gradually increase from the dam to the mouth.

The Powder River within the study area is often near its sediment-carrying capacity. During years or periods of reduced flows on the Powder River, sediment accumulates in the channel. At times of higher flows the sediment is resuspended and selected reaches of the channel are periodically flushed, the net result being erratic sediment movement from year to year.

Temperature

Temperature is a property of water that has a varying influence on physical, chemical, and biological processes that occur in a stream. Water temperature controls the bacterial oxidation rate of organic matter and the physiological processes of organisms. Many temperature standards exist for various water uses; however, comparisons from the study area are difficult because of the limited amount of continuous record.

Even with limited record, evidence shows that stream temperatures follow seasonal and diel cycles in response to insolation. Cyclical lags are most noticeable on larger streams and probably are influenced most by stream depth. With few exceptions, the perennial streams are ice covered and at $0^{o}C$ during the winter period; summertime temperatures reach maximums within the range of 20^{o}-$30^{o}C$. The Tongue River Dam tends to moderate both high and low downstream temperatures. During the winter, ice is noticeably absent in the stream reach downstream from the dam. The highest recorded temperatures generally were in the upstream parts of small drainages that are of the pool-riffle configuration.

Chemical measurements

Historically, the mode of transport of chemical constituents in a stream was thought to be primarily in the dissolved phase, which is considered here to be any substance passing through a 0.45 micrometer (micron) 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 conditions in the stream environment. Initial efforts have been made in the past few years to sample and analyze suspended particles for constituents that may be sorbed to them.

Suspended sediment is not evenly distributed throughout the vertical and horizontal dimensions of the stream cross section, as is generally true with dissolved constituents. To obtain accurate quantitative analytical results for constituents sorbed to sediment, a representative sample of 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 (Skougstad and others, 1979). The analytical result was the sum of the particular constituent transported in the dissolved and suspended phases. The result is referred to as the total recoverable-constituent concentration, such as "total recoverable iron."

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

Most of the water-quality variables measured during this study are included in the chemical category and are described in this section. A few of the variables are discussed individually, but the majority are conveniently placed into groups. The groups include major ions, major nutrients, and minor elements. With the exception of samples for minor elements, all samples were collected monthly during periods of flow. Minor-element samples were collected periodically.

Dissolved solids

Dissolved solids is the sum of all dissolved constituents in water and in reality is the total of the major ions in solution. In this study the ions most frequently comprising the higher percentages of dissolved solids were the cations calcium, magnesium, and sodium and the anions bicarbonate, sulfate, and chloride. Silica is also included in the major ion constituent category even though silica is nonionic at the pH of most natural waters (6.0 to 8.5). Specific conductance was used extensively as a semiquantitative measure of dissolved solids. With few exceptions, samples had dissolved solids-specific conductance ratios within the range of 0.60-0.80. A more limited range was evident when individual stations or streams were considered.

Numerous water-use standards have been established for dissolved solids. Of primary interest in the study area are those standards pertaining to domestic drinking water, irrigation water, and stock watering. The U.S. Environmental Protection Agency (1977) secondary drinking water standards specify that dissolved-solids concentrations should not exceed 500 mg/L if more suitable supplies are available. It is generally agreed, however, that higher concentrations can be consumed without harmful physiological effects.

Salinity hazards from dissolved solids pertaining to irrigation waters are dependent to a large extent on physical factors such as soil type, drainage condition, and crop type. The upper limit for best crop growth is considered to be near 1,000 mg/L. The classification shown in the following table, as modified from the U.S. Salinity Laboratory Staff (1954), is often used with respect to irrigation water.

Salinity hazard	Range in dissolved solids
Low	Less than 170 mg/L
Medium	170-500 mg/L
High	500-1,500 mg/L
Very high	More than 1,500 mg/L

The ability of livestock to tolerate levels of dissolved solids is dependent upon the type of stock as well as the period of adjustment to higher levels. Poultry, pigs, horses, cattle, and sheep in respective order have increasing degrees of tolerance to salinity. Arbitrary stockwater standards for Montana waters (McKee and Wolf, 1971) are shown below:

Category	Range of dissolved solids
Good	Less than 2,500 mg/L
Fair	2,500-3,500 mg/L
Poor	3,500-4,500 mg/L
Unfit	More than 4,500 mg/L

Ranges in concentration of dissolved solids varied considerably, not only areally but also temporally at individual stations. Concentrations as low as 40-100 mg/L were measured in some intermittent streams at times of snowmelt. Conditions that influenced the low values were frozen ground, which prevented water from penetrating the soil, and an absence of the base-flow component, which generally has high dissolved-solids concentrations.

The highest concentrations of dissolved solids ranged from about 5,000 to 6,500 mg/L. These concentrations generally were observed during late summer at the upstream parts of small drainages that characteristically had the pool-riffle configuration. Ground-water inflow, in which dissolved-solids concentrations were augmented by evaporation and transpiration from the pools, accounted for the high values.

In comparing stations near the mouths of the five drainages flowing into the Yellowstone River, the Tongue River had the smallest range (234-912 mg/L) and the lowest mean (548 mg/L) for dissolved-solids concentrations. The limited range is partly the result of the Tongue River Reservoir in which mixing of the base-flow and runoff components tends to moderate both the high and the low values. The lower mean concentration is due to the influence of snowmelt and rainfall from the high mountains of Wyoming.

Rosebud Creek was second to the Tongue River in low values for both range and mean concentration of dissolved solids. In contrast to the Tongue River this stream, like the other smaller streams, has a greater percentage of lowland runoff and less regulation.

At times many of the small tributary streams as well as the Powder River and Armells Creek show downstream decreases in dissolved solids--contrary to the usual pattern of downstream increases. The condition probably results from ponding in the upper reaches allowing for greater amounts of evaporation and transpiration. This in turn causes concentrations of dissolved solids in streams to increase beyond concentrations of ground water flowing into the stream. At some point in passage downstream, inflowing ground water acts to dilute the stream, thus decreasing the dissolved-solids concentration.

Major cations

Calcium, magnesium, sodium, and potassium--the major cations found in water--were present in varying concentrations at all stations. The first three cations each dominated at different times in samples from throughout the study area.

Calcium and magnesium are the principal constituents that account for water hardness in the study area. Although hardness is not reported in the tables, high values of either or both of these cations have a direct relationship to hardness.

High concentrations of sodium in water constitute a hazard to soils by causing accumulations of exchangeable sodium ions, resulting in a soil of low permeability and poor tilth. If the proportion of sodium in water is high, the alkali (sodium) hazard is high; conversely if calcium and magnesium predominate, the hazard is low. A measure of the sodium hazard (sodium-adsorption ratio or SAR) is defined by the U.S. Salinity Laboratory Staff (1954) as follows:

$$\mathrm{SAR} = \frac{(\mathrm{Na}^{+})}{\sqrt{\dfrac{(\mathrm{Ca}^{+2}) + (\mathrm{Mg}^{+2})}{2}}}$$

For the purpose of irrigation, the Salinity Laboratory has established the classification listed below. Some consideration must be given to soil type, however, and soil stress becomes progressively greater with finer soil textures and soils that are less apt to leach.

SAR value	Alkali (sodium) hazard
0-10	Low
10-18	Medium
18-26	High
26-Above	Very high

Generally, ion ratios showed that calcium increases with direct runoff and sodium is dominant in the base-flow component of streamflow. Magnesium concentrations seemed to be less dependent upon the flow component, showing a more stable ion ratio throughout the entire flow cycle. Of all the cations, sodium had the greatest percentage of increase with the passage of water downstream.

Concentrations of the two most dominant cations, calcium and sodium, are high for most stations during much of the year. Based on calcium and magnesium concentrations, water from the perennial streams is frequently classified as "very hard" (Durfor and Becker, 1964). Even though dominant much of the time, percentages of sodium were variable at the stations. During periods in late summer and fall, sodium frequently exceeded 50 percent of the total cations; however, SAR values seldom were greater than 10. The lowest sodium percentages were from runoff water in intermittent streams.

The Tongue River, owing to mixing of waters in the Tongue River Reservoir, showed the least fluctuation in cation ratios during the annual flow cycle. Conversely, the smaller perennial streams generally exhibited the largest variations in cation ratio. Sodium percentages were highest in the streams near the east side of the study area (Pumpkin Creek, Mizpah Creek, Powder River) as well as at the downstream parts of all drainages.

Major anions

Bicarbonate and sulfate are anions which occur in the highest concentrations and each is the dominant anion at different times during the study. Fluoride, chloride, and nitrate, the remaining major anions, were present, but in lower concentrations.

Even though excessive amounts of bicarbonate add to the dissolved solids, at the concentrations measured bicarbonate is seldom a problem for irrigation or animal consumption. A recommended upper limit for sulfate is 250 mg/L for secondary drinking water standards (U.S. Environmental Protection Agency, 1977) and a threshold limit for cattle consumption is suggested at 1,000 mg/L (McKee and Wolf, 1971). Although various standards are established for other anions, concentrations detected in the study indicate that few problems are present.

Bicarbonate like calcium was found to be dominant more frequently in direct-runoff water, and sulfate was generally associated with the sodium cation in the base-flow component. Although concentrations of chloride fluctuated greatly, they generally decreased with increased direct runoff and were highest at times of base flow. Fluoride concentrations were low (generally less than recommended limits for primary drinking water) but had a pattern similar to that of chloride with respect to direct runoff and base flow.

Because of mixing of waters in the Tongue River Reservoir, the anion ratios, like the cation ratios, showed the least fluctuation in this stream. The largest variations in anion ratios occurred on the smaller perennial streams when comparisons were made between high direct-runoff and base-flow conditions.

Although chloride concentrations were generally low, the Powder River frequently had concentrations that accounted for as much as 25 percent of the total anions, compared to about 1 percent for most other streams. The higher chloride concentrations in the Powder River drainage were not apparent from a study conducted during 1946-50 (Hembree and others, 1952), which suggests that more recent activities in the basin may be responsible.

Specific conductance

Specific conductance (conductance) of water is dependent upon the ability of ionized material in solution to conduct an electrical current; therefore, it gives an indication of the concentration of ions in the water. Conductance is also influenced by water temperature, increasing with an increase in temperature. All conductance values reported in this study are given in units of micromhos per centimeter (μmho/cm) at 25°C.

Because it can be measured readily at streamside or inexpensively in the laboratory, conductance has been used extensively in this study. Specific conductance had good correlation with dissolved solids and in many instances correlated well with many of the specific ions in solution. Regression statistics describing the relationship between specific conductance and several other water-quality variables were determined for the stations in the study area. They are listed in table 1 and are discussed in the text under the section heading "Functional relationships between water-quality variables."

Dissolved oxygen

Oxygen dissolved in natural waters is life-sustaining to most aquatic organisms and is the single most important constituent that allows a stream to purify itself of wastes. Concentrations of dissolved oxygen are influenced by many factors including water temperature, atmospheric pressure, reaeration at the water surface, photosynthetic production of oxygen, oxidation of constituents in the water, and respiration of aquatic flora and fauna. Dissolved-oxygen values for the study are reported in milligrams per liter and in percent of saturation.

Although considerable information pertaining to dissolved-oxygen requirements for aquatic life has been published, few standards exist for other water uses. Minimum concentrations of oxygen to sustain fish life are dependent upon species and age of the fish, prior acclimatization, water temperature, and concentrations of other gases and some trace elements in the water. For productive warm-water fisheries, however, McKee and Wolf (1971) recommend that dissolved-oxygen concentrations do not fall below 5 mg/L during extended periods throughout the day.

Dissolved-oxygen values at stations in the study area were most frequently within the range of 80-110 percent of saturation, although during some periods of the year values both below and above this range were measured. Values outside the range were much more frequent in the smaller streams, which are generally slower moving and often support a greater density of aquatic flora.

Depressed dissolved oxygen was associated with ice conditions, which prevented reaeration as organic matter was oxidized. To a lesser degree oxygen depletions were evident at times of high flows--caused also by oxidation of organic matter that was carried from land surfaces to streams by overland flow. Many of the largest fluctuations of dissolved oxygen occurred during the summer at times of maximum aquatic plant growth. The lowest values were measured during the early morning after night-long respiration had depleted the oxygen supply. Values above saturation were found in the late afternoon following all-day photosynthetic activity that produced oxygen in excess of that consumed.

Hydrogen-ion concentration

The hydrogen-ion concentration is normally expressed as pH. Strictly speaking, pH is the negative logarithm (base-10) of the hydrogen-ion activity. In a practical sense, however, hydrogen-ion activity is approximately equal to the hydrogen-ion concentration. The pH of a neutral solution is 7 with deviations below and above being acidic and basic, respectively. Carbon dioxide in the atmosphere generally causes rain and snow to be slightly acidic. Water that has had extensive contact with carbonate rocks of an aquifer tends to be basic. River water in areas not influenced by pollution generally has a pH between 6.5 and 8.5 (Hem, 1970). However, pH values can be in excess of this range when abundant aquatic photosynthesis takes up much of the dissolved carbon dioxide.

In this study pH values ranged from 6.9 to 8.9. The low values were frequently associated with direct runoff in which the water had characteristics of rain and snow. The higher pH values were often measured during periods of base flow and probably were influenced by the lithology of aquifers. It was also evident, especially during periods of late summer base flow, that aquatic photosynthesis caused some pH values to be elevated even higher.

Statistical computations in table 1 for pH are based on the actual values of pH and not the hydrogen-ion concentration.

Biochemical oxygen demand

The biochemical oxygen demand (BOD) is a measure of the utilization of dissolved oxygen by bacteria. In this study BOD refers to the amount of oxygen used by bacteria in oxidizing organic material during a period of 5 days while the sample was maintained at a constant temperature of 20°C.

The average BOD value for most of the perennial streams was near 2 mg/L but values in excess of 8 mg/L occurred infrequently at most stations. The highest values were measured during winter storms when overland flows across partly frozen surfaces carried large amounts of organic debris into the streams. The lower values were generally measured during periods of low to moderate flows.

Major plant nutrients

Nitrogen and phosphorus species are recognized as major plant nutrients, and in sufficient concentrations they can cause biological enrichment. At least 19 other elements in some chemical combination are essential for aquatic plants (Britton and others, 1975), but unlike nitrogen and phosphorus they rarely become exhausted to the degree that they limit plant growth. Nitrogen is originally derived from the atmosphere and the primary source of phosphorus is mostly from the mineral apatite associated with igneous rocks. Soils and sedimentary rocks are secondary sources for both nitrogen and phosphorus. Although nutrient enrichment occurs naturally in water, a most important cause of high concentrations of nitrogen and phosphorus is the activity of man--principally urbanization and agricultural production.

Nitrogen

Nitrogen commonly occurs in organic, ammonia, nitrite, and nitrate forms--the last species being the most highly oxidized. Because nitrogen may be transported in the suspended phase, samples of the water-sediment mixture were analyzed. Analyses were made for total organic, total ammonia, and total nitrite plus nitrate nitrogen. The sum of these species (total nitrogen) in the water-sediment mixture accounts for all the nitrogen transported in both dissolved and suspended phases.

Cyclical trends for nitrogen were noticed at most stations, with the highest concentrations occurring at times of high flows. Although these increases were associated with high flows, evidence suggests that the nitrogen is transported by the particulate matter that enters streams from overland flow. The particulate matter may be organic debris or fine sediment particles that sorb the nitrogen. In all instances where total nitrogen was high, the organic species accounted for most of the total.

Stations on the Tongue River generally had the lowest concentrations of nitrogen species and the Powder River had the highest--probably a result of the reservoir acting as a nitrogen sink for the Tongue River and high sediment loads contributing nitrogen to the Powder River. Respective mean concentrations of total nitrogen for these two drainages were 0.85 and 3.2 mg/L. The highest concentration measured on the main stem Tongue River was 4.3 mg/L and for the main stem Powder River, 53 mg/L. Among the smaller streams, those in the eastern part of the study area had the highest concentrations of nitrogen--a reflection of high sediment movement in this area. Total ammonia, with a mean concentration of 0.07 mg/L for the study area, tended to be cyclical and showed increased concentrations during the winter. This condition was caused by decomposition of organic matter under the ice and was frequently associated with decreased dissolved oxygen. This dissolved oxygen sag is most evident in data from East Fork Armells Creek. Other apparent nitrogen variations likely resulted from nitrogen uptake by plants during the growing periods and from use of crop fertilizers.

Total phosphorus

Total phosphorus concentrations in natural water usually are low and generally less than the total nitrogen concentrations. Unlike nitrogen, the atmosphere does not serve as a source for replenishing phosphorus in water. Phosphorus, therefore, is easily exhausted by algae and aquatic plant growth, and most often is the limiting nutrient. When more of it is made available, plant productivity may increase. Maximum contaminant levels have not been established for phosphorus in natural waters. However, the U.S. Council on Environmental Quality (1976) suggested 0.1 mg/L total phosphorus as the maximum concentration for protection of aquatic life.

Even though concentrations of total phosphorus were much less than those for total nitrogen, their patterns during the annual flow cycle in the study area were similar. Suspended sediment plays an important role in the transport of phosphorus. The highest mean concentration (0.85 mg/L) and the highest maximum concentration (9.5 mg/L) observed in the study area were from the main stem Powder River. Armells Creek and the Tongue River drainages had the lowest concentrations.

During the period of study, mean concentrations of total phosphorus for samples from the Powder River at Moorhead and near Locate were, respectively, 0.72 mg/L and 0.85 mg/L. Using water discharge at these stations and the above values, an estimate of mean phosphorus loading was computed to be 1,800 lb/day and 2,900 lb/day. This represents a gain of about 60 percent from within the study area. Similar calculations for the Tongue River at the mouth show a loading of 450 lb/day. Because of the infrequent sampling, these figures represent only an approximation; however, they suggest that the Powder River carries a high total phosphorus load--much higher than the other streams in the study area.

Minor elements

Substances that typically occur in water at concentrations less than 1 mg/L are commonly referred to as minor or trace elements. Generally minor elements are nontoxic to plants and animals at concentrations found in most natural waters, and in fact most are essential to plant growth as micro nutrients. High concentrations of minor elements are often toxic to organisms and frequently result from industrial and mining activities.

Some minor elements are only moderately soluble in water, but sorb strongly to clay particles and to other particulates in a manner similar to the nutrients. Minor elements that are more soluble often revert from the dissolved to the suspended phase as a function of various stream conditions, primarily pH. For this reason, both filtered water and the water-sediment mixture were analyzed to determine dissolved and total recoverable concentrations, respectively.

Aluminum

Toxicity of aluminum varies with hardness, turbidity, and pH. In most natural waters, concentrations of dissolved aluminum greater than 100 µg/L (micrograms per liter) would be deleterious to growth and survival of fish (National Academy of Sciences and National Academy of Engineering, 1973). Except for one sample on Snider Creek, all concentrations of dissolved aluminum were much below this limit.

Total recoverable aluminum was second highest in concentration of the minor elements. Only total iron concentrations were greater. High total recoverable aluminum might be expected because of its association with clays and because of the abundance of the element in the lithosphere. The highest measured concentration (270,000 µg/L) occurred in the Powder River at a time (June 19, 1975) when sediment concentrations were exceptionally high. Total recoverable aluminum and suspended sediment consistently had a direct relation during the study.

Arsenic

Arsenic, a constituent of certain pesticides, can be added to surface water from overland flow and runoff across agricultural land. High arsenic concentrations in natural water can also result from industrial waste disposal. Primary drinking water standards (U.S. Environmental Protection Agency, 1975) set an upper limit of 50 µg/L for dissolved arsenic.

Dissolved arsenic was below the drinking water standard in all samples from the study area, with mean values ranging from 1 to 3 µg/L at most stations. Mean concentrations for total recoverable arsenic were only slightly higher than those for dissolved. One exception was the Powder River at Moorhead. Two of the 12 samples obtained for total recoverable arsenic at this location contained concentrations of 300 and 350 µg/L. Both were collected during times of high sediment movement when clay particles were highly dominant in the particle-size distribution.

Beryllium

Beryllium is relatively rare in nature and commonly occurs in the form of a silicate as a constituent of the mineral beryl (Hem, 1970). In water of low pH, beryllium is strongly adsorbed by suspended clay particles and at higher pH, beryllium forms complexes with hydroxides that are slightly soluble.

In the study, analyses showed little more than detectable amounts of beryllium in either the dissolved phase or the water-sediment mixture. Only in samples from Armells Creek, Otter Creek, Mizpah Creek, and the Powder River were amounts slightly higher than 10 µg/L.

Boron

Boron is found in nearly all natural waters, with concentrations varying from traces to several thousand micrograms per liter. Sources of boron are minerals of granitic rocks and certain sedimentary evaporites that contain boric salts. Boron is essential to plant growth, but is highly toxic to many crops at concentrations only slightly above optimum. Although crops differ in susceptibility to boron, the U.S. Salinity Laboratory Staff (1954) found that plant injury often occurs with concentrations in excess of 1,000 μg/L.

Boron should create few problems in irrigation waters throughout the area. Mean values of dissolved boron were less than 500 μg/L at 80 percent of the stations, and at only two stations did the maximum concentration exceed 1,000 μg/L. The two highest values were in water from the most-upstream Pumpkin Creek station and in water from East Fork Armells Creek; respective concentrations were 1,800 and 1,500 μg/L.

Cadmium

Because amounts of cadmium in rocks are small, concentrations of cadmium in natural water are generally low. Evidence suggests that high concentrations of cadmium in drinking water are highly toxic. For this reason, a maximum contaminant level of 10 μg/L has been set by the U.S. Environmental Protection Agency (1975).

Measured concentrations of dissolved cadmium exceeded primary drinking water standards at least once in water from stations on Hanging Woman, Cook, and Otter Creeks. The streams are relatively small, but all are perennial in their lower reaches. Total recoverable cadmium concentrations frequently exceeded or equaled the 10 μg/L value at most stations.

Chromium

Chromium, which is a relatively common element in the environment, is frequently associated with industrial wastes. Primary drinking water standards (U.S. Environmental Protection Agency, 1975) set an upper limit of 50 μg/L. Upper limits for stock and wildlife watering, and fish life, have been set at 5,000 μg/L and 1,000 μg/L, respectively (McKee and Wolf, 1971).

Concentrations of dissolved chromium did not equal or exceed the 50 μg/L drinking water limit. However, values of total recoverable chromium frequently were above this limit; maximum concentration for the study area was 500 μg/L on June 19, 1975, for the Powder River at Moorhead. At the time of sampling, sediment concentrations were high and consisted predominantly of clay-size particles.

Copper

Copper is a widely distributed element in the environment, but because of solubility controls, occurs only in trace concentrations in natural waters. Water is sometimes contaminated by mining and by industrial activities. Secondary drinking water standards (U.S. Environmental Protection Agengy, 1977) set an upper limit for dissolved copper at 1,000 μg/L and McKee and Wolf (1971) recommend an upper threshold of 20 μg/L for fresh-water aquatic life.

Samples from most stations had mean dissolved concentrations of copper that were less than 5 μg/L. Water from Mizpah Creek near the mouth showed the highest dissolved concentration with a maximum of 28 μg/L. Water from the

Powder River at Moorhead had the highest total recoverable copper concentration, with values of 500 and 900 μg/L; both samples were collected during spring runoff at times of high sediment movement.

Iron

Although iron is one of the more abundant elements in rocks and soils, streams having near-neutral pH will not contain bothersome dissolved concentrations. Waters of low pH, which can result from industrial water and mine drainage, may have much higher dissolved concentrations. Particulate iron can be found in most all types of water. Secondary drinking water standards (U.S. Environmental Protection Agency, 1977) set an upper limit of 300 μg/L for dissolved iron.

Concentrations of dissolved iron from samples throughout the study area frequently exceeded drinking water standards. The highest values were measured at the small streams (Pumpkin Creek, Mizpah Creek, and Hanging Woman Creek) during times of depressed pH. In contrast to dissolved iron, high concentrations of total recoverable iron were found in samples from the two largest streams, the Tongue and Powder Rivers. The highest total recoverable concentration for the study area was 600,000 μg/L for the Powder River at Moorhead.

Lead

Lead, like some other minor elements, is probably limited in the stream environment by its solubility. Because of its toxicity to humans, the U.S. Environmental Protection Agency (1975) set a limit for dissolved lead at 50 μg/L in the primary drinking water standards. At a concentration of 100 μg/L, lead may be deleterious to fish life (McKee and Wolf, 1971).

One sample from Sarpy Creek had a concentration of dissolved lead (56 μg/L) that surpassed the primary drinking water standards; however, maximum concentrations of lead in several streams were slightly less than 50 μg/L. Maximum concentrations of total recoverable lead were frequently near 100 μg/L for most streams. The highest value for total recoverable lead (800 μg/L) was measured from the Powder River at Moorhead.

Lithium

Lithium is not widely found in nature, but being a highly mobile ion, it generally remains dissolved once brought into solution by weathering. No limits have been established for lithium in domestic water; however, toxicity to plants has been demonstrated with concentrations in water ranging from 1,000 to 5,000 μg/L (McKee and Wolf, 1971).

A sample from Otter Creek had the highest dissolved lithium concentration at 340 μg/L. The maximum total recoverable lithium concentration of 450 μg/L was measured at the Powder River at Moorhead. Differences between dissolved and total recoverable lithium at stations tended to be much less than those for other minor elements.

Manganese

Although not as abundant as iron, manganese concentrations in natural water are often high in comparison to most minor elements. Manganese is essential for plant growth, but concentrations as low as 500 μg/L have been reported to cause toxicity to selected plants (McKee and Wolf, 1971). National secondary drinking water regulations (U.S. Environmental Protection Agency, 1977) set an upper limit of 50 μg/L (dissolved) to prevent brownish staining of laundry and objectionable tastes to certain beverages.

The highest concentrations of dissolved manganese were measured in samples from small perennial streams during winter ice cover. The most upstream station on Pumpkin Creek had the highest measured dissolved concentration of 8,500 μg/L. High concentrations of total recoverable manganese correlated directly with suspended sediment throughout the study area. Samples from the Powder River had the highest values of total recoverable manganese.

Mercury

The background concentration of mercury in surface and ground waters is probably less than 0.1 μg/L (Jenne, 1972). Higher concentrations of mercury in natural water can result from mining, metallurgical, or other industrial wastes. Mercury and mercuric salts are considered to be toxic to human, fish, and plant life. Thus, a primary drinking water standard of 2 μg/L was set for dissolved mercury (U.S. Environmental Protection Agency, 1975).

One sample from the Powder River at Moorhead contained a concentration (4.0 μg/L) of dissolved mercury that exceeded the primary drinking water standard. The mean dissolved concentrations for most stations were less than 0.1 μg/L. Mean concentrations for total recoverable mercury were only slightly higher. The highest total recoverable mercury concentration, 4.0 μg/L, was observed in a sample from Spring Creek near Decker. It should be noted that other investigators (for example, Mike Bishop, Montana Department of State Lands, oral commun., 1979) have measured mercury in and downstream from the Tongue River Reservoir in concentrations that are higher than those reported by the U.S. Geological Survey.

Molybdenum

Molybdenum is rare in nature and is not considered to be significant in water pollution. Low concentrations of the metal are essential for plant growth and certain microbiological processes. No contaminant levels for drinking water standards have been set; however, a toxicity problem may occur when domestic animals forage on plants grown in areas having high amounts of available molybdenum. For this reason, the National Academy of Sciences and National Academy of Engineering (1973) recommend a maximum concentration of 10 μg/L in water continually used for irrigation.

Differences between dissolved and total recoverable molybdenum throughout the area were small; concentrations for both were generally less than

5 μg/L. Molybdenum in samples from stations in the Otter Creek drainage were slightly higher, with maximum dissolved and total recoverable concentrations near 10 μg/L. Poorer correlations were found between total recoverable molybdenum and suspended sediment than between most other minor elements and sediment.

Nickel

Elemental nickel is nearly insoluble in water; however, many ores and industrial compounds of nickel are highly soluble. The toxicity of nickel to humans is probably very low although it has been shown to be toxic to plants. An upper limit of 200 μg/L is recommended for irrigation waters that are continually used on soils (National Academy of Sciences and National Academy of Engineering, 1973).

Concentrations of dissolved nickel ranged from 0 to 21 μg/L in water samples from the study area. This range probably represents natural background conditions and compares to the median value of 10 μg/L for North American rivers as determined by Durum and Haffty (1963). Total recoverable nickel concentrations were considerably higher, with a maximum of 650 μg/L measured in a sample from the Powder River. Fine sediment particles apparently play a major role in the transport of nickel in the study area.

Selenium

Elemental selenium is highly insoluble; however, in an oxidized form appreciable amounts can occur in water. Because selenium is toxic to both animals and plants, various limits have been established. Primary drinking water regulations (U.S. Environmental Protection Agency, 1975) set upper limits of 10 μg/L for dissolved selenium. Recommended upper limits for livestock and irrigation waters are given, respectively, as 50 and 20 μg/L (National Academy of Sciences and National Academy of Engineering, 1973).

In no instance did dissolved concentrations surpass any of the above limits. The highest dissolved selenium concentrations of 7 μg/L were found in samples from both the Powder River near Locate and Squirrel Creek near Decker. The highest measured concentration of 17 μg/L total recoverable selenium was in a sample from the Powder River near Locate during a peak flow containing a high sediment load on May 22, 1978.

Vanadium

At concentrations found in natural waters, vanadium is generally not considered to be toxic to humans; thus, contaminant levels have not been set for drinking water. However, the National Academy of Sciences and National Academy of Engineering (1973) suggest an upper limit of 100 μg/L for livestock watering and continuous use as irrigation water on all soils.

Because of problems with analytical techniques, analyses were made for only the dissolved form of vanadium. Concentrations were consistently 10 or less μg/L with the most notable exception being Rosebud Creek. Samples from four stations on Rosebud Creek each had concentrations near 15 µg/L during a sampling period in November 1976.

Zinc

Zinc is common in ores and has many industrial uses. The metal has no known adverse physiological effects upon man except at very high concentrations (McKee and Wolf, 1971). However, for considerations of taste secondary drinking water regulations (U.S. Environmental Protection Agency, 1977) set an upper limit of 5,000 µg/L for dissolved zinc. Limits for livestock water are 25,000 µg/L (U.S. Environmental Protection Agency, 1977).

Measured concentrations for both dissolved and total recoverable zinc were much lower than the standards set for drinking water. Although dissolved zinc concentrations in samples from the Tongue River below Hanging Woman Creek were generally low, the maximum value (1,900 µg/L) for the study area was detected there. A high total recoverable zinc concentration of 2,700 µg/L was detected in water from the Powder River at Moorhead during a peak-runoff period.

Water-quality evaluation

Many attempts have been made to develop indices for evaluating water quality by means of numerical or other types of rating. All seem to have certain shortcomings when multiple water usage is considered. Table 2 has been designed to help appraise the water quality throughout the study area for several uses and to eliminate some of the informational loss inherent in the use of one-number indices. Unlike many methods for evaluating water, the table does not attempt to rank or categorize the stations.

The conditions listed at the top of table 2 are discussed in foregoing sections of the text and generally relate to esthetic values; standards for drinking water, stock water, and irrigation water; and ranges of values for the stations. For each station the lower numeral is the number of times samples have been analyzed for the particular water-quality variable; the upper numeral indicates the times that a value is greater than or less than the given condition. The table will allow users to easily determine the exceptions to the listed conditions and to make comparisons of water-quality conditions between stations. Although mean daily values are available for some of the variables at selected sites, only instantaneous values are used in this table.

FUNCTIONAL RELATIONSHIPS BETWEEN WATER-QUALITY VARIABLES

Certain functional relationships are often found to exist between constituents and the chemical or physical properties of a stream. Examination of the data using statistical techniques is a way of determining the strengths of such relationships. In this study the following simple and multiple linear regression models were used to describe the relationships.

Table 2.--Water-quality appraisal chart

[Lower numeral, number of times sampled; upper numeral, number of times sample was greater or less than stated value. Abbreviations: SAR, sodium-adsorption ratio; Na, sodium; BOD, biochemical oxygen demand; NH_4, ammonia; P, phosphorus; Fe, iron; Mn, manganese]

Station number (fig. 1)	Condition: Suspended sediment <20 mg/L	Suspended sediment <100 mg/L	Suspended sediment >5,000 mg/L	Temperature >25°C	Dissolved solids <500 mg/L	Dissolved solids <1,000 mg/L	Dissolved solids >4,500 mg/L	SAR >10	Percent Na >50	Dissolved sulfate <250 mg/L	Dissolved sulfate >1,000 mg/L	Dissolved oxygen <80 percent	Dissolved oxygen >110 percent	pH >8.5	BOD >8	Total NH_4 >0.07 mg/L	Total P >0.1 mg/L	Dissolved Fe >300 µg/L	Dissolved Mn >50 µg/L	Station name
1	9 31	19 31	0 31	0 32	3 32	4 32	0 32	0 32	18 32	3 32	15 32	14 31	0 31	0 32	2 30	9 32	5 32	3 32	3 8	Sarpy Cr nr Hysham
2	15 35	33 35	0 35	1 35	1 35	2 35	1 35	0 35	0 35	1 35	33 35	9 33	6 33	2 35	2 35	16 35	5 35	1 35	9 11	E. Fk. Armells Cr nr Colstrip
3	6 18	13 18	0 18	0 20	1 20	1 20	12 20	9 20	19 20	1 20	18 20	5 20	0 20	2 20	1 19	5 20	2 20	1 20	2 3	W. Fk. Armells Cr nr Forsyth
4	1 42	21 42	0 42	1 43	3 43	6 43	0 43	18 43	38 43	3 43	35 43	3 42	6 42	3 42	1 42	12 43	10 43	1 43	8 10	Armells Cr nr Forsyth
5	1 9	4 9	0 9	0 11	2 11	10 11	0 11	0 11	0 11	11 11	0 11	0 10	0 10	0 11	0 9	3 11	2 11	0 11	1 4	Rosebud Cr at Kirby
6	1 45	22 45	0 45	0 45	1 45	44 45	0 45	0 45	0 45	9 45	0 45	3 44	0 44	3 45	2 44	10 45	12 45	0 45	0 12	Rosebud Cr nr Colstrip
7	0 2	2 2	0 2	0 2	2 2	2 2	0 2	0 2	0 2	2 2	0 2	0 2	0 2	0 2	2 2	2 2	2 2	0 2	0 1	Greenleaf Cr nr Colstrip
8	1 36	18 36	0 36	0 37	1 37	33 37	0 36	0 37	0 37	6 37	0 37	5 36	1 36	4 37	0 35	7 37	14 37	0 37	0 8	Rosebud Cr ab Pony Cr
9	0 2	0 2	0 2	0 2	2 2	2 2	0 2	0 2	0 2	2 2	0 2	0 2	0 2	0 2	0 2	2 2	2 2	0 2	0 1	Snider Cr nr Brandenberg
10	1 32	6 32	0 32	0 32	2 32	24 32	0 32	0 32	0 32	6 32	0 32	2 32	0 32	1 32	1 32	6 32	11 32	0 32	1 7	Rosebud Cr nr Rosebud

Table 2.--Water-quality appraisal chart--Continued

Station number (fig. 1)	Suspended sediment <20 mg/L	Suspended sediment <100 mg/L	Suspended sediment >5,000 mg/L	Temperature > 25°C	Dissolved solids <500 mg/L	Dissolved solids <1,000 mg/L	Dissolved solids >4,500 mg/L	SAR > 10	Percent Na > 50	Dissolved sulfate <250 mg/L	Dissolved sulfate >1,000 mg/L	Dissolved oxygen <80 percent	Dissolved oxygen >110 percent	pH > 8.5	BOD > 8	Total NH4 >0.07 mg/L	Total P > 0.1 mg/L	Dissolved Fe > 300 µg/L	Dissolved Mn > 50 µg/L	Station name
11	0 46	7 46	1 46	0 49	3 46	32 46	0 46	0 47	3 47	6 47	0 47	3 46	4 46	3 48	1 46	11 47	22 47	1 47	0 10	Rosebud Cr at mouth
12	4 33	22 33	0 33	0 33	3 33	33 33	0 33	0 33	0 33	10 33	0 33	3 33	2 33	1 32	0 33	1 33	6 33	1 33	6 11	Squirrel Cr nr Decker
13	1 9	7 9	0 9	0 10	2 10	2 10	3 10	0 10	0 10	2 10	7 10	2 10	1 10	0 10	2 10	5 10	3 10	0 10	1 1	Deer Cr nr Decker
14	0 2	1 2	0 2	0 2	1 2	1 2	0 2	0 2	0 2	1 2	0 2	0 2	0 2	0 2	1 7	1 2	1 2	0 2	0 1	Spring Cr nr Decker
15	24 33	33 33	0 33	0 35	17 34	34 34	0 34	0 35	0 34	33 34	0 34	0 34	2 34	4 35	0 33	13 35	0 35	1 35	2 12	Tongue R at Tongue R Dam
16	0 2	1 2	0 2	0 2	2 2	2 2	0 2	0 2	0 2	2 2	0 2	0 2	0 2	0 2	1 2	0 2	2 2	0 2	0 1	Fourmile Cr nr Birney
17	0 4	2 4	0 4	0 3	0 1	1 1	0 1	0 1	0 1	0 1	0 1	0 0	0 0	0 1	0 1	0 1	0 1	0 1	0 1	Prairie Dog Cr nr Birney
18	0 2	2 2	0 2	0 2	1 2	2 2	0 2	0 2	0 2	2 2	0 2	0 2	0 2	0 2	1 2	0 2	1 2	0 2	0 0	Bull Cr nr Birney
19	2 9	8 9	0 9	0 9	0 7	1 7	2 7	0 7	0 7	0 7	4 7	5 7	0 7	0 8	0 4	3 7	2 7	0 7	3 3	E. Trail Cr nr Otter
20	2 8	6 8	0 8	0 9	0 9	0 9	1 9	0 9	4 9	0 9	8 9	2 9	1 9	0 9	0 9	3 9	2 9	0 9	4 5	Hanging Woman Cr bl Horse Cr
21	4 47	34 47	0 47	0 48	3 46	4 46	0 46	0 46	3 46	3 47	12 47	10 47	2 47	0 47	2 46	11 47	9 46	3 46	6 11	Hanging Woman Cr nr Birney

