Water-Quality, Bed-Sediment, and Biological Data (October 2002 through September 2003) and Statistical Summaries of Data for Streams in the Upper Clark Fork Basin, Montana

By Kent A. Dodge, Michelle I. Hornberger, and Irene R. Lavigne

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Multiply	By	To obtain
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
foot (ft)	0.3048	meter (m)
gallon (gal)	3.785	liter (L)
gallon (gal)	3,785	milliliter (mL)
inch (in.)	25.4	millimeter (mm)
inch (in.)	25,400	micrometer (μm)
mile (mi)	1.609	kilometer
ounce (oz)	28.35	gram (g)
part per million	1	microgram per gram (μg/g)
square mile (mi^2)	2.59	square kilometer
ton per day (ton/d)	907.2	kilogram per day

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8 \times °C) + 32$$

Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). Horizontal coordinate information is referenced to the North American Datum of 1927 (NAD 27).

Abbreviated water-quality units used in this report:

μg/g	micrograms per gram
μg/L	micrograms per liter
μg/mL	micrograms per milliliter
μm	micrometer
μS/cm	microsiemens per centimeter at 25 degrees Celsius
mg/L	milligrams per liter

Water-year definition:

A water year is the 12-month period from October 1 through September 30. It is designated by the calendar year in which it ends.

Acronyms used in the report:

ICAPES	inductively coupled argon plasma emission spectroscopy	RSD	relative standard deviation
LRL	laboratory reporting level	SRM	standard reference material
LT-MDL	long-term method detection level	USGS	U.S. Geological Survey
NWQL	USGS National Water Quality Laboratory, Denver, Colo.		

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Abstract

Water, bed sediment, and biota were sampled in streams from Butte to below Missoula as part of a program to characterize aquatic resources in the upper Clark Fork basin of western Montana. Sampling stations were located on the Clark Fork, five major tributaries, and four smaller tributaries. Water-quality data were obtained periodically at 18 stations during October 2002 through September 2003 (water year 2003). Data for 15 bed-sediment and 15 biological stations were obtained in September 2003. The primary constituents analyzed were trace elements associated with tailings from historical mining and smelting activities.

Water-quality data include concentrations of selected major ions, trace elements, and suspended sediment in stream samples. Daily values of streamflow, suspended-sediment concentration, and suspended-sediment discharge are given for three stations. Bed-sediment data include trace-element concentrations in the fine-grained and bulk fractions. Biological data include trace-element concentrations in whole-body tissue of aquatic benthic insects. Quality-assurance data are reported for analytical results of water, bed sediment, and biota. Statistical summaries of water-quality, bed-sediment, and biological data are provided for the period of record since 1985 for each station.

Introduction

The Clark Fork originates near Warm Springs in western Montana at the confluence of Silver Bow and Warm Springs Creeks (fig. 1). Along the 148-mi reach of stream from Silver Bow Creek in Butte to the Clark Fork at Milltown Reservoir, five major tributaries enter: Warm Springs Creek, Little Blackfoot River, Flint Creek, Rock Creek, and Blackfoot River. Principal surface-water uses in the 6,000-mi^2 Clark Fork basin above Missoula include irrigation, stock watering, light industry, hydroelectric power generation, and habitat for trout fisheries. Current land uses primarily are cattle production, logging, mining, and recreation. Large-scale mining and smelting were prevalent land uses in the upper basin for more than one hundred years, but are now largely discontinued.

Deposits of copper, gold, silver, and lead ores were extensively mined, milled, and smelted in the drainages of Silver Bow and Warm Springs Creeks from about 1870 to 1980. Moderate- and small-scale mining also occurred in the basins of most of the major tributaries to the upper Clark Fork. Tailings derived from mineral processing commonly contain large quantities of trace elements such as arsenic, cadmium, copper, lead, and zinc. Tailings have been eroded, mixed with stream sediment, transported downstream, and deposited in stream channels, on flood plains, and in the Warm Springs Ponds and Milltown Reservoir. The widely dispersed tailings continue to be re-eroded, transported, and redeposited along the stream channel and flood plain, especially during high flows. The occurrence of elevated trace-element concentrations in water and bed sediment can pose a potential risk to aquatic biota and human health.

Concern about the potential toxicity of trace elements to aquatic biota and human health has resulted in a comprehensive effort by State, Federal, and private entities to characterize the aquatic resources in the upper Clark Fork basin to guide and monitor remedial cleanup activities. A long-term data base was considered necessary to detect trends over time in order to evaluate the effectiveness of remediation. Water-quality data have been collected by the U.S. Geological Survey (USGS) at selected sites in the upper Clark Fork basin since 1985 (Lambing, 1987, 1988, 1989, 1990, 1991; Lambing and others, 1994, 1995; and Dodge and others, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003). Trace-element data for bed sediment and biota (aquatic benthic insects) have been collected intermittently since 1986 at selected sites as part of studies on bed-sediment contamination and bioaccumulation of metals conducted by the USGS National Research Program (Axtmann and Luoma, 1991; Cain and others, 1992, 1995; Axtmann and others, 1997; Hornberger and others, 1997). In March 1993, an expanded sampling program for water, bed sediment, and biota

[1]U.S. Geological Survey, Menlo Park, Calif.

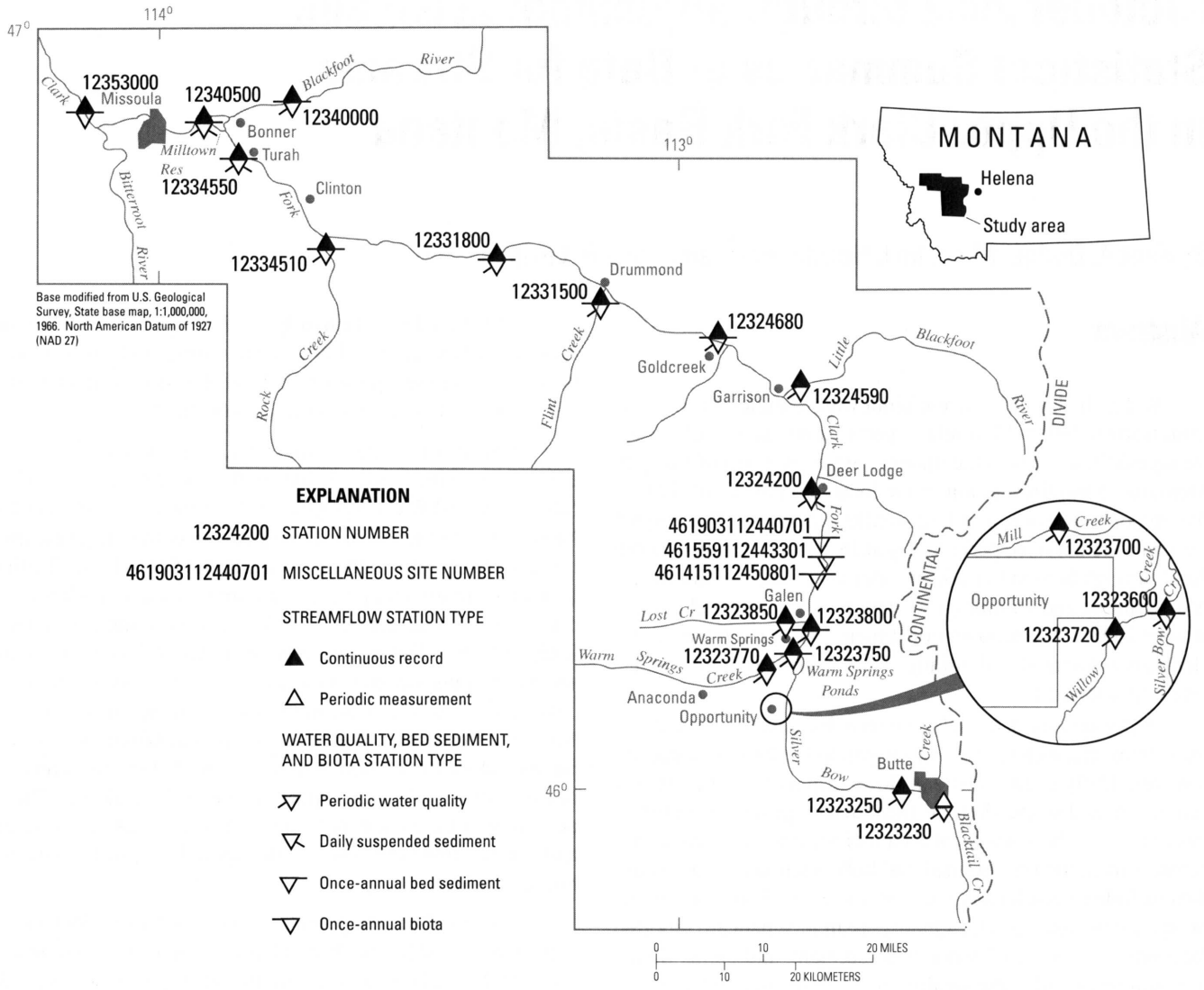

Figure 1. Location of study area.

was implemented by the USGS in cooperation with the U.S. Environmental Protection Agency to provide systematic, long-term monitoring to better quantify the seasonal and annual variability in selected constituents.