Table 2.--Water-quality appraisal chart--Continued

Station number (fig. 1)	Suspended sediment <20 mg/L	Suspended sediment <100 mg/L	Suspended sediment >5,000 mg/L	Temperature > 25°C	Dissolved solids <500 mg/L	Dissolved solids <1,000 mg/L	Dissolved solids >4,500 mg/L	SAR > 10	Percent Na > 50	Dissolved sulfate <250 mg/L	Dissolved sulfate >1,000 mg/L	Dissolved oxygen <80 percent	Dissolved oxygen >110 percent	pH > 8.5	BOD > 8	Total NH4 >0.07 mg/L	Total P > 0.1 mg/L	Dissolved Fe > 300 µg/L	Dissolved Mn > 50 µg/L	Station name
22	19 41	34 41	0 41	0 48	24 44	45 44	0 44	0 45	0 45	37 46	0 46	1 48	 48	7 48	0 36	4 45	7 45	0 47	2 18	Tongue R bl Hanging Woman Cr
23	14 34	31 34	0 34	0 34	1 33	3 33	0 33	0 33	0 33	1 34	0 34	3 34	2 34	2 34	0 34	1 34	3 34	0 33	5 7	Cook Cr nr Birney
24	2 9	8 9	0 9	1 9	0 9	0 9	6 9	0 9	0 9	0 9	8 9	2 9	4 9	1 9	0 9	0 9	2 9	0 9	0 3	Otter Cr nr Otter
25	0 5	5 5	0 5	0 5	3 5	4 5	0 5	0 5	0 5	3 5	1 5	2 5	0 5	0 5	3 4	2 5	4 5	0 5	0 0	Bear Cr at Otter
26	3 9	8 9	0 9	0 9	1 9	1 9	0 9	0 9	0 9	1 9	8 9	5 9	2 9	0 9	0 9	2 9	1 9	0 9	3 5	Otter Cr bl Fifteenmile Cr
27	0 2	1 2	0 2	0 2	2 2	2 2	0 2	0 2	0 2	2 2	0 2	0 2	0 2	0 2	2 2	1 2	2 2	0 2	0 1	Threemile Cr nr Ashland
28	5 16	14 16	0 16	0 16	0 16	1 16	0 16	0 16	8 16	0 16	14 16	8 15	2 15	0 16	0 16	5 16	4 16	1 16	5 6	Home Cr nr Ashland
29	3 45	33 45	0 45	1 46	3 45	4 45	0 45	0 46	11 46	3 46	33 46	10 45	1 45	5 45	2 46	18 45	8 46	2 46	3 10	Otter Cr at Ashland
30	4 9	9 9	0 9	0 9	2 9	3 9	0 9	0 9	0 9	2 9	6 9	4 9	0 9	0 9	2 8	2 9	3 9	0 9	0 0	Beaver Cr nr Ashland
31	4 13	9 13	0 13	0 47	17 44	4 44	0 44	0 45	0 45	26 44	0 44	4 46	1 46	1 45	1 44	3 44	9 45	0 45	0 12	Tongue R bl Brandenberg Br
32	0 3	2 3	0 3	0 3	3 3	3 3	0 3	0 3	1 3	3 3	0 3	0 3	0 3	0 3	1 2	1 3	3 3	0 3	0 0	Liscom Cr nr Ashland

Table 2.--Water-quality appraisal chart--Continued

Station number (fig. 1)	Condition: Suspended sediment <20 mg/L	Suspended sediment <100 mg/L	Suspended sediment >5,000 mg/L	Temperature > 25°C	Dissolved solids <500 mg/L	Dissolved solids <1,000 mg/L	Dissolved solids >4,500 mg/L	SAR > 10	Percent Na > 50	Dissolved sulfate <250 mg/L	Dissolved sulfate >1,000 mg/L	Dissolved oxygen <80 percent	Dissolved oxygen >110 percent	pH > 8.5	BOD > 8	Total NH_4 >0.07 mg/L	Total P > 0.1 mg/L	Dissolved Fe > 300 µg/L	Dissolved Mn > 50 µg/L	Station name
33	3 14	6 14	0 14	0 14	3 14	4 14	1 14	7 14	13 14	3 14	7 14	4 14	0 14	0 14	2 14	6 14	7 14	1 14	1 2	Foster Cr nr Volborg
34	2 21	11 21	0 21	1 21	0 21	1 21	8 21	0 21	4 21	0 21	20 21	15 21	4 21	0 21	0 21	5 21	5 21	2 21	3 4	Pumpkin Cr nr Loesch
35	3 6	6 6	0 6	1 6	0 6	0 6	0 6	0 6	0 6	0 6	5 6	4 6	1 6	0 6	0 6	1 6	1 6	1 6	2 2	Little Pumpkin Cr nr Volborg
36	4 9	8 9	0 9	1 9	0 9	0 9	3 9	2 9	9 9	0 9	9 9	3 9	1 9	0 9	0 9	1 9	1 9	1 9	0 1	Pumpkin Cr nr Volborg
37	0 23	8 23	2 23	2 24	5 22	8 22	0 22	5 22	22 22	5 22	6 22	3 23	3 23	4 24	2 23	8 23	11 23	0 22	1 6	Pumpkin Cr nr Miles City
38	3 36	19 36	0 36	1 73	15 50	50 50	0 50	0 50	1 50	28 50	0 50	1 73	2 73	3 73	0 7	1 14	18 50	0 18	0 18	Tongue R at Miles City
39	0 11	0 11	6 11	1 65	0 53	8 53	0 53	0 54	16 54	0 53	3 53	9 48	0 48	3 54	0 43	25 55	35 55	0 49	0 9	Powder R at Moorhead
40	4 18	12 18	0 18	0 19	0 19	0 19	5 19	0 19	0 19	0 19	19 19	11 18	6 18	0 19	1 18	7 19	8 19	2 19	5 5	Mizpah Cr at Olive
41	2 17	15 17	0 17	4 18	0 18	1 18	0 18	0 18	18 18	0 18	13 18	8 17	3 17	0 18	0 17	1 17	1 18	1 18	5 5	Mizpah Cr nr Volborg
42	0 24	6 24	5 24	2 25	4 22	9 22	0 22	12 22	22 22	5 24	7 24	5 24	2 24	7 25	2 24	9 23	14 24	1 22	3 8	Mizpah Cr nr Mizpah
43	0 41	1 41	12 41	0 78	1 49	10 49	0 49	0 49	24 49	2 49	2 49	9 72	1 72	0 72	0 5	4 14	38 49	0 17	0 17	Powder R nr Locate

(simple linear regression)

$$y = B_0 + B_1X \qquad (1)$$

where: y = dependent water-quality variable,
B_0 = regression constant (y intercept),
B_1 = regression coefficient of the independent variable, and
X = independent water-quality variable (either specific conductance or stream discharge).

(multiple linear regression)

$$y = B_0 + B_1X_1 + B_2X_2 \qquad (2)$$

where: y = dependent water-quality variable,
B_0 = regression constant (y intercept),
B_1 = partial regression coefficient for the first independent variable,
X_1 = first independent water-quality variable (discharge),
B_2 = partial regression coefficient for the second independent variable, and
X_2 = second independent variable (specific conductance).

Regression summaries for each water-quality variable are listed in table 1 along with descriptive statistics for each set of variable values. The strengths of functional relationships listed in the regression summaries are indicated by the coefficient of determination, standard error of estimate, significance of the partial regression coefficients, and significance of the correlation coefficient. The coefficient of determination, r^2, indicates the proportion of variance in the dependent variable that is explained by the regression equation; it can range from 0 to 1. The standard error of estimate is the standard deviation of the predicted values from the measured values. The $a = 0.05$ significance of the partial regression coefficient indicates a 95-percent likelihood that the regression coefficient is not equal to zero. The $a = 0.05$ significance of the correlation coefficient, r, indicates a 95-percent likelihood that a non-zero relationship exists between the dependent and independent variables. The correlation coefficient indicates the degree to which the variation in one variable is related to the variation in another variable and ranges from -1 to +1. No relationship exists if the correlation coefficient is zero, whereas a perfect relationship exists if the correlation coefficient is -1 or +1.

Regression models

Two sets of simple linear regressions were developed for most constituents using specific conductance and water discharge separately as independent variables. Based on the coefficient of determination, the better of the two equations was selected and included in table 1.

Specific conductance of water is dependent upon the concentration of ions in solution and, therefore, often correlates highly with the total of the dissolved constituents in solution, as well as with those individual constituents that are dominant in the dissolved phase. Correlations tend to be lower with the less dominant species. Most of the physical measurements had low correlation with specific conductance.

Because many of the physical and chemical characteristics are influenced by streamflow, higher correlations were sometimes found using discharge rather than specific conductance. On unregulated streams, low flows are associated with base flow and high flows with overland flow. Base flow contains high dissolved-solids concentration and low suspended-sediment concentration. Periods of overland flow tend to show the reverse conditions. Thus, variations in discharge resulting from base flow and overland flow tend to correlate with certain water-quality variables.

In an effort to improve the correlations found in the simple linear regression models, conductance and streamflow were used concurrently to produce multiple-linear regressions as given in table 1. By adding a second independent variable into the regression equation, one can expect a reduction in the standard error of estimate and an increase in the coefficient of determination. As would be expected, improvements were shown over use of the simple regression equations. However, as noted in table 1, improvements were often not large.

In general, throughout the study area those constituents that comprise the higher percentages of cationic and anionic species have a high correlation with conductance. This includes the cations magnesium, sodium, and calcium along with the anions sulfate and bicarbonate. The highest and most consistent correlations occur with dissolved solids and conductance. Other major ions present, but less dominant, frequently have low correlation with conductance--a result of the small percentage of electrical conductivity contributed by these ions. On occasion, the less dominant ions show better correlation with discharge than do the more dominant ions.

Discharge as the independent variable in the simple regression is used much less than is specific conductance. The highest correlations with discharge are found with physical measurements such as suspended sediment and turbidity. Occasionally the nutrients, and especially total phosphorus, were related better to discharge than to specific conductance. Regulation of streamflow from stock dams and irrigation diversions may result in discharge being a poor predictor for many water-quality variables.

Application of regression analysis

Regression equations can be used in different ways. By applying the independent variable(s) to the regression equation within the range of data used to develop the equation, values of the dependent variable can be simulated. Then it is only necessary to collect periodic check samples to test the adequacy of the regression relationship.

In using equations from the regression summaries listed in table 1, certain limitations should be kept in mind. The significance tests used for linear regression equations are based on the assumptions that the samples are drawn at random and that the values for the dependent and independent variables are normally distributed and linearly related. In addition, any array of the dependent variables should have the same variance.

Data which, through examination of scatter plots and residuals, do not satisfy these assumptions can be transformed and then tested. The most often used transformation is the log transformation; however, many others might provide a better fit.

The data in table 1 are presented to show which relationships are potentially strong. The number of stations and variables preclude close examination of the data to determine what transformations might be needed. Therefore, the regression equations are based on untransformed data. These data should be examined in greater detail to assure that the basic assumptions are satisfied if more sensitive regressions are required for simulation or for other purposes.

In some instances regressions may be used to assess land-use changes. For stations having adequate data, selected equations will serve to denote baseline conditions. Deviation from established regression equations may be due to alteration of water quality as a result of man's activity. However, further investigation of relationships between other variables might prove to be more sensitive for assessing land-use changes.

In this study, regression equations are used to simulate dissolved-solids concentrations and loads for the most downstream stations on both the Tongue and the Powder Rivers and for the Yellowstone River near Miles City for the 1978 water year. A computer program has been developed for simulating chemical quality of streamflow. The program utilizes daily records of specific conductance and stream discharge in conjunction with the appropriate regression equations. Use of the program enables daily solute concentrations and loads to be simulated as well as weekly, monthly, and annual averages to be computed.

Daily mean dissolved-solids concentrations were computed using regression equations in which the independent variable X is the daily mean conductance. Once simulated, the concentrations in milligrams per liter were further transformed into a daily mean dissolved-solids load in tons per day using equation 3. The program output is condensed in table 3 with simulated monthly and annual dissolved-solids loads given in tons. In addition to monthly loads the simulated monthly mean dissolved-solids concentrations are also listed in table 3. Daily and weekly loads and concentrations were omitted for the purpose of brevity.

$$C_L = QC_i K \qquad (3)$$

where: C_L is dissolved-solids load in tons per day,

Q is daily mean water discharge in cubic feet per second,

C_i is daily mean concentration in milligrams per liter, and

$$K = \frac{86{,}400 \text{ seconds per day} \times 62.4 \text{ pounds per cubic foot}}{2{,}000 \text{ pounds per ton} \times 1{,}000{,}000 \text{ mg per liter}} = 0.0027.$$

Table 3.--Simulated monthly mean dissolved-solids concentration and monthly and annual dissolved-solids loads at three stations during the 1978 water year

Month	Yellowstone River near Miles City		Tongue River at Miles City		Powder River near Locate	
	Dissolved solids (mg/L)	Dissolved solids (tons)	Dissolved solids (mg/L)	Dissolved solids (tons)	Dissolved solids (mg/L)	Dissolved solids (tons)
October	430	211,000	596	11,900	1,460	41,600
November	458	144,000	674	10,100	1,740	24,700
December	458	190,000	683	11,100	1,850	22,700
January	582	239,000	707	9,500	1,730	19,900
February	597	287,000	693	9,370	1,520	14,800
March	404	482,000	525	47,600	983	186,000
April	545	458,000	596	31,200	1,590	105,000
May	491	1,060,000	563	135,000	1,300	636,000
June	327	984,000	349	108,000	746	235,000
July	302	847,000	314	34,400	1,140	139,000
August	350	414,000	428	21,600	1,630	60,300
September	424	417,000	577	17,500	1,670	37,000
Total (rounded)	--	5,733,000	--	447,300	--	1,522,000

A graphical display of dissolved-solids loading for the three stations further illustrates the program output (fig. 2). The area beneath the lower

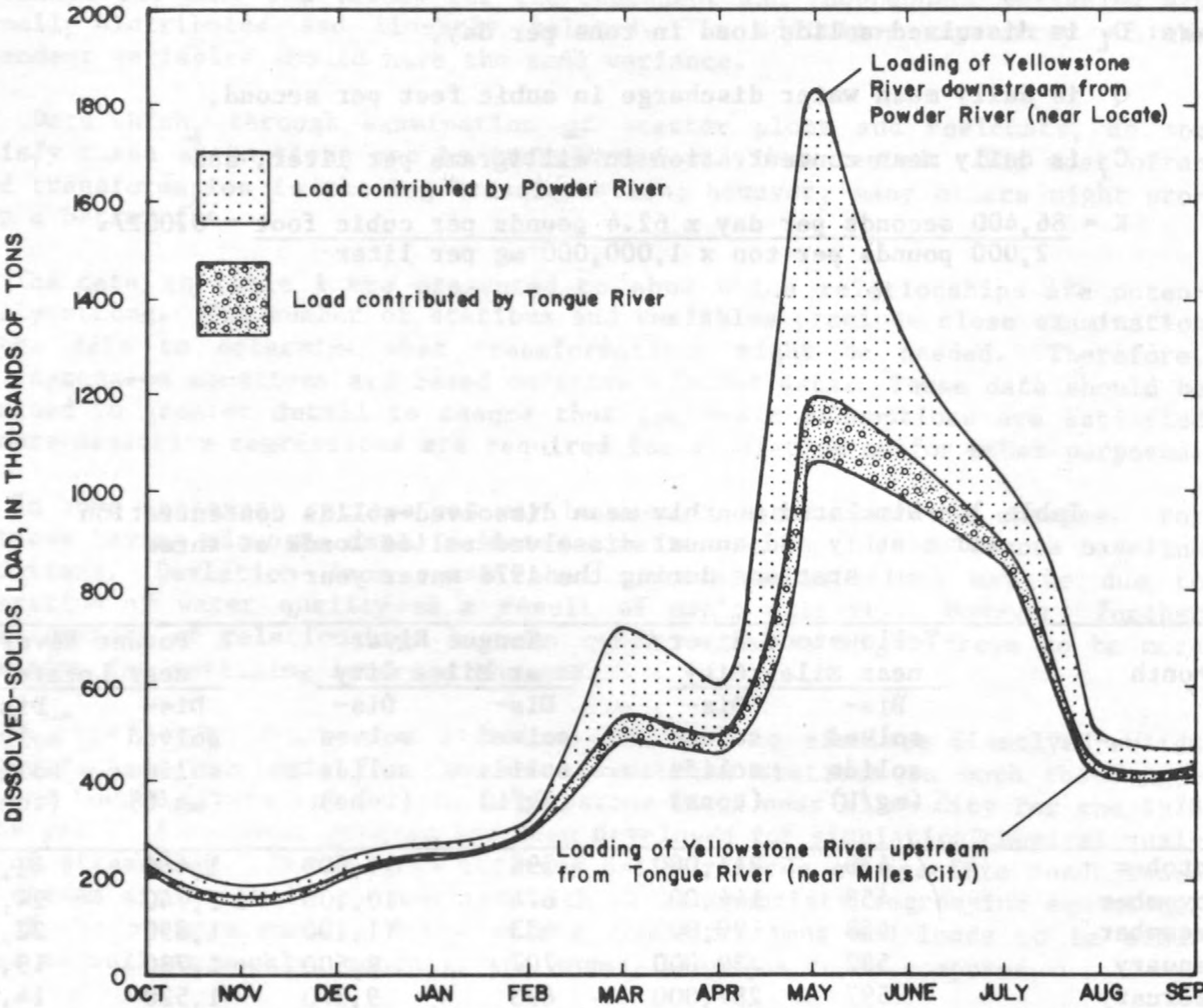

Figure 2.--Simulated dissolved-solids loading to Yellowstone River from Tongue and Powder Rivers, 1978 water year.

curve represents loading of the Yellowstone River upstream from the Tongue and Powder Rivers; the total area under the upper curve represents loading downstream from the Tongue and Powder Rivers. Loading contributed by the Tongue and Powder Rivers can be compared by observing the areas between curves. At this time sufficient data are not available to determine loading for the three smaller streams (Sarpy, Armells, and Rosebud Creeks) that flow directly into the Yellowstine River or to determine loading from just those parts of the Tongue and Powder River basins within the study area.

DRAINAGE SUMMARIES

This report describes water quality at selected stream locations in southeastern Montana and makes comparisons with various water-use classification standards. The most apparent feature of the study is the variability of water quality. The greatest variations are cyclic in nature, being most noticeable at individual stations throughout the annual flow cycle. Areal differences both within and between drainages in the study also are apparent but are more subtle than changes with time at individual stations.

Much of the water-quality variability during the annual cycle can be related to the dominance of either the base-flow or the direct-runoff component of streamflow at various periods of the year. Areal differences are influenced mostly by lithology, soil types, and land-use practices. Other natural and artificial conditions tend to affect both time and areal variability of water quality. Evaporation and transpiration, reactions of water with sediment, and aquatic biota all cause changes. In addition, the many impoundments and diversions for agricultural purposes affect the quality of water.

Although not entirely consistent in all drainages, the base-flow component of streamflow was generally associated with high concentrations of dissolved solids. Sodium and sulfate were the dominant cation and anion, respectively. Low discharge during periods of base flow resulted in minimal suspended-sediment loads and in turn minimum values for those constituents (total recoverable) analyzed from the water-sediment mixture. In contrast, direct-runoff water is generally low in concentrations of dissolved solids and characterized by the calcium cation and the bicarbonate anion. Direct-runoff water, often with much material in suspension, had high concentrations of total nutrients and total recoverable minor elements.

Powder River drainage

In comparing stations at the mouths of the five drainages in the study area that enter the Yellowstone River, water from the Powder River ranked near the middle of the group in dissolved-constituent concentrations, but far exceeded others in total recoverable-constituent concentrations and suspended sediment. Dissolved-solids concentration near the mouth of the Powder River ranged from 408 to 2,130 mg/L with a mean value of 1,380 mg/L. Percentages of sodium were slightly higher and the chloride-ion concentration was much higher than those observed in the other drainages. Total nutrients and total minor elements were generally the highest measured in the study area and showed increases with increased sediment concentrations.

Unlike other study-area streams, the water quality of the Powder River shows little change and at times slight reductions in major ions in passage from the Montana-Wyoming border to the Yellowstone River. Although the processes of evaporation, transpiration, and irrigation cause increased concentrations of major ions as water passes downstream, the combined effect of ground-water and surface-water inflow in this reach of the Powder River is to dilute the stream water. Streamflow in this reach of the river increases about 35 percent downstream.

Sediment movement in the Powder River appears to be erratic from year to year and is governed by intensity and duration of storms and spring runoff. During years of below-average streamflow, sediment apparently accumulates in the channel. During high flows the accumulated sediment is resuspended and transported downstream, thus periodically flushing selected reaches of the river channel. Suspended-sediment concentrations frequently exceed 10,000 mg/L during the periods of spring runoff and storms.

Mizpah Creek drains parts of the study area between the Tongue and Powder Rivers and enters the Powder River upstream from Locate. Streamflow in Mizpah Creek is sustained by ground-water inflow during much of the year, although samples were collected from flows in excess of 1,000 ft^3/s during storms and spring runoff. The water had a wider range of dissolved solids than did water of the Powder River, but the mean concentration was nearly the same. The sediment concentration was second only to the Powder River, and mean concentrations at the mouth for total nitrogen (3.82 mg/L) and total phosphorus (1.06 mg/L) were the highest in the study area.

Tongue River drainage

Of the water at the mouths of the drainages, the Tongue River generally had the best overall quality with respect to major ions, even though tributaries with inferior quality water contribute to the flow. The mean dissolved-solids concentration at the mouth was 548 mg/L with a range of 234-912 mg/L. The concentration increased about 25 percent as the Tongue River passed through the study area. The increased dissolved-solids concentration results from a combination of surface and subsurface inflow, irrigation practices, and evaporation and transpiration in the main channel.

The Tongue River Dam modifies many of the natural water-quality conditions of the streamflow. The reservoir with its capacity of 68,000 acre-feet moderates streamflow and causes mixing of dissolved constituents. The result is a reduction in range of concentrations. Many of the physical properties of water are affected in a like manner. Much of the suspended sediment carried by the river upstream from the reservoir settles to the bottom. In turn, those constituents transported by the sediment are, at least temporarily, lost from the stream.

Water that is relatively free of sediment as it leaves the Tongue River Dam increases in sediment concentration during passage downstream, particularly as overland flows contribute to inflow. Suspended-sediment concentrations at the mouth ranged from 5 to 4,360 mg/L with a mean of 428 mg/L; only Sarpy and Armells Creeks had lower mean concentrations. Total nitrogen and phosphorus concentrations associated with sediment fines also were less than most other streams.

Hanging Woman Creek, Otter Creek, and Pumpkin Creek, the three major tributaries to the Tongue River, contribute water high in dissolved solids during much of the year. Maximum dissolved-solids concentrations from the streams ranged from 2,700 to 3,200 mg/L with means in excess of 1,000 mg/L.

Exceptions to the high dissolved-solids concentrations occur during storms and periods of snowmelt when overland flow dilutes the base-flow component of streamflow, decreasing the dissolved-solids concentrations. However, these are generally times of maximum sediment concentration when total nutrients and total recoverable minor elements are at their highest.

The majority of the tributaries to the Tongue River are intermittent and contribute most of their water during surface-runoff periods. Extended flows generally persist as the alluvial aquifers are dewatered. Samples analyzed from the initial runoff are low in dissolved constituents, but because of runoff intensity the streamflow carries organic and inorganic particulate matter in suspension. However, during extended flows, as the alluvium is dewatered, the water has had longer contact with consolidated and unconsolidated materials under the land surface; thus, the concentrations of dissolved constituents increase as flows diminish. In addition, many of the streams are subject to both natural and artificial ponding, a condition that causes even higher dissolved-solids concentrations owing to increased evaporation and transpiration.

Rosebud Creek drainage

Mean dissolved-solids concentration at the mouth of Rosebud Creek is 876 mg/L or about 60 percent higher than Rosebud Creek at Kirby in the upstream drainage. In addition to having low dissolved-solids concentration in the upstream drainage, the chemical character of the water is modified in passage downstream. The combined effects of surface- and ground-water inflow between the stations increase the percentages of sodium and sulfate. Although the upstream to downstream changes in both dissolved solids and ion ratios are obvious when comparing annual means, these changes are not consistent throughout the flow cycle owing to differing affects of base-flow and direct-runoff components of streamflow.

Mean sediment concentration (572 mg/L) at the mouth of Rosebud Creek is slightly higher than the mean values from the Tongue River, Sarpy Creek, and Armells Creek but is much less than that of the Powder River. A comparison of the four Rosebud stations indicates that more than half the sediment load is contributed to the stream in the downstream one-fourth of the drainage. Total nitrogen and phosphorus follow the same pattern as suspended sediment and assume a like rank when the five major study area drainages are compared.

Armells and Sarpy Creek drainages

Armells Creek and Sarpy Creek are the smallest of the five drainages that enter the Yellowstone River. Both have many similar drainage and channel characteristics as well as water-quality similarities. The pool-riffle configurations of these streams affect both dissolved- and suspended-constituent concentrations.

The pooling, which is common throughout the two drainages but more prevalent in upper reaches, allows for increased evaporation and transpiration, leading to increased dissolved-solids concentrations in the streams. For much of the year Armells Creek shows a reduction in dissolved-solids concentration as the water passes downstream. The condition probably results from inflow of ground water lower in dissolved solids, which dilutes water from upstream. Throughout periods of surface runoff this condition is not apparent and the normal downstream increase in dissolved-solids concentration persists. Respective mean dissolved-solids concentrations at the mouths of Armells and Sarpy Creeks are 2,840 and 1,850 mg/L--the highest for the five drainages. These mean values, however, have a tendency to mask the broad range of measured concentrations.

Suspended-sediment concentrations and total recoverable constituent concentrations are low in comparison to the other drainages. The pooling nature of the stream and dense aquatic growth tend to trap sediment as it moves downstream, thus accounting for the relatively low concentrations.

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Table 1.--Statistical summary of data for each station

Station No. (fig. 1): 1 Station No. (USGS): 06294940 Station name: Sarpy Creek near Hysham, MT

	DESCRIPTIVE STATISTICS				
Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	33	0.00	31.08	411.00	87.37
Specific conductance (µmho/cm)	32	215.00	2558.50	4300.00	991.31
pH (units)	32	7.60	8.16	8.50	.24
Temperature (°C)	32	.00	7.16	23.00	7.60
Turbidity (JTU)	31	2.00	29.55	280.00	52.19
Oxygen, dissolved (mg/L)	31	1.80	9.10	12.60	2.14
Oxygen, dissolved (percent)	31	16.40	80.87	108.00	17.65
Biochemical oxygen demand (mg/L)	30	.00	2.66	12.00	2.68
Calcium, dissolved (mg/L)	32	18.00	92.50	190.00	37.29
Magnesium, dissolved (mg/L)	32	8.00	110.34	240.00	57.86
Sodium, dissolved (mg/L)	32	14.00	366.78	880.00	165.77
Sodium (percent)	32	23.00	51.91	65.00	9.48
Sodium-adsorption ratio	32	.60	5.98	10.00	2.16
Potassium, dissolved (mg/L)	32	7.10	9.88	14.00	2.03
Bicarbonate (mg/L)	32	89.00	544.81	886.00	188.91
Carbonate (mg/L)	32	.00	3.09	30.00	8.18
Sulfate, dissolved (mg/L)	32	40.00	974.81	2500.00	490.97
Chloride, dissolved (mg/L)	32	3.00	13.83	33.00	5.92
Fluoride, dissolved (mg/L)	32	.10	0.34	.50	.10
Silica, dissolved (mg/L)	32	.50	7.69	15.00	3.84
Dissolved solids, calculated (mg/L)	32	150.00	1847.69	4280.00	812.91
Nitrogen, NO_2+NO_3 total (mg/L as N)	32	.00	0.07	.46	.10
Nitrogen, ammonia total (mg/L as N)	32	.00	0.08	.44	.10
Nitrogen, organic total (mg/L as N)	32	.20	0.82	2.50	.52
Nitrogen, total (mg/L as N)	32	.39	0.97	2.90	.58
Phosphorus, total (mg/L as P)	32	.00	0.08	.46	.11
Sediment, suspended (mg/L)	31	6.00	90.94	416.00	95.88

	DISSOLVED		
Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	8	0.00	40.00
Arsenic (µg/L)	8	1.00	3.00
Beryllium (µg/L)	8	.00	10.00
Boron (µg/L)	32	110.00	780.00
Cadmium (µg/L)	8	.00	3.00
Chromium (µg/L)	8	.00	20.00
Copper (µg/L)	8	.00	6.00
Iron (µg/L)	32	10.00	410.00
Lead (µg/L)	8	1.00	56.00
Lithium (µg/L)	8	10.00	80.00
Manganese (µg/L)	8	30.00	170.00
Mercury (µg/L)	8	.00	.10
Molybdenum (µg/L)	8	.00	5.00
Nickel (µg/L)	8	.00	7.00
Selenium (µg/L)	7	.00	.00
Zinc (µg/L)	8	.00	50.00
Vanadium (µg/L)	8	.00	8.00

Period of record: Water years 1975-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
Q		0.500*	691	--	--		--	--
Q		.00096	0.243				0.00519	0.247
--	--	--	--	--	--	--	--	--
16.6 Q	.390	.451*	39.3	35.7	0.337*	-0.00681	.460*	39.7
11.3 K	-.00088	.169*	1.96				.167	1.99
K		.0303	17.4				.0309	17.7
1.79 Q	.0255	.748*	1.37	3.21	.0215*	-.00052	.764*	1.35
14.6 K	.0305	.657*	21.5	16.3	-.00855	.0299*	.657*	21.8
-10.0 K	.0466	.633*	34.6	-25.0	.0782	.0516*	.640*	34.9
-17.9 K	.151	.816*	70.1	-2.24	-.0818	.146*	.817*	71.0
54.7 Q	-.0783	.523*	6.54	54.2	-.0770*	.00017	.524*	6.64
1.61 K	.00173	.621*	1.32	3.38	-.00919*	.00115*	.692*	1.21
7.50 K	.00091	.196*	1.80	6.83	.00350	.00114*	.208*	1.82
114 K	.169	.783*	88.4	213	-.509*	.137*	.811*	83.9
K		.0288	8.06	-.0802	-.00198	.00127	.0290*	8.19
-127 K	.429	.750*	242	-.218	.472	.459*	.754*	244
1.76 K	.00497	.508*	4.77	2.09	-.00171	.00486*	.509*	4.85
.374 Q	-.00088	.585*	.0650	.260	-.00056*	.00004*	.663*	.0594
Q		.00428	3.80				.00654	3.85
-68.9 K	.749	.834*	326	-110	.216	.762*	.834*	331
.205 K	-.00005	.251*	.0889	.244	-.00021	-.00007*	.267*	.0894
.256 K	-.00007	.453*	.0768	.177	.00041	-.00005*	.513*	.0739
.734 Q	.00308	.275*	.438	1.02	.00227	-.00010	.294*	.438
1.91 K	-.00037	.395*	.445	1.45	.00237	-.00020	.461*	.427
.0468 Q	.00111	.757*	.0552	.110	.00094*	-.00002	.777*	.0538
66.4 Q	.742	.484*	222	51.1	.785*	.00548	.485*	71.2

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
8	110.00	2400.00
12	.00	11.00
12	.00	10.00
0	.	.
12	.00	20.00
12	.00	20.00
12	10.00	90.00
12	140.00	11000.00
11	100.00	100.00
12	10.00	70.00
12	20.00	6000.00
12	.00	.30
12	.00	10.00
11	.00	100.00
12	.00	2.00
8	8.00	120.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 2   Station No. (USGS): 06294980   Station name: East Fork Armells Creek near Colstrip, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	35	0.01	7.46	169.00	28.36
Specific conductance (µmho/cm)	35	290.00	4208.57	6990.00	1303.15
pH (units)	35	7.50	8.08	8.60	.26
Temperature (°C)	35	.00	8.73	26.00	8.57
Turbidity (JTU)	35	.00	7.74	40.00	9.33
Oxygen, dissolved (mg/L)	33	6.00	9.77	12.00	1.50
Oxygen, dissolved (percent)	33	66.00	92.76	141.00	19.76
Biochemical oxygen demand (mg/L)	35	.10	1.88	11.00	2.25
Calcium, dissolved (mg/L)	35	22.00	236.06	310.00	64.80
Magnesium, dissolved (mg/L)	35	13.00	333.54	460.00	102.97
Sodium, dissolved (mg/L)	35	13.00	356.71	490.00	101.95
Sodium (percent)	35	19.00	27.94	33.00	2.63
Sodium-adsorption ratio	35	.50	3.45	4.50	.74
Potassium, dissolved (mg/L)	35	7.40	17.38	23.00	3.56
Bicarbonate (mg/L)	35	71.00	473.89	656.00	128.81
Carbonate (mg/L)	35	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	35	75.00	2222.14	3000.00	655.04
Chloride, dissolved (mg/L)	35	2.00	48.03	86.00	17.86
Fluoride, dissolved (mg/L)	35	.00	.35	.70	.18
Silica, dissolved (mg/L)	35	.50	8.67	17.00	5.04
Dissolved solids, calculated (mg/L)	35	178.00	3457.34	4580.00	965.98
Nitrogen, NO_2+NO_3 total (mg/L as N)	35	.00	.13	.88	.20
Nitrogen, ammonia total (mg/L as N)	35	.00	.25	1.50	.40
Nitrogen, organic total (mg/L as N)	35	.00	.90	2.60	.57
Nitrogen, total (mg/L as N)	35	.43	1.27	3.20	.76
Phosphorus, total (mg/L as P)	35	.00	.06	.33	.07
Sediment, suspended (mg/L)	35	4.00	42.94	180.00	39.87

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	11	0.00	30.00
Arsenic (µg/L)	11	1.00	4.00
Beryllium (µg/L)	11	.00	10.00
Boron (µg/L)	35	120.00	1500.00
Cadmium (µg/L)	11	.00	6.00
Chromium (µg/L)	11	.00	20.00
Copper (µg/L)	11	.00	16.00
Iron (µg/L)	35	20.00	710.00
Lead (µg/L)	11	.00	41.00
Lithium (µg/L)	10	60.00	110.00
Manganese (µg/L)	11	.00	1100.00
Mercury (µg/L)	11	.00	.10
Molybdenum (µg/L)	10	2.00	5.00
Nickel (µg/L)	11	.00	21.00
Selenium (µg/L)	10	.00	2.00
Zinc (µg/L)	11	10.00	20.00
Vanadium (µg/L)	10	.00	1.60

Period of record: Water years 1975-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
4430 Q	-27.3	.345*	1070	--	--	--	--	--
Q		.0899	.254				.110	.256
--	--	--	--	--	--	--	--	--
6.13 Q	.216	.431*	7.15	13.2	.173*	-.00161	.464*	7.05
Q		.0184	1.49				.0737	1.47
Q		.0103	19.7				.0188	19.9
1.48 Q	.0530	.447*	1.70	4.56	.0341*	-.00070	.554*	1.55
76.5 K	.0374	.573*	42.5	116	-.649*	.0292*	.626*	40.4
65.8 K	.0638	.648*	62.0	115	-.802	.0537*	.679*	60.1
92.7 K	.0633	.624*	64.7	158	-1.08*	.0497*	.679*	60.7
28.5 Q	-.057	.349*	2.23	30.1	-.0676*	-.0003	.369*	2.23
3.63 Q	-.0202	.558*	.511	2.53	-.0134*	.0002*	.677*	.443
17.9 Q	-.0678	.291*	3.00	17.7	-.0665*	.00005	.292*	3.04
188 K	.0679	.472*	95.0	270	-1.33	.0509*	.528*	91.2
--	--	--	--	--	--	--	--	--
505 K	.408	.664*	382	873	-6.04*	.332*	.708*	362
50.5 Q	-.304	.230*	15.8	55.1	-.332*	-.00103	.234*	15.9
.369 Q	-.00228	.135*	.163	.548	-.00337*	-.00004	.195*	.160
K		.0806	4.86				.117	4.86
883 K	.612	.685*	548	1,460	-9.56*	.492*	.735*	509
K		.00280	.206				.00488	.209
K		.0181	.395	.0117	.00089	.00005	.0207	.126
1.79 K	-.00021	.232*	.502	1.85	-.00093	-.00022*	.233*	.509
K		.0748	.735				.0748	.746
.175 K	.00027	.226*	.0658	.139	.00059	-.00002	.589*	.0654
K		.0210	40.0				.0249	40.6