The purpose of this report is to present water-quality data for 18 stations and trace-element data for 15 bed-sediment and 15 biological stations in the upper Clark Fork basin collected from October 2002 through September 2003 (water year 2003). Quality-assurance data are presented for water-quality, bed-sediment, and biota samples. Statistical summaries also are provided for water-quality, bed-sediment, and biological data collected since 1985.

Sampling Locations And Types Of Data

Sampling stations in the upper Clark Fork basin are located on the Clark Fork mainstem, five major tributaries (Warm Springs Creek at Warm Springs, Little Blackfoot River near Garrison, Flint Creek near Drummond, Rock Creek near Clinton, and Blackfoot River near Bonner), and four smaller tributaries (Blacktail Creek at Harrison Avenue, Mill Creek at Opportunity, Willow Creek at Opportunity, and Lost Creek near Galen) from Butte to below Missoula (fig. 1). The stations, types of data collected, and period of record for each data type are listed in table 1. Mainstem sampling sites were selected to divide the upper Clark Fork into reaches of relatively uniform length, with each reach encompassing either a major tributary or depositional environment (Warm Springs Ponds and Milltown Reservoir). Major tributaries were sampled to describe water-quality characteristics of important hydrologic sources in the upper basin and to provide reference comparisons to the mainstem for bed sediment and biota. In 2003, three additional tributaries were included for continuous streamflow and periodic water-quality sampling—Mill Creek, Willow Creek, and Lost Creek. These tributaries drain the area near Anaconda and were added to gain more resolution on sources of metals entering the Clark Fork in an area of historical metal-processing activities. Water-quality data were obtained periodically at 18 stations; daily suspended-sediment data were obtained for part of the year at 3 of these stations. Trace-element data for 15 bed-sediment and 15 biological stations were obtained once-annually. Continuous streamflow data were collected at 18 stations.

A list of properties measured onsite and constituents analyzed in samples of water, bed sediment, and biota is given in table 2. Results of analyses for water, bed sediment, and biota as well as associated quality-assurance data for water year 2003 are listed in tables 4 through 20 at the back of the report. Statistical summaries of water-quality, bed-sediment, and biological data collected between March 1985 and September 2003 are given in tables 21-24 at the back of the report.

Quality assurance of data was maintained through the use of documented procedures designed to provide environmentally representative data. Acceptable performance of the procedures was verified with quality-control samples that were collected systematically to provide a measure of the accuracy, precision, and bias of the environmental data and to identify problems associated with sampling, processing, or analysis.

Water-Quality Data

Water-quality data consist of measurements of physical properties and concentrations of chemical and physical constituents analyzed in stream samples. At 14 sites, samples were collected 8 times per year on a schedule designed to describe seasonal and hydrologic variability. At four tributary sites, samples were collected only twice during the water year because of termination, and then reinstatement, of those sites in the sampling program.

Methods

Cross-sectional water samples were collected from multiple verticals across the stream using depth- and width-integration methods described by Ward and Harr (1990) and Edwards and Glysson (1999). These methods provide a vertically and laterally discharge-weighted composite sample that is representative of the entire flow passing through the cross section of a stream. Sampling equipment consisted of standard USGS depth-integrating suspended-sediment samplers (DH-48, DH-81, and D-74TM), which were either constructed of plastic or coated with a non-metallic epoxy paint, and equipped with nylon or Teflon nozzles.

Instantaneous streamflow at the time of water sampling was determined at all stations, either by direct measurement or from stage-discharge rating tables (Rantz and others, 1982). Onsite measurements of specific conductance, pH, and water temperature were made during collection of periodic water-quality samples. Onsite sample processing, including filtration and preservation, was performed according to procedures described by Ward and Harr (1990), Horowitz and others (1994), and the USGS (variously dated) National Field Manual for the Collection of Water-Quality Data.

Water samples were analyzed for the constituents listed in table 2 by the USGS National Water Quality Laboratory (NWQL) in Denver, Colo. The trace elements (arsenic, cadmium, copper, iron, lead, manganese, and zinc) were analyzed for filtered (0.45-µm pore size) and unfiltered recoverable concentrations. Calcium and magnesium also were determined in filtered samples to enable calculation of hardness. The terms "filtered" and "unfiltered recoverable" replace the terms "dissolved" and "total recoverable," respectively, which were used in the past. Filtered concentrations of arsenic, cadmium, copper, lead, manganese, and zinc were analyzed by inductively coupled plasma-mass spectrometry (Faires, 1993; Garbarino, 1999). Filtered concentrations of calcium, magnesium, and iron were analyzed by inductively coupled plasma-atomic emission spectrometry (Fishman, 1993). Unfiltered-recoverable trace-element concentrations were determined from unfiltered

Table 1. Type and period of data collection at sampling stations in the upper Clark Fork basin, Montana

[Abbreviation: P, present. Symbol: --, no data]

Station number (fig. 1)	Station name	Continuous-record streamflow	Periodic water quality[1]	Daily suspended sediment	Fine-grained bed sediment[2]	Bulk bed sediment[2]	Biota[2]
12323230	Blacktail Creek at Harrison Avenue, at Butte	--	03/93-08/95, 12/96-08/03	--	--	--	--
12323250	Silver Bow Creek below Blacktail Creek, at Butte	10/83-P	03/93-08/95, 12/96-P	--	--	--	--
12323600	Silver Bow Creek at Opportunity	07/88-P	03/93-08/95, 12/96-P	03/93-09/95	07/92-P	08/93-08/95, 08/97-P	07/92, 08/94, 08/95, 08/97-P
12323700	Mill Creek at Opportunity	04/03-P	03/03-P	--	--	--	--
12323720	Willow Creek at Opportunity	04/03-P	03/03-P	--	--	--	--
12323750	Silver Bow Creek at Warm Springs	03/72-09/79, 04/93-P	03/93-P	04/93-09/95	07/92-P	08/93, 08/95-P	07/92-P
12323770	Warm Springs Creek at Warm Springs	10/83-P	03/93-P	--	08/95, 08/97, 08/99, 08/02	08/95, 08/97, 08/99, 08/02	08/95, 08/97, 08/99, 08/02
12323800	Clark Fork near Galen	07/88-P	07/88-P	--	08/87, 08/91-P	08/93-P	08/87, 08/91-P
12323850	Lost Creek near Galen	04/03-P	03/03-P	--	--	--	--
461415112450801	Clark Fork below Lost Creek, near Galen	--	--	--	08/96-P	08/96-P	08/96-P
461559112443301	Clark Fork near Racetrack	--	--	--	08/96-P	08/96-P	08/96-P
461903112440701	Clark Fork at Dempsey Creek diversion, near Racetrack	--	--	--	08/96-P	08/96-P	08/96-P
12324200	Clark Fork at Deer Lodge	10/78-P	03/85-P	03/85-08/86, 04/87-03/03, 08/03-P	08/86, 08/87, 08/90-P	08/93-P	08/86, 08/87, 08/90-P
12324590	Little Blackfoot River near Garrison	10/72-P	03/85-P	--	08/86, 08/87, 08/94, 08/98, 08/01	08/94, 08/98, 08/01	08/87, 08/94 08/98, 08/01
12324680	Clark Fork at Goldcreek	10/77-P	03/93-P	--	07/92-P	08/93-P	07/92-P
12331500	Flint Creek near Drummond	08/90-04/03, 08/03-P	03/85-P	--	08/86, 08/89, 07/92-P	08/93-P	08/86, 07/92-P
12331800	Clark Fork near Drummond	04/93-P	03/93-P	--	08/86, 08/87, 08/91-P	08/93-P	08/86, 08/91-P
12334510	Rock Creek near Clinton	10/72-P	03/85-P	--	08/86, 08/87, 08/89, 08/91-99, 08/01-P	08/93-99, 08/01-P	08/87, 08/91-99, 08/01-P
12334550	Clark Fork at Turah Bridge, near Bonner	03/85-P	03/85-P	03/85-03/03, 08/03-P	08/86, 08/91-P	08/93-P	08/86, 08/91-P
12340000	Blackfoot River near Bonner	10/39-P	03/85-P	07/86-04/87, 06/88-09/95	08/86, 08/87, 08/91, 08/93-96, 08/98-01, 09/03	08/93, 08/94, 08/99-01, 09/03	08/86, 08/87, 08/91, 08/93, 08/96, 08/98, 09/00, 09/03
12340500	Clark Fork above Missoula	03/29-P	07/86-P[3]	07/86-04/87, 06/88-01/96, 03/96-03/03, 08/03-P	08/97-P	08/97-P	08/97-P
12353000	Clark Fork below Missoula[4]	10/29-P	03/85-09/95	--	08/86, 08/90-P	08/93-P	08/86, 08/90-P

[1]Onsite measurements of physical properties and laboratory analyses of selected major ions, trace elements, and suspended sediment. Prior to March 1993, laboratory analyses included only trace elements and suspended sediment, with the exception of Clark Fork below Missoula.