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
8	20.00	210.00
10	.00	5.00
10	.00	10.00
0	.	.
10	10.00	20.00
10	.00	30.00
10	10.00	40.00
10	200.00	2400.00
10	100.00	100.00
10	10.00	130.00
10	30.00	760.00
10	.00	.40
10	.00	4.00
10	50.00	100.00
10	.00	1.00
8	.00	40.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 3 Station No. (USGS): 06294991 Station name: West Fork Armells Creek near Forsyth, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	21	0.00	2.62	28.00	6.88
Specific conductance (µmho/cm)	20	765.00	4987.75	7100.00	1503.32
pH (units)	20	7.40	7.98	8.90	.39
Temperature (°C)	20	.00	7.60	22.50	7.71
Turbidity (JTU)	20	2.00	15.30	100.00	23.48
Oxygen, dissolved (mg/L)	20	6.40	9.48	13.20	1.78
Oxygen, dissolved (percent)	20	49.00	86.60	108.00	14.53
Biochemical oxygen demand (mg/L)	19	.50	2.07	8.40	2.03
Calcium, dissolved (mg/L)	20	33.00	193.95	290.00	66.31
Magnesium, dissolved (mg/L)	20	27.00	212.55	300.00	74.46
Sodium, dissolved (mg/L)	20	57.00	827.85	1200.00	294.59
Sodium (percent)	20	38.00	55.80	62.00	4.94
Sodium-adsorption ratio	20	1.80	9.53	13.00	2.52
Potassium, dissolved (mg/L)	20	6.90	12.90	16.00	2.14
Bicarbonate (mg/L)	20	134.00	569.85	875.00	189.40
Carbonate (mg/L)	20	.00	.85	11.00	2.74
Sulfate, dissolved (mg/L)	20	180.00	2586.50	3800.00	906.56
Chloride, dissolved (mg/L)	20	4.30	29.97	81.00	15.07
Fluoride, dissolved (mg/L)	20	.10	.32	.60	.10
Silica, dissolved (mg/L)	20	1.00	8.32	19.00	4.17
Dissolved solids, calculated (mg/L)	20	383.00	4154.65	5710.00	1400.59
Nitrogen, NO_2+NO_3 total (mg/L as N)	20	.00	.04	.33	.08
Nitrogen, ammonia total (mg/L as N)	20	.00	.04	.11	.03
Nitrogen, organic total (mg/L as N)	20	.35	.95	2.40	.49
Nitrogen, total (mg/L as N)	20	.43	1.03	2.50	.50
Phosphorus, total (mg/L as P)	20	.00	.04	.27	.06
Sediment, suspended (mg/L)	18	7.00	73.56	261.00	79.28

Variable	DISSOLVED Sample size	Minimum value	Maximum value
Aluminum (µg/L)	3	0.00	50.00
Arsenic (µg/L)	3	1.00	1.00
Beryllium (µg/L)	3	.00	10.00
Boron (µg/L)	20	130.00	710.00
Cadmium (µg/L)	3	.00	1.00
Chromium (µg/L)	3	.00	10.00
Copper (µg/L)	3	1.00	14.00
Iron (µg/L)	20	10.00	420.00
Lead (µg/L)	3	.00	2.00
Lithium (µg/L)	3	10.00	60.00
Manganese (µg/L)	3	40.00	470.00
Mercury (µg/L)	3	.00	.10
Molybdenum (µg/L)	3	.00	2.00
Nickel (µg/L)	3	4.00	10.00
Selenium (µg/L)	3	.00	1.00
Zinc (µg/L)	3	10.00	20.00
Vanadium (µg/L)	3	.50	1.70

Period of record: Water years 1975-77 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION					MULTIPLE REGRESSION				
Regression constant[1]		Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--		--	--	--	--	--	--	--	--
5410	Q	-152	.508*	1080	--	--	--	--	--
7.36	K	.00012	.223*	.356				.223	.366
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6.58	Q	3.18	.904*	7.47	-2.12	3.42*	.00161	.909*	7.48
	K		.0177	1.81				.0303	1.85
	K		.0373	14.6				.0402	15.1
7.36	K	-.00108	.608*	1.31	6.33	.0508	-.00090*	.623*	1.32
31.1	K	.0326	.548*	45.8	32.3	-.0590	.0324*	.548*	47.1
-10.3	K	.0447	.814*	33.0	-26.0	.812	.0474*	.816*	33.7
-91.9	K	.184	.885*	102	-153	3.15	.195*	.888*	104
57.3	Q	-.542	.595*	3.23	51.7	-.384*	.00104	.644*	3.12
1.89	K	.00153	.835*	1.05	2.66	-.0400	.00140*	.841*	1.06
8.28	K	.00093	.423*	1.67	10.2	-.101	.00059	.477*	1.64
130	K	.088	.490*	139	133	-.143	.0877*	.490*	143
	K		.0758	2.71				.0856	2.77
-224	K	.563	.873*	332	-381	8.13	.590*	.875*	339
883	K	.00583	.338*	12.6	-1.42	.119	.00623*	.340*	12.9
	Q		.181	.0967				.200	.0983
	K		.0221	4.23				.0476	4.30
-212	K	.875	.883*	492	-440	11.8	.915*	.885*	503
	K		.0563	.0767				.170	.0740
	K		.0542	.0321				.0579	.0330
	Q		.0764	.485				.0806	.497
	K		.0826	.489				.0912	.501
.0208	Q	.00789	.867*	.0222	.0425	.00728*	-00000	.873*	.0225
48.5	Q	8.22	.583*	52.7	-53.8	11.1*	.0188	.630*	51.3

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at = 0.05
[3]Asterisk denotes that partial regression coefficient is significant at = 0.05

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
5	20.00	300.00
7	.00	2.00
7	.00	10.00
0	.	.
7	10.00	30.00
7	.00	20.00
7	10.00	30.00
7	230.00	920.00
7	.00	100.00
7	10.00	60.00
7	50.00	800.00
7	.00	.10
7	.00	1.00
7	.00	150.00
7	.00	4.00
5	10.00	40.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 4 Station No. (USGS): 06294995 Station name: Armells Creek near Forsyth, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	43	0.01	25.09	462.00	91.27
Specific conductance (μmho/cm)	43	395.00	3757.00	7000.00	1534.74
pH (units)	42	7.40	8.24	8.70	.25
Temperature (°C)	43	.00	10.00	26.50	9.45
Turbidity (JTU)	42	1.00	71.55	780.00	146.31
Oxygen, dissolved (mg/L)	42	7.00	10.18	13.20	1.55
Oxygen, dissolved (percent)	42	69.10	96.72	138.00	14.32
Biochemical oxygen demand (mg/L)	42	.00	2.79	9.90	2.14
Calcium, dissolved (mg/L)	43	24.00	106.86	220.00	52.36
Magnesium, dissolved (mg/L)	43	12.00	119.37	260.00	65.39
Sodium, dissolved (mg/L)	43	35.00	647.51	1100.00	276.83
Sodium (percent)	43	36.00	63.12	80.00	11.45
Sodium-adsorption ratio	43	1.50	10.39	18.00	4.27
Potassium, dissolved (mg/L)	43	6.50	10.24	17.00	1.95
Bicarbonate (mg/L)	43	89.00	526.60	913.00	199.70
Carbonate (mg/L)	42	.00	5.57	100.00	17.53
Sulfate, dissolved (mg/L)	43	110.00	1653.26	2800.00	713.42
Chloride, dissolved (mg/L)	43	4.50	28.17	260.00	37.39
Fluoride, dissolved (mg/L)	43	.10	.40	.60	.13
Silica, dissolved (mg/L)	43	.00	6.47	14.00	3.28
Dissolved solids, calculated (mg/L)	43	245.00	2837.88	4470.00	1156.65
Nitrogen, NO_2+NO_3 total (mg/L as N)	43	.00	.06	.23	.07
Nitrogen, ammonia total (mg/L as N)	43	.00	.07	.59	.11
Nitrogen, organic total (mg/L as N)	43	.12	.92	3.10	.55
Nitrogen, total (mg/L as N)	43	.40	1.05	3.50	.63
Phosphorus, total (mg/L as P)	43	.01	.12	.86	.16
Sediment, suspended (mg/L)	42	13.00	196.93	1860.00	324.72

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (μg/L)	10	0.00	40.00
Arsenic (μg/L)	10	.00	2.00
Beryllium (μg/L)	10	.00	10.00
Boron (μg/L)	43	120.00	620.00
Cadmium (μg/L)	10	.00	2.00
Chromium (μg/L)	10	.00	20.00
Copper (μg/L)	10	.00	7.00
Iron (μg/L)	43	.00	510.00
Lead (μg/L)	10	.00	13.00
Lithium (μg/L)	10	10.00	60.00
Manganese (μg/L)	10	30.00	230.00
Mercury (μg/L)	10	.00	.10
Molybdenum (μg/L)	10	.00	6.00
Nickel (μg/L)	10	3.00	10.00
Selenium (μg/L)	8	.00	1.00
Zinc (μg/L)	10	.00	30.00
Vanadium (μg/L)	10	.00	9.00

Period of record: July 1974 to September 1978

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
4000 Q	-8.56	.254*	1320	--	--	--	--	--
8.00 K	.00006	.173*	.226	8.07	-.00052	.00005	.200*	.224
--	--	--	--	--	--	--	--	--
44.6 Q	1.05	.438*	110	195	.728*	-.0379*	.558*	99.7
Q		.0275	1.53				.0397	1.54
Q		.0198	14.2				.0201	14.4
6.44 K	-.0010	.501*	1.53	5.27	.0085*	-.00071*	.601*	1.38
37.5 K	.0184	.297*	43.5	4.30	-.0401	.0172*	.301*	43.9
13.1 K	.0285	.446*	48.6	14.9	-.0131	.0281*	.447*	49.1
1.43 K	.173	.885*	95.6	27.2	-.188	.167*	.888*	95.5
49.4 K	.0036	.241*	9.9	54.4	-.0362	.00256*	.303*	9.6
2.55 K	.00209	.561*	2.83	3.55	-.00731	.00187*	.578*	2.81
7.41 K	.00077	.353*	1.60	7.39	.00015	.00078*	.353*	1.62
107 K	.112	.743*	102	139	-.234	.105*	.752*	101
-9.21 K	.00389	.121*	16.4			*	.131	16.5
85.0 K	.421	.796*	327	143	-.421	.408*	.798*	329
1.23 K	.00712	.0872*	35.3				.0872	35.7
.181 K	.00006	.469*	.0943	.238	-.00042*	.00005*	.532*	.0895
Q		.0273	3.33				.0660	3.30
198 K	.707	.859*	440	303	-.770	.684*	.861*	441
.142 K	-.00002	.201*	.0642	.122	.00015	-.00002*	.226*	.0640
K		.0385	.108				.0392	.109
.816 Q	.00414	.474*	.393	1.26	.00319*	-.00011*	.547*	.370
.930 Q	.00456	.437*	.468	1.47	.00340*	-.00014*	.520*	.437
.0845 Q	.00126	.508*	.112	.271	.00086*	-.00005*	.657*	.0948
131 K	2.59	.540*	223	360	2.10*	-.0578*	.597*	211

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
9	210.00	17000.00
14	.00	6.00
14	.00	20.00
0	.	.
13	10.00	20.00
13	.00	64.00
13	10.00	300.00
14	250.00	30000.00
13	100.00	100.00
14	10.00	60.00
14	30.00	730.00
14	.00	.60
14	.00	6.00
13	50.00	100.00
14	.00	1.00
9	10.00	130.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 5 Station No. (USGS): 06295110 Station name: Rosebud Creek at Kirby, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	11	4.80	41.52	231.00	67.97
Specific conductance (µmho/cm)	11	657.00	870.27	929.00	81.38
pH (units)	11	8.00	8.17	8.50	.16
Temperature (°C)	11	.00	6.55	15.00	5.96
Turbidity (JTU)	9	5.00	54.67	180.00	69.71
Oxygen, dissolved (mg/L)	10	8.20	10.19	11.80	1.35
Oxygen, dissolved (percent)	10	82.00	92.00	97.00	4.67
Biochemical oxygen demand (mg/L)	9	.60	1.44	2.80	.87
Calcium, dissolved (mg/L)	11	56.00	75.55	87.00	8.73
Magnesium, dissolved (mg/L)	11	47.00	66.73	74.00	7.27
Sodium, dissolved (mg/L)	11	13.00	24.09	31.00	5.34
Sodium (percent)	11	7.00	9.73	12.00	1.68
Sodium-adsorption ratio	11	.30	.49	.60	.09
Potassium, dissolved (mg/L)	11	5.70	7.54	10.00	1.21
Bicarbonate (mg/L)	11	330.00	447.82	510.00	57.89
Carbonate (mg/L)	11	.00	2.36	26.00	7.84
Sulfate, dissolved (mg/L)	11	100.00	127.27	150.00	13.48
Chloride, dissolved (mg/L)	11	2.40	3.40	4.20	.59
Fluoride, dissolved (mg/L)	11	.40	.54	.70	.10
Silica, dissolved (mg/L)	11	11.00	15.64	19.00	2.80
Dissolved solids, calculated (mg/L)	11	414.00	544.18	612.00	54.14
Nitrogen, NO_2+NO_3 total (mg/L as N)	11	.07	.17	.38	.10
Nitrogen, ammonia total (mg/L as N)	11	.00	.05	.17	.06
Nitrogen, organic total (mg/L as N)	11	.23	.66	1.60	.46
Nitrogen, total (mg/L as N)	11	.32	.88	2.10	.58
Phosphorus, total (mg/L as P)	11	.00	.11	.37	.13
Sediment, suspended (mg/L)	9	12.00	208.89	612.00	203.68

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	4	0.00	80.00
Arsenic (µg/L)	4	1.00	11.00
Beryllium (µg/L)	4	.00	.00
Boron (µg/L)	11	70.00	170.00
Cadmium (µg/L)	4	1.00	3.00
Chromium (µg/L)	4	.00	.00
Copper (µg/L)	4	1.00	9.00
Iron (µg/L)	11	20.00	100.00
Lead (µg/L)	4	.00	16.00
Lithium (µg/L)	4	40.00	60.00
Manganese (µg/L)	4	30.00	60.00
Mercury (µg/L)	4	.00	.00
Molybdenum (µg/L)	4	2.00	5.00
Nickel (µg/L)	4	2.00	2.00
Selenium (µg/L)	4	.00	4.00
Zinc (µg/L)	4	10.00	30.00
Vanadium (µg/L)	4	1.00	2.00

Period of record: Water year 1978

REGRESSION SUMMARY								
SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
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925 Q	1.10	.739*	42.9	--	--		--	--
Q		.131	.148				.190	.148
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663 K	-.705	.808*	32.6	824	-.239	-.879*	.823*	33.8
Q		.290	1.14				.378	1.13
K		.303	4.11				.322	430
7.36 K	-.0069	.496*	.659				.542	.679
14.3 K	.0708	.440*	671	46.3	.0962	.135*	.569*	6.18
-11.9 K	.0908	.897*	2.58	-5.67	-.0099	.0842*	.899*	2.68
27.3 Q	-.0695	.715*	2.88	7.25	-.0456	.0217	.745*	2.85
10.6 Q	-.0189	.568*	1.08	11.3	-.0197	-.00075	.568*	1.13
.543 Q	-.0011	.611*	.0595	.271	-.00081	.00029	.629*	.0608
K		.197	1.03				.208	1.08
-100 K	.630	.783*	28.1	3.65	-.158	.519*	.792*	29.1
Q		.0230	7.78				.0231	8.20
-9.59 K	.164	.312*	20.5				.327	21.3
-2.17 K	.0064	.708*	.348	-3.10	.0015	.0074*	.713*	.362
-.197 K	.0008	.489*	.0722	-.312	.00018	.00096	.493*	.0754
-2.64 K	.0209	.417*	2.08				.423	2.17
-69.3 K	.712	.859*	24.3	-90.2	.0334	.734*	.859*	25.4
.998 K	-.0010	.585*	.0678	.772	.0004	-.00072	.598*	.0699
K		.234	.049				.238	.0512
4.39 K	-.0042	.621*	.277	3.71	.0011	-.0035	.628*	.289
5.69 K	-.0055	.656*	.333	4.84	.0013	-.0046	.663*	.345
1.27 K	-.0013	.788*	.0581	1.35	-.00013	-.0014*	.789*	.0608
2075 K	-2.16	.892*	71.6	2144	-.103	-2.24*	.892*	77.2

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
1	6900.00	6900.00
1	2.00	2.00
1	.00	.00
0	.	.
1	2.00	2.00
1	10.00	10.00
1	18.00	18.00
1	9800.00	9800.00
1	19.00	19.00
1	40.00	40.00
1	380.00	380.00
1	.00	.00
0	.	.
0	.	.
1	10.00	10.00
1	40.00	40.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 6 Station No. (USGS): 06295250 Station name: Rosebud Creek near Colstrip, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	45	9.60	63.73	310.00	65.81
Specific conductance (μmho/cm)	45	310.00	1192.44	1750.00	253.73
pH (units)	45	7.50	8.25	8.90	.27
Temperature (°C)	45	.00	8.61	23.00	8.28
Turbidity (JTU)	45	5.00	83.73	600.00	133.49
Oxygen, dissolved (mg/L)	44	6.20	9.90	13.80	1.99
Oxygen, dissolved (percent)	44	69.00	92.35	110.00	9.03
Biochemical oxygen demand (mg/L)	44	.30	2.17	16.40	2.56
Calcium, dissolved (mg/L)	45	29.00	76.02	100.00	13.42
Magnesium, dissolved (mg/L)	45	19.00	87.62	110.00	15.48
Sodium, dissolved (mg/L)	45	13.00	66.04	100.00	15.75
Sodium (percent)	45	15.00	20.11	25.00	2.38
Sodium-adsorption ratio	45	.50	1.22	1.70	.23
Potassium, dissolved (mg/L)	45	7.10	9.47	12.00	1.24
Bicarbonate (mg/L)	45	132.00	470.60	606.00	85.86
Carbonate (mg/L)	45	.00	2.56	34.00	6.26
Sulfate, dissolved (mg/L)	45	54.00	285.42	420.00	61.62
Chloride, dissolved (mg/L)	45	1.10	6.41	70.00	9.75
Fluoride, dissolved (mg/L)	45	.20	.57	.70	.09
Silica, dissolved (mg/L)	45	7.10	15.31	22.00	3.45
Dissolved solids, calculated (mg/L)	45	198.00	781.69	1000.00	134.06
Nitrogen, NO_2+NO_3 total (mg/L as N)	45	.00	.13	.42	.13
Nitrogen, ammonia total (mg/L as N)	45	.00	.07	.74	.14
Nitrogen, organic total (mg/L as N)	45	.06	.67	2.00	.45
Nitrogen, total (mg/L as N)	45	.09	.87	2.30	.54
Phosphorus, total (mg/L as P)	45	.00	.14	1.30	.21
Sediment, suspended (mg/L)	45	19.00	206.67	1040.00	250.52

Variable	Sample size	DISSOLVED Minimum value	Maximum value
Aluminum (μg/L)	12	0.00	30.00
Arsenic (μg/L)	12	1.00	4.00
Beryllium (μg/L)	12	.00	10.00
Boron (μg/L)	45	100.00	240.00
Cadmium (μg/L)	12	.00	4.00
Chromium (μg/L)	12	.00	20.00
Copper (μg/L)	12	.00	4.00
Iron (μg/L)	45	.00	260.00
Lead (μg/L)	12	.00	14.00
Lithium (μg/L)	12	40.00	60.00
Manganese (μg/L)	12	.00	50.00
Mercury (μg/L)	12	.00	.30
Molybdenum (μg/L)	12	.00	3.00
Nickel (μg/L)	12	1.00	7.00
Selenium (μg/L)	11	.00	5.00
Zinc (μg/L)	12	.00	20.00
Vanadium (μg/L)	12	.20	15.00

Period of record: Water years 1975-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
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1310 Q	-1.79	.216*	225	--	--	--	--	--
Q		.0729	.255		*		.111	.253
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349 K	-.222	.178*	122	229	.579	-.153	.242*	119
5.76 K	.0034	.197*	1.79	6.52	-.0037	.0030*	.209*	1.8
94.9 Q	-.0410	.0915*	8.61				.0926	8.71
9.93 K	-.0065	.424*	1.96	8.08	.0088	.0054*	.465*	1.92
32.5 K	.0365	.477*	9.73	18.1	.0693*	.0449*	.567*	8.96
26.9 K	.0509	.694*	8.62	37.6	-.0515*	.0448*	.731*	8.17
8.12 K	-.0479	.599*	10.0	24.6	-.0763*	.0388*	.678*	9.05
21.5 Q	-.0227	.398*	1.84	18.8	-.0190*	.0021	.436*	1.80
.487 K	.0006	.449*	.172	.796	-.0015*	.0004*	.591*	.150
6.51 K	.0025	.260*	1.07	7.75	-.0059*	.0018*	.339*	1.02
175 K	.248	.537*	59.1	242	-.323*	.209*	.586*	56.6
Q		.0469	6.18				.0575	6.22
71.8 K	.179	.545*	41.7	105	-.159	.160*	.567*	41.1
1.57 Q	.0763	.265*	8.36	-26.8	.115*	.0217*	.515*	6.87
.622 Q	-.0009	.376*	.0735	.451	-.0006*	-.0001*	.476*	.0678
5.90 K	.0079	.337*	2.81	8.53	-.0127	.0064*	.384*	2.74
239 K	.455	.742*	68.9	303	-.307	.418*	.760*	67.2
Q		.0737	.131				.0740	.132
Q		.0331	.135				.0345	.136
1.97 K	-.00110	.376*	.362	1.40	-.00279*	-.00076*	.505*	.326
.548 Q	.00500	.369*	.436	1.56	.00362*	-.00078*	.472*	.404
.0573 Q	.00123	.150*	.195	.211	.00102*	-.00012	.166*	.195
79.1 Q	2.00	.276*	216	448	1.50*	-.283*	.341*	208

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
9	180.00	8800.00
13	.00	9.00
13	.00	10.00
0	.	.
13	.00	10.00
13	.00	20.00
13	.00	310.00
13	310.00	16000.00
13	4.00	100.00
13	40.00	60.00
13	20.00	600.00
13	.00	.30
12	1.00	6.00
13	.00	65.00
13	.00	2.00
9	10.00	130.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 7 Station No. (USGS): 06295350 Station name: Greenleaf Creek near Colstrip, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	2	4.90	9.95	15.00	7.14
Specific conductance (µmho/cm)	2	85.00	107.50	130.00	31.82
pH (units)	2	7.40	7.70	8.00	.42
Temperature (°C)	2	.00	.25	.50	.35
Turbidity (JTU)	2	40.00	50.00	60.00	14.14
Oxygen, dissolved (mg/L)	2	10.60	10.70	10.80	.14
Oxygen, dissolved (percent)	2	81.00	81.50	82.00	.71
Biochemical oxygen demand (mg/L)	2	9.50	10.25	11.00	1.06
Calcium, dissolved (mg/L)	2	13.00	15.00	17.00	2.83
Magnesium, dissolved (mg/L)	2	2.90	3.85	4.80	1.34
Sodium, dissolved (mg/L)	2	1.00	1.50	2.00	.71
Sodium (percent)	2	4.00	5.00	6.00	1.41
Sodium-adsorption ratio	2	.10	.10	.10	.00
Potassium, dissolved (mg/L)	2	5.60	6.55	7.50	1.34
Bicarbonate (mg/L)	2	48.00	57.50	67.00	13.44
Carbonate (mg/L)	2	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	2	6.30	12.65	19.00	8.98
Chloride, dissolved (mg/L)	2	1.30	1.65	2.00	.49
Fluoride, dissolved (mg/L)	2	.00	.05	.10	.07
Silica, dissolved (mg/L)	2	6.30	7.00	7.70	.99
Dissolved solids, calculated (mg/L)	2	60.00	77.00	94.00	24.04
Nitrogen, NO_2+NO_3 total (mg/L as N)	2	.08	.08	.08	.00
Nitrogen, ammonia total (mg/L as N)	2	.16	.26	.35	.13
Nitrogen, organic total (mg/L as N)	2	1.60	1.65	1.70	.07
Nitrogen, total (mg/L as N)	2	1.90	2.00	2.10	.14
Phosphorus, total (mg/L as P)	2	.24	.34	.43	.13
Sediment, suspended (mg/L)	2	78.00	82.00	86.00	5.66

		DISSOLVED	
Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	1	0.00	0.00
Arsenic (µg/L)	1	2.00	2.00
Beryllium (µg/L)	1	.00	.00
Boron (µg/L)	2	80.00	130.00
Cadmium (µg/L)	1	1.00	1.00
Chromium (µg/L)	1	.00	.00
Copper (µg/L)	1	19.00	19.00
Iron (µg/L)	2	40.00	300.00
Lead (µg/L)	1	6.00	6.00
Lithium (µg/L)	0	.	.
Manganese (µg/L)	1	.00	.00
Mercury (µg/L)	1	.30	.30
Molybdenum (µg/L)	0	.	.
Nickel (µg/L)	1	.00	.00
Selenium (µg/L)	0	.	.
Zinc (µg/L)	1	10.00	10.00
Vanadium (µg/L)	0	.	.

Period of record: Water years 1975-76 (discontinued)

REGRESSION SUMMARY[1]

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant	Regression coefficient	Coefficient of determination	Standard error of estimate	Regression constant	Partial regression coefficient Q	Partial regression coefficient K	Coefficient of determination	Standard error of estimate
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[1]Insufficient samples to develop regressions.

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
0	.	.
1	3.00	3.00
1	10.00	10.00
0	.	.
1	10.00	10.00
1	10.00	10.00
1	50.00	50.00
1	2300.00	2300.00
1	100.00	100.00
1	10.00	10.00
1	70.00	70.00
1	.20	.20
1	.00	.00
1	50.00	50.00
1	.00	.00
0	.	.
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 8 | Station No. (USGS): 06295400 | Station name: Rosebud Creek above Pony Creek, near Colstrip, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	37	6.40	55.05	258.00	56.04
Specific conductance (µmho/cm)	37	400.00	1281.62	1900.00	296.49
pH (units)	37	7.40	8.26	8.80	.32
Temperature (°C)	37	.00	8.84	23.50	8.58
Turbidity (JTU)	36	7.00	71.56	550.00	108.07
Oxygen, dissolved (mg/L)	36	6.50	9.69	13.80	1.99
Oxygen, dissolved (percent)	36	53.40	90.46	118.00	11.26
Biochemical oxygen demand (mg/L)	35	.00	1.64	3.20	.91
Calcium, dissolved (mg/L)	37	28.00	75.57	94.00	13.45
Magnesium, dissolved (mg/L)	37	19.00	90.86	120.00	17.17
Sodium, dissolved (mg/L)	37	15.00	76.08	120.00	20.55
Sodium (percent)	37	16.00	21.97	27.00	2.74
Sodium-adsorption ratio	37	.50	1.38	2.00	.30
Potassium, dissolved (mg/L)	37	1.10	9.64	13.00	2.01
Bicarbonate (mg/L)	37	140.00	468.35	617.00	82.36
Carbonate (mg/L)	37	.00	4.24	39.00	9.12
Sulfate, dissolved (mg/L)	37	62.00	324.38	560.00	84.01
Chloride, dissolved (mg/L)	37	3.10	5.33	13.00	1.62
Fluoride, dissolved (mg/L)	37	.20	.57	.70	.10
Silica, dissolved (mg/L)	37	7.30	15.01	22.00	3.49
Dissolved solids, calculated (mg/L)	37	214.00	832.68	1150.00	163.97
Nitrogen, NO_2+NO_3 total (mg/L as N)	37	.00	.12	.37	.12
Nitrogen, ammonia total (mg/L as N)	37	.00	.05	.25	.07
Nitrogen, organic total (mg/L as N)	37	.02	.79	3.80	.66
Nitrogen, total (mg/L as N)	37	.19	.95	3.80	.67
Phosphorus, total (mg/L as P)	37	.00	.10	.45	.10
Sediment, suspended (mg/L)	36	12.00	180.17	822.00	196.34

Variable	Sample size	DISSOLVED Minimum value	Maximum value
Aluminum (µg/L)	8	0.00	20.00
Arsenic (µg/L)	9	1.00	28.00
Beryllium (µg/L)	8	.00	10.00
Boron (µg/L)	36	100.00	250.00
Cadmium (µg/L)	8	.00	1.00
Chromium (µg/L)	8	.00	10.00
Copper (µg/L)	8	1.00	5.00
Iron (µg/L)	37	.00	190.00
Lead (µg/L)	8	.00	2.00
Lithium (µg/L)	8	40.00	60.00
Manganese (µg/L)	8	.00	30.00
Mercury (µg/L)	8	.00	.10
Molybdenum (µg/L)	8	1.00	3.00
Nickel (µg/L)	8	1.00	7.00
Selenium (µg/L)	7	.00	1.00
Zinc (µg/L)	8	.00	30.00
Vanadium (µg/L)	8	.40	14.00

Period of record: Water year 1975-77 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
Q		.0840	288	--	--	--	--	--
Q		.0206	.319				.0212	.323
--	--	--	--	--	--	--	--	--
270 K	-.155	.185*	99.0	198	.573	-.124*	.267*	95.3
5.07 K	.00360	.296*	1.69	5.62	-.00439	.00336*	.311*	1.70
Q		.0594	11.1				.0806	11.1
3.89 K	-.00173	.247*	.805	3.40	.00664*	-.00161*	.386*	.739
29.5 K	.0359	.627*	8.33	29.7	-.00159	.0358*	.627*	8.45
35.9 K	.0429	.548*	11.7	53.9	-.144*	.0350*	.750*	8.83
10.4 K	.0512	.546*	14.0	29.0	-.148*	.0431*	.695*	11.7
23.5 Q	-.0275	.316*	2.30	18.2	-.0215*	.00390*	.479*	2.04
.470 K	.00071	.492*	.218	.746	-.00220*	.00059*	.646*	.185
10.8 Q	-.0212	.349*	1.65	8.44	-.0186*	.00173	.408*	1.59
183 K	.222	.641*	50.0	226	-.340*	.204*	.690*	47.2
Q		.0877	8.84				.0884	8.96
72.5 K	.197	.481*	61.4	138	-.521*	.168*	.592*	55.2
K		.139	1.53			*	.146	1.54
.631 Q	-.00105	.335*	.0842	.493	-.00090*	.00010*	.414*	.0802
9.47 K	.00432	.135*	3.29	10.9	-.0112	.00371	.164*	3.29
258 K	.448	.657*	97.3	391	-1.06*	.390*	.778*	79.5
Q		.899	.118				.0921	.119
Q		.0528	.0716				.0764	.0717
1.94 K	-.00090	.162*	.616	1.52	.00334	-.00072*	.235*	.597
.656 Q	.00534	.198*	.612	1.69	.00418*	-.00076*	.300*	.580
.0525 Q	.00089	.239*	.0901	.211	.00071*	-.00012*	.343*	.0849
578 K	-.311	.227*	175	461	.936	-.261*	.293*	170

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
8	200.00	4600.00
12	.00	18.00
12	.00	10.00
0	.	.
12	.00	20.00
11	.00	20.00
12	10.00	50.00
12	420.00	8200.00
12	100.00	100.00
12	40.00	60.00
12	20.00	310.00
12	.00	.40
12	1.00	4.00
12	.00	50.00
12	.00	2.00
8	.00	40.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 9 Station No. (USGS): 06295420 Station name: Snider Creek near Brandenberg, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	2	10.00	31.00	52.00	29.70
Specific conductance (µmho/cm)	2	65.00	70.00	75.00	7.07
pH (units)	2	7.40	7.55	7.70	.21
Temperature (°C)	2	1.00	2.00	3.00	1.41
Turbidity (JTU)	2	120.00	135.00	150.00	21.21
Oxygen, dissolved (mg/L)	2	10.70	10.75	10.80	.07
Oxygen, dissolved (percent)	2	84.00	86.00	88.00	2.83
Biochemical oxygen demand (mg/L)	2	4.80	5.05	5.30	.35
Calcium, dissolved (mg/L)	2	6.70	7.20	7.70	.71
Magnesium, dissolved (mg/L)	2	1.90	2.00	2.10	.14
Sodium, dissolved (mg/L)	2	3.00	3.10	3.20	.14
Sodium (percent)	2	16.00	17.50	19.00	2.12
Sodium-adsorption ratio	2	.20	.25	.30	.07
Potassium, dissolved (mg/L)	2	3.60	4.00	4.40	.57
Bicarbonate (mg/L)	2	28.00	35.00	42.00	9.90
Carbonate (mg/L)	2	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	2	3.30	4.20	5.10	1.27
Chloride, dissolved (mg/L)	2	.90	.90	.90	.00
Fluoride, dissolved (mg/L)	2	.00	.00	.00	.00
Silica, dissolved (mg/L)	2	4.60	4.65	4.70	.07
Dissolved solids, calculated (mg/L)	2	38.00	43.50	49.00	7.78
Nitrogen, NO_2+NO_3 total (mg/L as N)	2	.14	.15	.15	.01
Nitrogen, ammonia total (mg/L as N)	2	.25	.28	.31	.04
Nitrogen, organic total (mg/L as N)	2	.18	.57	.95	.54
Nitrogen, total (mg/L as N)	2	.64	.97	1.30	.47
Phosphorus, total (mg/L as P)	2	.30	.33	.36	.04
Sediment, suspended (mg/L)	2	128.00	137.50	147.00	13.44

Variable	DISSOLVED Sample size	Minimum value	Maximum value
Aluminum (µg/L)	1	130.00	130.00
Arsenic (µg/L)	1	1.00	1.00
Beryllium (µg/L)	1	.00	.00
Boron (µg/L)	2	50.00	60.00
Cadmium (µg/L)	1	3.00	3.00
Chromium (µg/L)	1	20.00	20.00
Copper (µg/L)	1	9.00	9.00
Iron (µg/L)	2	40.00	200.00
Lead (µg/L)	1	10.00	10.00
Lithium (µg/L)	1	1.00	1.00
Manganese (µg/L)	1	10.00	10.00
Mercury (µg/L)	1	.00	.00
Molybdenum (µg/L)	1	1.00	1.00
Nickel (µg/L)	1	4.00	4.00
Selenium (µg/L)	1	.00	.00
Zinc (µg/L)	1	20.00	20.00
Vanadium (µg/L)	1	2.00	2.00

Period of record: Water year 1978

REGRESSION SUMMARY[1]

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant	Regression coefficient	Coefficient of determination	Standard error of estimate	Regression constant	Partial regression coefficient Q	Partial regression coefficient K	Coefficient of determination	Standard error of estimate
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[1]Insufficient samples to develop regression.