[2]Laboratory analyses of trace elements.

[3]Prior to October 1989, water-quality data for Clark Fork above Missoula only included suspended-sediment data.

[4]Bed sediment and biota sampled about 30 miles downstream from streamflow-gaging station to conform to previous sampling location.

Table 2. Properties measured onsite and constituents analyzed in samples of water, bed sediment, and biota from the upper Clark Fork basin, Montana

Water		Bed sediment	Biota
Property	Constituent	Constituent	Constituent
Streamflow	Hardness (calculated)	Arsenic	Arsenic
Specific conductance	Calcium	Cadmium	Cadmium
pH	Magnesium	Chromium	Chromium
Temperature	Arsenic	Copper	Copper
	Cadmium	Iron	Iron
	Copper	Lead	Lead
	Iron	Manganese	Manganese
	Lead	Nickel	Nickel
	Manganese	Silver	Zinc
	Zinc	Zinc	
	Suspended sediment		

samples that were first digested with dilute hydrochloric acid (Hoffman and others, 1996) and then analyzed for arsenic by graphite furnace-atomic absorption spectrometry (Jones and Garbarino, 1999) and for cadmium, copper, iron, lead, manganese, and zinc by inductively coupled plasma-mass spectrometry (Garbarino and Struzeski, 1998).

Cross-sectional water samples also were collected for analysis of suspended sediment whenever periodic water-quality samples were collected. These samples were analyzed for suspended-sediment concentration and the percentage of suspended sediment mass finer than 0.062-mm diameter (silt size and smaller) by the USGS sediment laboratory in Helena, Mont., according to methods described by Guy (1969) and Lambing and Dodge (1993).

At the three daily suspended-sediment stations (table 1), suspended-sediment samples were collected 2 to 9 times per week for only part of the year (October through March, and August through September) as the result of program modifications. These samples were collected by local contract observers using the depth-integration method at a single vertical near midstream. The samples were analyzed for suspended-sediment concentration and were used to determine daily mean suspended-sediment concentrations according to methods described by Porterfield (1972). Five supplemental water-quality and suspended-sediment samples were collected at Clark Fork at Turah Bridge, near Bonner (12334550) and Clark Fork above Missoula (12340500), from May 29-June 2. These samples were collected to better define variability in trace-element and suspended-sediment concentrations above and below Milltown Reservoir during high flow.

Results

Water-quality data for samples collected periodically during water year 2003 are presented in table 4. The types of data include instantaneous streamflow, onsite measurements of water-quality properties, and analytical results for chemical constituents and suspended sediment.

Daily streamflow and available daily suspended-sediment data for water year 2003 at the three daily suspended-sediment stations are given in tables 5 through 7. Monthly descriptive statistics for each parameter are provided along with totals for the annual discharge of water and suspended sediment.

Quality Assurance

Quality-assurance procedures used for the collection and field processing of water-quality samples are described by Ward and Harr (1990), Knapton and Nimick (1991), Horowitz and others (1994), Edwards and Glysson (1999), and the USGS (variously dated) National Field Manual for the Collection of Water-Quality Data. Standard procedures used by the NWQL for internal sample handling and quality assurance are described by Friedman and Erdmann (1982), Jones (1987), and Pritt and Raese (1995). Quality-assurance procedures used by the Montana District sediment laboratory are described by Lambing and Dodge (1993).

The quality of analytical results reported for water-quality samples was evaluated by quality-control samples that were submitted from the field and analyzed concurrently in the laboratory with routine samples. These quality-control samples consisted of replicates, spikes, and blanks which provide quantitative information on the precision and bias of the overall field and laboratory process. Each type of quality-control sample was submitted at a proportion equivalent to about 5 percent of the total number of water-quality samples. Therefore, the total number of quality-control samples represented about 15 percent of the total number of water-quality samples.

In addition to quality-control samples submitted from the field, internal quality-assurance practices at the NWQL are per-

formed systematically to provide quality control of analytical procedures (Pritt and Raese, 1995). These internal practices include analyses of quality-control samples such as calibration standards, standard reference water samples, replicate samples, deionized-water blanks, or spiked samples at a proportion equivalent to at least 10 percent of the sample load. The NWQL participates in a blind-sample program where standard reference water samples prepared by the USGS Branch of Quality Systems are routinely inserted into the sample line for each analytical method at a frequency proportional to the sample load. The laboratory also participates in external evaluation studies twice-yearly with the U.S. Environmental Protection Agency, the Canadian Center for Inland Water, and the USGS Branch of Quality Systems to assess analytical performance.

Replicate data can be obtained in different ways to provide an assessment of precision (reproducibility) of analytical results. Replicate samples are two or more samples considered to be essentially identical in composition. Replicate samples can be obtained in the field (field replicate) by either repeating the collection process to obtain two or more independent composite samples, or by splitting a single composite sample into two or more subsamples. The individual replicate samples are then analyzed separately. Likewise, a single sample can be analyzed two or more times in the laboratory to obtain a measure of analytical variability (laboratory replicate).

Precision of analytical results for field replicates is affected by numerous sources of variability within the field and laboratory environments, including sample collection, sample processing, and sample analysis. To provide data on precision for samples exposed to all sources of variability, replicate stream samples for chemical analysis were obtained in the field by splitting a composite stream sample, and replicate stream samples for suspended-sediment analysis were obtained in the field by concurrently collecting two independent cross-sectional samples. Analyses of these field replicates indicate the reproducibility of environmental data that are affected by the combined variability potentially introduced by field and laboratory processes.

Analytical precision was evaluated with laboratory replicates, which excluded field sources of variability. Two independent analyses were made of an individual sample selected randomly in the laboratory from the group of samples comprising each analytical run. A separate analysis of the sample was made at the beginning and end of each analytical run to provide information on the reproducibility of laboratory analytical results independent of possible variability caused by field collection and processing of samples.

Spiked samples are used to evaluate bias, which measures the ability of an analytical method to accurately quantify a known amount of analyte added to a sample. Because some constituents in stream water can potentially interfere with the analysis of a targeted analyte, it is important to determine whether such effects are causing biased (inaccurate) analyses. Deionized-water blanks and aliquots of stream samples were spiked in the laboratory with known amounts of the same trace elements analyzed in water samples. Analyses of spiked blanks indicate if the spiking procedure and analytical method are within control for a water matrix that is presumably free of chemical interference. Analyses of spiked aliquots of stream samples indicate if the chemical matrix of the stream water interferes with the analytical measurement and whether these interferences could contribute significant bias to reported trace-element concentrations for stream samples.

Blank samples of deionized water were routinely analyzed to identify the presence and magnitude of contamination that potentially could bias analytical results. The particular type of blank sample routinely tested was a "field" blank. Field blanks are aliquots of deionized water that are certified as trace-element free and are processed through the sampling equipment used to collect stream samples. These blanks are then subjected to the same processing (sample splitting, filtration, preservation, transportation, and laboratory handling) as stream samples. Blank samples are analyzed for the same constituents as those of stream samples to identify whether any detectable concentrations exist.

All water samples were handled in accordance with chain-of-custody procedures that provide documentation of sample identity, shipment, receipt, and laboratory handling. All samples submitted from a sampling episode were stored and analyzed as a discrete sample group, independent of other samples submitted to the NWQL. Therefore, statistical descriptions of quality-control data generated for this monitoring program are directly applicable to the analytical results for stream samples reported herein.

Data-quality objectives (table 3) were established for water-quality data as part of the study plan for the expanded long-term monitoring program that was initiated in 1993. The objectives identify analytical requirements of detectability and serve as a guide for identifying questionable data by establishing acceptable limits for precision and bias of laboratory results. Comparisons of quality-control data to data-quality objectives are used to evaluate whether sampling and analytical procedures are producing environmentally representative data in a consistent manner. Data that did not meet the objectives were evaluated for acceptability, and corrective action was taken, when appropriate.

During water year 1999, the NWQL began implementation of a new, statistically based convention for establishing reporting levels and for reporting low-concentration data (Childress and others, 1999). Quality-control data are collected on a continuing basis to determine long-term method detection levels (LT-MDLs) and laboratory reporting levels (LRLs). These values are re-evaluated each year and, consequently, may change from year to year. The methods are designed to limit the possible occurrence of a false positive or false negative error to 1 percent or less. Accordingly, concentrations are reported as less than the LRL for samples in which the analyte was either not detected or did not pass identification criteria. Analytes that are detected at concentrations between the LT-MDL and LRL and that pass identification criteria are estimated. Estimated concentrations are noted with a remark code of "E." These data

need to be used with the understanding that their uncertainty is greater than that of data reported without the "E" remark code.

The precision of analytical results for a constituent can be determined by estimating a standard deviation of the differences between replicate measurements for several sets of samples. These replicate measurements may consist either of individual analyses of a pair of samples considered to be essentially identical (field replicates) or multiple analyses of an individual sample (laboratory replicates). The differences in concentration between replicate analyses can be used to estimate a standard deviation according to the following equation (Taylor, 1987):

$$S = \sqrt{\frac{\Sigma d^2}{2k}} \quad (1)$$

where

S = standard deviation of the difference in concentration between replicate analyses,

d = difference in concentration between each pair of replicate analyses, and

k = number of pairs of replicate analyses.

Precision also can be expressed as a relative standard deviation (RSD), in percent, which is computed from the standard deviation and the mean concentration for all the replicate analyses. Expressing precision relative to a mean concentration standardizes comparison of precision among individual constituents. The RSD, in percent, is calculated according to the following equation (Taylor, 1987):

Table 3. Data-quality objectives for analyses of water-quality samples collected in the upper Clark Fork basin, Montana

[The terms "filtered" and "unfiltered recoverable" replace the former terms "dissolved" and "total recoverable," respectively. Abbreviations: µg/L, micrograms per liter; mg/L, milligrams per liter; mm, millimeter. Symbol: --, not determined]

Constituent	Data-quality objectives		
	Detectability	Precision	Bias
	Laboratory reporting level[1]	Maximum relative standard deviation of laboratory replicate analyses, in percent	Maximum deviation of spike recovery, in percent
Calcium, filtered	0.01 mg/L	20	--
Magnesium, filtered	.008 mg/L	20	--
Arsenic, unfiltered recoverable	2 µg/L	20	25
Arsenic, filtered	.3 µg/L	20	25
Cadmium, unfiltered recoverable	.04 µg/L	20	25
Cadmium, filtered	.04 µg/L	20	25
Copper, unfiltered recoverable	.6 µg/L	20	25
Copper, filtered	.2 µg/L	20	25
Iron, unfiltered recoverable	6-20 µg/L	20	25
Iron, filtered	8-10 µg/L	20	25
Lead, unfiltered recoverable	.06 µg/L	20	25
Lead, filtered	.08 µg/L	20	25
Manganese, unfiltered recoverable	.22 µg/L	20	25
Manganese, filtered	.2 µg/L	20	25
Zinc, unfiltered recoverable	2 µg/L	20	25
Zinc, filtered	1 µg/L	20	25
Sediment, suspended	1 mg/L	--	--
Sediment, suspended, percent finer than 0.062 mm	1 percent	--	--

[1]For those constituents showing a range of values, the laboratory reporting level changed during water year 2003.

$$RSD = \frac{S}{\bar{x}} \times 100 \quad (2)$$

where

RSD = relative standard deviation,
S = standard deviation, and
$\bar{x}$ = mean of all replicate concentrations.

Paired analyses of field replicates are presented in table 8. The precision estimated for each constituent based on these paired results, which include both field and laboratory sources of variability, is reported in table 9. Statistics for precision of field-replicate analyses were based on the values reported in table 8, which are rounded to standard USGS reporting levels for the particular constituent and its analytical method (Timme, 1994).

Data-quality objectives for precision are not directly applicable to field replicates because of the inability to determine whether the variability results from field sample collection and processing, or laboratory handling and analysis. However, a statistical calculation of precision for the field replicates is provided in table 9 to illustrate overall reproducibility of environmental data that incorporates both field and laboratory sources of variability. The data-quality objective used to evaluate precision of results for field replicates was a maximum relative standard deviation of 20 percent (table 3). Precision estimates for the field replicate analysis were within the 20-percent relative standard deviation limit for all constituents.

Analytical precision for chemical constituents based on replicate laboratory analyses of individual samples, which includes only laboratory sources of variability, is reported in table 10. Statistics for analytical precision of laboratory-replicate analyses are based on unrounded values stored in laboratory data files. The data-quality objective for analytical precision of laboratory-replicate analyses was a maximum relative standard deviation of 20 percent. Precision estimates for laboratory-replicate analyses (table 10) were within the 20-percent relative standard deviation limit for all constituents.

Analyses of an unspiked sample and a spiked aliquot of the same sample provide a measure of the recovery efficiency for the analytical method within the chemical matrix of the sample. The data-quality objective for acceptable spike recovery of trace elements in water samples was a maximum deviation of 25 percent from a theoretical 100-percent recovery of added constituent. At the laboratory, a spiked deionized-water blank and a spiked aliquot of a stream sample were prepared and analyzed along with the original unspiked sample. The differences between the spiked and unspiked sample concentrations were determined and used to compute recovery, in percent, according to equation 3 below:

$$\text{Spike recovery, in percent} = \frac{\text{spiked sample concentration} - \text{unspiked sample concentration}}{\text{spike concentration}} \times 100 \quad (3)$$

If the spike recovery for a trace element was outside a range of 75 to 125 percent, the instrument was recalibrated and the entire sample set and spiked samples were reanalyzed for that particular trace element until recoveries were improved to the extent possible. Results of recovery efficiency for individual trace elements in spiked deionized-water blanks and spiked stream samples are presented in tables 11 and 12, respectively. The mean spike recovery for deionized-water samples spiked with trace elements (table 11) ranged from 87.9 to 101.6 percent. The mean spike recovery for spiked stream samples (table 12) ranged from 91.6 to 108.6 percent. The 95-percent confidence intervals (Taylor, 1987) for the mean of spike recovery for each constituent analyzed in stream samples (table 12) did not exceed a 25-percent deviation from an expected 100-percent recovery.

High or low bias is indicated if the confidence interval does not include 100 percent recovery. All laboratory-spiked deionized-water blank samples (table 11) had confidence intervals for percent recovery that included 100 percent, except filtered iron (87.4-98.8) and unfiltered recoverable lead (93.9-98.1) percent. All laboratory-spiked stream samples (table 12) had confidence intervals for percent recovery that included 100 percent, except unfiltered recoverable copper (89.7-93.5), unfiltered recoverable lead (93.7-99.9), and unfiltered recoverable zinc (87.5-98.5) percent. Because the mean spike recoveries for all constituents met data-quality objectives, no adjustments were made to analytical results for stream samples on the basis of spike recoveries.

Analytical results for field blanks are presented in table 13. A field blank with constituent concentrations equal to or less than the LRL for the analytical method indicates that the entire process of sample collection, field processing, and laboratory analysis is presumably free of significant contamination. If detectable concentrations in field blanks were equal to or greater than twice the LRL (typical measurement precision at the analytical detection level), the concentrations were noted during data review. Analytical results from the field blank for the next sample set were evaluated for a consistent trend that may indicate systematic contamination. Sporadic, infrequent exceedances of twice the LRL probably represent random contamination or instrument calibration error that is not persistent in the process and which is not likely to cause significant positive bias in a long-term record of analytical results. However, if concentrations for a particular constituent exceeded twice the LRL in field blanks from two consecutive field trips, blank samples were collected from individual components of the processing sequence and were submitted for analysis in order to identify the source of contamination.

Trace-element concentrations in field blanks were almost always less than the LRL. Minor detections equal to the LRL were noted for filtered copper and unfiltered recoverable zinc.

No adjustments were made to water-quality sample results based on these minor detections because neither constituent exceeded the LRL in consecutive blank samples.

One major exceedance occurred for filtered cadmium (0.34 µg/L) following an annual equipment blank collected through a D-74 TM sampler. This sample was collected about 3 weeks prior to the associated sampling run, and the collected bottles remained in the Montana District office until they could be submitted with the environmental samples. Also, all subsequent blank samples collected through this sampler had filtered cadmium concentration below the LRL, and all environmental samples collected immediately following this blank had filtered cadmium levels of 0.04 µg/L or less. This random exceedance is not traceable to any systematic processing source, and concentrations in environmental samples apparently were not affected; therefore, no adjustments to environmental data were warranted.

A minor, but more persistent level of potential bias occurred for filtered zinc in blank samples collected from February through the first sampling trip in June, with filtered zinc concentrations ranging from 2 to 4 µg/L. In response to this trend, an equipment blank was prepared along with incremental blank samples collected after each step in the processing sequence. Analytical results from this quality-assurance assessment indicated that a small amount of contamination was being introduced from the tubing used in the filtration process. After the tubing was replaced, no further contamination was noted in blank samples. Filtered zinc concentrations for environmental samples were decreased by 2-4 µg/L for all samples collected during the affected period based on the magnitude of the filtered zinc concentration in the blank sample collected for that specific sampling trip.

Bed-Sediment Data

Bed-sediment data consist of analyses of trace-element concentrations in the fine-grained and bulk (fine- plus coarse-grained) fractions of the bed-sediment sample. Bed-sediment samples were collected once-annually during low, stable flow conditions and the same season (typically August) as previous samples to facilitate data comparisons among years.

Methods

Bed-sediment samples were collected in September 2003 using protocols described by E.V. Axtmann (U.S. Geological Survey, written commun., 1994). Samples were collected from the surfaces of streambed deposits in low-velocity areas near the edge of the stream using an acid-washed polypropylene scoop. Whenever possible, samples were collected from both sides of the stream. Three composite samples of fine-grained bed sediment and one composite sample of bulk bed sediment were collected at each site.