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
1	1900.00	1900.00
1	2.00	2.00
1	.00	.00
0	.	.
1	2.00	2.00
1	30.00	30.00
0	.	.
1	3300.00	3300.00
0	.	.
1	.00	.00
1	50.00	50.00
1	.00	.00
1	6.00	6.00
1	23.00	23.00
1	.00	.00
1	40.00	40.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 10 Station No. (USGS): 06295500 Station name: Rosebud Creek near Rosebud, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	32	10.00	65.68	312.00	66.13
Specific conductance (µmho/cm)	32	350.00	1257.50	1870.00	325.04
pH (units)	32	7.50	8.20	8.60	.27
Temperature (°C)	32	.00	7.45	23.00	8.16
Turbidity (JTU)	32	5.00	123.44	480.00	141.62
Oxygen, dissolved (mg/L)	32	5.90	10.09	12.70	2.05
Oxygen, dissolved (percent)	32	67.00	89.64	103.00	7.91
Biochemical oxygen demand (mg/L)	32	.20	2.04	8.50	1.76
Calcium, dissolved (mg/L)	32	26.00	73.94	98.00	16.19
Magnesium, dissolved (mg/L)	32	18.00	88.03	120.00	23.00
Sodium, dissolved (mg/L)	32	21.00	83.56	130.00	25.07
Sodium (percent)	32	17.00	24.50	32.00	3.34
Sodium-adsorption ratio	32	.80	1.53	2.30	.34
Potassium, dissolved (mg/L)	32	7.30	9.63	12.00	1.42
Bicarbonate (mg/L)	32	139.00	447.81	616.00	105.96
Carbonate (mg/L)	32	.00	3.56	30.00	7.73
Sulfate, dissolved (mg/L)	32	62.00	344.44	600.00	105.17
Chloride, dissolved (mg/L)	32	2.70	5.34	7.50	1.19
Fluoride, dissolved (mg/L)	32	.20	.54	.70	.12
Silica, dissolved (mg/L)	32	6.90	14.56	22.00	3.73
Dissolved solids, calculated (mg/L)	32	215.00	844.34	1190.00	206.70
Nitrogen, NO_2+NO_3 total (mg/L as N)	32	.00	.12	.37	.12
Nitrogen, ammonia total (mg/L as N)	32	.00	.04	.22	.05
Nitrogen, organic total (mg/L as N)	32	.13	.83	1.70	.42
Nitrogen, total (mg/L as N)	32	.13	.99	1.90	.50
Phosphorus, total (mg/L as P)	32	.01	.13	.46	.14
Sediment, suspended (mg/L)	32	18.00	349.78	946.00	272.75

Variable	DISSOLVED Sample size	Minimum value	Maximum value
Aluminum (µg/L)	7	0.00	30.00
Arsenic (µg/L)	7	1.00	3.00
Beryllium (µg/L)	7	.00	10.00
Boron (µg/L)	32	90.00	260.00
Cadmium (µg/L)	7	.00	3.00
Chromium (µg/L)	7	.00	10.00
Copper (µg/L)	7	1.00	6.00
Iron (µg/L)	32	.00	160.00
Lead (µg/L)	7	.00	10.00
Lithium (µg/L)	7	10.00	60.00
Manganese (µg/L)	7	.00	130.00
Mercury (µg/L)	7	.00	.10
Molybdenum (µg/L)	7	.00	3.00
Nickel (µg/L)	7	1.00	9.00
Selenium (µg/L)	5	1.00	1.00
Zinc (µg/L)	7	10.00	30.00
Vanadium (µg/L)	7	.40	16.00

Period of record: Water years 1975-77 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
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1460 Q	-3.04	.383*	259	--	--	--	--	--
Q		.383	.270				.0382	.274
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418 K	-.234	.289*	121	372	.205	-.208*	.295*	123
6.80 K	.00261	.172*	1.89				.173	1.93
K		.101	7.62				.107	7.73
6.97 K	-.00392	.527*	1.23	6.89	.00035	-.00388*	.527*	1.25
18.5 K	.0441	.784*	7.66	1.85	.0743*	.0534*	.840*	6.69
4.34 K	.0666	.884*	7.95	8.93	-.0205	.0640*	.887*	8.01
1.07 K	.0656	.723*	13.4	-3.28	.0194	.0680*	.725*	13.6
K		.00784	3.38				.00909	3.44
.630 K	.00072	.469*	.253	.623	.00003	.00072*	.469*	.257
6.27 K	.00267	.372*	1.14	7.11	-.00373	.00220*	.391*	1.15
88.2 K	.286	.770*	51.7	39.9	.215	.313*	.781*	51.3
Q		.0496	7.66				.0575	7.76
1.45 K	.273	.711*	57.5	7.85	-.0286	.269*	.711*	58.5
2.02 K	.00264	.517*	.842	1.65	.00163	.00284*	.522*	.852
.180 K	.00029	.589*	.079	.278	-.00044	.00023*	.624*	.077
7.13 K	.00590	.264*	3.26	7.57	-.00194	.00566*	.265*	3.31
86.9 K	.602	.897*	67.4	62.5	.109	.616*	.898*	68.3
K		.0881	.119				.1000	.121
Q		.0431	.054				.0508	.054
2.08 K	-.00099	.574*	.282	1.74	.00151	-.00080*	.608*	.275
2.33 K	-.00107	.487*	.364	1.89	.00200	-.00082*	.530*	.354
.485 K	-.00028	.406*	.112	.401	.00037	-.00023*	.425*	.112
235 Q	1.74	.178*	251	518	1.15	-.194	.211*	250

[1] Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2] Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3] Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
8	450.00	7300.00
12	.00	9.00
12	.00	10.00
0	.	.
12	.00	10.00
12	.00	35.00
12	10.00	30.00
12	680.00	11,000.00
12	100.00	100.00
12	20.00	60.00
12	40.00	420.00
12	.00	1.20
12	.00	3.00
12	.00	50.00
12	.00	1.00
8	20.00	60.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 11   Station No. (USGS): 06296003   Station name: Rosebud Creek at Mouth, near Rosebud, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	49	5.80	86.67	916.00	163.15
Specific conductance (µmho/cm)	49	257.00	1305.55	2060.00	352.09
pH (units)	48	6.90	8.21	8.80	.36
Temperature (°C)	49	.00	9.20	25.00	8.78
Turbidity (JTU)	44	5.00	268.34	2500.00	551.18
Oxygen, dissolved (mg/L)	47	6.20	10.24	13.20	1.84
Oxygen, dissolved (percent)	46	67.00	94.80	117.00	9.97
Biochemical oxygen demand (mg/L)	46	.20	2.18	8.80	1.76
Calcium, dissolved (mg/L)	47	12.00	72.47	110.00	19.30
Magnesium, dissolved (mg/L)	47	6.90	85.70	130.00	28.24
Sodium, dissolved (mg/L)	47	24.00	101.87	190.00	32.53
Sodium (percent)	47	19.00	29.74	63.00	8.63
Sodium-adsorption ratio	47	.90	1.98	3.80	.64
Potassium, dissolved (mg/L)	47	4.30	9.79	13.00	1.78
Bicarbonate (mg/L)	46	110.00	446.02	636.00	115.50
Carbonate (mg/L)	46	.00	3.46	21.00	6.17
Sulfate, dissolved (mg/L)	47	39.00	364.19	620.00	114.98
Chloride, dissolved (mg/L)	47	2.20	5.60	9.20	1.39
Fluoride, dissolved (mg/L)	47	.20	.58	1.10	.15
Silica, dissolved (mg/L)	47	.30	13.12	22.00	4.25
Dissolved solids, calculated (mg/L)	46	150.00	876.35	1270.00	235.48
Nitrogen, NO_2+NO_3 total (mg/L as N)	47	.00	.15	1.10	.19
Nitrogen, ammonia total (mg/L as N)	47	.00	.04	.38	.07
Nitrogen, organic total (mg/L as N)	47	.13	1.10	6.10	1.20
Nitrogen, total (mg/L as N)	47	.17	1.29	6.80	1.30
Phosphorus, total (mg/L as P)	47	.00	.27	2.30	.48
Sediment, suspended (mg/L)	46	35.00	572.37	7239.99	1240.58

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	10	0.00	210.00
Arsenic (µg/L)	11	.00	4.00
Beryllium (µg/L)	10	.00	10.00
Boron (µg/L)	47	100.00	310.00
Cadmium (µg/L)	10	.00	3.00
Chromium (µg/L)	10	.00	30.00
Copper (µg/L)	10	.00	9.00
Iron (µg/L)	47	.00	420.00
Lead (µg/L)	10	.00	17.00
Lithium (µg/L)	10	7.00	60.00
Manganese (µg/L)	10	10.00	40.00
Mercury (µg/L)	10	.00	.90
Molybdenum (µg/L)	10	1.00	4.00
Nickel (µg/L)	10	.00	10.00
Selenium (µg/L)	8	.00	2.00
Zinc (µg/L)	10	.00	40.00
Vanadium (µg/L)	10	.40	15.00

Period of record: Water years 1975-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
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1420 Q	-1.31	.368*	278	--	--		--	--
Q		.0278	.355				.0381	.357
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18.7 Q	2.69	.695*	308	194	2.52*	-.125	.699*	310
K		.0700	1.78				.0715	1.79
Q		.0592	9.70				.0670	9.76
5.95 K	-.00289	.356*	1.43	5.33	.00135	-.00252*	.366*	1.43
12.6 K	.0457	.643*	11.8	15.4	-.00598	.0439*	.645*	11.9
-8.22 K	.0731	.806*	12.4	2.87	-.0236	.0661*	.817*	12.2
11.2 K	.0700	.567*	21.2	-1.59	.0271	.0780*	.578*	21.1
27.1 Q	.0294	.322*	7.04	24.0	.0323*	.00221	.327*	7.09
K		.0410	.623	.666	.00175*	.00089*	.166*	.587
4.81 K	.00389	.575*	1.16	6.25	-.00306*	.00298*	.624*	1.10
75.1 K	.287	.773*	55.0	113	.0807	.263*	.781*	54.6
Q		.0352	6.18				.0389	6.24
-27.6 K	.304	.847*	44.8	-14.3	-.0283	.295*	.848*	45.1
2.02 K	.00281	.482*	1.01	2.46	-.00095	.00253*	.489*	1.01
.196 K	.00029	.487*	.104	.243	-.00010	.00026*	.495*	.105
14.3 Q	-.0131	.258*	3.65	11.5	-.0104*	.00201	.275*	3.65
39.8 K	.648	.939*	57.9	83.6	-.0930	.620*	.941*	57.2
.424 K	-.00022	.148*	.178	.435	-.00002	-.00022*	.149*	.180
.0258 Q	.00019	.220*	.058	.0978	.00012	-.00005	.262*	.057
.521 Q	.00641	.790*	.545	1.45	.00555*	-.00066*	.812*	.520
.666 Q	.00690	.766*	.628	1.99	.00567*	-.00094*	.804*	.581
.049 Q	.00250	.733*	.249	.284	.00228*	-.00016	.742*	.247
-23.2 Q	6.55	.783*	585	-242	6.75*	.154	.784*	590

[1] Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2] Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3] Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
8	710.00	4800.00
13	.00	10.00
13	.00	10.00
0	.	.
12	.00	20.00
13	.00	100.00
12	10.00	60.00
13	1000.00	71000.00
12	100.00	100.00
13	30.00	60.00
13	60.00	1400.00
13	.00	1.20
13	.00	4.00
12	.00	100.00
13	.00	3.00
8	10.00	290.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 12 Station No. (USGS): 06306100 Station name: Squirrel Creek near Decker, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	33	0.26	5.97	50.00	10.97
Specific conductance (µmho/cm)	33	630.00	1144.97	1710.00	245.56
pH (units)	32	7.70	8.23	8.60	.23
Temperature (°C)	33	.00	8.61	21.00	7.55
Turbidity (JTU)	33	1.00	50.00	500.00	98.93
Oxygen, dissolved (mg/L)	33	7.40	9.70	11.80	1.41
Oxygen, dissolved (percent)	33	76.00	93.49	114.00	9.38
Biochemical oxygen demand (mg/L)	33	.20	1.38	5.80	1.14
Calcium, dissolved (mg/L)	33	58.00	82.88	100.00	12.36
Magnesium, dissolved (mg/L)	33	41.00	89.52	120.00	20.29
Sodium, dissolved (mg/L)	33	13.00	38.91	65.00	13.50
Sodium (percent)	33	7.00	12.39	17.00	2.30
Sodium-adsorption ratio	33	.30	.69	1.10	.20
Potassium, dissolved (mg/L)	33	4.30	6.97	11.00	1.56
Bicarbonate (mg/L)	33	240.00	447.88	608.00	91.23
Carbonate (mg/L)	32	.00	1.31	13.00	3.32
Sulfate, dissolved (mg/L)	33	130.00	279.09	370.00	61.56
Chloride, dissolved (mg/L)	33	1.60	3.47	7.60	1.37
Fluoride, dissolved (mg/L)	33	.20	.38	.50	.09
Silica, dissolved (mg/L)	33	5.30	11.63	16.00	2.66
Dissolved solids, calculated (mg/L)	33	377.00	735.15	956.00	148.80
Nitrogen, NO_2+NO_3 total (mg/L as N)	33	.00	.14	.57	.15
Nitrogen, ammonia total (mg/L as N)	33	.00	.02	.09	.02
Nitrogen, organic total (mg/L as N)	33	.09	.52	2.30	.43
Nitrogen, total (mg/L as N)	33	.23	.69	2.90	.54
Phosphorus, total (mg/L as P)	33	.00	.08	.63	.12
Sediment, suspended (mg/L)	33	5.00	118.97	970.00	180.98

	DISSOLVED		
Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	11	0.00	30.00
Arsenic (µg/L)	11	.00	4.00
Beryllium (µg/L)	11	.00	10.00
Boron (µg/L)	33	50.00	200.00
Cadmium (µg/L)	11	.00	2.00
Chromium (µg/L)	11	.00	20.00
Copper (µg/L)	11	.00	13.00
Iron (µg/L)	33	10.00	400.00
Lead (µg/L)	11	0.00	14.00
Lithium (µg/L)	11	30.00	80.00
Manganese (µg/L)	11	20.00	130.00
Mercury (µg/L)	11	.00	.00
Molybdenum (µg/L)	11	.00	5.00
Nickel (µg/L)	11	.00	7.00
Selenium (µg/L)	11	.00	7.00
Zinc (µg/L)	11	.00	20.00
Vanadium (µg/L)	11	.40	5.50

Period of record: Water years 1976-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
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1240 Q	-15.8	.511*	173	--	--	--	--	--
K		.0644	.220				.0699	.223
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8.89 Q	6.77	.585*	64.7	123	5.33*	-.0921	.611*	63.7
Q		.0160	1.43				.112	1.38
115 K	-.0185	.236*	8.21	128	-.314	-.0286*	.305*	7.95
1.09 Q	.0458	.200*	1.05	1.88	.0359	-.00064	.209*	1.07
39.3 K	.0382	.569*	8.22	37.4	.0434	.0396*	.569*	8.34
1.21 K	.0773	.861*	7.67	22.8	-.499*	.0612*	.897*	6.70
-19.1 K	.0507	.845*	5.37	-11.8	-.168	.0453*	.854*	5.29
3.68 K	.00762	.659*	1.36	6.41	-.0633*	.00557*	.704*	1.28
-.113 K	.00070	.790*	.0898	.0622	-.00407*	.00057*	.816*	.0853
2.07 K	.00428	.456*	1.16	2.76	-.0160	.00376*	.463*	1.17
67.4 K	.332	.800*	41.4	140	-1.68	.278*	.821*	39.9
Q		.0155	3.34				.0373	3.36
9.64 K	.236	.865*	23.1	62.0	-1.21*	.197*	.888*	21.4
3.77 Q	-.0474	.148*	1.27				.166	1.28
.166 K	.00019	.264*	.0767	.227	-.00142	.00014	.280*	.0771
3.25 K	.00733	.460*	1.96	2.48	.0178	.00791*	.463*	1.99
71.5 K	.581	.900*	48.0	190	-2.75*	.492*	.920*	43.5
.547 K	-.00035	.340*	.122	.667	-.00277	-.00044*	.361*	.122
K		.0342	.0236				.0348	.0240
.351 Q	.0276	.503*	.308	1.20	.0168*	-.00068*	.576*	.289
2.52 K	-.00161	.541*	.366	1.92	.0139	-.00116*	.582*	.355
.411 K	-.00029	.381*	.0919	.279	.00305	-.00019*	.423*	.0901
51.3 Q	11.1	.474*	133	371	7.11*	-.257	.534*	128

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
7	20.00	3600.00
8	.00	4.00
8	.00	10.00
0	.	.
8	.00	10.00
8	.00	66.00
8	.00	23.00
8	330.00	18000.00
8	17.00	100.00
8	30.00	70.00
8	60.00	650.00
8	.00	.20
7	1.00	2.00
8	18.00	50.00
8	.00	5.00
8	.00	80.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 13 Station No. (USGS): 06306800 Station name: Deer Creek near Decker, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	10	0.06	2.56	9.10	3.66
Specific conductance (µmho/cm)	10	450.00	4040.50	6250.00	2251.95
pH (units)	10	7.40	8.06	8.40	.31
Temperature (°C)	10	.00	7.20	14.00	6.07
Turbidity (JTU)	10	2.00	61.70	400.00	123.49
Oxygen, dissolved (mg/L)	10	6.30	9.73	12.00	1.85
Oxygen, dissolved (percent)	10	49.00	91.70	129.00	20.86
Biochemical oxygen demand (mg/L)	10	.60	4.80	20.40	6.14
Calcium, dissolved (mg/L)	10	32.00	219.40	320.00	113.77
Magnesium, dissolved (mg/L)	10	14.00	205.60	340.00	121.90
Sodium, dissolved (mg/L)	10	30.00	511.60	800.00	305.14
Sodium (percent)	10	31.00	41.60	48.00	5.44
Sodium-adsorption ratio	10	1.10	5.49	7.70	2.56
Potassium, dissolved (mg/L)	10	7.90	13.00	17.00	3.62
Bicarbonate (mg/L)	10	86.00	470.10	660.00	232.30
Carbonate (mg/L)	10	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	10	130.00	2010.00	3200.00	1193.89
Chloride, dissolved (mg/L)	10	4.20	14.28	27.00	7.11
Fluoride, dissolved (mg/L)	10	.10	.32	.50	.11
Silica, dissolved (mg/L)	10	4.00	6.79	11.00	2.28
Dissolved solids, calculated (mg/L)	10	268.00	3213.80	4950.00	1851.70
Nitrogen, NO_2+NO_3 total (mg/L as N)	10	.00	.12	.57	.18
Nitrogen, ammonia total (mg/L as N)	10	.00	.11	.52	.16
Nitrogen, organic total (mg/L as N)	10	.23	1.19	2.70	.80
Nitrogen, total (mg/L as N)	10	.30	1.43	3.80	1.11
Phosphorus, total (mg/L as P)	10	.00	.09	.34	.11
Sediment, suspended (mg/L)	9	13.00	109.11	411.00	123.23

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	1	0.00	0.00
Arsenic (µg/L)	1	1.00	1.00
Beryllium (µg/L)	1	10.00	10.00
Boron (µg/L)	10	100.00	180.00
Cadmium (µg/L)	1	1.00	1.00
Chromium (µg/L)	1	10.00	10.00
Copper (µg/L)	1	.00	.00
Iron (µg/L)	10	10.00	290.00
Lead (µg/L)	1	3.00	3.00
Lithium (µg/L)	1	210.00	210.00
Manganese (µg/L)	1	570.00	570.00
Mercury (µg/L)	1	.00	.00
Molybdenum (µg/L)	1	2.00	2.00
Nickel (µg/L)	1	10.00	10.00
Selenium (µg/L)	1	.00	.00
Zinc (µg/L)	1	20.00	20.00
Vanadium (µg/L)	1	.20	.20

Period of record: Water years 1975-77 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
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5560 Q	-596	.938*	595	--	--	--	--	--
K		.0841	.310				.360	.278
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218 K	-.0387	.498*	92.8				.521	96.9
Q		.327	1.61				.549	1.41
K		.0560	21.5				.374	18.7
1.59 Q	1.26	.561*	4.30				.563	4.60
17.0 K	.0501	.983*	15.8	104	-9.76	.0347*	.989*	13.5
-9.10 K	.0531	.964*	24.7	-18.1	1.01	.0547*	.964*	26.4
-31.3 K	.134	.983*	41.8	60.4	-10.2	.118*	.984*	43.4
45.0 Q	-1.33	.805*	2.55	42.9	-1.11	.00038	.807*	2.71
.996 K	.00111	.953*	.587	3.14	-.240	.00073	.961*	.576
Q		.230	3.37				.232	3.60
630 Q	-62.7	.975*	38.6	365	-34.2*	.0478*	.989*	27.9
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-120 K	.527	.988*	137	164	-31.9	.477*	.989*	142
3.70 K	.00262	.687*	4.22	-5.82	1.07	.00430	.706*	4.37
.381 Q	-.0234	.598*	.0763	.513	-.0381	-.00002	.612*	.0802
K		.251	2.09				.353	2.08
-91.3 K	.818	.990*	200	504	-66.8	.713*	.991*	202
.0303 Q	.0367	.558*	.127				.559	.135
.0270 Q	.0329	.571*	.111	-.100	.0464	.00002	.577*	.118
2.19 K	-.00025	.496*	.599				.501	.637
2.85 K	-.00035	.512*	.821				.512	.878
.0181 Q	.0281	.835*	.0485	.09460	.0199	-.00001	.840*	.0511
K		.269	113				.379	112

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
3	60.00	140.00
4	.00	5.00
4	10.00	10.00
0	.	.
4	10.00	30.00
4	.00	60.00
4	10.00	70.00
4	220.00	5000.00
4	100.00	200.00
4	20.00	220.00
4	140.00	850.00
4	.00	.20
4	.00	5.00
4	50.00	200.00
4	.00	.00
3	30.00	50.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 14. Station No. (USGS): 06306900 Station name: Spring Creek near Decker, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	2	1.00	9.50	18.00	12.02
Specific conductance (μmho/cm)	2	149.00	879.50	1610.00	1033.08
pH (units)	2	8.00	8.25	8.50	.35
Temperature (°C)	2	.00	4.50	9.00	6.36
Turbidity (JTU)	2	35.00	267.50	500.00	328.80
Oxygen, dissolved (mg/L)	2	10.00	10.50	11.00	.71
Oxygen, dissolved (percent)	2	84.00	91.50	99.00	10.61
Biochemical oxygen demand (mg/L)	2	1.70	7.35	13.00	7.99
Calcium, dissolved (mg/L)	2	24.00	67.00	110.00	60.81
Magnesium, dissolved (mg/L)	2	5.30	62.65	120.00	81.11
Sodium, dissolved (mg/L)	2	4.40	50.20	96.00	64.77
Sodium (percent)	2	10.00	15.50	21.00	7.78
Sodium-adsorption ratio	2	.20	.85	1.50	.92
Potassium, dissolved (mg/L)	2	4.10	6.30	8.50	3.11
Bicarbonate (mg/L)	2	100.00	260.00	420.00	226.27
Carbonate (mg/L)	2	.00	4.00	8.00	5.66
Sulfate, dissolved (mg/L)	2	18.00	314.00	610.00	418.61
Chloride, dissolved (mg/L)	2	.30	1.35	2.40	1.48
Fluoride, dissolved (mg/L)	2	.10	.25	.40	.21
Silica, dissolved (mg/L)	2	2.70	4.70	6.70	2.83
Dissolved solids, calculated (mg/L)	2	111.00	640.50	1170.00	748.83
Nitrogen, NO_2+NO_3 total (mg/L as N)	2	.01	.15	.29	.20
Nitrogen, ammonia total (mg/L as N)	2	.01	.15	.29	.20
Nitrogen, organic total (mg/L as N)	2	.57	1.09	1.60	.73
Nitrogen, total (mg/L as N)	2	.59	1.40	2.20	1.14
Phosphorus, total (mg/L as P)	2	.05	.68	1.30	.88
Sediment, suspended (mg/L)	2	92.00	656.00	1220.00	797.62

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (μg/L)	1	60.00	60.00
Arsenic (μg/L)	1	2.00	2.00
Beryllium (μg/L)	1	.00	.00
Boron (μg/L)	2	70.00	100.00
Cadmium (μg/L)	1	2.00	2.00
Chromium (μg/L)	1	10.00	10.00
Copper (μg/L)	1	4.00	4.00
Iron (μg/L)	2	20.00	140.00
Lead (μg/L)	1	8.00	8.00
Lithium (μg/L)	1	7.00	7.00
Manganese (μg/L)	1	20.00	20.00
Mercury (μg/L)	1	.00	.00
Molybdenum (μg/L)	1	1.00	1.00
Nickel (μg/L)	1	2.00	2.00
Selenium (μg/L)	1	.00	.00
Zinc (μg/L)	1	10.00	10.00
Vanadium (μg/L)	1	3.00	3.00

Period of record: Water year 1978

REGRESSION SUMMARY[1]

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant	Regression coefficient	Coefficient of determination	Standard error of estimate	Regression constant	Partial regression coefficient Q	Partial regression coefficient K	Coefficient of determination	Standard error of estimate
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[1]Insufficient samples to develop regressions.

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
0	.	.
1	5.00	5.00
1	.00	.00
0	.	.
1	1.00	1.00
1	50.00	50.00
1	32.00	32.00
1	25000.00	25000.00
1	5.00	5.00
1	10.00	10.00
1	660.00	660.00
1	4.00	4.00
1	5.00	5.00
1	59.00	59.00
1	2.00	2.00
1	90.00	90.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 15 Station No. (USGS): 06307500 Station name: Tongue River at Tongue River Dam, near Decker, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	35	3.10	529.52	4140.00	772.77
Specific conductance (μmho/cm)	35	278.00	687.49	945.00	206.65
pH (units)	35	7.80	8.25	8.80	.23
Temperature (°C)	35	2.00	10.73	22.50	7.52
Turbidity (JTU)	33	1.00	5.97	30.00	6.23
Oxygen, dissolved (mg/L)	34	6.80	10.43	13.20	1.89
Oxygen, dissolved (percent)	34	85.00	102.56	141.00	8.91
Biochemical oxygen demand (mg/L)	33	.10	1.34	3.90	.76
Calcium, dissolved (mg/L)	35	29.00	59.86	81.00	16.47
Magnesium, dissolved (mg/L)	35	14.00	39.80	63.00	13.90
Sodium, dissolved (mg/L)	35	9.80	30.71	46.00	10.83
Sodium (percent)	34	13.00	17.24	24.00	2.00
Sodium-adsorption ratio	35	.40	.75	1.10	.18
Potassium, dissolved (mg/L)	34	1.50	3.53	5.30	1.04
Bicarbonate (mg/L)	35	110.00	243.89	332.00	69.47
Carbonate (mg/L)	34	.00	.71	7.00	1.80
Sulfate, dissolved (mg/L)	34	54.00	170.21	260.00	61.30
Chloride, dissolved (mg/L)	34	1.10	3.11	4.60	1.08
Fluoride, dissolved (mg/L)	35	.10	.27	.60	.09
Silica, dissolved (mg/L)	35	1.00	5.55	12.00	2.43
Dissolved solids, calculated (mg/L)	34	173.00	436.47	617.00	135.17
Nitrogen, NO_2+NO_3 total (mg/L as N)	35	.00	.10	.42	.11
Nitrogen, ammonia total (mg/L as N)	35	.00	.06	.31	.07
Nitrogen, organic total (mg/L as N)	35	.09	.53	3.50	.57
Nitrogen, total (mg/L as N)	35	.27	.69	3.80	.58
Phosphorus, total (mg/L as P)	35	.00	.04	.10	.02
Sediment, suspended (mg/L)	33	4.00	16.91	50.00	10.69

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (μg/L)	12	0.00	30.00
Arsenic (μg/L)	12	.00	5.00
Beryllium (μg/L)	12	.00	10.00
Boron (μg/L)	35	40.00	150.00
Cadmium (μg/L)	12	.00	5.00
Chromium (μg/L)	12	.00	20.00
Copper (μg/L)	12	.00	10.00
Iron (μg/L)	35	.00	980.00
Lead (μg/L)	12	.00	49.00
Lithium (μg/L)	12	7.00	30.00
Manganese (μg/L)	12	.00	80.00
Mercury (μg/L)	12	.00	.10
Molybdenum (μg/L)	12	.00	2.00
Nickel (μg/L)	12	.00	10.00
Selenium (μg/L)	12	.00	1.00
Zinc (μg/L)	12	.00	20.00
Vanadium (μg/L)	12	.00	3.00

Period of record: Water years 1976-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
771 Q	-.156	.359*	162	--	--	--	--	--
7.89 K	.00053	.198*	.216	7.91	-.00001	.00051*	.198*	.220
--	--	--	--	--	--	--	--	--
2.61 Q	.00616	.616*	3.92	7.55	.00516*	-.00637	.645*	3.83
5.15 K	.00764	.685*	1.08	4.34	.00038	.00852*	.701*	1.07
Q		.0248	8.94				.0249	9.08
K		.0422	.779				.0447	.791
3.24 K	.0799	.734*	9.73	2.70	.00025	.0805*	.734*	9.87
-4.22 K	.0639	.863*	515	-.811	-.00162	.0602*	.868*	5.13
-3.72 K	.0501	.870*	3.91	-.326	-.00161	.0464*	.879*	3.84
14.4 K	.00421	.183*	1.83	15.8	-.00068	.00266	.227*	1.81
.252 K	.00073	.680*	.101	.359	-.00005	.00061*	.711*	.0976
.606 K	.00423	.700*	.568	1.02	-.00020	.00377*	.714*	.562
15.7 K	.331	.927*	18.7	32.3	-.00793	.313*	.933*	18.3
K		.0666	1.88				.0671	1.91
-33.5 K	.293	.920*	17.3	-23.6	-.00450	.282*	.922*	17.4
.134 K	.00430	.633*	.658	.201	-.00003	.00423*	.633*	.668
.301 Q	-.00007	.318*	.0749	.185	-.00004*	.00015	.390*	.0719
K		.0717	2.34				.0747	2.38
23.3 K	.658	.959*	27.3	2.37	-.0116	.630*	.962*	26.7
K		.0667	.105				.0734	.106
K		.0504	.0643				.0564	.0651
K		.0150	.563				.0399	.564
K		.0368	.572				.0673	.572
K		.0269	.0228				.0270	.0232
14.0 Q	.00601	.207*	9.60	15.3	.00573*	-.00179	.208*	9.76

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
8	60.00	600.00
8	.00	2.00
8	.00	10.00
0	.	.
8	.00	10.00
8	.00	10.00
8	.00	14.00
8	60.00	850.00
8	28.00	100.00
8	7.00	40.00
8	30.00	90.00
8	.00	.10
7	.00	10.00
8	3.00	50.00
8	.00	1.00
8	.00	50.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 16 Station No. (USGS): 06307510 Station name: Fourmile Creek near Birney, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	2	0.71	0.77	0.84	0.09
Specific conductance (μmho/cm)	2	245.00	387.50	530.00	201.53
pH (units)	2	7.70	7.95	8.20	.35
Temperature (°C)	2	.00	.00	.00	.00
Turbidity (JTU)	2	40.00	40.00	40.00	.00
Oxygen, dissolved (mg/L)	2	11.20	11.60	12.00	.57
Oxygen, dissolved (percent)	2	86.00	89.00	92.00	4.24
Biochemical oxygen demand (mg/L)	2	7.60	9.80	12.00	3.11
Calcium, dissolved (mg/L)	2	23.00	31.50	40.00	12.02
Magnesium, dissolved (mg/L)	2	9.20	20.60	32.00	16.12
Sodium, dissolved (mg/L)	2	6.50	25.25	44.00	26.52
Sodium (percent)	2	12.00	20.00	28.00	11.31
Sodium-adsorption ratio	2	.30	.80	1.30	.71
Potassium, dissolved (mg/L)	2	7.60	9.30	11.00	2.40
Bicarbonate (mg/L)	2	86.00	99.00	112.00	18.38
Carbonate (mg/L)	2	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	2	44.00	122.00	200.00	110.31
Chloride, dissolved (mg/L)	2	2.50	4.05	5.60	2.19
Fluoride, dissolved (mg/L)	2	.10	.15	.20	.07
Silica, dissolved (mg/L)	2	5.60	6.35	7.10	1.06
Dissolved solids, calculated (mg/L)	2	143.00	268.50	394.00	177.48
Nitrogen, NO_2+NO_3 total (mg/L as N)	2	.12	.16	.19	.05
Nitrogen, ammonia total (mg/L as N)	2	.03	.05	.06	.02
Nitrogen, organic total (mg/L as N)	2	1.20	1.25	1.30	.07
Nitrogen, total (mg/L as N)	2	1.40	1.45	1.50	.07
Phosphorus, total (mg/L as P)	2	.13	.18	.22	.06
Sediment, suspended (mg/L)	2	39.00	70.50	102.00	44.55

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (μg/L)	1	60.00	60.00
Arsenic (μg/L)	1	4.00	4.00
Beryllium (μg/L)	1	.00	.00
Boron (μg/L)	2	110.00	190.00
Cadmium (μg/L)	1	1.00	1.00
Chromium (μg/L)	1	.00	.00
Copper (μg/L)	1	9.00	9.00
Iron (μg/L)	2	90.00	110.00
Lead (μg/L)	1	4.00	4.00
Lithium (μg/L)	0	.	.
Manganese (μg/L)	1	20.00	20.00
Mercury (μg/L)	1	.10	.10
Molybdenum (μg/L)	0	.	.
Nickel (μg/L)	1	2.00	2.00
Selenium (μg/L)	0	.	.
Zinc (μg/L)	1	60.00	60.00
Vanadium (μg/L)	0	.	.

Period of record: Water years 1975-76 (discontinued)

REGRESSION SUMMARY[1]

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant	Regression coefficient	Coefficient of determination	Standard error of estimate	Regression constant	Partial regression coefficient Q	Partial regression coefficient K	Coefficient of determination	Standard error of estimate
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[1]Insufficient samples to develop regressions.

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
0	.	.
1	4.00	4.00
1	10.00	10.00
0	.	.
1	20.00	20.00
1	10.00	10.00
1	70.00	70.00
1	2700.00	2700.00
1	100.00	100.00
1	10.00	10.00
1	70.00	70.00
1	.10	.10
1	1.00	1.00
1	50.00	50.00
1	.00	.00
0	.	.
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 17 Station No. (USGS): 06307528 Station name: Prairie Dog Creek near Birney, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	4	0.53	5.76	15.00	6.35
Specific conductance (µmho/cm)	1	1120.00	1120.00	1120.00	.
pH (units)	1	8.30	8.30	8.30	.
Temperature (°C)	3	10.00	13.67	17.50	3.75
Turbidity (JTU)	1	25.00	25.00	25.00	.
Oxygen, dissolved (mg/L)	0	.	.	.	.
Oxygen, dissolved (percent)	0	.	.	.	.
Biochemical oxygen demand (mg/L)	1	1.70	1.70	1.70	.
Calcium, dissolved (mg/L)	1	69.00	69.00	69.00	.
Magnesium, dissolved (mg/L)	1	92.00	92.00	92.00	.
Sodium, dissolved (mg/L)	1	59.00	59.00	59.00	.
Sodium (percent)	1	19.00	19.00	19.00	.
Sodium-adsorption ratio	1	1.10	1.10	1.10	.
Potassium, dissolved (mg/L)	1	10.00	10.00	10.00	.
Bicarbonate (mg/L)	1	360.00	360.00	360.00	.
Carbonate (mg/L)	1	.00	.00	.00	.
Sulfate, dissolved (mg/L)	1	370.00	370.00	370.00	.
Chloride, dissolved (mg/L)	1	6.40	6.40	6.40	.
Fluoride, dissolved (mg/L)	1	.30	.30	.30	.
Silica, dissolved (mg/L)	1	8.90	8.90	8.90	.
Dissolved solids, calculated (mg/L)	1	793.00	793.00	793.00	.
Nitrogen, NO_2+NO_3 total (mg/L as N)	1	.01	.01	.01	.
Nitrogen, ammonia total (mg/L as N)	1	.01	.01	.01	.
Nitrogen, organic total (mg/L as N)	1	.60	.60	.60	.
Nitrogen, total (mg/L as N)	1	.62	.62	.62	.
Phosphorus, total (mg/L as P)	1	.04	.04	.04	.
Sediment, suspended (mg/L)	4	72.00	425.00	1420.00	663.57

Variable	DISSOLVED Sample size	Minimum value	Maximum value
Aluminum (µg/L)	1	10.00	10.00
Arsenic (µg/L)	1	1.00	1.00
Beryllium (µg/L)	1	.00	.00
Boron (µg/L)	1	90.00	90.00
Cadmium (µg/L)	1	.00	.00
Chromium (µg/L)	1	.00	.00
Copper (µg/L)	1	3.00	3.00
Iron (µg/L)	1	30.00	30.00
Lead (µg/L)	1	.00	.00
Lithium (µg/L)	1	70.00	70.00
Manganese (µg/L)	1	20.00	20.00
Mercury (µg/L)	1	.20	.20
Molybdenum (µg/L)	1	2.00	2.00
Nickel (µg/L)	1	.00	.00
Selenium (µg/L)	1	1.00	1.00
Zinc (µg/L)	1	10.00	10.00
Vanadium (µg/L)	1	.40	.40

Period of record: Water year 1978

REGRESSION SUMMARY[1]

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regres-sion con-stant	Regres-sion coeffi-cient	Coeffi-cient of deter-mination	Standard error of estimate	Regres-sion constant	Partial regression coefficient Q	K	Coeffi-cient of deter-mination	Standard error of estimate
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[1]Insufficient samples to develop regressions.

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
0	.	.
0	.	.
0	.	.
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 18   Station No. (USGS): 06307530   Station name: Bull Creek near Birney, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	2	2.00	8.00	14.00	8.49
Specific conductance (μmho/cm)	2	170.00	425.00	680.00	360.62
pH (units)	2	7.50	7.95	8.40	.64
Temperature (°C)	2	.00	.00	.00	.00
Turbidity (JTU)	2	30.00	35.00	40.00	7.07
Oxygen, dissolved (mg/L)	2	10.60	11.40	12.20	1.13
Oxygen, dissolved (percent)	2	82.00	88.00	94.00	8.49
Biochemical oxygen demand (mg/L)	2	5.60	6.95	8.30	1.91
Calcium, dissolved (mg/L)	2	13.00	30.50	48.00	24.75
Magnesium, dissolved (mg/L)	2	6.70	25.85	45.00	27.08
Sodium, dissolved (mg/L)	2	7.30	39.65	72.00	45.75
Sodium (percent)	2	19.00	26.00	33.00	9.90
Sodium-adsorption ratio	2	.40	1.10	1.80	.99
Potassium, dissolved (mg/L)	2	7.40	8.65	9.90	1.77
Bicarbonate (mg/L)	2	71.00	145.50	220.00	105.36
Carbonate (mg/L)	2	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	2	26.00	128.00	230.00	144.25
Chloride, dissolved (mg/L)	2	1.70	3.40	5.10	2.40
Fluoride, dissolved (mg/L)	2	.10	.20	.30	.14
Silica, dissolved (mg/L)	2	4.70	6.60	8.50	2.69
Dissolved solids, calculated (mg/L)	2	102.00	315.00	528.00	301.23
Nitrogen, NO_2+NO_3 total (mg/L as N)	2	.10	.23	.36	.18
Nitrogen, ammonia total (mg/L as N)	2	.04	.06	.07	.02
Nitrogen, organic total (mg/L as N)	2	.95	1.03	1.10	.11
Nitrogen, total (mg/L as N)	2	1.30	1.35	1.40	.07
Phosphorus, total (mg/L as P)	2	.07	.16	.24	.12
Sediment, suspended (mg/L)	2	28.00	39.00	50.00	15.56

Variable	DISSOLVED Sample size	Minimum value	Maximum value
Aluminum (μg/L)	0	.	.
Arsenic (μg/L)	0	.	.
Beryllium (μg/L)	0	.	.
Boron (μg/L)	2	100.00	190.00
Cadmium (μg/L)	0	.	.
Chromium (μg/L)	0	.	.
Copper (μg/L)	0	.	.
Iron (μg/L)	2	90.00	90.00
Lead (μg/L)	0	.	.
Lithium (μg/L)	0	.	.
Manganese (μg/L)	0	.	.
Mercury (μg/L)	0	.	.
Molybdenum (μg/L)	0	.	.
Nickel (μg/L)	0	.	.
Selenium (μg/L)	0	.	.
Zinc (μg/L)	0	.	.
Vanadium (μg/L)	0	.	.

Period of record: Water years 1975-76 (discontinued)

REGRESSION SUMMARY[1]

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant	Regression coefficient	Coefficient of determination	Standard error of estimate	Regression constant	Partial regression coefficient Q	Partial regression coefficient K	Coefficient of determination	Standard error of estimate
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[1]Insufficient samples to develop regressions.

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
0	.	.
1	3.00	3.00
1	10.00	10.00
0	.	.
1	20.00	20.00
1	10.00	10.00
1	70.00	70.00
1	1600.00	1600.00
1	100.00	100.00
1	.00	.00
1	60.00	60.00
1	.00	.00
1	.00	.00
1	50.00	50.00
1	.00	.00
0	.	.
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 19 Station No. (USGS): 06307560 Station name: East Trail Creek near Otter, MT

	DESCRIPTIVE STATISTICS				
Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	9	0.10	6.15	36.00	11.63
Specific conductance (µmho/cm)	8	1219.00	3459.25	7119.99	2105.97
pH (units)	8	8.00	8.20	8.50	.17
Temperature (°C)	9	.00	5.94	18.00	7.50
Turbidity (JTU)	7	3.00	56.71	310.00	112.96
Oxygen, dissolved (mg/L)	6	3.40	6.93	10.20	2.78
Oxygen, dissolved (percent)	6	30.00	58.67	86.00	21.87
Biochemical oxygen demand (mg/L)	4	1.40	3.22	6.30	2.13
Calcium, dissolved (mg/L)	7	50.00	133.43	220.00	58.21
Magnesium, dissolved (mg/L)	7	57.00	212.43	450.00	146.33
Sodium, dissolved (mg/L)	7	120.00	460.00	990.00	321.87
Sodium (percent)	7	36.00	43.29	50.00	4.35
Sodium-adsorption ratio	7	2.60	5.36	9.20	2.42
Potassium, dissolved (mg/L)	7	7.50	10.51	16.00	3.22
Bicarbonate (mg/L)	7	140.00	398.29	660.00	199.64
Carbonate (mg/L)	7	.00	.14	1.00	.38
Sulfate, dissolved (mg/L)	7	480.00	1787.14	3400.00	1146.37
Chloride, dissolved (mg/L)	7	3.90	11.66	21.00	6.95
Fluoride, dissolved (mg/L)	7	.10	.21	.30	.07
Silica, dissolved (mg/L)	7	.80	4.89	8.40	2.89
Dissolved solids, calculated (mg/L)	7	793.00	2817.57	5330.00	1758.89
Nitrogen, NO_2+NO_3 total (mg/L as N)	7	.01	.66	4.00	1.48
Nitrogen, ammonia total (mg/L as N)	7	.01	.06	.12	.04
Nitrogen, organic total (mg/L as N)	7	.46	.81	1.40	.33
Nitrogen, total (mg/L as N)	7	.54	1.53	5.50	1.77
Phosphorus, total (mg/L as P)	7	.02	.11	.28	.08
Sediment, suspended (mg/L)	9	3.00	91.11	454.00	138.96

	DISSOLVED		
Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	3	20.00	20.00
Arsenic (µg/L)	3	1.00	1.00
Beryllium (µg/L)	3	.00	.00
Boron (µg/L)	7	90.00	220.00
Cadmium (µg/L)	3	.00	2.00
Chromium (µg/L)	3	.00	20.00
Copper (µg/L)	3	.00	6.00
Iron (µg/L)	7	40.00	240.00
Lead (µg/L)	3	.00	5.00
Lithium (µg/L)	3	40.00	190.00
Manganese (µg/L)	3	100.00	650.00
Mercury (µg/L)	3	.00	.00
Molybdenum (µg/L)	3	1.00	3.00
Nickel (µg/L)	3	.00	10.00
Selenium (µg/L)	3	1.00	2.00
Zinc (µg/L)	3	20.00	30.00
Vanadium (µg/L)	3	.00	.00

Period of record: Water years 1977-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
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Q		.277	1930	--	--	--	--	--
K		.298	.153				.301	.167
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-2.24 Q	8.70	.980*	17.5	-8.43	8.84*	.00148	.981*	19.2
K		.441	2.32				.466	2.62
K		.310	20.3				.431	21.3
K		.205	2.33				.236	3.23
K		.445	47.5				.485	51.2
-14.5 K	.0640	.975*	25.1	-15.7	.0669	.0642*	.975*	28.1
-34.9 K	.140	.958*	71.9	-10.6	-1.39	.135*	.961*	78.3
45.1 Q	-.273	.653*	2.80	41.1	-.183	.00097	.834*	2.17
1.72 K	.00102	.917*	.761	2.26	-.0303	.00093*	.936*	.748
5.63 K	.00138	.933*	.910	5.22	.0231	.00145*	.940*	.970
94.5 K	.0856	.939*	54.2	137	-2.46	.0781*	.957*	51.0
K		.207	.369				.244	.402
38.6 K	.493	.943*	300	155	-6.63	.473*	.947*	324
1.01 K	.00300	.952*	1.67	.453	.0317	.00310*	.954*	1.82
Q		.0628	.0732				.0643	.0818
Q		.263	2.71				.274	3.01
124 K	.759	.950*	429	298	-9.95	.729*	.954*	461
-.111 Q	.114	.978*	.238	-.338	.119*	.00005	.983*	.234
Q		.420	.0353				.446	.0386
Q		.562	.240		*		.730	.211
.611 Q	.135	.960*	.390	.0860	.147*	.00013	.978*	.323
.0643 Q	.00632	.915*	.0271	.0536	.00656*	.00000	.918*	.0298
15.7 Q	12.0	.933*	41.2	8.00	12.2*	.00190	.934*	44.9

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
1	1700.00	1700.00
1	2.00	2.00
1	.00	.00
0	.	.
1	1.00	1.00
1	10.00	10.00
1	3.00	3.00
1	790.00	790.00
1	6.00	6.00
1	40.00	40.00
1	130.00	130.00
1	.00	.00
1	6.00	6.00
1	3.00	3.00
1	11.00	11.00
1	20.00	20.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 20 Station No. (USGS): 06307570 Station name: Hanging Woman Creek below Horse Creek near Birney, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	9	0.06	14.44	94.00	31.42
Specific conductance (μmho/cm)	9	1830.00	4178.89	6600.00	1577.21
pH (units)	9	7.70	8.08	8.40	.23
Temperature (°C)	9	1.00	9.22	18.00	6.72
Turbidity (JTU)	9	3.00	38.67	220.00	69.90
Oxygen, dissolved (mg/L)	9	7.00	9.27	11.80	1.76
Oxygen, dissolved (percent)	9	79.00	90.11	117.00	11.54
Biochemical oxygen demand (mg/L)	9	1.10	2.42	6.40	1.65
Calcium, dissolved (mg/L)	9	76.00	150.67	220.00	41.64
Magnesium, dissolved (mg/L)	9	76.00	211.33	320.00	82.26
Sodium, dissolved (mg/L)	9	250.00	573.33	900.00	221.19
Sodium (percent)	9	46.00	49.33	53.00	2.60
Sodium-adsorption ratio	9	4.80	6.94	9.50	1.62
Potassium, dissolved (mg/L)	9	9.90	13.32	16.00	1.76
Bicarbonate (mg/L)	9	180.00	478.89	640.00	155.92
Carbonate (mg/L)	9	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	9	850.00	1961.11	3100.00	773.70
Chloride, dissolved (mg/L)	9	5.50	15.58	27.00	7.16
Fluoride, dissolved (mg/L)	9	.10	.59	.80	.27
Silica, dissolved (mg/L)	9	5.10	9.43	16.00	3.51
Dissolved solids, calculated (mg/L)	9	1360.00	3172.22	4750.00	1162.01
Nitrogen, NO_2+NO_3 total (mg/L as N)	9	.00	.08	.33	.11
Nitrogen, ammonia total (mg/L as N)	9	.01	.09	.30	.11
Nitrogen, organic total (mg/L as N)	9	.21	.74	1.50	.41
Nitrogen, total (mg/L as N)	9	.45	.91	2.10	.51
Phosphorus, total (mg/L as P)	9	.02	.11	.60	.19
Sediment, suspended (mg/L)	8	5.00	121.25	609.00	202.81

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (μg/L)	5	0.00	50.00
Arsenic (μg/L)	5	1.00	4.00
Beryllium (μg/L)	5	.00	10.00
Boron (μg/L)	9	80.00	400.00
Cadmium (μg/L)	5	1.00	5.00
Chromium (μg/L)	5	.00	10.00
Copper (μg/L)	5	.00	4.00
Iron (μg/L)	9	10.00	120.00
Lead (μg/L)	5	2.00	38.00
Lithium (μg/L)	5	50.00	190.00
Manganese (μg/L)	5	50.00	320.00
Mercury (μg/L)	5	.00	.00
Molybdenum (μg/L)	5	2.00	6.00
Nickel (μg/L)	5	1.00	6.00
Selenium (μg/L)	5	.00	2.00
Zinc (μg/L)	5	.00	30.00
Vanadium (μg/L)	5	.00	.50

Period of record: Water year 1978

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
4670 Q	-34.2	.463*	1240	--	--	--	--	--
Q		.282	.211				.284	.228
--	--	--	--	--	--	--	--	--
7.05 Q	2.19	.968*	13.4	-36.7	2.51*	.00936*	.992*	7.28
K		.272	1.61				.282	1.72
Q		.00747	12.3				.0138	13.2
1.74 Q	.0482	.849*	.726	.296	.589*	.00031	.897*	.659
165 Q	-.989	.557*	29.6				.595	30.6
.0877 K	.0506	.939*	21.7	37.5	-.526	.0434*	.961*	18.7
-.590 K	.137	.959*	47.9	14.8	-.217	.134*	.960*	51.4
K		.249	2.41	40.6	.0744*	.00183*	.684*	1.69
2.78 K	.00100	.942*	.419	2.45	.00453	.00106*	.946*	.436
14.0 Q	-.0454	.661*	1.09	12.1	-.0318	.00040	.730*	1.05
541 Q	-4.33	.762*	81.4	592	-4.70*	-.0109	.768*	86.7
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-53.3 K	.482	.966*	153	-55.6	.0317	.482*	.966*	166
1.98 K	.00325	.514*	5.33				.576	5.38
.694 Q	-.00729	.713*	.155	.710	-.00741*	.00000	.714*	.168
Q		.254	3.24				.261	3.49
171 K	.718	.950*	277	453	-3.96	.665*	.957*	280
.0395 Q	.00273	.564*	.0805				.568	.0866
K		.334	.0994				.381	.104
.594 Q	.01011	.588*	.284	-.232	.0161*	.00018*	.832*	.196
.690 Q	.0149	.860*	.202	.0590	.0196*	.00014*	.955*	.123
.0271 Q	.00581	.963*	.0382	-.0729	.00654*	.00002	.981*	.0298
28.2 K	5.77	.889*	73.1	-253	7.72*	.0644*	.978*	35.3

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
1	2000.00	2000.00
1	9.00	9.00
1	.00	.00
0	.	.
1	2.00	2.00
1	10.00	10.00
1	16.00	16.00
1	13000.00	13000.00
1	26.00	26.00
1	50.00	50.00
1	600.00	600.00
1	.00	.00
0	.	.
1	32.00	32.00
1	4.00	4.00
1	70.00	70.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 21 Station No. (USGS): 06307600 Station name: Hanging Woman Creek near Birney, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	48	0.56	19.16	359.00	57.75
Specific conductance (μmho/cm)	47	240.00	2378.19	4220.00	745.40
pH (units)	47	7.40	8.12	8.50	.21
Temperature (°C)	48	.00	8.95	25.00	8.33
Turbidity (JTU)	46	2.00	47.04	400.00	86.77
Oxygen, dissolved (mg/L)	47	5.10	9.37	13.20	2.23
Oxygen, dissolved (percent)	47	60.90	87.84	120.00	11.99
Biochemical oxygen demand (mg/L)	46	.00	2.37	10.30	2.27
Calcium, dissolved (mg/L)	46	27.00	100.50	150.00	26.13
Magnesium, dissolved (mg/L)	47	11.00	111.81	210.00	37.76
Sodium, dissolved (mg/L)	46	17.00	299.76	580.00	108.96
Sodium (percent)	46	23.00	46.22	58.00	4.95
Sodium-adsorption ratio	46	.70	4.77	7.20	1.26
Potassium, dissolved (mg/L)	46	7.50	13.96	19.00	2.52
Bicarbonate (mg/L)	47	89.00	536.02	669.00	154.79
Carbonate (mg/L)	47	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	47	57.00	876.53	1900.00	340.84
Chloride, dissolved (mg/L)	47	2.50	10.92	19.00	3.71
Fluoride, dissolved (mg/L)	47	.10	.89	1.30	.32
Silica, dissolved (mg/L)	46	6.70	14.98	23.00	4.77
Dissolved solids, calculated (mg/L)	46	176.00	1696.41	3160.00	567.71
Nitrogen, NO_2+NO_3 total (mg/L as N)	47	.00	.12	.74	.14
Nitrogen, ammonia total (mg/L as N)	47	.00	.05	.49	.08
Nitrogen, organic total (mg/L as N)	47	.14	.75	3.70	.70
Nitrogen, total (mg/L as N)	47	.18	.92	3.70	.77
Phosphorus, total (mg/L as P)	46	.00	.10	.78	.15
Sediment, suspended (mg/L)	47	9.00	91.72	566.00	114.15

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (μg/L)	11	0.00	40.00
Arsenic (μg/L)	11	.00	2.00
Beryllium (μg/L)	11	.00	10.00
Boron (μg/L)	47	110.00	820.00
Cadmium (μg/L)	11	.00	35.00
Chromium (μg/L)	11	.00	20.00
Copper (μg/L)	11	.00	4.00
Iron (μg/L)	46	.00	1500.00
Lead (μg/L)	11	.00	10.00
Lithium (μg/L)	11	50.00	120.00
Manganese (μg/L)	11	10.00	160.00
Mercury (μg/L)	11	.00	.10
Molybdenum (μg/L)	11	2.00	5.00
Nickel (μg/L)	11	.00	8.00
Selenium (μg/L)	10	.00	1.00
Zinc (μg/L)	11	.00	20.00
Vanadium (μg/L)	11	.00	5.00

Period of record: Water years 1975-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
2480 Q	-5.88	.198*	675	--	--	--	--	--
7.82 K	.00012	.195*	.191	7.83	-.00008	.00012*	.196*	.193
--	--	--	--	--	--	--	--	--
29.3 Q	1.03	.455*	64.8	98.8	.863*	-.0281*	.503*	62.6
K		.0434	2.20				.0916	2.17
Q		.0668	11.7				.0668	11.8
1.76 Q	.0643	.464*	1.70	4.84	.0403*	-.00119*	.548*	1.58
22.8 K	.0327	.890*	8.76	17.7	.0521*	.0345*	.900*	8.44
-1.64 K	.0477	.887*	12.8	-2.17	.00545	.0479*	.887*	13.0
-35.7 K	.141	.954*	23.7	-28.6	-.0732	.139*	.955*	23.6
35.4 K	.00457	.483*	3.60	37.9	-.0265*	.00368*	.558*	3.37
1.04 K	.00157	.883*	.434	1.33	-.00294*	.00147*	.898*	.412
8.03 K	.00250	.557*	1.70	8.66	-.00657	.00278*	.575*	1.68
158 K	.159	.587*	101	255	-1.01*	.125*	.696*	87.3
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-154 K	.433	.898*	110	-232	.805*	.460*	.912*	103
1.94 K	.00378	.576*	2.44	2.51	-.00593	.0358*	.582*	2.45
.937 Q	-.00271	.234*	.280	.693	-.00213*	.00010	.277*	.275
15.6 Q	-.0360	.185*	4.35	15.7	-.0362*	-.00005	.185*	4.40
-64.4 K	.741	.968*	103	-85.7	.219	.749*	.968*	103
.0899 Q	.00160	.394*	.113	.0463	.00170*	.00002	.401*	.114
.159 K	-.00004	.156*	.0779	.171	-.00013	-.00005*	.162*	.0786
1.55 K	-.00034	.130*	.658	1.31	.00244	-.00026	.161*	.654
.821 Q	.00578	.177*	.710	1.56	.00402	-.00030	.244*	.689
.0732 Q	.00146	.288*	.132	.207	.00114*	-.00005	.343*	.128
67.7 Q	1.44	.505*	81.7	-5.30	1.59*	.0292	.530*	80.5

[1] Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2] Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3] Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
8	90.00	2100.00
13	.00	4.00
12	.00	10.00
0	.	.
13	10.00	20.00
13	.00	14.00
13	.00	20.00
13	350.00	5700.00
13	100.00	100.00
13	20.00	120.00
13	40.00	390.00
13	.00	.40
13	1.00	4.00
13	.00	50.00
13	.00	2.00
8	10.00	60.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 22 Station No. (USGS): 06307610 Station name: Tongue River below Hanging Woman Creek, near Birney, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	48	46.00	626.73	4150.00	834.86
Specific conductance (µmho/cm)	48	280.00	728.52	1310.00	232.73
pH (units)	48	7.70	8.29	8.70	.24
Temperature (°C)	48	.00	9.35	22.50	8.36
Turbidity (JTU)	41	1.00	13.88	85.00	19.39
Oxygen, dissolved (mg/L)	48	7.00	9.99	12.80	1.88
Oxygen, dissolved (percent)	48	69.00	94.43	107.00	7.06
Biochemical oxygen demand (mg/L)	36	.10	1.71	8.00	1.37
Calcium, dissolved (mg/L)	45	30.00	58.89	86.00	16.88
Magnesium, dissolved (mg/L)	48	13.00	40.87	73.00	14.58
Sodium, dissolved (mg/L)	45	13.00	38.69	110.00	17.48
Sodium (percent)	45	16.00	20.36	32.00	2.85
Sodium-adsorption ratio	45	.50	.92	2.20	.30
Potassium, dissolved (mg/L)	45	1.60	4.10	7.30	1.32
Bicarbonate (mg/L)	47	120.00	246.98	376.00	72.65
Carbonate (mg/L)	44	.00	1.11	10.00	2.53
Sulfate, dissolved (mg/L)	46	47.00	185.70	420.00	76.60
Chloride, dissolved (mg/L)	46	1.20	3.43	7.20	1.24
Fluoride, dissolved (mg/L)	46	.10	.28	.50	.09
Silica, dissolved (mg/L)	44	.50	4.85	9.30	1.99
Dissolved solids, calculated (mg/L)	44	176.00	456.68	896.00	163.24
Nitrogen, NO_2+NO_3 total (mg/L as N)	45	.00	.09	.75	.13
Nitrogen, ammonia total (mg/L as N)	45	.00	.03	.26	.04
Nitrogen, organic total (mg/L as N)	45	.15	.48	2.40	.38
Nitrogen, total (mg/L as N)	45	.23	.60	3.30	.48
Phosphorus, total (mg/L as P)	45	.00	.05	.38	.07
Sediment, suspended (mg/L)	41	2.00	47.32	292.00	64.06

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	13	0.00	120.00
Arsenic (µg/L)	13	.00	2.00
Beryllium (µg/L)	13	.00	10.00
Boron (µg/L)	44	10.00	150.00
Cadmium (µg/L)	13	.00	2.00
Chromium (µg/L)	13	.00	10.00
Copper (µg/L)	14	1.00	4.00
Iron (µg/L)	47	.00	260.00
Lead (µg/L)	14	.00	20.00
Lithium (µg/L)	11	7.00	30.00
Manganese (µg/L)	18	.00	120.00
Mercury (µg/L)	12	.00	.10
Molybdenum (µg/L)	11	.00	2.00
Nickel (µg/L)	13	.00	9.00
Selenium (µg/L)	14	.00	2.00
Zinc (µg/L)	14	.00	1900.00
Vanadium (µg/L)	13	.50	9.00

Period of record: Water years 1974-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
831 Q	-.167	.370*	185	--	--	--	--	--
8.34 Q	-.00009	.108*	.229		*		.114	.230
--	--	--	--	--	--	--	--	--
3.03 Q	.0164	.586*	12.6	4.65	.0161*	-.00196	.586*	12.8
5.43 K	.00623	.594*	1.20	5.19	.00011	.00647*	.595*	1.21
Q		.0439	6.92				.0661	6.91
K		.0995	1.30				.0995	1.32
10.6 K	.0668	.867*	6.17	12.5	-.00083	.0650*	.868*	6.22
-3.89 K	.0613	.954*	3.12	-3.11	-.00035	.0605*	.955*	3.14
-10.9 K	.0687	.859*	6.57	-12.3	.00064	.0701*	.860*	6.63
15.0 K	.00741	.377*	2.25	15.4	-.00015	.00707*	.378*	2.27
.121 K	.00111	.770*	.143	.116	.00000	.00111*	.770*	.145
1.29 K	.00391	.488*	.944	1.47	-.00008	.00373*	.490*	.953
27.5 K	.302	.942*	17.5	35.3	-.00350	.295*	.943*	17.5
-1.28 K	.00333	.0995*	2.43				.101	2.45
-45.3 K	.317	.950*	17.2	-47.6	.00100	.320*	.950*	17.4
.233 K	.00441	.702*	.678	-.209	.00020	.00485*	.714*	.671
.0648 K	.00030	.620*	.0556	.0996	-.00002	.00027*	.634*	.0552
4.12 Q	.00103	.188*	1.86	4.41	.00097*	-.00036	.189*	1.88
-30.4 K	.676	.971*	27.4	-29.8	-.00027	.675*	.971*	27.7
Q		.00337	.134				.00354	.135
K		.00157	.0468				.00166	.0474
.386 Q	.00015	.118*	.357				.127	.359
Q		.0839	.465				.0896	.468
.0282 Q	.00004	.210*	.0630	.0968	.00002	-.00008	.259*	.0617
15.8 Q	.0478	.454*	47.9	7.48	.0494*	.0100	.455*	48.5

[1] Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2] Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at = 0.05
[3] Asterisk denotes that partial regression coefficient is significant at = 0.05

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
14	30.00	600.00
11	.00	2.00
11	.00	10.00
3	140.00	200.00
11	4.00	10.00
11	.00	20.00
14	.00	20.00
11	20.00	3900.00
14	30.00	100.00
11	9.00	40.00
11	10.00	110.00
14	.00	.30
11	.00	6.00
11	6.00	50.00
14	.00	4.00
14	10.00	280.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 23 Station No. (USGS): 06307615 Station name: Cook Creek near Birney, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	34	0.10	2.66	43.00	7.74
Specific conductance (µmho/cm)	34	270.00	1761.76	2250.00	360.95
pH (units)	34	7.70	8.13	8.60	.25
Temperature (°C)	34	.00	7.76	21.00	7.50
Turbidity (JTU)	34	.00	78.56	2400.00	410.38
Oxygen, dissolved (mg/L)	34	5.10	10.15	13.80	2.32
Oxygen, dissolved (percent)	34	54.00	92.28	117.00	12.62
Biochemical oxygen demand (mg/L)	34	.20	1.63	7.40	1.55
Calcium, dissolved (mg/L)	33	19.00	78.58	97.00	13.87
Magnesium, dissolved (mg/L)	34	11.00	106.15	130.00	23.06
Sodium, dissolved (mg/L)	33	16.00	173.39	210.00	39.15
Sodium (percent)	33	26.00	36.39	40.00	2.89
Sodium-adsorption ratio	33	.70	2.96	3.50	.53
Potassium, dissolved (mg/L)	33	6.60	12.99	16.00	1.74
Bicarbonate (mg/L)	34	92.00	615.12	720.00	129.82
Carbonate (mg/L)	34	.00	1.65	30.00	6.39
Sulfate, dissolved (mg/L)	34	46.00	490.47	670.00	105.96
Chloride, dissolved (mg/L)	34	2.30	6.62	11.00	1.84
Fluoride, dissolved (mg/L)	34	.10	1.10	1.40	.23
Silica, dissolved (mg/L)	33	5.60	21.16	53.00	7.58
Dissolved solids, calculated (mg/L)	33	152.00	1195.70	1470.00	245.82
Nitrogen, NO_2+NO_3 total (mg/L as N)	34	.00	.46	1.70	.48
Nitrogen, ammonia total (mg/L as N)	34	.00	.03	.19	.03
Nitrogen, organic total (mg/L as N)	34	.02	.59	3.60	.63
Nitrogen, total (mg/L as N)	34	.13	1.08	3.80	.75
Phosphorus, total (mg/L as P)	34	.00	.08	1.50	.25
Sediment, suspended (mg/L)	34	2.00	135.56	3469.99	589.88

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	7	0.00	40.00
Arsenic (µg/L)	7	1.00	3.00
Beryllium (µg/L)	7	.00	10.00
Boron (µg/L)	34	100.00	250.00
Cadmium (µg/L)	7	.00	30.00
Chromium (µg/L)	7	.00	20.00
Copper (µg/L)	7	.00	3.00
Iron (µg/L)	33	.00	290.00
Lead (µg/L)	7	.00	9.00
Lithium (µg/L)	7	80.00	120.00
Manganese (µg/L)	7	40.00	160.00
Mercury (µg/L)	7	.00	.10
Molybdenum (µg/L)	7	2.00	4.00
Nickel (µg/L)	7	2.00	7.00
Selenium (µg/L)	6	.00	4.00
Zinc (µg/L)	7	4.00	10.00
Vanadium (µg/L)	7	.00	4.00

Period of record: Water years 1975-77 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
1850 Q	-32.3	.481*	264	--	--	--	--	--
7.47 K	.00038	.293*	.214	7.53	-.00226	.00034*	.296*	.217
--	--	--	--	--	--	--	--	--
-51.8 Q	49.1	.858*	157	-852	63.1*	.433*	.933*	110
Q		.0251	2.33				.0270	2.36
K		.0146	12.9				.0147	13.1
1.20 Q	.162	.654*	.926	4.27	.108*	-.00166*	.732*	.829
15.1 K	.0362	.892*	4.63	15.9	-.0272	.0358*	.892*	4.71
1.45 K	.0594	.866*	8.58	18.3	-.583*	.0508*	.886*	8.05
7.36 K	.0948	.766*	19.2	49.4	-1.44*	.0730*	.809*	17.7
37.0 Q	-.212	.332*	2.40	32.8	-.140	.00227	.374*	2.37
.878 K	.00119	.657*	.316	1.44	-.0191	.00090*	.698*	.301
7.53 K	.00312	.419*	1.35	7.66	-.00435	.00305*	.419*	1.37
44.7 K	.324	.811*	57.4	218	-6.01*	.234*	.877*	46.9
Q		.00433	6.47				.00989	6.56
20.2 K	.267	.827*	44.8	31.0	-.373	.261*	.827*	45.5
2.31 K	.00245	.231*	1.63	2.26	.00197	.00248*	.231*	1.66
.170 K	.00053	.696*	.128	.336	-.00575	.00044*	.716*	.126
4.64 K	.00943	.202*	6.88	10.1	-.185	.00663	.221*	6.91
67.3 K	.644	.898*	79.9	222	-5.31*	.564*	.912*	75.1
K		.111	.455				.133	.457
K		.00582	.0350				.0120	.0354
.403 Q	.0696	.723*	.338	.308	.0713*	.00005	.724*	.343
.919 Q	.0611	.398*	.591	-.301	.0825*	.00066	.451*	.573
.00050 Q	.0313	.906*	.0792	-.325	.0370*	.00018*	.938*	.0651
-51.2 Q	70.3	.851*	231	-1200	90.5*	.623*	.927*	165

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
7	50.00	230.00
12	.00	3.00
12	.00	10.00
0	.	.
12	.00	30.00
12	.00	28.00
12	.00	110.00
12	170.00	2500.00
12	100.00	100.00
12	10.00	150.00
12	30.00	140.00
12	.00	.20
12	.00	4.00
12	.00	50.00
12	.00	3.00
7	.00	70.00
--	--	--

Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 24 Station No. (USGS): 06307665 Station name: Otter Creek near Otter, MT

Variable	DESCRIPTIVE STATISTICS Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	9	0.01	0.36	1.60	0.53
Specific conductance (µmho/cm)	9	2070.00	5543.33	6650.00	1436.24
pH (units)	9	7.80	8.09	8.60	.25
Temperature (°C)	9	.00	11.22	26.50	8.76
Turbidity (JTU)	9	1.00	26.11	220.00	72.72
Oxygen, dissolved (mg/L)	9	6.60	10.21	17.00	2.62
Oxygen, dissolved (percent)	9	51.00	108.00	193.00	40.35
Biochemical oxygen demand (mg/L)	9	.70	1.39	3.40	.86
Calcium, dissolved (mg/L)	9	79.00	176.56	230.00	49.99
Magnesium, dissolved (mg/L)	9	120.00	366.67	470.00	105.95
Sodium, dissolved (mg/L)	9	250.00	717.78	990.00	218.45
Sodium (percent)	9	37.00	44.00	48.00	3.32
Sodium-adsorption ratio	9	4.10	6.98	8.90	1.48
Potassium, dissolved (mg/L)	9	10.00	19.22	25.00	5.38
Bicarbonate (mg/L)	9	270.00	604.44	760.00	141.70
Carbonate (mg/L)	9	.00	2.00	18.00	6.00
Sulfate, dissolved (mg/L)	9	920.00	2857.78	3800.00	842.94
Chloride, dissolved (mg/L)	9	5.80	20.53	27.00	6.62
Fluoride, dissolved (mg/L)	9	.30	.52	.60	.11
Silica, dissolved (mg/L)	9	4.20	9.68	17.00	4.08
Dissolved solids, calculated (mg/L)	9	1530.00	4470.00	5800.00	1252.71
Nitrogen, NO_2+NO_3 total (mg/L as N)	9	.00	.03	.08	.03
Nitrogen, ammonia total (mg/L as N)	9	.00	.02	.07	.02
Nitrogen, organic total (mg/L as N)	9	.06	.72	1.40	.37
Nitrogen, total (mg/L as N)	9	.17	.76	1.50	.37
Phosphorus, total (mg/L as P)	9	.00	.06	.25	.08
Sediment, suspended (mg/L)	9	14.00	48.00	201.00	60.13

Variable	DISSOLVED Sample size	Minimum value	Maximum value
Aluminum (µg/L)	3	0.00	10.00
Arsenic (µg/L)	3	1.00	2.00
Beryllium (µg/L)	3	.00	10.00
Boron (µg/L)	9	270.00	780.00
Cadmium (µg/L)	3	2.00	3.00
Chromium (µg/L)	3	.00	20.00
Copper (µg/L)	3	.00	2.00
Iron (µg/L)	9	20.00	80.00
Lead (µg/L)	3	3.00	11.00
Lithium (µg/L)	3	260.00	340.00
Manganese (µg/L)	3	8.00	40.00
Mercury (µg/L)	3	.00	.00
Molybdenum (µg/L)	3	2.00	3.00
Nickel (µg/L)	3	.00	3.00
Selenium (µg/L)	3	.00	3.00
Zinc (µg/L)	3	10.00	30.00
Vanadium (µg/L)	3	.00	.40

Period of record: Water year 1978

REGRESSION SUMMARY

SIMPLE REGRESSION					MULTIPLE REGRESSION				
Regression constant[1]		Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--		--	--	--	--	--		--	--
	Q		.181	1440	--	--	--	--	--
	K		.223	.252			.00008	.223	.275
--		--	--	--	--	--	--	--	--
288	K	-.0478	.834*	33.9	299	22.1	-.0514*	.856*	34.6
	K		.0245	3.21			.00053	.0731	3.43
	K		.109	43.7			.00948	.109	47.9
4.04	K	-.00051	.723*	.499	.436	.628	-.00061*	.856*	.394
	K		.383	45.0			.0251	.412	48.1
20.3	K	.0617	.743*	57.7	-27.6	-94.3*	.0770*	.952*	27.4
-20.9	K	.130	.864*	82.1	-62.7	-82.5	.144*	.906*	74.9
	Q		.313	2.83			.00017	.318	3.09
2.04	K	.000869	.860*	.558	2.00	-.0774	.00088*	.861*	.609
	K		.448	4.53			.00278	.462	4.89
171	K	.0783	.605*	101			.0869*	.638	106
	Q		.0641	6.65			.00164	.182	6.81
-128	K	.530	.912*	262	-313	-364*	.590*	.964*	184
-2.32	K	.00435	.912*	6.80	-3.66	-2.65	.00478*	.953*	1.73
	K		.348	.0982			.00005	.363	.106
	Q		.347	3.81			.00114	.469	3.76
27.2	K	.791	.899*	421	-274	-594*	.887*	.960*	289
	Q		.187	.0271			-.00001	.364	.0262
	Q		.0391	.0271			-.00000	.0888	.0289
	Q		.499	.301			-.00006	.545	.315
.570	Q	.518	.548*	.287			-.00007	.602	.295
.334	K	-.00005	.689*	.0535	.363	.0559	.00006*	.793*	.0478
246	K	-.0357	.727*	33.6	253	15.7	-.0380*	.743*	35.2

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
0	.	.
--	--	--

Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 25 Station No. (USGS): 06307670 Station name: Bear Creek at Otter, MT

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
		DESCRIPTIVE STATISTICS			
Discharge, instantaneous (ft^3/s)	5	0.01	15.16	53.10	22.11
Specific conductance (µmho/cm)	5	225.00	1070.00	3000.00	1111.04
pH (units)	5	7.00*	7.86	8.40	.57
Temperature (°C)	5	.00	3.20	14.00	6.10
Turbidity (JTU)	5	3.00	24.60	50.00	17.20
Oxygen, dissolved (mg/L)	5	6.30	9.38	11.80	2.61
Oxygen, dissolved (percent)	5	59.00	78.62	91.00	14.18
Biochemical oxygen demand (mg/L)	4	2.40	8.92	14.00	4.93
Calcium, dissolved (mg/L)	5	21.00	55.60	160.00	58.73
Magnesium, dissolved (mg/L)	5	9.00	48.80	150.00	57.55
Sodium, dissolved (mg/L)	5	14.00	124.20	390.00	153.57
Sodium (percent)	5	24.00	38.20	49.00	9.63
Sodium-adsorption ratio	5	.60	2.48	5.30	1.85
Potassium, dissolved (mg/L)	5	5.80	10.98	18.00	4.62
Bicarbonate (mg/L)	5	69.00	226.60	584.00	208.71
Carbonate (mg/L)	5	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	5	47.00	401.40	1300.00	510.98
Chloride, dissolved (mg/L)	5	2.60	6.10	13.00	4.10
Fluoride, dissolved (mg/L)	5	.10	.30	.60	.21
Silica, dissolved (mg/L)	5	6.10	8.62	14.00	3.15
Dissolved solids, calculated (mg/L)	5	140.00	767.20	2330.00	892.18
Nitrogen, NO_2+NO_3 total (mg/L as N)	5	.01	.08	.16	.07
Nitrogen, ammonia total (mg/L as N)	5	.03	.06	.11	.03
Nitrogen, organic total (mg/L as N)	5	.57	1.00	1.40	.40
Nitrogen, total (mg/L as N)	5	.62	1.13	1.60	.44
Phosphorus, total (mg/L as P)	5	.02	.18	.27	.10
Sediment, suspended (mg/L)	5	27.00	61.00	92.00	25.33

Variable	Sample size	Minimum value	Maximum value
		DISSOLVED	
Aluminum (µg/L)	0	.	.
Arsenic (µg/L)	0	.	.
Beryllium (µg/L)	0	.	.
Boron (µg/L)	5	70.00	330.00
Cadmium (µg/L)	0	.	.
Chromium (µg/L)	0	.	.
Copper (µg/L)	0	.	.
Iron (µg/L)	5	80.00	160.00
Lead (µg/L)	0	.	.
Lithium (µg/L)	0	.	.
Manganese (µg/L)	0	.	.
Mercury (µg/L)	0	.	.
Molybdenum (µg/L)	0	.	.
Nickel (µg/L)	0	.	.
Selenium (µg/L)	0	.	.
Zinc (µg/L)	0	.	.
Vanadium (µg/L)	0	.	.