Individual samples of fine-grained bed sediment were collected by scooping material from the surfaces of three to five randomly selected deposits along pool or low-velocity areas. The three to five individual samples were combined to form a single composite sample. This collection process was repeated three times to obtain three composite samples. Each composite sample was wet-sieved onsite through a 0.064-mm nylon-mesh sieve using ambient stream water. The fraction of bed sediment in each composite sample that was finer than 0.064 mm was transferred to an acid-washed 500-mL polyethylene bottle and transported to the laboratory on ice.

Individual samples of bulk bed sediment also were collected by scooping material from the surfaces of three to five randomly selected deposits. The individual unsieved samples were composited into an acid-washed polyethylene bottle to form a single composite sample, each of which were then transported to the laboratory on ice. Because the streambed at most sampling locations is predominantly gravel and cobble, deposits were selected where gravel and cobble could be excluded from the samples. Generally, bulk bed-sediment samples were composed of particles smaller than about 10 mm in diameter.

Bed-sediment samples were prepared for analysis at the USGS National Research Program laboratory in Menlo Park, Calif. Fine-grained and bulk bed-sediment samples were oven-dried at 60 °C and ground using an acid-washed ceramic mortar and pestle. Duplicate aliquots of approximately 0.6 g of sediment from each of the three composite fine-grained bed-sediment samples were digested using a hot, concentrated, nitric acid reflux according to methods described by Luoma and Bryan (1981). Duplicate aliquots were similarly digested from the single composite sample of bulk bed sediment. After a digestion period of up to several weeks, the aliquots were evaporated to dryness on a hot plate. The dry residue was redissolved with 20 mL of 0.6N (normal) hydrochloric acid. The reconstituted aliquots then were filtered through a 0.45-µm filter using a syringe and in-line disposable filter cartridge. The filtrate was subsequently diluted to a 2:10, 3:10, or 5:10 ratio with 0.6N hydrochloric acid. These final solutions were analyzed for arsenic, cadmium, copper, iron, lead, manganese, nickel, silver, and zinc using inductively coupled argon plasma emission spectroscopy (ICAPES). Chromium data for the 2003 samples were omitted from this report because the values were not reliable.

Results

Concentrations of trace elements measured in samples of fine-grained and bulk bed sediment collected during September 2003 are summarized in tables 14 and 15, respectively. Liquid-phase concentrations, in µg/mL, that were analyzed in the reconstituted aliquots of digested bed sediment were converted to solid-phase concentrations, in µg/g, using the following equation:

$$\mu g/g = \frac{\mu g/mL \times \text{volume of digested sample, in mL}}{\text{dry weight of sample, in g} \times \text{dilution ratio}} \quad (4)$$

The reported solid-phase concentrations in tables 14 and 15 are the means of all analyses of duplicate aliquots from each composite sample collected at the site. Because the conversion from liquid-phase to solid-phase concentration is dependent on both the dilution ratio and the dry weight of the sample, analytical detection limits for some trace elements might differ among stations and among years.

Quality Assurance

The protocols for field collection and processing of bed-sediment samples are designed to prevent contamination from metal sources. Non-metallic sampling and processing equipment was acid-washed and rinsed with deionized water prior to the first sample collection. Nylon-mesh sieves were washed in a laboratory-grade detergent and rinsed with deionized water. All equipment was given a final rinse onsite with stream water. Sampling equipment that was reused at each site was rinsed between sites with 10-percent nitric acid, deionized water, and stream water. Separate sieves were used at each site and, therefore, did not require between-site cleaning.

Quality assurance of analytical results for bed sediment included laboratory instrument calibration with standard solutions and analysis of quality-control samples designed to identify the presence and magnitude of bias (E.V. Axtmann, U.S. Geological Survey, written commun., 1994). Quality-control samples consisted of standard reference materials and procedural blanks. Each type of sample was analyzed in a proportion equivalent to about 10 to 20 percent of the total number of bed-sediment samples.

Standard reference materials (SRMs) are commercially prepared materials that have certified concentrations of trace elements. Replicate analyses of SRMs are used to indicate the precision (reproducibility) of analytical results and the ability of the method to accurately measure a known quantity of a constituent. Recovery efficiency of trace-element analyses of SRMs for bed sediment is summarized in table 16. Two SRMs consisting of agricultural soils representing low and high concentrations of trace elements were analyzed to test recovery efficiency for a range of concentrations generally similar to those occurring in the upper Clark Fork basin. The digestion process used to analyze bed-sediment samples is not a "total" digestion (does not liberate elements associated with crystalline lattices); therefore, 100-percent recovery may not be achieved for elements strongly bound to the sediment. The percent recovery of trace elements in SRM analyses that use less than a total digestion is useful to indicate which trace elements display strong sediment-binding characteristics in the SRM and whether analytical recovery is consistent between multiple sets of analyses.

Although data-quality objectives have not been established for bed sediment, percent recoveries shown in table 16 illustrate analytical performance. Cadmium and silver concentrations were less than the analytical detection limit in the low-concentration standard (SRM 2709). The reason for the lack of measurable recoveries for cadmium and silver in this SRM is believed to be the result of analyzing concentrations very close to the detection limit (0.0001 µg/mL and 0.001 µg/mL, respectively) coupled with signal enhancement resulting from matrix interference. Percent recoveries for copper were 50.4 percent for the low-concentration standard (SRM 2709) and 66.2 percent for the high-concentration standard (SRM 2711). Arsenic and zinc in SRM 2709 and silver in SRM 2711 also displayed low recoveries (68.1 , 76.2, and 78.5 percent, respectively). Although these recovery values are relatively low, no adjustments were made to the data because the results from instrument calibration with standard solutions were well within acceptable limits (5-10 percent). Mean recoveries were within 20 percent of complete recovery for all other constituents in both the low- and high-concentration SRMs and ranged from about 83 to 116 percent. No adjustments were made to trace-element concentrations in bed-sediment samples on the basis of recovery efficiencies.

Procedural blanks for bed-sediment samples consisted of the same reagents used for sample digestion and reconstitution. Concentrated nitric acid used for sample digestion was heated and evaporated to dryness. After evaporation, 0.6N hydrochloric acid was added to the dry residue. Procedural blanks, therefore, represent the same chemical matrix as the reagents used to digest and reconstitute bed-sediment samples. No dilution of the reagents was made prior to analysis in order to maximize and detect any potential contamination associated with sample handling and analysis in the laboratory environment. Results of trace-element analyses of procedural blanks for bed sediment are in table 17.

Analytical results of procedural blanks are reported as a liquid-phase concentration, in µg/mL, which is equivalent to parts per million. Determination of the significance of a detectable blank concentration is based on the magnitude of the equivalent solid-phase concentration, in µg/g, relative to the ambient concentration of the trace element in bed-sediment samples. If a detectable blank concentration represents 10 percent or more of the ambient solid-phase concentration, then the blank concentration is subtracted to remove potential contamination bias. One procedural blank had a cadmium concentration at the analytical detection limit. However, because this one sample had a concentration less than 1 percent of the ambient concentration in environmental samples, no adjustments were made to trace-element concentrations in bed-sediment samples on the basis of procedural blanks.

Biological Data

Biological data consist of analyses of trace-element concentrations in the whole-body tissue of aquatic benthic insects. Insect samples were collected once-annually at the same sites and dates as bed-sediment samples (table 1), allowing for a

direct comparison of biological data among years and with bed-sediment data.

Methods

Insect samples were collected using protocols described in Hornberger and others (1997). Immature stages of benthic insects were collected using a large nylon-mesh kick net. A single riffle at each station was sampled repeatedly until an adequate number of individuals was collected to provide sufficient mass for analysis. Targeted taxa for collection were *Hydropsyche* spp. and *Arctopsyche grandis* of the Order Trichoptera (caddisflies), and *Claassenia sabulosa* of the Order Plecoptera (stoneflies). Samples of each taxon were sorted by genus and placed in acid-washed plastic containers. Samples were frozen on dry ice within 30 minutes of collection in a small amount of ambient river water. In previous years (1986-98), benthic insects were depurated for a period of 6-8 hours in an effort to evacuate gut contents. In 1998, a comparison of samples collected using both methods showed no significant difference in metal concentrations in benthic insects, with the exception of copper. Average copper concentrations in depurated samples were 8-25 percent lower than in samples frozen within 30 minutes of collection (M.I. Hornberger, unpub. data, 2000). The change in the field protocol minimizes the chance of metal loss through cell membranes during depuration and is consistent with methods established by Cain and Luoma (1998). However, caution needs to be exercised in comparing recent copper data for insects with earlier data because of the possibility of higher concentrations resulting from the change in field protocol.

Insect samples were processed and analyzed at the USGS National Research Program laboratory in Menlo Park, Calif. Insects were thawed and rinsed with ultra-pure deionized water to remove particulate matter and then sorted to their lowest possible taxonomic level. If large numbers of specimens had been collected at a station, similar-sized individuals were composited into replicate subsamples. Subsamples were placed in tared scintillation vials and oven-dried at 70 °C. Subsamples were weighed to obtain a final dry weight and digested by reflux using concentrated nitric acid (Cain and others, 1992). After digestion, insect samples were evaporated to dryness on a hot plate. The dry residue was reconstituted in 0.6N hydrochloric acid, filtered through a 0.45-μm filter, and analyzed undiluted by ICAPES for arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc.

Results

Concentrations of trace elements in whole-body tissue of aquatic insects collected during September 2003 are summarized in table 18. The variability in the number of composite samples among species and among sites reflects differences in insect abundance, with the number of composite samples increasing with the relative abundance of insects. Liquid-phase concentrations analyzed in the reconstituted samples were converted to solid-phase concentrations using equation 4. As with bed sediment, minimum reporting levels may differ among sites as a result of variable sample weights. In general, the smaller the biological sample weight (a function of insect abundance), the higher the minimum reporting level. Therefore, higher minimum reporting levels do not necessarily imply a higher trace-element concentration in tissue.

Two species of *Hydropsyche* were targeted for collection in this study due to their occurrence at most, but not all, sites: *Hydropsyche cockerelli* and *Hydropsyche occidentalis*. *Hydropsyche* species that could not be positively identified were considered to belong to the *morosa* group and are categorized as *Hydropsyche* spp. or *Hydropsyche morosa* group (in previous reports). *Arctopsyche grandis* and *Claasenia sabulosa* also were collected, where available, to represent additional insect taxa that are fairly widely distributed in the upper Clark Fork basin.

Quality Assurance

The protocols for field collection and processing of biota samples are designed to prevent contamination from metal sources. Non-metallic nets, sampling equipment, and processing equipment were employed in all sample collection. Equipment was acid-washed and rinsed in ultra-pure deionized water prior to the first sample collection. Nets and equipment were thoroughly rinsed in ambient stream water at each new mainstem station. New nets were used for all tributary stations. Biota samples were collected sequentially at stations along an increasing concentration gradient to minimize effects from potential station-to-station carryover contamination.

Quality assurance of analytical results for biota samples included laboratory instrument calibration with standard solutions and analyses of quality-control samples designed to quantify precision and to identify the presence and magnitude of bias. Quality-control samples consisted of a SRM and procedural blanks. Each type of sample was analyzed in a proportion equivalent to about 10 to 20 percent of the total number of biota samples.

Recovery efficiency for trace-element analyses of the SRM for biota is summarized in table 19. The reference material tested was lobster hepatopancreas. Data-quality objectives have not been established for analytical recovery in biota, but percent recoveries are shown to illustrate analytical performance. Mean SRM recoveries were within 12 percent of certified values for arsenic, cadmium, copper, iron, manganese, and zinc. Mean recoveries for chromium and nickel were within 26 percent, and recoveries for lead were within 52 percent. The low recoveries for lead were attributed to 7 of the 12 samples having concentrations less than the instrument analytical detection limit. Additionally, a quality-control standard with a similar solution concentration as the SRM samples was analyzed throughout the analysis. Recoveries for all reported elements were within 10 percent of the quality-control standard.

Results of trace-element analyses of procedural blanks for biota are in table 20. Procedural blanks for biota consisted of the same reagents used to digest and reconstitute tissue of aquatic insects. The blanks were analyzed undiluted at a proportion of one blank per site. Analytical results for all blanks were less than the analytical detection limit; thus, no contamination bias was indicated.

Statistical Summaries of Data

Statistical summaries of water-quality, bed-sediment, and biological data are provided in tables 21-24 for the period of record at each station since 1985. The summaries include the period of record, number of samples, maximum, minimum, mean, and median of concentrations.

Statistical summaries of water-quality data (table 21) are based on results of cross-sectional samples collected periodically by the USGS during the period of record for each station. The summaries do not include data for supplemental single-vertical samples collected during several years by a contract observer at Clark Fork at Turah Bridge, near Bonner; Blackfoot River near Bonner; and Clark Fork above Missoula. Inclusion of results for supplemental samples that targeted high-flow conditions or maintenance drawdowns of Milltown Reservoir would disproportionately skew the long-term statistics at these three sites relative to the other sites in the network. Statistical summaries of bed-sediment (table 22 and 23) and biological data (table 24) are based on results of samples collected once-annually during the indicated years. Because not all stations were sampled for bed sediment and biota every year, the data for some sites do not represent a consecutive annual record.

Sample sizes and statistics for bed-sediment data are based on a compilation of single annual-mean concentrations determined from the combined results of multiple composite samples for a given year. Therefore, sample sizes for bed sediment represent the number of years sampled. In contrast, sample sizes and statistics for biological data are based on individual analyses for each composite sample collected in an individual year, rather than on a single annual-mean concentration from all composites combined. Biota sample sizes reflect differences in species abundance at each site and among all years. As a result, the statistics for biota describe a wider range of variation in trace-element concentrations than would be evident if results from individual composite samples were averaged. The abundance of aquatic insects at a particular site in a given year limits the biomass of the sample which, in turn, may result in variable analytical detection limits. Where analytical detection limits vary among years, statistical summaries are provided only as a general indication of the range of detection.

The presence or absence of insect species at a given site can vary among years and may result in different taxa being analyzed in the long-term period of record. Because *Hydropsyche* insects were not sorted to the species level during 1986-89, statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics for the *Hydropsyche morosa* group are based on the combined results for two or more species because these samples could not be identified clearly to the species level, but the individual insects had *morosa* characteristics.

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DATA

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003

[The terms "filtered" and "unfiltered recoverable" replace the former terms "dissolved" and "total recoverable," respectively. Abbreviations: ft^3/s, cubic feet per second; °C, degrees Celsius; E, estimated; µg/L, micrograms per liter; µS/cm, microsiemens per centimeter at 25 °C; mg/L, milligrams per liter; mm, millimeter; ton/d, tons per day. Symbols: <, less than analytical detection limit; --, no data]

12323230--BLACKTAIL CREEK AT HARRISON AVENUE, AT BUTTE, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite (µS/cm)	Temperature, water (°C)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered (µg/L)
MAR 2003									
17...	0850	9.0	7.6	246	1.5	87	24.4	6.27	5.0
APR									
02...	0850	16	7.8	211	3.0	77	21.4	5.66	4.4
28...	1015	15	7.8	242	4.5	93	26.8	6.31	3.6
MAY									
26...	0810	6.8	7.8	251	12.0	100	29.5	6.76	5.1
JUN									
03...	1550	6.9	8.4	266	16.0	110	32.2	7.37	6.1
16...	0720	3.5	7.7	323	9.5	130	35.6	9.00	2.8
JUL									
28...	1000	2.6	7.8	342	11.5	140	41.5	9.54	2.0
AUG									
25...	1015	2.7	7.8	337	11.0	140	39.3	9.43	1.6

Date	Arsenic, unfiltered recoverable (µg/L)	Cadmium, filtered (µg/L)	Cadmium, unfiltered recoverable (µg/L)	Copper, filtered (µg/L)	Copper, unfiltered recoverable (µg/L)	Iron, filtered (µg/L)	Iron, unfiltered recoverable (µg/L)	Lead, filtered (µg/L)
MAR 2003								
17...	6	0.04	0.09	5.5	12.5	278	1,130	0.40
APR								
02...	6	.10	.11	6.8	16.9	312	1,450	.62
28...	5	.09	.05	5.6	7.8	280	590	.32
MAY								
26...	6	.07	.04	5.0	6.3	188	370	.16
JUN								
03...	7	E.03	.04	4.1	5.2	209	420	.10
16...	3	.04	E.03	2.1	2.5	72	260	.35
JUL								
28...	E2	.06	E.02	1.4	2.2	25	200	<.08
AUG								
25...	3	.08	E.03	1.8	3.1	22	190	<.08

Date	Lead, unfiltered recoverable (µg/L)	Manganese, filtered (µg/L)	Manganese, unfiltered recoverable (µg/L)	Zinc, filtered (µg/L)	Zinc, unfiltered recoverable (µg/L)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
17...	3.78	140	164	5	15	85	23	0.56
APR								
02...	4.86	39.7	72	8	27	82	31	1.3
28...	.81	30.5	35	4	6	82	7	.28
MAY								
26...	.36	30.4	32	5	4	89	3	.06
JUN								
03...	.38	18.6	24	<1	3	87	5	.09
16...	.26	50.2	50	5	3	96	2	.02
JUL								
28...	.20	38.8	41	3	3	83	3	.02
AUG								
25...	.22	39.7	45	3	3	81	3	.02

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12323250--SILVER BOW CREEK BELOW BLACKTAIL CREEK, AT BUTTE, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (°C)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
17...	1000	29	7.6	402	3.0	120	34.4	8.58	6.4
APR									
02...	1010	31	7.5	400	5.0	120	34.6	8.81	5.2
28...	1120	28	7.5	435	7.5	140	38.4	9.55	5.3
MAY									
26...	0845	20	7.7	451	12.5	150	42.2	10.7	6.4
JUN									
03...	1700	18	8.0	482	17.0	160	44.0	10.9	7.5
16...	0830	15	7.6	532	13.0	160	45.3	11.8	5.4
JUL									
28...	1120	14	7.9	512	18.0	160	44.3	10.8	6.4
AUG									
25...	1040	16	7.6	539	17.5	160	43.5	11.5	5.6