Period of record: Water year 1975-77 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
Q		.313	1060	--	--	--	--	--
8.22 Q	-.0238	.842*	.263				.894	.263
--	--	--	--	--	--	--	--	--
K		.513	13.9				.514	17.0
K		.642	1.80				.747	1.86
Q		.488	11.7				.527	13.8
18.2 K	-.0159	.970*	1.05	22.7	-.0754	.0210*	.999*	.247
-.474 K	.0524	.983*	8.85	-10.5	.369	.0565*	.996*	5.10
-6.51 K	.0517	.996*	4.17	-11.0	.164	.0535*	.999*	2.83
-23.5 K	.138	.997*	9.19	-26.8	.124	.139*	.998*	10.8
44.3 Q	-.402	.852*	4.28				.863	5.05
.784 K	.00158	.903*	.666	1.40	-.0229	.00133*	.954*	.559
6.93 K	.00378	.827*	2.22				.917	1.88
26.1 K	.187	.995*	17.8	29.4	-.120	.186*	.995*	21.5
--	--	--	--	--	--	--	--	--
-89.9 K	.459	.997*	33.6	-125	1.30	4.74*	.999*	23.7
2.35 K	.00350	.902*	1.49				.902	1.82
.117 K	.00017	.803*	.109				.830	.124
5.69 K	.00274	.934*	.937			*	.936	1.12
-91.4 K	.802	.999*	39.9	-140	1.79*	.822*	.999*	15.0
K		.280	.0673				.341	.0788
K		.132	.0352				.348	.0374
K		.563	.307				.659	.333
K		.621	.313				.662	.362
.275 K	-.00009	.908*	.0353				.911	.0426
K		.0361	28.7				.0444	35.0

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
0	.	.
1	2.00	2.00
1	10.00	10.00
0	.	.
1	10.00	10.00
1	10.00	10.00
1	90.00	90.00
1	1600.00	1600.00
1	100.00	100.00
1	20.00	20.00
1	110.00	110.00
1	.00	.00
1	1.00	1.00
1	50.00	50.00
1	.00	.00
0	.	.
--	--	--

Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 26 Station No. (USGS): 06307717 Station name: Otter Creek below Fifteenmile Creek near Otter, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	9	0.05	13.68	76.00	24.21
Specific conductance (μmho/cm)	9	680.00	2992.22	4200.00	1023.33
pH (units)	9	7.90	8.20	8.50	.23
Temperature (°C)	9	.00	9.94	24.50	9.06
Turbidity (JTU)	9	2.00	13.56	80.00	25.29
Oxygen, dissolved (mg/L)	9	5.30	8.40	11.20	1.95
Oxygen, dissolved (percent)	9	49.00	83.11	116.00	23.59
Biochemical oxygen demand (mg/L)	9	.60	2.26	6.60	1.90
Calcium, dissolved (mg/L)	9	32.00	96.89	150.00	35.33
Magnesium, dissolved (mg/L)	9	33.00	190.33	280.00	70.75
Sodium, dissolved (mg/L)	9	60.00	366.67	580.00	145.95
Sodium (percent)	9	37.00	42.33	50.00	3.39
Sodium-adsorption ratio	9	1.80	4.84	7.20	1.42
Potassium, dissolved (mg/L)	9	9.00	17.78	26.00	5.19
Bicarbonate (mg/L)	9	140.00	561.11	720.00	181.00
Carbonate (mg/L)	9	.00	2.56	15.00	5.36
Sulfate, dissolved (mg/L)	9	230.00	1270.00	1900.00	476.55
Chloride, dissolved (mg/L)	9	3.10	14.67	27.00	7.89
Fluoride, dissolved (mg/L)	9	.20	.56	.70	.21
Silica, dissolved (mg/L)	9	2.50	8.48	19.00	6.06
Dissolved solids, calculated (mg/L)	9	444.00	2246.00	3180.00	799.72
Nitrogen, NO_2+NO_3 total (mg/L as N)	9	.01	.11	.61	.20
Nitrogen, ammonia total (mg/L as N)	9	.00	.10	.63	.20
Nitrogen, organic total (mg/L as N)	9	.46	.81	1.40	.29
Nitrogen, total (mg/L as N)	9	.62	1.01	2.20	.48
Phosphorus, total (mg/L as P)	9	.00	.07	.32	.10
Sediment, suspended (mg/L)	9	5.00	41.44	117.00	35.77

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (μg/L)	5	0.00	20.00
Arsenic (μg/L)	5	1.00	3.00
Beryllium (μg/L)	5	.00	20.00
Boron (μg/L)	9	120.00	640.00
Cadmium (μg/L)	5	1.00	4.00
Chromium (μg/L)	5	.00	10.00
Copper (μg/L)	5	1.00	3.00
Iron (μg/L)	9	10.00	100.00
Lead (μg/L)	5	2.00	28.00
Lithium (μg/L)	5	30.00	160.00
Manganese (μg/L)	5	30.00	100.00
Mercury (μg/L)	5	.00	.10
Molybdenum (μg/L)	5	2.00	10.00
Nickel (μg/L)	5	.00	2.00
Selenium (μg/L)	5	.00	1.00
Zinc (μg/L)	5	.00	30.00
Vanadium (μg/L)	5	.00	2.00

Period of record: Water year 1978

REGRESSION SUMMARY

SIMPLE REGRESSION					MULTIPLE REGRESSION				
Regression constant[1]		Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--		--	--	--	--	--	--	--	--
3640	Q	-39.2	.854*	445	--	--	--	--	--
	K		.321	.196				.515	.181
--		--	--	--	--	--	--	--	--
.0835	Q	1.00	.909*	8.67	-17.3	1.19*	.00478	.915*	9.20
	Q		.244	1.65				.247	1.80
	Q		.0210	23.5				.102	24.6
1.44	Q	.0620	.621*	1.33	-.540	.136*	.00188	.771*	1.13
	Q		.416	31.1				.416	34.0
-12.0	K	.0680	.982*	10.7	16.5	-.350	.0603*	.984*	11.1
-53.1	K	.141	.982*	22.0	-158	1.29	.169*	.989*	19.0
34.3	K	.00265	.623*	2.40				.665	2.48
.741	K	.00136	.945*	.383	-.150	.0109	.00160*	.950*	.401
	Q		.360	4.79				3.60	5.24
682	Q	-7.28	.954*	43.8	730	-7.79*	-.0131	.955*	47.5
	K		.00311	3.05				.0542	3.25
-130	K	.466	.988*	59.8	-369	2.94	.530*	.991*	56.1
-.391	K	.00541	.685*	4.27				.685	4.68
	Q		.315	.197				.540	.177
	Q		.0647	6.45				.511	5.11
-94.0	K	.781	.995*	6.28	34.3	-1.58	.747*	.996*	66.4
	K		.0762	.215				.429	.185
-.0127	Q	.00798	.889*	.0772	.138	.00636	-.00004	.896*	.0821
.695	Q	.00908	.594*	.206	-.840	.0256*	.000422*	.932*	.0921
.806	Q	.0171	.783*	.247	.654	.0187	.00004	.784*	.270
.0195	Q	.00372	.835*	.0453	-.133	.00537*	.00004	.863*	.0452
24.0	Q	1.28	.747*	19.2	27.4	1.24	-.00098	.748*	20.7

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
1	200.00	200.00
1	3.00	3.00
1	5.00	5.00
0	.	.
1	1.00	1.00
1	.00	.00
1	19.00	19.00
1	310.00	310.00
1	5.00	5.00
1	150.00	150.00
1	30.00	30.00
1	.00	.00
1	8.00	8.00
1	5.00	5.00
1	.00	.00
1	30.00	30.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 27 Station No. (USGS): 06307730 Station name: Threemile Creek near Ashland, MT

	DESCRIPTIVE STATISTICS				
Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	2	1.81	11.90	22.00	14.28
Specific conductance (μmho/cm)	2	260.00	307.50	355.00	67.18
pH (units)	2	7.50	7.55	7.60	.07
Temperature (°C)	2	.00	1.75	3.50	2.47
Turbidity (JTU)	2	20.00	60.00	100.00	56.57
Oxygen, dissolved (mg/L)	2	10.60	10.90	11.20	.42
Oxygen, dissolved (percent)	2	86.00	87.50	89.00	2.12
Biochemical oxygen demand (mg/L)	2	10.10	10.20	10.30	.14
Calcium, dissolved (mg/L)	2	17.00	19.50	22.00	3.54
Magnesium, dissolved (mg/L)	2	8.20	9.10	10.00	1.27
Sodium, dissolved (mg/L)	2	18.00	19.00	20.00	1.41
Sodium (percent)	2	29.00	30.00	31.00	1.41
Sodium-adsorption ratio	2	.90	.90	.90	.00
Potassium, dissolved (mg/L)	2	7.00	7.70	8.40	.99
Bicarbonate (mg/L)	2	80.00	87.50	95.00	10.61
Carbonate (mg/L)	2	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	2	49.00	58.00	67.00	12.73
Chloride, dissolved (mg/L)	2	2.00	2.00	2.00	.00
Fluoride, dissolved (mg/L)	2	.10	.25	.40	.21
Silica, dissolved (mg/L)	2	5.10	5.65	6.20	.78
Dissolved solids, calculated (mg/L)	2	149.00	165.00	181.00	22.63
Nitrogen, NO_2+NO_3 total (mg/L as N)	2	.04	.05	.06	.01
Nitrogen, ammonia total (mg/L as N)	2	.01	.05	.09	.06
Nitrogen, organic total (mg/L as N)	2	1.00	1.15	1.30	.21
Nitrogen, total (mg/L as N)	2	1.20	1.25	1.30	.07
Phosphorus, total (mg/L as P)	2	.16	.26	.36	.14
Sediment, suspended (mg/L)	2	24.00	118.00	212.00	132.94

	DISSOLVED		
Variable	Sample size	Minimum value	Maximum value
Aluminum (μg/L)	1	0.00	0.00
Arsenic (μg/L)	1	4.00	4.00
Beryllium (μg/L)	1	.00	.00
Boron (μg/L)	2	110.00	110.00
Cadmium (μg/L)	1	.00	.00
Chromium (μg/L)	1	.00	.00
Copper (μg/L)	1	8.00	8.00
Iron (μg/L)	2	60.00	190.00
Lead (μg/L)	1	6.00	6.00
Lithium (μg/L)	0	.	.
Manganese (μg/L)	1	20.00	20.00
Mercury (μg/L)	1	.00	.00
Molybdenum (μg/L)	0	.	.
Nickel (μg/L)	1	2.00	2.00
Selenium (μg/L)	0	.	.
Zinc (μg/L)	1	20.00	20.00
Vanadium (μg/L)	0	.	.

Period of record: Water years 1975-77 (discontinued)

REGRESSION SUMMARY[1]

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant	Regression coefficient	Coefficient of determination	Standard error of estimate	Regression constant	Partial regression coefficient Q	Partial regression coefficient K	Coefficient of determination	Standard error of estimate
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[1]Insufficient samples to develop regressions.

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
0	.	.
1	3.00	3.00
1	10.00	10.00
0	.	.
1	20.00	20.00
1	10.00	10.00
1	50.00	50.00
1	1500.00	1500.00
1	100.00	100.00
1	10.00	10.00
1	60.00	60.00
1	.00	.00
1	.00	.00
1	50.00	50.00
1	3.00	3.00
0	.	.
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 28 Station No. (USGS): 06307735 Station name: Home Creek near Ashland, MT

		DESCRIPTIVE STATISTICS			
Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	16	0.01	1.55	23.00	5.72
Specific conductance (µmho/cm)	16	1060.00	3409.37	4200.00	823.13
pH (units)	16	7.80	8.07	8.30	.18
Temperature (°C)	16	.00	11.63	24.50	7.80
Turbidity (JTU)	15	2.00	24.63	300.00	73.58
Oxygen, dissolved (mg/L)	15	5.80	8.17	10.90	1.76
Oxygen, dissolved (percent)	15	47.00	82.53	120.00	22.17
Biochemical oxygen demand (mg/L)	16	.60	2.26	6.80	1.83
Calcium, dissolved (mg/L)	16	46.00	92.75	120.00	24.63
Magnesium, dissolved (mg/L)	16	41.00	186.25	240.00	51.30
Sodium, dissolved (mg/L)	16	130.00	483.13	610.00	123.27
Sodium (percent)	16	48.00	50.63	54.00	1.93
Sodium-adsorption ratio	16	3.40	6.58	7.50	1.09
Potassium, dissolved (mg/L)	16	4.30	18.96	26.00	5.15
Bicarbonate (mg/L)	16	200.00	775.00	900.00	195.75
Carbonate (mg/L)	16	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	16	380.00	1338.75	1700.00	348.14
Chloride, dissolved (mg/L)	16	2.90	11.74	18.00	4.37
Fluoride, dissolved (mg/L)	16	.20	.99	1.20	.27
Silica, dissolved (mg/L)	16	6.70	13.12	21.00	4.64
Dissolved solids, calculated (mg/L)	16	719.00	2529.31	3160.00	641.87
Nitrogen, NO_2+NO_3 total (mg/L as N)	16	.00	.17	.46	.12
Nitrogen, ammonia total (mg/L as N)	16	.00	.10	.47	.12
Nitrogen, organic total (mg/L as N)	16	.04	.72	1.50	.37
Nitrogen, total (mg/L as N)	16	.26	.99	1.90	.38
Phosphorus, total (mg/L as P)	16	.02	.09	.30	.08
Sediment, suspended (mg/L)	16	6.00	53.00	356.00	85.07

		DISSOLVED	
Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	6	0.00	20.00
Arsenic (µg/L)	6	1.00	6.00
Beryllium (µg/L)	6	.00	10.00
Boron (µg/L)	16	160.00	800.00
Cadmium (µg/L)	6	1.00	4.00
Chromium (µg/L)	6	.00	10.00
Copper (µg/L)	6	.00	5.00
Iron (µg/L)	16	30.00	710.00
Lead (µg/L)	6	1.00	25.00
Lithium (µg/L)	6	40.00	170.00
Manganese (µg/L)	6	50.00	1000.00
Mercury (µg/L)	6	.00	.10
Molybdenum (µg/L)	6	.00	4.00
Nickel (µg/L)	6	.00	4.00
Selenium (µg/L)	6	.00	1.00
Zinc (µg/L)	6	20.00	70.00
Vanadium (µg/L)	6	.00	1.00

Period of record: Water years 1977-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
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3560 Q	-112	.593*	559	--	--	--	--	--
K		.133	.174				.133	.194
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4.96 Q	13.1	.996*	4.93	3.00	13.1*	.00055	.996*	5.12
K		.0533	1.77				.0876	1.81
K		.0311	22.4				.0588	23.1
5.44 K	-.00103	.371*	1.18	9.77	-.222*	-.00221*	.702*	.842
12.8 K	.0233	.615*	16.1	-7.06	1.02	.0287*	.638*	16.3
-24.6 K	.0621	.978*	8.18	-23.9	-.0360	.0619*	.978*	8.51
-21.3 K	.149	.970*	23.0	-5.61	-.804	.144*	.970*	23.8
Q		.0580	2.00				.0589	2.08
2.43 K	.00122	.840*	.467				.857	.460
7.52 K	.00330	.286*	4.57				.286	4.76
-20.2 K	.233	.964*	39.5	42.1	-3.17	.216*	.967*	39.1
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-92.2 K	.420	.982*	50.1	-154	3.16	.437*	.983*	50.6
-1.31 K	.00400	.688*	2.36	-1.32	.00024	.00400*	.688*	2.46
-.103 K	.00032	.927*	.0793	-.0148	-.00454	.00030*	.930*	.0805
Q		.0677	4.79				.0721	4.97
-123 K	.779	.991*	63.9	-157	1.77	.788*	.991*	66.1
Q		.0419	.121				.0433	.126
K		.182	.119	.754	-.00221*	-.00018*	.596*	.0873
Q		.0531	.383				.0590	.397
K		.125	.379				.148	.390
.391 K	-.00009	.834*	.0340	.385	.00029	-.00009*	.834*	.0354
31.1 Q	14.1	.900*	27.9	8.51	14.8*	.00632	.901*	28.7

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at = 0.05

[3]Asterisk denotes that partial regression coefficient is significant at = 0.05

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
0	.	.
1	3.00	3.00
1	5.00	5.00
0	.	.
1	2.00	2.00
1	40.00	40.00
1	24.00	24.00
1	15000.00	15000.00
1	16.00	16.00
1	40.00	40.00
1	260.00	260.00
1	.10	.10
1	3.00	3.00
1	15.00	15.00
1	1.00	1.00
1	50.00	50.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 29 Station No. (USGS): 06307740 Station name: Otter Creek at Ashland, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	46	0.06	26.95	390.00	76.65
Specific conductance (μmho/cm)	46	370.00	2693.37	3900.00	747.71
pH (units)	45	7.20	8.21	8.60	.29
Temperature (°C)	46	.00	9.10	26.50	9.02
Turbidity (JTU)	46	1.00	29.15	270.00	46.16
Oxygen, dissolved (mg/L)	45	3.00	9.34	13.40	2.48
Oxygen, dissolved (percent)	45	37.00	86.01	112.00	14.35
Biochemical oxygen demand (mg/L)	46	.00	2.24	10.20	1.90
Calcium, dissolved (mg/L)	46	23.00	79.28	120.00	24.84
Magnesium, dissolved (mg/L)	46	15.00	149.11	210.00	44.82
Sodium, dissolved (mg/L)	46	26.00	353.54	470.00	108.68
Sodium (percent)	46	29.00	47.04	54.00	4.84
Sodium-adsorption ratio	46	1.00	5.29	6.70	1.32
Potassium, dissolved (mg/L)	46	8.10	18.76	37.00	4.90
Bicarbonate (mg/L)	46	110.00	584.98	810.00	164.25
Carbonate (mg/L)	45	.00	6.60	58.00	13.49
Sulfate, dissolved (mg/L)	46	80.00	1061.52	1500.00	329.05
Chloride, dissolved (mg/L)	45	1.30	12.64	29.00	4.97
Fluoride, dissolved (mg/L)	46	.10	.72	1.00	.20
Silica, dissolved (mg/L)	46	1.20	8.94	20.00	4.75
Dissolved solids, calculated (mg/L)	45	228.00	1987.47	2690.00	578.18
Nitrogen, NO_2+NO_3 total (mg/L as N)	46	.00	.22	.81	.24
Nitrogen, ammonia total (mg/L as N)	45	.00	.09	.74	.12
Nitrogen, organic total (mg/L as N)	45	.19	.99	3.90	.70
Nitrogen, total (mg/L as N)	45	.55	1.29	3.90	.73
Phosphorus, total (mg/L as P)	46	.00	.09	.68	.13
Sediment, suspended (mg/L)	45	10.00	87.38	536.00	99.08

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (μg/L)	10	0.00	30.00
Arsenic (μg/L)	10	.00	2.00
Beryllium (μg/L)	10	.00	20.00
Boron (μg/L)	46	100.00	650.00
Cadmium (μg/L)	10	.00	50.00
Chromium (μg/L)	10	.00	20.00
Copper (μg/L)	10	.00	10.00
Iron (μg/L)	46	10.00	490.00
Lead (μg/L)	10	1.00	18.00
Lithium (μg/L)	10	100.00	150.00
Manganese (μg/L)	10	4.00	140.00
Mercury (μg/L)	10	.00	.10
Molybdenum (μg/L)	10	2.00	6.00
Nickel (μg/L)	10	.00	14.00
Selenium (μg/L)	9	.00	2.00
Zinc (μg/L)	10	.00	110.00
Vanadium (μg/L)	10	.00	10.00

Period of record: Water years 1975-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
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2850 Q	-4.12	.348*	604	--	--	--	--	--
7.72 K	.00018	.229*	.255	7.77	-.00021	.00017*	.233*	.257
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146 K	-.0434	.493*	33.2	121	.0944	-.0354*	.524*	32.6
Q		.00237	2.48				.00326	2.51
K		.02585	14.2				.0263	14.3
7.78 K	-.00204	.649*	1.14	7.67	.00048	-.00200*	.649*	1.16
17.0 K	.0231	.485*	17.8	11.6	.0204	.0249*	.490*	18.0
-6.23 K	.0577	.926*	12.2	-3.21	-.0113	.0567*	.926*	12.3
-23.0 K	.140	.925*	29.7	-4.97	-.0678	.134*	.928*	29.5
34.4 K	.00469	.524*	3.34	36.0	-.00597	.00418*	.535*	3.34
1.00 K	.00159	.811*	.575	1.29	-.00110	.00150*	.816*	.574
9.77 K	.00334	.259*	4.22	10.9	-.00406	.00300*	.265*	4.26
50.1 K	.199	.817*	71.0	125	-.281*	.175*	.839*	67.4
Q		.0281	13.5				.0338	13.6
-79.1 K	.424	.926*	87.9	-118	.145	.436*	.927*	90.0
1.72 K	.00396	.327*	4.25	.572	.00431	.00433*	.332*	4.28
.106 K	.00023	.690*	.113	.187	-.00030	.00020*	.707*	.111
K		.00880	4.74				.0108	4.78
-48.4 K	.753	.961*	114	-29.8	-.0701	.747*	.961*	115
Q		.00520	.241				.00560	.243
.313 K	-.00008	.267*	.106	.291	.00008	-.00008*	.270*	.107
K		.0665	.682				.0670	.689
2.10 K	-.00031	.0997*	.699				.100	.707
.443 K	-.00013	.601*	.0807	.391	.00020	-.00012*	.619*	.0797
287 K	-.0741	.319*	82.7	209	.291*	-.0496*	.385*	79.5

[1] Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2] Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3] Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
7	160.00	780.00
12	.00	4.00
11	.00	10.00
0	.	.
12	10.00	10.00
12	.00	90.00
12	.00	110.00
12	280.00	2900.00
12	100.00	100.00
12	20.00	150.00
12	40.00	360.00
12	.00	.80
12	1.00	9.00
12	.00	50.00
12	.00	3.00
7	.00	40.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 30   Station No. (USGS): 06307810   Station name: Beaver Creek near Ashland, MT

	DESCRIPTIVE STATISTICS				
Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	9	.58	12.72	42.30	17.62
Specific conductance (µmho/cm)	9	400.00	2784.44	4080.00	1647.93
pH (units)	9	7.70	8.01	8.30	.18
Temperature (°C)	9	.00	7.28	15.50	5.99
Turbidity (JTU)	9	1.00	10.56	40.00	14.16
Oxygen, dissolved (mg/L)	9	6.00	9.01	11.60	1.95
Oxygen, dissolved (percent)	9	63.00	81.33	103.00	13.47
Biochemical oxygen demand (mg/L)	8	1.10	4.34	11.30	4.26
Calcium, dissolved (mg/L)	9	20.00	113.67	170.00	62.95
Magnesium, dissolved (mg/L)	9	15.00	160.00	260.00	99.63
Sodium, dissolved (mg/L)	9	30.00	344.44	560.00	223.59
Sodium (percent)	9	33.00	41.22	47.00	5.12
Sodium-adsorption ratio	9	1.20	4.46	6.40	2.20
Potassium, dissolved (mg/L)	9	9.40	17.53	25.00	5.80
Bicarbonate (mg/L)	9	94.00	521.11	755.00	285.30
Carbonate (mg/L)	9	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	9	100.00	1237.78	2000.00	807.06
Chloride, dissolved (mg/L)	9	1.20	6.98	11.00	3.89
Fluoride, dissolved (mg/L)	9	.10	.40	.50	.17
Silica, dissolved (mg/L)	9	5.60	10.86	15.00	3.36
Dissolved solids, calculated (mg/L)	9	230.00	2150.44	3400.00	1337.61
Nitrogen, NO_2+NO_3 total (mg/L as N)	9	.01	.04	.15	.05
Nitrogen, ammonia total (mg/L as N)	9	.00	.06	.34	.11
Nitrogen, organic total (mg/L as N)	9	.22	1.09	2.40	.63
Nitrogen, total (mg/L as N)	9	.23	1.18	2.40	.67
Phosphorus, total (mg/L as P)	9	.01	.08	.19	.06
Sediment, suspended (mg/L)	9	6.00	28.89	73.00	22.92

	DISSOLVED		
Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	0	.	.
Arsenic (µg/L)	0	.	.
Beryllium (µg/L)	0	.	.
Boron (µg/L)	9	140.00	940.00
Cadmium (µg/L)	0	.	.
Chromium (µg/L)	0	.	.
Copper (µg/L)	0	.	.
Iron (µg/L)	9	10.00	180.00
Lead (µg/L)	0	.	.
Lithium (µg/L)	0	.	.
Manganese (µg/L)	0	.	.
Mercury (µg/L)	0	.	.
Molybdenum (µg/L)	0	.	.
Nickel (µg/L)	0	.	.
Selenium (µg/L)	0	.	.
Zinc (µg/L)	0	.	.
Vanadium (µg/L)	0	.	.

Period of record: Water years 1975-76 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
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3960 Q	-92.7	.983*	231	--	--	--	--	--
Q		.0860	.187				.0886	.202
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3.44 Q	.560	.485*	10.9				.486	11.7
11.2 K	-.00079	.449*	1.54				.449	1.67
K		.0323	14.2				.0324	15.3
1.11 Q	.228	.953*	.995	-8.39	.450*	.00242	.968*	.905
8.58 K	.0377	.976*	10.4	81.5	-1.73	.0194	.980*	10.3
-7.03 K	.0600	.985*	13.2	-27.9	.493	.0652*	.985*	14.2
-24.9 K	.133	.956*	50.2	53.0	-1.84	.113	.956*	54.0
44.6 Q	-.263	.822*	2.31	41.7	-.195	.00073	.823*	2.49
6.01 Q	-.122	.949*	.534	3.88	-.0721	.00054	.951*	.562
8.05 K	.00341	.938*	1.55	-.0972	.193	.00545	.944*	1.59
43.4 K	.172	.982*	41.0	217	-4.11	.128	.983*	43.0
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-118 K	.487	.989*	91.1	-582	11.0	.603*	.990*	94.0
Q		.413	3.18				.451	3.33
.517 Q	-.00917	.870*	.0667	.973	-.0198	-.00012	.891*	.0661
12.9 Q	-.163	.729*	1.87	24.9	-.444	-.00303	.767*	1.88
-103 K	.809	.994*	111	-339	5.59	.869*	.994*	119
.00948 Q	.00231	.726*	.0268	-.368	.0111*	.00010*	.910*	.0166
K		.408	.0878				.518	.0854
Q		.0233	.662				.0602	.701
Q		.100	.674				.121	.720
.186 K	-.00004	.921*	.0190	.130	.00132	-.00002	.923*	.0202
K		.216	21.7				.223	23.3

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at α = 0.05
[3]Asterisk denotes that partial regression coefficient is significant at α = 0.05

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
2	70.00	100.00
3	2.00	10.00
3	.00	10.00
0	.	.
3	10.00	20.00
3	.00	10.00
3	10.00	50.00
3	280.00	1600.00
3	100.00	100.00
3	20.00	140.00
3	50.00	140.00
3	.00	.00
3	.00	3.00
3	50.00	50.00
3	.00	.00
2	30.00	50.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 31   Station No. (USGS): 06307830   Station name: Tongue River below Brandenberg Bridge, near Ashland, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	47	83.00	699.42	3960.00	795.72
Specific conductance (µmho/cm)	46	350.00	774.26	1300.00	242.10
pH (units)	45	7.30	8.17	8.70	.28
Temperature (°C)	47	.00	9.87	25.00	8.68
Turbidity (JTU)	45	1.00	31.87	200.00	47.67
Oxygen, dissolved (mg/L)	46	6.80	9.89	13.10	1.81
Oxygen, dissolved (percent)	46	61.00	94.24	111.00	9.45
Biochemical oxygen demand (mg/L)	44	.40	1.85	7.80	1.64
Calcium, dissolved (mg/L)	45	27.00	59.71	88.00	15.74
Magnesium, dissolved (mg/L)	45	15.00	41.49	62.00	14.15
Sodium, dissolved (mg/L)	45	17.00	47.49	110.00	20.18
Sodium (percent)	45	17.00	23.36	33.00	3.16
Sodium-adsorption ratio	45	.60	1.13	2.20	.34
Potassium, dissolved (mg/L)	45	2.00	4.51	8.30	1.37
Bicarbonate (mg/L)	45	85.00	254.40	397.00	75.99
Carbonate (mg/L)	44	.00	.64	10.00	1.91
Sulfate, dissolved (mg/L)	44	63.00	206.68	390.00	78.78
Chloride, dissolved (mg/L)	44	1.40	3.91	6.10	1.16
Fluoride, dissolved (mg/L)	45	.10	.30	.40	.08
Silica, dissolved (mg/L)	45	.30	5.33	9.30	1.89
Dissolved solids, calculated (mg/L)	44	203.00	497.14	868.00	164.36
Nitrogen, NO_2+NO_3 total (mg/L as N)	45	.00	.05	.22	.06
Nitrogen, ammonia total (mg/L as N)	44	.00	.03	.20	.04
Nitrogen, organic total (mg/L as N)	43	.05	.60	2.10	.45
Nitrogen, total (mg/L as N)	44	.10	.66	2.10	.47
Phosphorus, total (mg/L as P)	45	.00	.07	.30	.08
Sediment, suspended (mg/L)	13	8.00	172.38	1000.00	295.51

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	12	0.00	30.00
Arsenic (µg/L)	12	.00	3.00
Beryllium (µg/L)	12	.00	10.00
Boron (µg/L)	45	20.00	170.00
Cadmium (µg/L)	12	.00	6.00
Chromium (µg/L)	12	.00	10.00
Copper (µg/L)	12	.00	5.00
Iron (µg/L)	45	.00	190.00
Lead (µg/L)	12	1.00	21.00
Lithium (µg/L)	12	10.00	40.00
Manganese (µg/L)	12	.00	20.00
Mercury (µg/L)	12	.00	.10
Molybdenum (µg/L)	12	.00	3.00
Nickel (µg/L)	12	1.00	8.00
Selenium (µg/L)	11	.00	2.00
Zinc (µg/L)	12	.00	90.00
Vanadium (µg/L)	12	.50	5.90

Period of record: Water years 1974-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant[3]	Partial regression coefficient[4] Q	Partial regression coefficient[4] K	Coefficient of determination[2]	Standard error of estimate
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907 Q	-.193	.413*	184	--	--	--	--	--
K		.0562	.277				.0625	.279
--	--	--	--	--	--	--	--	--
1.52 Q	.0445	.570*	31.6	37.9	.0366*	.0401	.595*	31.1
6.07 K	.00490	.426*	4.31	5.91	.00007	.00501	.426*	1.38
K		.0452	9.29				.0743	9.24
1.42 Q	.00062	.0984*	1.56				.0998	1.57
11.7 K	.0621	.932*	4.10	13.0	-.00055	.0609*	.933*	4.13
-1.85 K	.0561	.939*	3.48	-.915	-.00040	.0552*	.940*	3.52
-12.3 K	.0772	.876*	7.10	-15.6	.00143	.0802*	.878*	7.13
16.6 K	.00869	.455*	2.33	16.1	.00023	.00919*	.457*	2.35
.161 K	.00125	.789*	.159	.106	.00002	.00130*	.790*	.160
1.96 K	.00328	.343*	1.11	2.03	-.00003	.00322*	.344*	1.12
28.7 K	.292	.884*	26.2	41.9	-.00566	.280*	.886*	26.3
K		.0348	1.89				.0421	1.91
-34.9 K	.310	.933*	20.3	-44.6	.00402	.319*	.934*	20.4
.908 K	.00387	.669*	.668	1.34	-.00018	.00347*	.678*	.666
.102 K	.00025	.634*	.0465	.151	-.00002	.00021*	.662*	.0452
Q		.0607	1.85				.0721	1.86
-14.6 K	.657	.962*	32.1	-19.4	.00198	.662*	.962*	32.4
Q		.0784	.0528				.0784	.0534
K		.0750	.0425				.0785	.0430
.460 Q	.00020	.133*	.415	.527	.00018	-.00007	.134*	.420
.504 Q	.00023	.162*	.428	.502	.00023*	.00000	.162*	.433
.0191 Q	.00007	.507*	.0552	.0884	.00005*	-.00007	.539*	.0539
-2.14 K	.174	.601*	94.6	-238	.327*	.211*	.780*	105

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Regression for sediment calculated from 1096 observations
[4]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
9	40.00	6000.00
12	.00	4.00
11	.00	10.00
0	.	.
12	.00	10.00
12	.00	50.00
12	.00	30.00
12	90.00	13000.00
12	100.00	100.00
12	10.00	30.00
11	10.00	300.00
12	.00	.50
12	.00	3.00
12	.00	50.00
12	.00	1.00
9	.00	80.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 32 Station No. (USGS): 06307840 Station name: Liscom Creek near Ashland, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	3	0.30	9.47	18.20	8.96
Specific conductance (µmho/cm)	3	120.00	141.67	170.00	25.66
pH (units)	3	7.70	8.10	8.40	.36
Temperature (°C)	3	.00	.17	.50	.29
Turbidity (JTU)	3	40.00	46.67	50.00	5.77
Oxygen, dissolved (mg/L)	3	10.60	11.47	12.00	.76
Oxygen, dissolved (percent)	3	82.00	87.33	91.00	4.73
Biochemical oxygen demand (mg/L)	2	6.80	7.55	8.30	1.06
Calcium, dissolved (mg/L)	3	13.00	16.33	19.00	3.06
Magnesium, dissolved (mg/L)	3	3.90	5.43	6.90	1.50
Sodium, dissolved (mg/L)	3	3.70	15.10	37.00	18.97
Sodium (percent)	3	11.00	25.33	53.00	23.97
Sodium-adsorption ratio	3	.20	.83	2.10	1.10
Potassium, dissolved (mg/L)	3	5.40	6.50	8.20	1.49
Bicarbonate (mg/L)	3	55.00	61.33	69.00	7.09
Carbonate (mg/L)	3	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	3	15.00	33.67	59.00	22.74
Chloride, dissolved (mg/L)	3	1.60	13.53	37.00	20.32
Fluoride, dissolved (mg/L)	3	.00	.07	.10	.06
Silica, dissolved (mg/L)	3	3.80	5.40	7.00	1.60
Dissolved solids, calculated (mg/L)	3	84.00	126.67	193.00	58.23
Nitrogen, NO_2+NO_3 total (mg/L as N)	3	.01	.10	.16	.08
Nitrogen, ammonia total (mg/L as N)	3	.02	.05	.10	.04
Nitrogen, organic total (mg/L as N)	3	1.40	1.53	1.80	.23
Nitrogen, total (mg/L as N)	3	1.40	1.67	2.00	.31
Phosphorus, total (mg/L as P)	3	.19	.25	.31	.06
Sediment, suspended (mg/L)	3	60.00	115.33	223.00	93.25

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	0	.	.
Arsenic (µg/L)	0	.	.
Beryllium (µg/L)	0	.	.
Boron (µg/L)	3	90.00	240.00
Cadmium (µg/L)	0	.	.
Chromium (µg/L)	0	.	.
Copper (µg/L)	0	.	.
Iron (µg/L)	3	70.00	170.00
Lead (µg/L)	0	.	.
Lithium (µg/L)	0	.	.
Manganese (µg/L)	0	.	.
Mercury (µg/L)	0	.	.
Molybdenum (µg/L)	0	.	.
Nickel (µg/L)	0	.	.
Selenium (µg/L)	0	.	.
Zinc (µg/L)	0	.	.
Vanadium (µg/L)	0	.	.

Period of record: Water years 1975-77 (discontinued)

REGRESSION SUMMARY[1]								
SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant	Regression coefficient	Coefficient of determination	Standard error of estimate	Regression constant	Partial regression coefficient Q	Partial regression coefficient K	Coefficient of determination	Standard error of estimate
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[1]Insufficient samples to develop regressions.