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
17...	9	.25	.52	10.3	32.3	191	1,060	.79
APR								
02...	8	.23	.40	14.1	35.8	173	1,380	.74
28...	6	.24	.28	10.9	17.2	145	440	.30
MAY								
26...	8	.24	.30	12.2	21.8	84	380	.24
JUN								
03...	9	.13	.24	12.2	21.3	44	320	.19
16...	6	.23	.29	13.2	20.0	30	250	.26
JUL								
28...	6	.09	.11	8.4	15.6	22	120	.20
AUG								
25...	6	.15	.17	9.8	16.2	24	120	.24

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
17...	7.38	245	297	110	169	83	24	1.9
APR								
02...	10.5	144	212	86	139	92	39	3.3
28...	1.60	178	163	102	111	88	7	.53
MAY								
26...	1.89	196	196	80	107	87	7	.38
JUN								
03...	1.53	132	146	47	77	90	6	.29
16...	1.50	153	156	88	106	92	4	.16
JUL								
28...	.65	22.2	26	34	45	86	4	.15
AUG								
25...	1.03	75.6	85	59	66	86	2	.09

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12323600--SILVER BOW CREEK AT OPPORTUNITY, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite (µS/cm)	Temperature, water (°C)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered (µg/L)
MAR 2003									
15...	0930	176	7.8	276	1.5	81	24.2	4.96	14.7
APR									
02...	1115	61	8.1	418	5.5	140	40.3	9.01	11.0
28...	1220	75	8.4	385	6.5	140	41.7	8.72	10.3
MAY									
26...	1000	101	8.4	331	10.5	130	40.8	7.15	11.5
JUN									
03...	1430	90	8.7	318	14.0	130	40.5	7.25	9.5
16...	1145	39	9.1	407	16.0	160	48.5	9.74	12.5
JUL									
28...	1225	13	8.9	574	21.0	210	61.9	12.9	22.1
AUG									
25...	1315	17	8.8	572	20.0	200	59.1	13.3	19.3

Date	Arsenic, unfiltered recoverable (µg/L)	Cadmium, filtered (µg/L)	Cadmium, unfiltered recoverable (µg/L)	Copper, filtered (µg/L)	Copper, unfiltered recoverable (µg/L)	Iron, filtered (µg/L)	Iron, unfiltered recoverable (µg/L)	Lead, filtered (µg/L)
MAR 2003								
15...	91	2.08	5.22	142	860	141	8,760	3.17
APR								
02...	27	1.45	2.23	69.7	214	71	1,600	1.38
28...	15	.84	1.18	50.0	97.0	90	760	.92
MAY								
26...	14	.37	.78	28.5	73.9	55	780	.39
JUN								
03...	14	.29	.58	25.4	60.6	38	620	.27
16...	15	.35	.69	30.4	61.1	30	430	.31
JUL								
28...	22	.23	.52	25.3	54.3	32	280	.39
AUG								
25...	28	.78	1.31	37.8	95.2	9	290	.26

Date	Lead, unfiltered recoverable (µg/L)	Manganese, filtered (µg/L)	Manganese, unfiltered recoverable (µg/L)	Zinc, filtered (µg/L)	Zinc, unfiltered recoverable (µg/L)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
15...	269	767	1,190	491	1,230	83	238	113
APR								
02...	52.9	521	635	336	539	88	56	9.2
28...	15.5	343	349	177	251	91	18	3.6
MAY								
26...	12.4	227	274	59	163	86	28	7.6
JUN								
03...	10.2	172	211	40	119	84	17	4.1
16...	7.47	203	248	38	139	84	9	.95
JUL								
28...	5.38	85.7	117	28	97	81	5	.18
AUG								
25...	7.43	279	329	82	204	80	6	.28

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12323700--MILL CREEK AT OPPORTUNITY, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (^oC)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
17...	1210	9.6	8.2	207	3.0	85	23.0	6.57	37.0
APR									
02...	1255	14	8.0	186	5.0	73	20.0	5.69	33.2
28...	1345	21	8.0	129	5.5	51	14.4	3.74	33.6
MAY									
26...	1220	110	7.8	81	9.5	32	9.14	2.23	29.9
JUN									
11...	1430	261	7.8	59	9.5	24	7.01	1.57	23.0
16...	1005	79	7.9	83	9.0	37	10.6	2.55	20.5
JUL									
28...	1420	3.6	8.1	169	18.5	74	21.0	5.36	31.5
AUG									
25...	1230	2.1	8.1	195	16.0	85	23.5	6.32	29.7

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
17...	38	.08	.11	3.7	5.0	39	120	.18
APR								
02...	36	.09	.11	4.7	7.5	37	200	.17
28...	35	.10	.15	5.2	8.0	51	210	.23
MAY								
26...	50	.08	.85	5.8	38.8	53	1,960	.32
JUN								
11...	36	.08	.51	6.0	25.1	50	1,300	.27
16...	22	.06	.13	3.3	6.9	41	320	.22
JUL								
28...	32	.05	.06	2.4	3.3	45	100	.14
AUG								
25...	35	.05	.06	2.2	3.2	60	100	.11

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
17...	.48	3.6	6	3	5	78	1	.03
APR								
02...	1.08	4.8	10	4	8	87	5	.19
28...	1.19	4.4	14	6	7	78	6	.34
MAY								
26...	12.7	15.7	113	3	41	49	107	32
JUN								
11...	8.01	7.0	64	4	26	52	78	55
16...	1.74	6.4	17	3	10	51	10	2.1
JUL								
28...	.30	11.1	12	2	2	88	1	.01
AUG								
25...	.17	9.8	11	2	3	80	1	.01

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12323720--WILLOW CREEK AT OPPORTUNITY, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (^oC)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
17...	1100	9.8	8.0	318	3.5	140	38.7	9.38	33.1
APR									
02...	1145	14	8.3	333	5.5	130	36.8	9.27	57.0
28...	1250	20	8.1	181	6.0	73	22.0	4.37	26.1
MAY									
26...	1040	46	7.9	225	11.5	98	28.5	6.58	101
JUN									
03...	1445	33	7.9	213	13.5	95	27.8	6.19	69.4
16...	0925	14	7.9	261	11.5	110	31.9	7.80	42.6
JUL									
28...	1305	6.3	8.2	322	17.0	150	42.6	9.89	24.2
AUG									
25...	1200	6.6	8.0	307	14.5	130	38.3	9.53	13.2

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
17...	35	.06	.07	4.2	10.6	34	210	.24
APR								
02...	65	.05	.10	7.9	17.1	49	250	.28
28...	27	.04	.11	5.6	11.8	70	410	.30
MAY								
26...	104	.08	.30	14.1	36.9	87	840	.50
JUN								
03...	69	.05	.13	9.2	17.0	48	290	.21
16...	44	.05	.09	4.5	9.5	47	220	.28
JUL								
28...	23	E.03	.04	2.7	4.5	14	80	E.06
AUG								
25...	16	.05	.05	2.4	4.4	8	100	.19

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
17...	2.12	49.3	62	8	16	93	5	.13
APR								
02...	1.98	37.9	46	6	15	94	9	.34
28...	2.67	24.2	38	10	14	86	17	.92
MAY								
26...	8.41	32.8	70	8	41	76	51	6.3
JUN								
03...	2.55	18.7	31	5	15	76	15	1.3
16...	1.72	19.0	24	5	10	91	6	.23
JUL								
28...	.78	10.6	14	2	4	88	3	.05
AUG								
25...	.71	13.2	18	2	4	96	2	.04

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12323750--SILVER BOW CREEK AT WARM SPRINGS, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (^oC)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
18...	0925	132	8.4	494	4.5	190	57.3	11.6	19.5
APR									
02...	1435	121	8.5	492	7.0	200	58.6	12.3	15.8
28...	1500	137	8.4	438	8.5	170	51.2	10.9	16.3
MAY									
26...	1350	213	8.9	278	14.0	110	30.5	7.35	37.9
JUN									
01...	1650	424	8.6	253	15.5	110	31.1	6.68	39.3
16...	1310	137	9.0	265	15.5	100	30.0	7.18	28.6
JUL									
28...	1520	22	9.0	524	25.0	240	69.5	16.0	30.6
AUG									
25...	1415	24	9.0	578	21.5	260	75.9	17.7	26.0

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
18...	31	.31	.56	27.8	96.8	26	1,420	.57
APR								
02...	19	.04	.11	7.0	18.4	15	340	.14
28...	19	.05	.17	6.3	13.3	16	270	.11
MAY								
26...	43	.05	.36	8.6	23.8	36	760	.27
JUN								
01...	43	.06	.15	8.5	14.4	43	320	.17
16...	30	.04	.10	5.7	8.9	35	200	.14
JUL								
28...	30	E.03	.06	3.5	7.1	10	110	<.08
AUG								
25...	32	.07	.05	4.5	6.6	E6	100	E.06