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
0	.	.
1	2.00	2.00
1	10.00	10.00
0	.	
1	10.00	10.00
1	.00	.00
1	10.00	10.00
1	1700.00	1700.00
1	100.00	100.00
1	10.00	10.00
1	30.00	30.00
1	.00	.00
1	.00	.00
1	50.00	50.00
1	.00	.00
0	.	.
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 33 Station No. (USGS): 06307890 Station name: Foster Creek near Volborg, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	14	0.01	28.58	300.00	79.35
Specific conductance (µmho/cm)	14	170.00	2661.29	6300.00	1796.03
pH (units)	14	7.20	7.99	8.40	.34
Temperature (°C)	14	.00	7.82	22.50	8.39
Turbidity (JTU)	14	7.00	207.93	2200.00	575.82
Oxygen, dissolved (mg/L)	14	7.20	9.26	12.40	1.79
Oxygen, dissolved (percent)	14	63.00	83.29	94.00	8.96
Biochemical oxygen demand (mg/L)	14	2.00	4.87	13.40	3.03
Calcium, dissolved (mg/L)	14	15.00	65.86	140.00	42.05
Magnesium, dissolved (mg/L)	14	5.90	62.42	160.00	47.90
Sodium, dissolved (mg/L)	14	20.00	477.43	1200.00	343.56
Sodium (percent)	14	39.00	68.43	80.00	9.26
Sodium-adsorption ratio	14	1.10	9.35	16.00	4.19
Potassium, dissolved (mg/L)	14	5.00	8.80	13.00	2.56
Bicarbonate (mg/L)	14	69.00	349.43	630.00	197.10
Carbonate (mg/L)	13	.00	1.46	11.00	3.62
Sulfate, dissolved (mg/L)	14	45.00	1115.36	2800.00	814.84
Chloride, dissolved (mg/L)	14	2.60	11.15	26.00	6.90
Fluoride, dissolved (mg/L)	14	.10	.33	.50	.14
Silica, dissolved (mg/L)	14	4.10	6.87	9.70	1.94
Dissolved solids, calculated (mg/L)	14	133.00	1922.07	4660.00	1351.17
Nitrogen, $NO_2 \cdot NO_3$ total (mg/L as N)	14	.00	.05	.32	.09
Nitrogen, ammonia total (mg/L as N)	14	.00	.09	.33	.10
Nitrogen, organic total (mg/L as N)	14	.30	1.08	2.10	.49
Nitrogen, total (mg/L as N)	14	.66	1.22	2.40	.49
Phosphorus, total (mg/L as P)	14	.04	.20	.90	.24
Sediment, suspended (mg/L)	14	4.00	421.43	4259.99	1110.99

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	2	10.00	300.00
Arsenic (µg/L)	2	1.00	3.00
Beryllium (µg/L)	2	.00	.00
Boron (µg/L)	14	.00	670.00
Cadmium (µg/L)	2	1.00	7.00
Chromium (µg/L)	2	10.00	20.00
Copper (µg/L)	2	2.00	13.00
Iron (µg/L)	14	30.00	600.00
Lead (µg/L)	2	4.00	7.00
Lithium (µg/L)	2	10.00	50.00
Manganese (µg/L)	2	40.00	60.00
Mercury (µg/L)	2	.00	.00
Molybdenum (µg/L)	2	.00	1.00
Nickel (µg/L)	2	4.00	9.00
Selenium (µg/L)	2	.00	.00
Zinc (µg/L)	2	20.00	60.00
Vanadium (µg/L)	2	1.30	3.60

Period of record: Water years 1975-77 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION					MULTIPLE REGRESSION				
Regression constant[1]		Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--		--	--	--	--	--	--	--	--
	Q		.159	1710	--	--	--	--	--
	K		.178	.320				.183	.333
--		--	--	--	--	--	--	--	--
	K		.0297	590				.0542	609
	K		.260	1.60				.297	1.63
	Q		.0206	9.23				.0248	9.62
8.09	K	-.00121	.513*	2.20	7.90	.00252	-.00116*	.517*	2.29
4.96	K	.0229	.955*	9.25	3.30	.0220	.0203*	.957*	9.51
-7.70	K	.0263	.976*	7.76	-11.1	.0445	.0271*	.980*	7.31
-29.2	K	.190	.990*	35.1	-35.8	.0874	.192*	.991*	36.0
71.5	Q	-.106	.824*	4.05	70.6	-.103*	.00028	.826*	4.20
3.54	K	.00218	.877*	1.53	4.44	-.0119*	.00197*	.920*	1.29
5.57	K	.00121	.722*	1.41	5.65	-.00108	.00119*	.723*	1.47
65.8	K	.107	.943*	48.9	68.1	-.0306	.106*	.943*	51.0
	K		.179	3.42				.180	3.59
-89.1	K	.453	.995*	59.6	-108	.245	.457*	.996*	59.2
1.24	K	.00372	.938*	1.78	.980	.00348	.00378*	.940*	1.84
.181	K	.00006	.516*	.100	.213	-.00041	.00005*	.563*	.0994
5.20	K	.00063	.336*	1.65				.376	1.67
-74.8	K	.750	.995*	102	-103	.374	.757*	.995*	102
	K		.174	.0880				.175	.0918
	Q		.176	.0923				.192	.0955
	K		.260	.440				.290	.450
1.65	K	-.00016	.347*	.413				.402	.413
	K		.200	.224				.267	.224
	K		.0230	1140				.0457	1180

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
4	1900.00	11000.00
6	1.00	6.00
6	.00	10.00
0	.	.
6	10.00	10.00
6	.00	20.00
6	10.00	20.00
6	680.00	10000.00
6	100.00	100.00
6	10.00	30.00
5	60.00	170.00
6	.00	.20
6	.00	1.00
6	50.00	50.00
6	.00	1.00
4	50.00	70.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 34   Station No. (USGS): 06308160   Station name: Pumpkin Creek near Loesch, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	21	0.01	7.45	146.00	31.76
Specific conductance (µmho/cm)	21	819.00	5190.43	10000.00	1797.79
pH (units)	21	7.20	7.90	8.30	.28
Temperature (°C)	21	.00	10.26	26.00	9.36
Turbidity (JTU)	21	1.00	15.48	80.00	22.88
Oxygen, dissolved (mg/L)	21	.00	7.08	14.40	3.78
Oxygen, dissolved (percent)	21	.00	75.43	178.00	48.51
Biochemical oxygen demand (mg/L)	21	.40	1.80	5.50	1.35
Calcium, dissolved (mg/L)	21	43.00	194.43	310.00	58.65
Magnesium, dissolved (mg/L)	21	32.00	264.86	380.00	88.31
Sodium, dissolved (mg/L)	21	76.00	705.05	1100.00	237.80
Sodium (percent)	21	40.00	48.33	53.00	2.74
Sodium-adsorption ratio	21	2.10	7.57	9.90	1.78
Potassium, dissolved (mg/L)	21	8.20	20.91	30.00	4.66
Bicarbonate (mg/L)	21	110.00	654.24	1110.00	214.89
Carbonate (mg/L)	21	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	21	300.00	2504.76	4000.00	854.09
Chloride, dissolved (mg/L)	21	3.00	15.41	26.00	5.33
Fluoride, dissolved (mg/L)	21	.10	.51	.80	.17
Silica, dissolved (mg/L)	21	5.70	12.50	24.00	4.53
Dissolved solids, calculated (mg/L)	21	523.00	4043.00	6430.00	1330.14
Nitrogen, NO_2+NO_3 total (mg/L as N)	21	.00	.04	.26	.06
Nitrogen, ammonia total (mg/L as N)	21	.00	.12	1.10	.28
Nitrogen, organic total (mg/L as N)	21	.58	.96	1.50	.27
Nitrogen, total (mg/L as N)	21	.59	1.11	2.20	.38
Phosphorus, total (mg/L as P)	21	.01	.13	.75	.18
Sediment, suspended (mg/L)	21	4.00	125.05	606.00	136.41

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	4	0.00	30.00
Arsenic (µg/L)	4	.00	10.00
Beryllium (µg/L)	4	.00	10.00
Boron (µg/L)	21	200.00	1800.00
Cadmium (µg/L)	4	1.00	5.00
Chromium (µg/L)	4	.00	20.00
Copper (µg/L)	4	.00	6.00
Iron (µg/L)	21	.00	13000.00
Lead (µg/L)	4	3.00	35.00
Lithium (µg/L)	4	20.00	190.00
Manganese (µg/L)	4	50.00	8500.00
Mercury (µg/L)	4	.00	.00
Molybdenum (µg/L)	4	2.00	5.00
Nickel (µg/L)	4	.00	7.00
Selenium (µg/L)	4	.00	.00
Zinc (µg/L)	4	20.00	30.00
Vanadium (µg/L)	4	.00	2.00

Period of record: Water years 1976-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--		--	--
Q		.117	1730	--	--		--	--
K		.156	.267				.157	.275
--	--	--	--	--	--	--	--	--
12.5 Q	.393	.302*	19.6	-10.7	.477*	.00436	.406*	18.6
12.1 K	-.00096	.211*	3.44			*	.218	3.52
K		.0785	47.8				.0794	49.1
K		.0602	1.37				.0623	1.41
65.0 K	.0249	.585*	38.8	72.1	-.183	.0238*	.593*	39.4
39.6 K	.0434	.780*	42.5	48.6	-.229	.0420*	.786*	43.0
80.8 K	.120	.827*	102	89.8	-.233	.119*	.828*	104
43.7 K	.00090	.349*	2.27	42.5	.0308	.00109*	.463*	2.12
3.13 K	.00085	.747*	.918	3.03	.00258	.00087*	.749*	.940
11.0 K	.00191	.541*	3.24	11.1	-.00215	.00189*	.541*	3.33
104 K	.106	.787*	102	127	-.582	.102*	.793*	103
--	--	--	--	--	--	--	--	--
236 K	.437	.847*	343	276	-1.02	.431*	.848*	351
258 K	.00247	.695*	3.02	3.37	-.0203	.00235*	.709*	3.03
.141 K	.00007	.591*	.110	.185	-.00111	.00007*	.631*	.108
6.05 K	.00124	.243*	4.05			*	.243	4.16
484 K	.686	.859*	513	560	-1.95	.674*	.861*	523
.129 K	-.00002	.255*	.0534			*	.260	.0547
-.256 K	.00007	.211*	.259			*	.229	.263
Q		.0387	.269				.0715	.272
K		.107	.372				.197	.362
-.119 K	.00005	.210*	.168			*	.236	.170
-129 K	.0489	.416*	107	-173	1.13	.0558*	.477*	104

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
3	60.00	340.00
3	.00	18.00
3	.00	10.00
0	.	.
3	10.00	10.00
3	.00	10.00
3	10.00	20.00
3	550.00	1200.00
3	100.00	100.00
3	20.00	160.00
3	180.00	4500.00
3	.00	.00
3	2.00	4.00
3	50.00	100.00
3	.00	.00
3	.00	30.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 35 Station No. (USGS): 06308170 Station name: Little Pumpkin Creek near Volborg, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	6	0.01	0.37	1.10	0.40
Specific conductance (µmho/cm)	6	1830.00	3940.00	7850.00	2035.35
pH (units)	6	7.30	7.85	8.10	.30
Temperature (°C)	6	.50	5.75	25.00	10.10
Turbidity (JTU)	6	1.00	3.00	4.00	1.10
Oxygen, dissolved (mg/L)	6	5.10	7.87	9.80	1.79
Oxygen, dissolved (percent)	6	40.00	72.50	129.00	32.02
Biochemical oxygen demand (mg/L)	6	.80	2.67	7.90	2.70
Calcium, dissolved (mg/L)	6	74.00	127.33	180.00	34.91
Magnesium, dissolved (mg/L)	6	110.00	213.33	290.00	60.88
Sodium, dissolved (mg/L)	6	190.00	410.00	560.00	127.75
Sodium (percent)	6	38.00	41.83	44.00	2.14
Sodium-adsorption ratio	6	3.30	5.10	6.00	.98
Potassium, dissolved (mg/L)	6	2.10	21.18	30.00	10.23
Bicarbonate (mg/L)	6	239.00	568.17	746.00	199.13
Carbonate (mg/L)	6	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	6	830.00	1621.67	2300.00	477.51
Chloride, dissolved (mg/L)	6	8.40	10.82	13.00	1.78
Fluoride, dissolved (mg/L)	6	.20	.47	.60	.14
Silica, dissolved (mg/L)	6	7.80	10.73	14.00	2.13
Dissolved solids, calculated (mg/L)	6	1360.00	2696.67	3760.00	798.77
Nitrogen, NO_2+NO_3 total (mg/L as N)	6	.00	.05	.23	.09
Nitrogen, ammonia total (mg/L as N)	6	.00	.02	.09	.04
Nitrogen, organic total (mg/L as N)	6	.67	.98	1.20	.23
Nitrogen, total (mg/L as N)	6	.69	1.04	1.30	.26
Phosphorus, total (mg/L as P)	6	.04	.10	.26	.08
Sediment, suspended (mg/L)	6	4.00	34.00	91.00	33.15

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	2	20.00	30.00
Arsenic (µg/L)	2	1.00	3.00
Beryllium (µg/L)	2	.00	.00
Boron (µg/L)	6	350.00	900.00
Cadmium (µg/L)	2	2.00	5.00
Chromium (µg/L)	2	.00	.00
Copper (µg/L)	2	2.00	9.00
Iron (µg/L)	6	50.00	350.00
Lead (µg/L)	2	8.00	17.00
Lithium (µg/L)	2	60.00	110.00
Manganese (µg/L)	2	60.00	190.00
Mercury (µg/L)	2	.00	.00
Molybdenum (µg/L)	2	.00	2.00
Nickel (µg/L)	2	4.00	8.00
Selenium (µg/L)	2	1.00	1.00
Zinc (µg/L)	2	10.00	10.00
Vanadium (µg/L)	2	.60	1.60

Period of record: Water Years 1976-77 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
Q		.169	2070	--	--	--	--	--
K		.585	.217				.635	.235
--	--	--	--	--	--	--	--	--
K		.0149	1.22				.0295	1.39
K		.190	1.80				.231	2.03
K		.0709	34.5				.0859	39.5
K		.359	2.41				.589	2.23
65.4 K	.0157	.839*	15.7				.839	18.1
114 K	.0252	.708*	36.8				.708	42.4
209 K	.0510	.660*	83.2				.660	96.1
K		.118	2.24				.214	2.45
K		.518	.761				.525	.872
30.2 Q	-24.4	.890*	3.79	28.8	-23.7*	.00031	.893*	4.31
K		.484	160				.518	178
--	--	--	--	--	--	--	--	--
792 K	.211	.805*	236			*	.810	269
K		.635	1.20				.676	1.31
K		.174	.139				.295	.148
7.07 K	.00093	.789*	1.09			*	.807	1.21
1350 K	.341	.753*	444				.753	512
K		.318	.0824				.458	.0849
Q		.146	.0374				.238	.0407
Q		.424	.192				.568	.192
Q		.409	.226				.723	.179
K		.244	.0803				.447	.0793
K		.655	21.8				.773	20.4

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
0	.	
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 36 Station No. (USGS): 06308190 Station name: Pumpkin Creek near Volborg, MT

Variable	DESCRIPTIVE STATISTICS				
	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	9	0.02	1.76	4.60	1.60
Specific conductance (µmho/cm)	9	3880.00	5027.78	7000.00	995.26
pH (units)	9	7.10	8.04	8.40	.38
Temperature (°C)	9	.00	9.61	27.00	9.97
Turbidity (JTU)	9	2.00	5.00	10.00	2.83
Oxygen, dissolved (mg/L)	9	7.20	8.71	12.40	1.66
Oxygen, dissolved (percent)	9	55.00	84.56	115.00	20.10
Biochemical oxygen demand (mg/L)	9	.50	1.62	2.60	.60
Calcium, dissolved (mg/L)	9	90.00	153.33	230.00	38.73
Magnesium, dissolved (mg/L)	9	140.00	210.00	280.00	49.75
Sodium, dissolved (mg/L)	9	520.00	776.67	1300.00	243.67
Sodium (percent)	9	52.00	56.67	62.00	2.92
Sodium-adsorption ratio	9	7.20	9.51	14.00	2.08
Potassium, dissolved (mg/L)	9	13.00	17.78	21.00	2.73
Bicarbonate (mg/L)	9	433.00	608.44	961.00	162.86
Carbonate (mg/L)	9	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	9	1700.00	2433.33	3600.00	672.68
Chloride, dissolved (mg/L)	9	12.00	16.56	26.00	4.77
Fluoride, dissolved (mg/L)	9	.20	.42	.60	.12
Silica, dissolved (mg/L)	9	.50	6.89	13.00	4.06
Dissolved solids, calculated (mg/L)	9	2750.00	3916.67	5950.00	1044.05
Nitrogen, NO_2+NO_3 total (mg/L as N)	9	.00	.04	.21	.06
Nitrogen, ammonia total (mg/L as N)	9	.00	.04	.14	.04
Nitrogen, organic total (mg/L as N)	9	.68	1.01	1.20	.17
Nitrogen, total (mg/L as N)	9	.71	1.07	1.30	.20
Phosphorus, total (mg/L as P)	9	.02	.05	.14	.04
Sediment, suspended (mg/L)	9	9.00	48.56	177.00	54.09

Variable	DISSOLVED		
	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	1	20.00	20.00
Arsenic (µg/L)	1	.00	.00
Beryllium (µg/L)	1	.00	.00
Boron (µg/L)	9	450.00	960.00
Cadmium (µg/L)	1	1.00	1.00
Chromium (µg/L)	1	.00	.00
Copper (µg/L)	1	2.00	2.00
Iron (µg/L)	9	10.00	350.00
Lead (µg/L)	1	5.00	5.00
Lithium (µg/L)	1	60.00	60.00
Manganese (µg/L)	1	50.00	50.00
Mercury (µg/L)	1	.00	.00
Molybdenum (µg/L)	1	.00	.00
Nickel (µg/L)	1	3.00	3.00
Selenium (µg/L)	1	.00	.00
Zinc (µg/L)	1	20.00	20.00
Vanadium (µg/L)	1	.40	.40

Period of record: Water year 1976-77 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
Q		.438	798	--	--	--	--	--
Q		.0479	.401				.207	.395
--	--	--	--	--	--	--	--	--
K		.00937	3.01				.0192	3.23
Q		.435	1.33				.435	1.44
Q		.0341	21.1				.0342	22.8
4.46 K	-.00056	.888*	.213	5.11	-.0913	-.00066*	.922*	.192
K		.387	32.4			*	.529	30.7
-11.0 K	.0440	.774*	25.3	-37.5	3.72	.0479*	.782*	26.8
-395 K	.233	.906*	79.8	-615	30.8	.266*	.929*	74.8
45.1 K	.00230	.618*	1.93			*	.625	2.29
-.268 K	.00195	.862*	.827	-1.71	.202	.00216*	.876*	.848
7.28 K	.00209	.580*	1.89				.610	1.97
-25.4 K	.126	.593*	111	-402	52.8	.182*	.746*	94.9
--	--	--	--	--	--	--	--	--
-739 K	.631	.871*	258	-791	7.26	.639*	.872*	278
Q		.250	4.42				.299	4.61
K		.423	.0976	-.343	.0520	.00013*	.693*	.0769
Q		.00184	4.34				.0104	4.67
-1110 K	.999	.908*	339	-1680	79.9	1.08*	.916*	349
Q		.264	.0594				.295	.0628
Q		.0168	.0437				.0793	.0457
K		.0338	.182				.0339	.196
Q		.0635	.207				.0667	.223
K		.0706	.0393				.0837	.0421
Q		.0822	55.4				.0866	59.7

[1] Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2] Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3] Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
1	50.00	50.00
1	1.00	1.00
1	.00	.00
0	.	.
1	10.00	10.00
1	10.00	10.00
1	10.00	10.00
1	380.00	380.00
1	100.00	100.00
1	100.00	100.00
1	150.00	150.00
1	.00	.00
1	4.00	4.00
1	50.00	50.00
1	.00	.00
1	.00	.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 37 Station No. (USGS): 06308400 Station name: Pumpkin Creek near Miles City, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	24	0.01	117.26	1730.00	359.65
Specific conductance (µmho/cm)	24	195.00	1857.75	4120.00	1234.14
pH (units)	24	7.70	8.26	8.70	.27
Temperature (°C)	24	.00	11.02	29.50	10.49
Turbidity (JTU)	22	7.00	1045.91	11000.00	2589.12
Oxygen, dissolved (mg/L)	23	4.80	9.61	12.40	1.94
Oxygen, dissolved (percent)	23	56.00	92.35	119.00	16.24
Biochemical oxygen demand (mg/L)	23	.60	3.97	11.00	2.74
Calcium, dissolved (mg/L)	22	7.50	52.65	130.00	33.19
Magnesium, dissolved (mg/L)	22	3.00	41.77	120.00	32.50
Sodium, dissolved (mg/L)	22	26.00	339.64	830.00	236.90
Sodium (percent)	22	54.00	69.73	79.00	6.83
Sodium-adsorption ratio	22	1.90	8.11	15.00	3.72
Potassium, dissolved (mg/L)	22	3.40	9.67	18.00	4.08
Bicarbonate (mg/L)	23	67.00	340.39	676.00	196.63
Carbonate (mg/L)	22	.00	4.50	28.00	7.78
Sulfate, dissolved (mg/L)	22	34.00	729.18	1700.00	520.14
Chloride, dissolved (mg/L)	22	1.80	6.60	13.00	3.28
Fluoride, dissolved (mg/L)	22	.10	0.37	.60	.13
Silica, dissolved (mg/L)	22	1.10	6.17	11.00	2.73
Dissolved solids, calculated (mg/L)	22	120.00	1359.95	3190.00	917.35
Nitrogen, NO_2+NO_3 total (mg/L as N)	23	.00	.28	1.50	.36
Nitrogen, ammonia total (mg/L as N)	23	.00	.13	1.30	.28
Nitrogen, organic total (mg/L as N)	23	.00	2.37	16.00	3.68
Nitrogen, total (mg/L as N)	23	.65	2.80	18.00	4.09
Phosphorus, total (mg/L as P)	23	.00	.61	5.80	1.35
Sediment, suspended (mg/L)	23	21.00	2090.39	23400.00	5279.28

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	6	10.00	200.00
Arsenic (µg/L)	6	.00	4.00
Beryllium (µg/L)	6	.00	10.00
Boron (µg/L)	22	120.00	500.00
Cadmium (µg/L)	6	.00	3.00
Chromium (µg/L)	6	.00	10.00
Copper (µg/L)	6	8.00	18.00
Iron (µg/L)	22	.00	200.00
Lead (µg/L)	6	.00	17.00
Lithium (µg/L)	6	2.00	30.00
Manganese (µg/L)	6	.00	90.00
Mercury (µg/L)	6	.00	.20
Molybdenum (µg/L)	6	.00	2.00
Nickel (µg/L)	6	6.00	14.00
Selenium (µg/L)	6	.00	4.00
Zinc (µg/L)	6	10.00	60.00
Vanadium (µg/L)	6	.00	8.80

Period of record: Water years 1976-78

REGRESSION SUMMARY

SIMPLE REGRESSION					MULTIPLE REGRESSION				
Regression constant[1]		Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--		--	--	--	--	--	--	--	--
	Q		.150	1120	--	--	--	--	--
8.09	K	.00010	.200*	.249			*	.202	.254
--		--	--	--	--	--	--	--	--
	K		.113	2500				.116	2560
	K		.00996	1.93				.0115	1.97
	Q		.0999	15.5				.109	15.8
6.29	K	-.00127	.330*	2.35	5.60	.00197	-.00103*	.390*	2.30
7.42	K	.0233	.787*	15.1	8.55	-.00331	.0229*	.788*	15.4
-3.04	K	.0227	.767*	15.6	-3.17	.00039	.0228*	.767*	16.0
-12.7	K	.183	.965*	43.5	-15.1	.00697	.184*	.965*	44.4
	Q		.0208	6.80				.0246	6.95
3.21	K	.00262	.804*	1.62	3.49	-.00082	.00252*	.810*	1.63
4.50	K	.00270	.709*	2.15	4.67	-.00050	.00264*	.711*	2.20
67.0	K	.146	.865*	72.2	70.7	-.0110	.145*	.866*	73.8
-1.10	K	.00290	.223*	6.86			*	.223	7.03
-65.3	K	.409	.987*	57.8	-69.7	-.0126	.411*	.987*	59.0
1.73	K	.00250	.924*	.893	1.47	.00077	.00259*	.931*	.873
.285	K	.00005	.189*	.117				.219	.117
	Q		.0247	2.63				.0417	2.67
-30.6	K	.719	.985*	110	-34.3	.0110	.720*	.985*	113
	K		.133	.335				.113	.342
.289	K	-.00009	.169*	.250				.215	.249
	K		.0872	3.46				.0938	3.53
	K		.109	3.81				.112	3.89
	K		.137	1.24				.190	1.23
	K		.118	5180				.119	5230

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at = 0.05
[3]Asterisk denotes that partial regression coefficient is significant at = 0.05

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
6	160.00	4500.00
6	1.00	35.00
6	.00	10.00
0		.
6	.00	20.00
6	.00	180.00
6	10.00	320.00
6	150.00	160000.00
6	100.00	200.00
6	30.00	130.00
6	40.00	2800.00
6	.00	.50
6	1.00	20.00
6	19.00	100.00
6	.00	6.00
6	.00	930.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 38   Station No. (USGS): 06308500   Station name: Tongue River at Miles City, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	50	90.00	780.88	5020.00	1157.72
Specific conductance (µmho/cm)	73	368.00	759.45	1320.00	214.02
pH (units)	73	7.70	8.28	8.60	.20
Temperature (°C)	73	.00	13.54	27.00	9.33
Turbidity (JTU)	45	1.00	130.44	1200.00	275.68
Oxygen, dissolved (mg/L)	73	6.50	9.76	15.60	2.14
Oxygen, dissolved (percent)	73	79.00	98.14	116.00	6.61
Biochemical oxygen demand (mg/L)	7	.80	2.26	5.50	1.66
Calcium, dissolved (mg/L)	50	27.00	59.98	84.00	15.30
Magnesium, dissolved (mg/L)	50	14.00	42.14	63.00	14.23
Sodium, dissolved (mg/L)	50	13.00	63.82	130.00	24.32
Sodium (percent)	50	18.00	29.48	54.00	7.02
Sodium-adsorption ratio	50	.60	1.56	3.00	.53
Potassium, dissolved (mg/L)	50	2.30	4.79	7.30	1.05
Bicarbonate (mg/L)	45	120.00	277.64	390.00	68.46
Carbonate (mg/L)	43	.00	.81	8.00	1.94
Sulfate, dissolved (mg/L)	50	76.00	231.06	440.00	83.66
Chloride, dissolved (mg/L)	50	1.60	4.13	8.70	1.42
Fluoride, dissolved (mg/L)	50	.10	.30	.50	.08
Silica, dissolved (mg/L)	50	.40	5.74	9.00	1.96
Dissolved solids, calculated (mg/L)	50	234.00	548.04	912.00	167.73
Nitrogen, NO_2+NO_3 total (mg/L as N)	50	.00	.10	.45	.10
Nitrogen, ammonia total (mg/L as N)	14	.00	.03	.25	.06
Nitrogen, organic total (mg/L as N)	9	.18	1.59	4.20	1.28
Nitrogen, total (mg/L as N)	45	.12	.94	4.30	.94
Phosphorus, total (mg/L as P)	50	.00	.20	1.90	.36
Sediment, suspended (mg/L)	36	5.00	427.89	4359.99	883.51

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	1	20.00	20.00
Arsenic (µg/L)	18	.00	3.00
Beryllium (µg/L)	1	10.00	10.00
Boron (µg/L)	1	180.00	180.00
Cadmium (µg/L)	18	.00	6.00
Chromium (µg/L)	18	.00	20.00
Copper (µg/L)	18	.00	8.00
Iron (µg/L)	18	.00	150.00
Lead (µg/L)	18	.00	41.00
Lithium (µg/L)	1	30.00	30.00
Manganese (µg/L)	18	.00	20.00
Mercury (µg/L)	18	.00	.20
Molybdenum (µg/L)	1	.00	.00
Nickel (µg/L)	1	1.00	1.00
Selenium (µg/L)	18	.00	1.00
Zinc (µg/L)	18	.00	70.00
Vanadium (µg/L)	1	.50	.50

Period of record: Water years 1974-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
907 Q	-.105	.271*	199	--	--	--	--	--
8.32 Q	-.00006	.0829*	.212		*		.105	.211
--	--	--	--	--	--	--	--	--
-31.7 Q	.259	.778*	132	-32.8	.260*	.00121	.778*	133
5.13 K	.00652	.498*	1.52	4.57	.00019	.00702*	.506*	1.53
99.5 Q	-.00186	.0823*	7.17				.0828	7.24
K		.122	1.63				.141	1.76
11.6 K	.0588	.804*	6.76	17.0	-.00189	.0539*	.818*	6.57
-3.80 K	.0557	.843*	5.60	-1.80	-.00069	.0539*	.845*	5.61
-5.46 K	.0838	.656*	14.1	-17.0	.00401*	.0941*	.682*	13.7
Q		.0636	6.73	20.5	.00242*	.00854	.123*	6.58
.642 K	.00110	.239*	.459	.251	.00014*	.00145*	.303*	.443
2.12 K	.00323	.519*	.724	1.13	.00034*	.00411*	.623*	.647
47.5 K	.273	.868*	24.9	74.1	-.0102*	.249*	.881*	23.9
Q		.0368	1.93				.046	1.95
-45.2 K	.335	.879*	28.8	-77.2	.0111*	.363*	.897*	27.0
-.0377 K	.00506	.704*	.765	-.199	.00006	.00521*	.705*	.771
.125 K	.00021	.428*	.0576	.153	.00001	.00019*	.444*	.0574
K		.00215	1.97				.00270	1.99
-15.3 K	.682	.912*	49.4	-71.2	.0193*	.732*	.925*	46.1
.0595 Q	.00005	.273*	.0855	-.0538	.00005*	.00013*	.334*	.0826
.00605 Q	.00002	.425*	.0466	.0645	.00002	-.00006	.462*	.0468
3.61 K	-.00278	.407*	.993				.407	1.05
.498 Q	.00059	.452*	.689	.271	.00063*	.00025	.454*	.695
.0210 Q	.00023	.542*	.241	.115	.00022*	-.00010	.546*	.243
-178 Q	1.07	.753*	445	-570	1.14*	.429	.762*	444

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at α = 0.05
[3]Asterisk denotes that partial regression coefficient is significant at α = 0.05

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
1	350.00	350.00
18	.00	26.00
1	10.00	10.00
0	.	.
18	.00	20.00
18	.00	80.00
18	10.00	170.00
18	190.00	74000.00
18	.00	100.00
1	20.00	20.00
17	10.00	1000.00
17	.00	.30
1	3.00	3.00
1	50.00	50.00
18	.00	2.00
18	10.00	340.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 39 Station No. (USGS): 06324500 Station name: Powder River at Moorhead, MT

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
	DESCRIPTIVE STATISTICS				
Discharge, instantaneous (ft^3/s)	60	20.00	997.51	12099.97	2101.10
Specific conductance (µmho/cm)	55	730.00	2023.00	3490.00	553.91
pH (units)	54	7.50	8.14	8.60	.31
Temperature (°C)	65	.00	9.36	25.50	8.49
Turbidity (JTU)	52	7.00	1344.08	33000.00	4612.91
Oxygen, dissolved (mg/L)	54	4.60	9.29	12.80	2.01
Oxygen, dissolved (percent)	48	35.00	89.03	108.00	14.68
Biochemical oxygen demand (mg/L)	43	.40	2.33	6.20	1.27
Calcium, dissolved (mg/L)	54	50.00	132.00	220.00	32.48
Magnesium, dissolved (mg/L)	54	16.00	59.19	110.00	17.57
Sodium, dissolved (mg/L)	54	74.00	245.83	490.00	84.46
Sodium (percent)	54	29.00	47.24	56.00	5.59
Sodium-adsorption ratio	54	1.80	4.42	7.00	1.14
Potassium, dissolved (mg/L)	54	3.10	6.75	17.00	2.30
Bicarbonate (mg/L)	54	140.00	271.37	432.00	72.27
Carbonate (mg/L)	49	.00	.06	2.00	.32
Sulfate, dissolved (mg/L)	53	290.00	668.11	1300.00	205.73
Chloride, dissolved (mg/L)	54	.10	143.26	320.00	64.24
Fluoride, dissolved (mg/L)	52	.20	.46	.80	.13
Silica, dissolved (mg/L)	54	2.90	7.67	13.00	2.32
Dissolved solids, calculated (mg/L)	53	625.00	1406.51	2510.00	376.83
Nitrogen, NO_2+NO_3 total (mg/L as N)	55	.00	.33	1.40	.26
Nitrogen, ammonia total (mg/L as N)	55	.00	.08	.28	.07
Nitrogen, organic total (mg/L as N)	54	.11	3.24	52.00	7.47
Nitrogen, total (mg/L as N)	54	.14	3.64	53.00	7.59
Phosphorus, total (mg/L as P)	55	.00	.72	9.50	1.38
Sediment, suspended (mg/L)	11	234.00	11690.34	49699.90	15383.33

Variable	Sample size	Minimum value	Maximum value
	DISSOLVED		
Aluminum (µg/L)	11	0.00	60.00
Arsenic (µg/L)	9	.00	1.00
Beryllium (µg/L)	9	.00	20.00
Boron (µg/L)	51	70.00	890.00
Cadmium (µg/L)	9	.00	2.00
Chromium (µg/L)	9	.00	10.00
Copper (µg/L)	11	.00	10.00
Iron (µg/L)	49	.00	250.00
Lead (µg/L)	11	1.00	10.00
Lithium (µg/L)	9	30.00	120.00
Manganese (µg/L)	9	.00	30.00
Mercury (µg/L)	11	.00	4.00
Molybdenum (µg/L)	9	.00	4.00
Nickel (µg/L)	9	2.00	7.00
Selenium (µg/L)	10	.00	3.00
Zinc (µg/L)	11	.00	180.00
Vanadium (µg/L)	9	.00	6.00

Period of record: Water years 1974-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant[3]	Partial regression coefficient[4] Q	Partial regression coefficient[4] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
2090 Q	-.121	.144*	528	--	--	--	--	--
8.22 Q	-.00007	.155*	.281	7.91	-.00005*	.00015*	.221*	.273
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Q		.0165	4760				.0481	4730
Q		.0559	1.92				.0725	1.92
Q		.0186	14.6				.0236	14.7
2.04 Q	.00041	.391*	1.04	2.31	.00040*	-.00013	.394*	1.05
34.8 K	.0480	.684*	18.6	31.9	.00094	.0491*	.686*	18.7
7.83 K	.0255	.675*	10.1	9.24	-.00045	.0249*	.677*	10.2
-26.1 K	.133	.770*	41.7	-7.72	-.00587	.126*	.782*	40.1
48.0 Q	-.00153	.207*	5.36	41.0	-.00113*	.00332*	.292*	5.11
1.10 K	.00162	.609*	.741	1.50	-.00013*	.00147*	.640*	.718
1.64 K	.00257	.404*	1.79	1.70	-.00002	.00255*	.404*	1.80
280 Q	-.0178	.215*	61.4	209	-.0137*	.0342*	.284*	59.3
Q		.00497	.656				.00704	.662
9.03 K	.322	.698*	116	-10.1	.00593	.329*	.700*	117
-38.3 K	.0888	.591*	42.2	-24.6	-.00436	.0836*	.603*	42.0
.244 K	.00011	.202*	.127	.234	.00000	.00012*	.204*	.128
Q		.00521	2.31				.00848	2.33
89.8 K	.640	.817*	166	125	-.0110	.627*	.819*	167
Q		.0908	.262		*		.107	.262
Q		.0464	.0745				.0668	.0744
Q		.0403	7.44				.0618	7.43
Q		.0444	7.55				.0657	7.54
Q		.0299	1.38				.0353	1.39
822 Q	4.88	.374*	4560	-3030	4.53*	1.96	.524*	5870

[1] Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2] Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3] Regression for sediment calculated from 1096 observations
[4] Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
11	1300.00	270000.00
12	.00	350.00
12	.00	20.00
2	410.00	410.00
12	.00	20.00
12	.00	500.00
14	10.00	900.00
12	560.00	600000.00
14	100.00	800.00
12	50.00	450.00
11	20.00	9700.00
12	.00	1.10
12	.00	5.00
12	50.00	650.00
14	.00	8.00
11	30.00	2700.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 40 Station No. (USGS): 06326050 Station name: Mizpah Creek at Olive, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	19	0.01	0.37	1.60	0.40
Specific conductance (µmho/cm)	19	2680.00	4526.32	5810.00	1027.33
pH (units)	19	7.10	7.81	8.10	.31
Temperature (°C)	19	.00	10.55	22.50	8.91
Turbidity (JTU)	18	1.00	2.72	7.00	1.64
Oxygen, dissolved (mg/L)	18	.00	6.77	14.40	4.81
Oxygen, dissolved (percent)	18	.00	71.78	164.00	51.61
Biochemical oxygen demand (mg/L)	18	.60	2.76	14.00	3.14
Calcium, dissolved (mg/L)	19	170.00	271.05	380.00	73.65
Magnesium, dissolved (mg/L)	19	150.00	296.84	390.00	74.69
Sodium, dissolved (mg/L)	19	220.00	471.58	660.00	142.33
Sodium (percent)	19	29.00	34.42	41.00	3.24
Sodium-adsorption ratio	19	2.90	4.66	6.40	1.02
Potassium, dissolved (mg/L)	19	8.10	16.52	24.00	4.82
Bicarbonate (mg/L)	19	287.00	503.47	1010.00	180.45
Carbonate (mg/L)	19	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	19	1300.00	2436.84	3300.00	646.54
Chloride, dissolved (mg/L)	19	3.80	23.52	61.00	11.04
Fluoride, dissolved (mg/L)	19	.20	.25	.40	.07
Silica, dissolved (mg/L)	19	.40	12.99	39.00	8.93
Dissolved solids, calculated (mg/L)	19	2050.00	3778.42	5050.00	938.01
Nitrogen, NO_2+NO_3 total (mg/L as N)	19	.00	.02	.05	.02
Nitrogen, ammonia total (mg/L as N)	19	.00	.20	1.50	.42
Nitrogen, organic total (mg/L as N)	19	.47	1.11	1.80	.36
Nitrogen, total (mg/L as N)	19	.53	1.32	3.00	.57
Phosphorus, total (mg/L as P)	19	.03	.13	.33	.11
Sediment, suspended (mg/L)	18	6.00	153.39	733.00	215.86

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	5	0.00	30.00
Arsenic (µg/L)	5	.00	10.00
Beryllium (µg/L)	5	.00	10.00
Boron (µg/L)	19	.00	530.00
Cadmium (µg/L)	5	.00	4.00
Chromium (µg/L)	5	.00	20.00
Copper (µg/L)	5	.00	1.00
Iron (µg/L)	19	30.00	540.00
Lead (µg/L)	5	1.00	30.00
Lithium (µg/L)	5	50.00	110.00
Manganese (µg/L)	5	90.00	6600.00
Mercury (µg/L)	5	.00	.00
Molybdenum (µg/L)	5	.00	5.00
Nickel (µg/L)	5	1.00	7.00
Selenium (µg/L)	5	.00	1.00
Zinc (µg/L)	5	10.00	40.00
Vanadium (µg/L)	5	.00	.40

Period of record: Water years 1976-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
Q		.0222	1020	--	--		--	--
Q		.109	.293				.192	.288
--	--	--	--	--	--	--	--	--
Q		.0558	1.64				.0872	1.67
18.9 K	-.00271	.345*	4.02	18.9	1.77	-.00286*	.373*	4.06
208 K	-.0304	.375*	42.0	207	22.4	-.0322*	.414*	42.1
Q		.0709	3.22				.152	3.18
65.6 K	.0451	.395*	57.5	63.5	29.0	.0432*	.426*	57.6
-8.50 K	.0680	.838*	30.8	-10.0	21.0	.0666*	.853*	30.2
-60.8 K	.118	.712*	77.5	-63.7	40.5	.116*	.728*	77.5
K		.166	2.97				.166	3.06
1.28 K	.00075	.556*	.692	1.27	.159	.00074*	.561*	.708
-2.64 K	.00431	.730*	2.70	-2.56	-1.13	.00438*	.739*	2.73
14.7 K	.106	.364*	145	19.7	-68.6	.111*	.393*	146
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28.7 K	.537	.695*	367	14.5	198	.524*	.713*	366
.940 K	.00498	.216*	9.78			*	.231	9.97
K		.0525	.0688				.0544	.0708
-6.40 K	.00423	.236*	7.84	-5.92	-6.74	.00467*	.350*	7.44
20.7 K	.836	.812*	414	3.13	245	.819*	.826*	410
K		.113	.0147				.125	.0150
Q		.0418	.409				.0530	.419
.325 K	.00018	.246*	.317	.344	-.268	.00019*	.355*	.302
K		.139	.532				.269	.504
-.131 K	.00006	.281*	.0956	-.127	-.0568	.00006*	.332*	.0948
227 Q	-193	.131*	207	199	-197	.00652	.132*	214

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
4	20.00	100.00
4	1.00	2.00
4	.00	10.00
0	.	.
3	10.00	10.00
4	.00	30.00
3	10.00	20.00
4	180.00	940.00
3	100.00	100.00
4	60.00	120.00
4	60.00	7100.00
4	.00	.00
4	.00	4.00
3	50.00	50.00
4	.00	1.00
4	.00	40.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 41 Station No. (USGS): 06326200 Station name: Mizpah Creek near Volborg, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	18	0.01	1.01	8.90	2.25
Specific conductance (µmho/cm)	18	1370.00	2978.89	3900.00	612.25
pH (units)	18	7.50	7.89	8.30	.25
Temperature (°C)	18	.00	10.97	29.50	10.38
Turbidity (JTU)	17	1.00	8.24	30.00	7.18
Oxygen, dissolved (mg/L)	17	3.00	7.72	11.10	2.08
Oxygen, dissolved (percent)	17	23.00	79.71	131.00	31.76
Biochemical oxygen demand (mg/L)	17	.40	1.67	6.70	1.51
Calcium, dissolved (mg/L)	18	45.00	123.78	170.00	31.41
Magnesium, dissolved (mg/L)	18	31.00	77.22	95.00	14.71
Sodium, dissolved (mg/L)	18	200.00	450.00	550.00	84.51
Sodium (percent)	18	57.00	60.56	67.00	2.97
Sodium-adsorption ratio	18	5.60	7.82	9.70	1.04
Potassium, dissolved (mg/L)	18	8.00	9.74	12.00	1.08
Bicarbonate (mg/L)	18	244.00	572.56	729.00	119.32
Carbonate (mg/L)	18	.00	.00	.00	.00
Sulfate, dissolved (mg/L)	18	470.00	1093.89	1300.00	205.03
Chloride, dissolved (mg/L)	18	5.80	8.83	12.00	1.39
Fluoride, dissolved (mg/L)	18	.20	.34	.40	.06
Silica, dissolved (mg/L)	18	4.70	12.37	18.00	4.27
Dissolved solids, calculated (mg/L)	18	888.00	2059.33	2470.00	367.45
Nitrogen, NO_2+NO_3 total (mg/L as N)	18	.00	.02	.03	.01
Nitrogen, ammonia total (mg/L as N)	17	.00	.02	.21	.05
Nitrogen, organic total (mg/L as N)	17	.05	.57	1.70	.48
Nitrogen, total (mg/L as N)	17	.13	.61	1.70	.47
Phosphorus, total (mg/L as P)	18	.00	.04	.16	.04
Sediment, suspended (mg/L)	17	12.00	82.06	385.00	86.60

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	5	0.00	40.00
Arsenic (µg/L)	5	.00	1.00
Beryllium (µg/L)	5	.00	10.00
Boron (µg/L)	18	240.00	420.00
Cadmium (µg/L)	5	1.00	2.00
Chromium (µg/L)	5	.00	20.00
Copper (µg/L)	5	.00	2.00
Iron (µg/L)	18	10.00	320.00
Lead (µg/L)	5	2.00	7.00
Lithium (µg/L)	5	40.00	40.00
Manganese (µg/L)	5	270.00	1800.00
Mercury (µg/L)	5	.00	.20
Molybdenum (µg/L)	5	.00	1.00
Nickel (µg/L)	5	3.00	8.00
Selenium (µg/L)	5	.00	.00
Zinc (µg/L)	5	.00	20.00
Vanadium (µg/L)	5	.00	.70

Period of record: Water year 1976-77 (discontinued)

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
Q		.090	584	--	--	--	--	--
K		.145	.240			*	.293	.225
--	--	--	--	--	--	--	--	--
5.40 Q	2.66	.731*	3.85	2.93	2.73*	.00080	.735*	3.95
Q		.0253	2.12				.0515	2.17
Q		.00064	32.8				.00069	34.0
5.80 K	-.00138	.332*	1.28	4.74	.240	-.00111*	.453*	1.20
5.74 K	.0394	.583*	20.4	32.5	-6.26*	.0324*	.765*	15.8
17.6 K	.0203	.666*	8.80	17.8	-.0488	.0202*	.666*	9.07
108 K	.115	.691*	47.2	81.3	6.25	.122*	.717*	46.7
59.7 Q	.924	.492*	2.12	59.6	.926*	.00003	.492*	2.19
4.96 K	.00097	.320*	.862	4.06	.212*	.00120*	.511*	.754
Q		.0150	1.19	9.22			.0235	1.23
83.8 K	.164	.710*	64.3	154	-16.4*	.146*	.798*	55.3
--	--	--	--	--	--	--	--	--
276 K	.276	.671*	118	210	15.4	.293*	.697*	117
4.12 K	.00162	.451*	1.10	3.98	.0311	.00166*	.453*	1.10
.106 K	.00008	.603*	.0394	.0779	.00657	.00009*	.655*	.0378
13.5 Q	-1.25	.438*	3.20	6.06	-1.05*	.00245	.550*	2.95
565 K	.538	.795*	167	441	5.74	.544*	.796*	172
K		.00966	.0110				.00966	.0113
Q		.00650	.0494				.00710	.0510
1.88 K	-.00044	.324*	.397	1.53	.0787	-.00035*	.453*	.369
1.89 K	-.00043	.335*	.379	1.55	.0763	-.00034*	.467*	.351
.0241 Q	.0138	.534*	.0291	.0970	.0119*	-.00003*	.640*	.0264
-175 K	.0860	.392*	69.7	-179	1.01	.0872*	.393*	72.1

[1] Q indicates discharge as independent variable; K indicates specific conductance as independent variable
[2] Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$
[3] Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
5	50.00	350.00
5	.00	3.00
5	.00	10.00
0	.	.
5	10.00	20.00
5	.00	45.00
5	10.00	10.00
5	280.00	990.00
5	100.00	100.00
5	30.00	40.00
5	150.00	1700.00
5	.00	.10
5	.00	2.00
5	50.00	200.00
5	.00	1.00
5	.00	30.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 42   Station No. (USGS): 06326300   Station name: Mizpah Creek near Mizpah, MT

DESCRIPTIVE STATISTICS					
Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	25	0.04	62.08	1270.00	252.26
Specific conductance (µmho/cm)	25	270.00	1950.56	4100.00	1104.95
pH (units)	25	7.50	8.28	8.80	.33
Temperature (°C)	25	.00	10.50	27.50	10.37
Turbidity (JTU)	23	5.00	1199.13	9500.00	2346.97
Oxygen, dissolved (mg/L)	24	5.20	9.81	13.20	2.16
Oxygen, dissolved (percent)	24	61.00	92.71	128.00	16.32
Biochemical oxygen demand (mg/L)	24	.60	3.99	11.20	2.69
Calcium, dissolved (mg/L)	22	4.00	46.50	84.00	24.21
Magnesium, dissolved (mg/L)	22	1.90	32.26	81.00	22.06
Sodium, dissolved (mg/L)	22	37.00	376.36	720.00	225.53
Sodium (percent)	22	56.00	74.55	93.00	9.96
Sodium-adsorption ratio	22	2.40	10.51	18.00	4.72
Potassium, dissolved (mg/L)	22	3.70	8.07	13.00	2.42
Bicarbonate (mg/L)	24	86.00	387.12	788.00	204.68
Carbonate (mg/L)	24	.00	5.75	28.00	8.60
Sulfate, dissolved (mg/L)	24	48.00	676.71	1300.00	426.69
Chloride, dissolved (mg/L)	24	2.90	7.30	15.00	3.38
Fluoride, dissolved (mg/L)	24	.10	.42	0.70	.16
Silica, dissolved (mg/L)	24	1.10	6.35	13.00	2.89
Dissolved solids, calculated (mg/L)	22	168.00	1390.59	2550.00	789.81
Nitrogen, NO_2+NO_3 total (mg/L as N)	24	.00	.45	2.20	.61
Nitrogen, ammonia total (mg/L as N)	23	.01	.19	1.00	.31
Nitrogen, organic total (mg/L as N)	23	.19	3.16	14.00	4.29
Nitrogen, total (mg/L as N)	23	.49	3.82	17.00	4.89
Phosphorus, total (mg/L as P)	24	.02	1.06	6.60	1.93
Sediment, suspended (mg/L)	24	23.00	3181.79	18400.00	5510.39

DISSOLVED			
Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	8	0.00	600.00
Arsenic (µg/L)	8	.00	18.00
Beryllium (µg/L)	8	.00	10.00
Boron (µg/L)	23	80.00	550.00
Cadmium (µg/L)	8	.00	5.00
Chromium (µg/L)	8	.00	10.00
Copper (µg/L)	8	2.00	28.00
Iron (µg/L)	22	.00	1100.00
Lead (µg/L)	8	1.00	19.00
Lithium (µg/L)	8	10.00	120.00
Manganese (µg/L)	8	.00	120.00
Mercury (µg/L)	8	.00	.10
Molybdenum (µg/L)	8	.00	5.00
Nickel (µg/L)	8	2.00	14.00
Selenium (µg/L)	8	.00	2.00
Zinc (µg/L)	8	.00	100.00
Vanadium (µg/L)	8	.00	10.00

Period of record: Water years 1976-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant	Partial regression coefficient[3] Q	Partial regression coefficient[3] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
Q		.126	1020	--	--	--	--	--
7.93 K	.00019	.381*	.268	7.91	.00010	.00020*	.386*	.272
--	--	--	--	--	--	--	--	--
2850 K	-.880	.176*	2180			*	.194	2210
K		.0789	2.07				.146	2.04
K		.0403	16.2				.0428	16.6
7.43 K	-.00182	.543*	1.87	6.92	.00212	-.00163*	.580*	1.84
14.5 K	.0158	.550*	15.9	16.1	-.00642	.0152*	.555*	16.2
1.62 K	.0148	.572*	14.3	1.78	-.00066	.0147*	.572*	14.6
-17.0 K	.196	.973*	36.5	-16.6	-.00155	.196*	.973*	37.3
76.0 Q	-.0159	.181*	8.92				.208	8.98
4.16 K	.00321	.594*	2.96	4.84	-.00278	.00296*	.615*	2.95
5.89 K	.00110	.269*	2.02	4.78	.00449*	.00151*	.482*	1.74
63.2 K	.168	.851*	79.3	68.4	-.0237	.166*	.852*	80.9
-3.14 K	.00471	.370*	6.92	-3.53	.00179	.00485*	.373*	7.06
-47.7 K	.374	.970*	72.2	-46.7	-.00506	.374*	.970*	73.7
2.75 K	.00237	.618*	2.06	1.87	.00409*	.00271*	.702*	1.86
.444 Q	-.00029	.218*	.139				.223	.141
K		.0649	2.74				.0978	2.75
-.121 K	.690	.983*	102	5.22	-.0216	.688*	.983*	105
.925 K	.00026	.221*	.535	.993	-.00031	-.00028*	.236*	.542
.380 K	-.00011	.161*	.277			*	.201	.276
6.40 K	-.00176	.219*	3.73	7.04	-.00296	-.00200*	.248*	3.75
7.75 K	-.00213	.248*	4.18	8.50	-.00351	-.00241*	.278*	4.19
2.58 K	-.00082	.228*	1.67	2.86	-.00129	-.00093*	.254*	1.61
7760 K	-2.41	.232*	4940	8500	-3.31	-2.68*	.253*	4990

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE

Sample size	Minimum value	Maximum value
7	380.00	54000.00
6	1.00	30.00
6	.00	20.00
1	660.00	660.00
7	4.00	20.00
7	.00	130.00
7	10.00	120.00
7	380.00	74000.00
7	52.00	200.00
7	20.00	60.00
7	40.00	1200.00
6	.00	.30
6	.00	5.00
7	.00	200.00
6	.00	2.00
6	10.00	430.00
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Table 1.--Statistical summary of data for each station--Continued

Station No. (fig. 1): 43 Station No. (USGS): 06326500 Station name: Powder River near Locate, MT

DESCRIPTIVE STATISTICS

Variable	Sample size	Minimum value	Mean	Maximum value	Standard deviation
Discharge, instantaneous (ft^3/s)	55	24.00	1531.45	23999.95	3969.90
Specific conductance (µmho/cm)	72	615.00	2073.12	2900.00	482.00
pH (units)	72	7.50	8.20	8.50	.22
Temperature (°C)	78	.00	13.28	25.50	8.64
Turbidity (JTU)	45	4.00	972.07	5800.00	1298.09
Oxygen, dissolved (mg/L)	72	2.70	8.91	15.70	2.01
Oxygen, dissolved (percent)	72	20.00	90.40	118.00	14.77
Biochemical oxygen demand (mg/L)	5	.90	2.04	3.60	1.00
Calcium, dissolved (mg/L)	49	44.00	123.65	200.00	35.90
Magnesium, dissolved (mg/L)	49	14.00	54.65	100.00	18.53
Sodium, dissolved (mg/L)	49	61.00	253.69	420.00	81.21
Sodium (percent)	49	37.00	50.24	69.00	5.57
Sodium-adsorption ratio	49	2.00	4.76	6.90	1.11
Potassium, dissolved (mg/L)	49	4.30	7.37	12.00	1.80
Bicarbonate (mg/L)	45	87.00	281.93	480.00	83.58
Carbonate (mg/L)	42	.00	.14	2.00	.52
Sulfate, dissolved (mg/L)	49	220.00	690.61	1200.00	226.34
Chloride, dissolved (mg/L)	49	13.00	106.39	220.00	48.21
Fluoride, dissolved (mg/L)	49	.20	.45	.70	.10
Silica, dissolved (mg/L)	49	4.90	8.94	13.00	2.24
Dissolved solids, calculated (mg/L)	49	408.00	1382.31	2130.00	403.45
Nitrogen, NO_2+NO_3 total (mg/L as N)	49	.00	.39	1.20	.27
Nitrogen, ammonia total (mg/L as N)	14	.01	.06	.19	.05
Nitrogen, organic total (mg/L as N)	8	.47	3.88	9.60	3.67
Nitrogen, total (mg/L as N)	43	.47	2.82	10.00	2.68
Phosphorus, total (mg/L as P)	49	.01	.85	3.20	.96
Sediment, suspended (mg/L)	41	31.00	4733.04	34499.93	7126.72

DISSOLVED

Variable	Sample size	Minimum value	Maximum value
Aluminum (µg/L)	0	.	.
Arsenic (µg/L)	17	0.00	10.00
Beryllium (µg/L)	0	.	.
Boron (µg/L)	0	.	.
Cadmium (µg/L)	17	.00	4.00
Chromium (µg/L)	17	.00	10.00
Copper (µg/L)	17	2.00	8.00
Iron (µg/L)	17	.00	150.00
Lead (µg/L)	17	.00	19.00
Lithium (µg/L)	0	.	.
Manganese (µg/L)	17	.00	10.00
Mercury (µg/L)	17	.00	.30
Molybdenum (µg/L)	0	.	.
Nickel (µg/L)	0	.	.
Selenium (µg/L)	17	.00	7.00
Zinc (µg/L)	17	.00	40.00
Vanadium (µg/L)	0	.	.

Period of record: Water years 1975-78

REGRESSION SUMMARY

SIMPLE REGRESSION				MULTIPLE REGRESSION				
Regression constant[1]	Regression coefficient	Coefficient of determination[2]	Standard error of estimate	Regression constant[3]	Partial regression coefficient[4] Q	Partial regression coefficient[4] K	Coefficient of determination[2]	Standard error of estimate
--	--	--	--	--	--	--	--	--
2040 Q	-.0483	.120*	521	--	--	--	--	--
8.24 Q	-.00003	.191*	.218	8.14	-.00002*	.00005	.201*	.219
--	--	--	--	--	--	--	--	--
2410 K	-.729	.0990*	1250				.101	1260
Q		.00739	2.29				.00869	2.31
K		.00807	17.0				.0115	17.2
1.45 Q	.00052	.840*	.464				.885	.482
14.3 K	.0559	.732*	18.8	1.04	.00211*	.0611*	.780*	17.2
-6.06 K	.0310	.846*	7.34	-10.3	.00068*	.0327*	.865*	6.96
-18.7 K	.139	.886*	27.7	-9.78	-.00143	.136*	.890*	27.5
51.1 Q	-.00059	.180*	5.04	50.9	-.00059*	.00011	.180*	5.10
1.84 K	.00149	.548*	.752	2.26	-.00007*	.00133*	.596*	.718
2.87 K	.00229	.493*	1.29	1.82	.00017*	.00271*	.611*	1.14
88.8 K	.0980	.431*	63.8	122	-.00576	.0841*	.448*	63.5
K		.0272	.521				.0322	.526
-28.1 K	.367	.798*	103	-99.5	.0114*	.395*	.832*	94.5
-27.5 K	.0690	.578*	32.7	-13.0	-.00230	.0633*	.607*	31.9
K		.0739	.101				.0794	.101
5.18 K	.00190	.223*	1.97	6.03	-.00014	.00157*	.274*	1.93
-14.3 K	.713	.942*	98.5	-62.5	.00766*	.732*	.947*	95.2
.351 Q	.00003	.160*	.246	.394	.00003*	-.00002*	.161*	.248
.148 K	-.00004	.346*	.0390				.353	.0403
K		.334	3.03			*	.549	2.69
7.76 K	-.00258	.278*	2.28	8.18	-.00007	-.00276*	.281*	2.30
2.75 K	-.00097	.313*	.799	2.22	.00008*	-.00076*	.421*	.741
900 Q	4.71	.331*	5280	3990	2.14*	-1.40	.568*	2000

[1]Q indicates discharge as independent variable; K indicates specific conductance as independent variable

[2]Asterisk denotes that correlation coefficient, which is the square root of the coefficient of determination, is significant at $\alpha = 0.05$

[3]Regression for sediment calculated from 1096 observations

[4]Asterisk denotes that partial regression coefficient is significant at $\alpha = 0.05$

TOTAL RECOVERABLE		
Sample size	Minimum value	Maximum value
0	.	.
17	0.00	92.00
0	.	.
0	.	.
17	.00	20.00
17	.00	240.00
17	8.00	390.00
17	920.00	300000.00
17	12.00	400.00
0	.	.
17	30.00	6300.00
16	.00	.60
0	.	.
0	.	.
17	.00	17.00
17	50.00	1600.00
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Table 4.--Station descriptions

[Number to left of station name is the same as shown on fig. 1; number to right is formal USGS station number. Station descriptions are in downstream order]

Station 1 SARPY CREEK NEAR HYSHAM, MT (06294940)

LOCATION.--Lat 46°14'12", long 107°08'03", in SE1/4 SE1/4 sec. 30, T. 6 N., R. 37 E., Treasure County, 100 ft (30 m) upstream from bridge on FAS Route 415, 0.8 mi (1.3 km) upstream from Hysham Canal, and 5.5 mi (8.8 km) southeast of Hysham.

Station 2 EAST FORK ARMELLS CREEK NEAR COLSTRIP, MT (06294980)

LOCATION.--Lat 45°58'42", long 106°38'38", in SE1/4 SW1/4 SW1/4 sec. 28, T. 3 N., R. 41 E., Rosebud County, on private road bridge, 0.9 mi (1.4 km) downstream from Corral Creek, and 6.7 mi (10.8 km) north of Colstrip.

Station 3 WEST FORK ARMELLS CREEK NEAR FORSYTH, MT (06294991)

LOCATION.--Lat 46°05'10", long 106°46'09", in SW1/4 SW1/4 NW1/4 sec. 21, T. 4 N., R. 40 E., Rosebud County, 0.7 mi (1.1 km) upstream from mouth, and 13.5 mi (21.7 km) southwest of Forsyth.

Station 4 ARMELLS CREEK NEAR FORSYTH, MT (06294995)

LOCATION.--Lat 46°14'59", long 106°48'22", in SE1/4 NW1/4 NE1/4 sec. 26, T. 6 N., R. 39 E., Rosebud County, 300 ft (90 m) upstream from bridge on Interstate Highway I-94, 2 mi (3 km) upstream from mouth, and 6 mi (10 km) southwest of Forsyth.

Station 5 ROSEBUD CREEK AT KIRBY, MT (06295110)

LOCATION.--Lat 45°19'59", long 106°59'10", in SW1/4 SE1/4 NW1/4 sec. 8, T. 6 S., R. 39 E., Bighorn County, at private bridge at Kirby, 50 ft (15 m) downstream from Cache Creek.

Station 6 ROSEBUD CREEK NEAR COLSTRIP, MT (06295250)

LOCATION.--Lat 45°46'03", long 106°34'10", in SE1/4 SW1/4 NE1/4 sec. 8, T. 1 S., R. 42 E., Rosebud County, 10 ft (3 m) downstream from bridge on FAS Route 315, 1.5 mi (2.4 km) downstream from Lee Coulee, and 8.4 mi (13.5 km) southeast of Colstrip.

Station 7 GREENLEAF CREEK NEAR COLSTRIP, MT (06295350)

LOCATION.--Lat 45°48'57", long 106°25'08", in NW1/4 NW1/4 NW1/4 sec. 29, T. 1 N., R. 43 E., Rosebud County, on county road, 0.8 mi (1.3 km) upstream from mouth, and 11.0 mi (17.7 km) southeast of Colstrip.

Station 8 ROSEBUD CREEK ABOVE PONY CREEK, NEAR COLSTRIP, MT (06295400)

LOCATION.--Lat 45°53'33", long 106°24'03", in NE1/4 SE1/4 SE1/4 sec. 29, T. 2 N., R. 43 E., Rosebud County, on private road bridge, 0.3 mi (0.5 km) upstream from Pony Creek and 11.6 mi (18.7 km) northeast of Colstrip.

Station 9 SNIDER CREEK NEAR BRANDENBERG, MT (06295420)

LOCATION.--Lat 45°55'39", long 106°23'02", in S1/2 NE1/4 sec. 16, T. 2 N., R. 43 E., Rosebud County, at county road crossing, 0.3 mi (0.5 km) upstream from mouth, and 7.8 mi (12.6 km) northwest of Brandenberg.

Station 10 ROSEBUD CREEK NEAR ROSEBUD, MT (06295500)

LOCATION.--Lat 46°06'46", long 106°27'08", in SW1/4 NE1/4 SW1/4 sec. 12, T. 4 N., R. 42 E., Rosebud County, on private road bridge, 1.0 mi (1.6 km) downstream from Cottonwood Creek, and 12 mi (19 km) south of Rosebud.

Station 11 ROSEBUD CREEK AT MOUTH, NEAR ROSEBUD, MT (06296003)

LOCATION.--Lat 46°15'53", long 106°28'30", in SW1/4 NW1/4 NE1/4 sec. 21, T. 6 N., R. 42 E., Rosebud County, 0.4 mi (0.6 km) upstream from bridge on Interstate Highway I-94, 0.8 mi (1.3 km) upstream from mouth, and 1.6 mi (2.6 km) southwest of Rosebud.

Station 12 SQUIRREL CREEK NEAR DECKER, MT (06306100)

LOCATION.--Lat 45°03'05", long 106°55'36", in NW1/4 NW1/4 sec. 14, T. 9 S., R. 39 E., Big Horn County, 0.4 mi (0.6 km) upstream from Powers Cormack ditch, 0.5 mi (0.8 km) northwest of C X Ranch, 4 mi (6 km) northwest of Decker, and 7 mi (11 km) upstream from mouth.

Station 13 DEER CREEK NEAR DECKER, MT (06306800)

LOCATION.--Lat 45°03'19", long 106°42'09", in NW1/4 SW1/4 SW1/4 sec. 10, T. 9 S., R. 41 E., Big Horn County, at county road bridge, 6.1 mi (9.8 km) upstream from mouth, and 8.5 mi (13.7 km) northeast of Decker.

Station 14 SPRING CREEK NEAR DECKER, MT (06306900)

LOCATION.--Lat 45°05'09", long 106°50'12", in SW1/4 NW1/4 SE1/4 sec. 33, T. 8 S., R.40 E., Bighorn County, on county road bridge, 0.2 mi (0.3 km) downstream from South Fork, 1.2 mi (1.9 km) upstream from Tongue River Reservoir, and 5.3 mi (8.5 km) northeast of Decker.

Table 4.--Station descriptions--Continued

Station 15 TONGUE RIVER AT TONGUE RIVER DAM, NEAR DECKER, MT (06307500)

LOCATION.--Lat 45°08'29", long 106°46'15", SW1/4 SE1/4 SE1/4 sec. 12, T. 8 S., R. 40 E., Big Horn County, 0.5 mi (0.8 km) downstream from Tongue River Dam, 4 mi (6 km) upstream from Post Creek, 8 mi (13 km) northeast of Decker, 16 mi (26 km) southeast of Kirby, and at mile 162.3 (261.1 km).

Station 16 FOURMILE CREEK NEAR BIRNEY, MT (06307510)

LOCATION.--Lat 45°12'28", long 106°42'52", in NE1/4 NW1/4 NE1/4 sec. 28, T. 7 S., R. 41 E., Rosebud County, on dirt road, 0.9 mi (1.4 km) upstream from mouth, and 12.5 mi (20.1 km) southwest of Birney.

Station 17 PRAIRIE DOG CREEK NEAR BIRNEY, MT (06307528)

LOCATION.--Lat 45°17'28", long 106°40'56", in SE1/4 NW1/4 NW1/4 sec. 26, T. 6 S., R. 41 E., Rosebud County, about 3.3 mi (5.2 km) upstream from mouth, and 7 mi (11.0 km) southwest of Birney.

Station 18 BULL CREEK NEAR BIRNEY, MT (06307530)

LOCATION.--Lat 45°17'17", long 106°35'55", in NE1/4 SW1/4 NW1/4 sec. 28, T. 6 S., R. 42 E., Rosebud County, 0.4 mi (0.6 km) upstream from mouth, and 4.8 mi (7.7 km) southwest of Birney.

Station 19 EAST TRAIL CREEK NEAR OTTER, MT (06307560)

LOCATION.--Lat 45°04'25", long 106°24'11", in NW1/4 SE1/4 NE1/4 sec. 12, T. 9 S., R. 43 E., Bighorn County, 1.1 mi (1.8 km) upstream from mouth, and 14 mi (23 km) southwest of Otter.

Station 20 HANGING WOMAN CREEK BELOW HORSE CREEK NEAR BIRNEY, MT (06307570)

LOCATION.--Lat 45°04'09", long 106°24'35", in SE1/4 SE1/4 NW1/4 sec. 12, T. 9 S., R. 43 E., Bighorn County, 0.8 mi (1.3 km) downstream from flume No. 2, 1.1 mi (1.8 km) upstream from mouth, and 14 mi (23 km) southwest of Otter.

Station 21 HANGING WOMAN CREEK NEAR BIRNEY, MT (06307600)

LOCATION.--Lat 45°17'57", long 106°30'28", in N1/2 NW1/4 SE1/4 sec. 19, T. 6 S., R. 43 E., Rosebud County, 0.5 mi (0.8 km) downstream from bridge on Birney-Otter Road, 1.6 mi (2.6 km) downstream from East Fork, 1.6 mi (2.6 km) south of Birney, and 3.3 mi (5.3 km) upstream from mouth.

Station 22 TONGUE RIVER BELOW HANGING WOMAN CREEK, NEAR BIRNEY, MT (06307610)

LOCATION.--Lat 45°20'19", long 106°31'28", in SW1/4 SE1/4 SE1/4 sec. 1, T. 6 S., R. 42 E., Rosebud County, at bridge on county road, 1.2 mi (1.9 km) northwest of Birney, 2.5 mi (4.0 km) downstream from Hanging Woman Creek, and at mile 148.8 (239.4 km).

Station 23 COOK CREEK NEAR BIRNEY, MT (06307615)

LOCATION.--Lat 45°22'39", long 106°29'45", in SW1/4 NE1/4 NW1/4 sec. 25, T. 5 S., R. 42 E., Rosebud County, on dirt road 0.1 mi (0.2 km) upstream from mouth, and 3.8 mi (6.1 km) north of Birney.

Station 24 OTTER CREEK NEAR OTTER, MT (06307665)

LOCATION.--Lat 45°08'15", 106°07'22", in NE1/4 NE1/4 SE1/4 sec. 18, T. 8 S., R. 46 E., Powder River County, 0.2 mi (0.3 km) downstream from Pasture Creek, 5.5 mi (8.8 km) upstream from Bradshaw Creek, and 6.2 mi (10.0 km) southeast of Decker.

Station 25 BEAR CREEK AT OTTER, MT (06307670)

LOCATION.--Lat 45°12'20", long 106°12'15", in NW1/4 NE1/4 sec. 27, T. 7 S., R. 45 E., Powder River County, 500 ft (150 m) west of Otter Post Office, and 2.6 mi (4.2 km) upstream from mouth.

Station 26 OTTER CREEK BELOW FIFTEENMILE CREEK NEAR OTTER, MT (06307717)

LOCATION.--Lat 45°23'29", long 106°08'37", in N1/2 sec. 23, T. 5 S., R. 45 E., Powder River County, on county road bridge, 1.0 mi (1.6 km) downstream from Fifteenmile Creek, and 13.1 mi (21.1 km) northeast of Otter.

Station 27 THREEMILE CREEK NEAR ASHLAND, MT (06307730)

LOCATION.--Lat 45°30'46", long 106°09'25", in NW1/4 SE1/4 SE1/4 sec. 3, T. 4 S., R. 45 E., Rosebud County, on dirt road, 1.5 mi (2.4 km) upstream from mouth, and 7.6 mi (12.2 km) southeast of Ashland.

Station 28 HOME CREEK NEAR ASHLAND, MT (06307735)

LOCATION.--Lat 45°32'35", long 106°11'39", in SE1/4 NE1/4 SE1/4 sec. 29, T. 3 S., R. 45 E., Powder River County, 150 ft (45.7 m) west of Otter Creek road culvert, 1.0 mi (1.6 km) upstream from mouth, about 2.0 mi (3.2 km) south of Highway 212, and 5.1 mi (8.2 km) southeast of Ashland.

Table 4.--Station descriptions--Continued

Station 29 OTTER CREEK AT ASHLAND, MT (06307740)

LOCATION.--Lat 45°35'18", long 106°15'17", in NE1/4 NE1/4 SE1/4 sec. 11, T. 3 S., R. 44 E., Rosebud County, 200 ft (60 m) downstream from bridge on U.S. Highway 212, 2.5 mi (4.0 km) upstream from mouth, and 0.3 mi (0.5 km) southeast of Ashland.

Station 30 BEAVER CREEK NEAR ASHLAND, MT (06307810)

LOCATION.--45°47'52", long 106°14'17", in NW1/4 SE1/4 NE1/4 sec. 34, T. 1 N., R. 44 E., Rosebud County, at county road bridge, 0.8 mi (1.3 km) upstream from mouth, and 14.7 mi (23.7 km) north of Ashland.

Station 31 TONGUE RIVER BELOW BRANDENBERG BRIDGE, NEAR ASHLAND, MT (06307830)

LOCATION.--Lat 45°52'18", long 106°11'7", in NE1/4 SW1/4 NW1/4 sec. 6, T. 1 N., R. 45 E., Custer County, 3.1 mi (5.0 km) downstream from Goodale Creek, 6.5 mi (10.5 km) downstream from Brandenberg Bridge, and 21 mi (34 km) north of Ashland.

Station 32 LISCOM CREEK NEAR ASHLAND, MT (06307840)

LOCATION.--Lat 45°54'09", long 106°09'51", in SE1/4 NW1/4 NW1/4 sec. 27, T. 2 N., R. 45 E., Custer County, at county road bridge, 0.8 mi (1.3 km) upstream from mouth, and 21 mi (34 km) northeast of Ashland.

Station 33 FOSTER CREEK NEAR VOLBORG, MT (06307890)

LOCATION.--Lat 46°01'53", long 105°57'07", in NE1/4 SE1/4 NW1/4 sec. 12, T. 3 N., R. 46 E., Custer County, 0.6 mi (1.0 km) upstream from mouth, and 18.5 mi (29.8 km) northwest of Volborg.

Station 34 PUMPKIN CREEK NEAR LOESCH, MT (06308160)

LOCATION.--Lat 45°42'40", long 105°43'40", in NW1/4 sec. 31, T. 1 S., R. 49 E., Powder River County, at bridge on county road, 0.9 mi (1.4 km) northeast of Loesch, and 9.0 mi (14.5 km) upstream from Little Pumpkin Creek.

Station 35 LITTLE PUMPKIN CREEK NEAR VOLBORG, MT (06308170)

LOCATION.--Lat 45°46'00", long 105°46'42", in NE1/4 SE1/4 NE1/4 sec. 10, T. 1 S., R. 48 E., Powder River County, at county bridge 1.1 mi (1.8 km) upstream from Horkan Creek, 6.9 mi (11.1 km) southwest of Volborg, and 7.7 mi (12.4 km) upstream from mouth.

Station 36 PUMPKIN CREEK NEAR VOLBORG, MT (06308190)

LOCATION.--Lat 45°51'50", long 105°40'10", in W1/2 sec. 5, T. 1 N., R. 49 E., Custer County, at bridge on U.S. Highway 212, 1.5 mi (2.4 km) upstream from Basin Creek, and 1.6 mi (2.6 km) northeast of Volborg.

Station 37 PUMPKIN CREEK NEAR MILES CITY, MT (06308400)

LOCATION.--Lat 46°13'42", long 105°41'24", in SE1/4 NW1/4 SW1/4 sec. 35, T. 6 N., R. 48 E., Custer County, 30 ft (9 m) upstream from bridge on U.S. Highway 312, 7.5 mi (12.1 km) upstream from mouth, and 16 mi (26 km) southeast of Miles City.

Station 38 TONGUE RIVER AT MILES CITY, MT (06308500)

LOCATION.--Lat 46°21'30", long 105°48'24", in SE1/4 sec. 23, T. 7 N., R. 47 E., Custer County, 4 mi (6 km) south of Miles City, and 8 mi (13 km) upstream from mouth.

Station 39 POWDER RIVER AT MOORHEAD, MT (06324500)

LOCATION.--Lat 45°04'04", long 105°52'10", in NW1/4 SE1/4 NW1/4 sec. 8, T. 9 S., R. 48 E., Powder River County, at bridge on county road, 1.1 mi (1.8 km) upstream from discontinued post office at Moorhead, 1.2 mi (1.9 km) upstream from present gage, and 4.0 mi (6.4 km) north of Wyoming-Montana State line.

Station 40 MIZPAH CREEK AT OLIVE, MT (06326050)

LOCATION.--Lat 45°32'30", long 105°31'40", in SW1/4 sec. 26, T. 3 S., R. 50 E., Powder River County, at bridge on U.S. Highway 212 at Olive, approximately 1.0 mi (1.6 km) downstream from YT Creek.

Station 41 MIZPAH CREEK NEAR VOLBORG, MT (06326200)

LOCATION.--Lat 45°56'00", long 105°23'40", in SW1/4 sec. 9, T. 2 N., R. 51 E., Custer County, at bridge on county road, approximately 2.0 mi (3.2 km) downstream from Spring Creek, and 15.1 mi (24.3 km) northeast of Volborg.

Station 42 MIZPAH CREEK NEAR MIZPAH, MT (06326300)

LOCATION.--Lat 46°15'39", long 105°17'34", in NW1/4 NE1/4 SW1/4 sec. 24, T. 6 N., R. 51 E., Custer County, 10 ft (3 m) upstream from county bridge, 1.0 mi (1.6 km) upstream from mouth, and 1.6 mi (2.6 km) northwest of Mizpah.

Station 43 POWDER RIVER NEAR LOCATE, MT (06326500)

LOCATION.-- Lat 46°26'56", long 105°18'44", in NW1/4 SW1/4 sec. 14, T. 8 N., R. 51 E., Custer County, 1.5 mi (2.4 km) downstream from bridge on U.S. Highway 12 at present site of Locate (5 mi, 8 km, west of former site of Locate), 1.5 mi (2.4 km) upstream from Locate Creek, and 25 mi (40 km) east of Miles City.

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