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
18...	41.8	405	493	37	158	97	24	8.6
APR								
02...	5.13	122	172	7	32	92	7	2.3
28...	2.16	78.7	114	2	18	88	8	3.0
MAY								
26...	6.32	34.2	110	<1	28	90	31	18
JUN								
01...	1.78	69.1	117	1	12	83	11	13
16...	1.20	42.3	81	2	8	86	5	1.8
JUL								
28...	.73	53.0	98	1	5	83	4	.24
AUG								
25...	.47	72.4	122	7	5	53	5	.32

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12323770--WARM SPRINGS CREEK AT WARM SPRINGS, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (°C)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
18...	0910	39	8.4	369	3.0	180	54.6	10.8	4.9
APR									
02...	1415	46	8.5	358	5.5	170	51.3	10.4	4.8
28...	1425	57	8.5	308	6.5	150	45.1	8.65	4.4
MAY									
26...	1425	137	8.1	179	11.5	86	26.9	4.54	7.8
JUN									
01...	1510	389	8.0	155	10.0	72	22.5	3.85	11.6
16...	1225	154	8.2	185	11.5	85	25.9	5.05	5.2
JUL									
28...	1500	25	8.7	312	20.0	160	48.3	8.53	9.3
AUG									
25...	1355	36	8.5	292	16.0	140	43.6	8.10	5.8

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
18...	5	.06	E.03	2.5	7.5	E9	110	.32
APR								
02...	4	E.04	E.03	3.0	7.1	11	80	E.07
28...	4	E.03	.06	3.1	8.9	E8	110	E.05
MAY								
26...	17	E.03	.36	5.1	89.5	22	1,670	.12
JUN								
01...	20	.06	.24	11.1	66.6	28	1,010	.12
16...	6	E.03	.07	3.4	12.5	15	180	E.05
JUL								
28...	9	E.03	E.03	3.2	5.9	12	60	<.08
AUG								
25...	7	E.03	.04	2.9	6.9	9	80	E.08

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
18...	.79	210	255	2	4	69	5	.53
APR								
02...	.44	143	182	<1	3	58	5	.62
28...	.76	110	150	<1	4	71	6	.92
MAY								
26...	10.7	91.3	580	<1	38	68	94	35
JUN								
01...	5.58	41.2	189	2	24	70	56	59
16...	1.08	65.3	93	2	5	69	8	3.3
JUL								
28...	.27	52.8	80	<1	E2	74	2	.14
AUG								
25...	.40	36.8	95	<1	E2	80	3	.29

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12323800--CLARK FORK NEAR GALEN, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite (µS/cm)	Temperature, water (°C)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered (µg/L)
MAR 2003									
18...	1015	180	8.3	471	4.5	190	57.8	11.6	16.1
APR									
02...	1535	175	8.5	462	6.5	190	56.8	11.7	12.5
28...	1545	193	8.4	408	8.0	170	50.7	10.5	13.0
MAY									
26...	1515	352	8.5	243	14.5	100	30.5	6.51	27.0
JUN									
01...	1610	905	8.3	216	13.0	91	27.5	5.46	26.2
16...	1350	275	8.6	232	14.5	97	28.7	6.25	16.6
JUL									
28...	1620	42	8.6	430	21.5	200	60.9	12.3	17.1
AUG									
25...	1515	56	8.6	414	19.0	190	55.8	12.1	12.7

Date	Arsenic, unfiltered recoverable (µg/L)	Cadmium, filtered (µg/L)	Cadmium, unfiltered recoverable (µg/L)	Copper, filtered (µg/L)	Copper, unfiltered recoverable (µg/L)	Iron, filtered (µg/L)	Iron, unfiltered recoverable (µg/L)	Lead, filtered (µg/L)
MAR 2003								
18...	26	.25	.43	21.1	74.9	18	1,120	.46
APR								
02...	17	.05	.11	6.3	21.8	12	340	.12
28...	15	.05	.15	5.7	16.7	14	260	.09
MAY								
26...	36	E.03	.44	8.2	68.0	27	1,250	.23
JUN								
01...	37	.07	.30	11.1	56.8	31	950	.18
16...	19	E.04	.10	5.0	15.7	22	240	.09
JUL								
28...	17	.04	.06	4.0	9.1	10	110	<.08
AUG								
25...	17	E.03	.06	3.9	8.9	E5	140	E.05

Date	Lead, unfiltered recoverable (µg/L)	Manganese, filtered (µg/L)	Manganese, unfiltered recoverable (µg/L)	Zinc, filtered (µg/L)	Zinc, unfiltered recoverable (µg/L)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
18...	31.0	325	410	31	116	90	23	11
APR								
02...	4.38	105	183	6	28	74	11	5.2
28...	2.15	74.2	138	4	18	76	10	5.2
MAY								
26...	10.1	63.0	406	<1	46	80	62	59
JUN								
01...	6.94	52.4	227	5	41	55	52	127
16...	1.91	49.6	103	2	12	68	9	6.7
JUL								
28...	.78	53.2	97	2	6	85	3	.34
AUG								
25...	.65	36.3	82	2	5	78	3	.45

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12323850--LOST CREEK NEAR GALEN, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (^oC)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
18...	1050	48	8.4	643	4.5	320	92.0	20.8	19.5
APR									
02...	1605	59	8.5	861	7.0	420	117	32.3	41.8
28...	1610	18	8.6	627	8.5	300	88.2	20.3	11.7
MAY									
26...	1545	13	8.7	549	19.0	270	77.4	18.0	14.8
JUN									
03...	1250	15	8.6	579	13.5	290	84.3	19.0	15.5
16...	1435	4.4	8.6	625	23.0	280	78.8	21.2	10.5
JUL									
28...	1700	1.3	8.6	540	26.5	200	48.5	19.9	10.3
AUG									
25...	1540	5.0	8.5	638	22.5	290	79.7	22.0	13.2

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
18...	21	E.03	.06	2.9	13.0	E7	270	.10
APR								
02...	43	.05	.11	6.7	22.5	18	280	.33
28...	11	E.03	.05	2.5	5.8	E6	70	<.08
MAY								
26...	14	E.03	.04	3.5	6.8	E6	70	E.05
JUN								
03...	16	E.03	.04	3.4	7.3	E6	80	<.08
16...	10	E.02	E.03	3.0	4.4	E4	40	<.08
JUL								
28...	9	E.02	E.03	3.2	4.5	<8	20	<.08
AUG								
25...	16	E.02	E.02	2.6	4.5	<8	10	<.08

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
18...	1.23	19.5	30	1	7	65	16	2.1
APR								
02...	1.30	23.6	33	2	9	59	24	3.8
28...	.32	14.2	15	<1	3	66	5	.24
MAY								
26...	.30	8.5	13	<1	3	43	9	.32
JUN								
03...	.32	8.6	13	<1	3	46	9	.36
16...	.14	5.3	8	1	E2	18	8	.10
JUL								
28...	E.04	2.0	2	<1	E1	77	2	.01
AUG								
25...	E.04	1.9	3	<1	<2	51	16	.22

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12324200--CLARK FORK AT DEER LODGE, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (^oC)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
18...	1215	342	8.2	515	5.0	220	64.6	13.5	16.2
APR									
03...	0720	347	8.2	576	3.5	250	72.4	17.2	16.7
28...	1730	282	8.6	460	9.5	190	57.2	12.3	13.7
MAY									
26...	1725	471	8.1	278	16.5	120	34.7	7.26	19.5
JUN									
01...	1900	1,010	8.0	250	14.0	110	32.2	6.44	23.7
16...	1515	347	8.3	303	18.5	130	38.6	8.19	17.0
JUL									
29...	0730	40	8.0	495	15.5	210	63.8	12.8	17.8
AUG									
25...	1635	80	8.6	495	21.0	220	64.6	13.5	15.8

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
18...	27	.12	.41	14.0	95.8	12	1,420	.25
APR								
03...	25	.07	.33	9.9	66.1	18	1,040	.14
28...	17	.06	.18	7.6	31.1	E8	460	E.07
MAY								
26...	34	.06	.65	13.0	119	27	2,020	.24
JUN								
01...	53	.08	.88	18.7	241	44	2,910	.54
16...	21	.06	.20	9.6	38.3	24	490	.14
JUL								
29...	17	.06	.07	8.0	13.5	9	80	<.08
AUG								
25...	20	.04	.11	6.6	17.8	<8	150	E.06

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
18...	22.1	83.9	259	19	102	68	60	55
APR								
03...	10.2	51.2	204	9	67	57	55	52
28...	4.08	27.1	112	3	30	68	22	17
MAY								
26...	18.0	36.2	339	4	108	70	94	120
JUN								
01...	33.9	40.9	402	9	167	52	187	510
16...	4.88	26.2	100	6	32	64	24	22
JUL								
29...	.67	34.4	48	8	13	88	3	.32
AUG								
25...	1.46	17.1	73	3	13	69	14	3.0

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12324590--LITTLE BLACKFOOT RIVER NEAR GARRISON, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (^oC)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
AUG 2003									
27...	0815	25	8.0	347	14.5	170	49.3	11.9	5.7
SEP									
22...	1000	40	8.2	321	9.0	150	44.6	9.84	4.7

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
AUG 2003								
27...	5	<.04	<.04	.9	1.1	13	60	<.08
SEP								
22...	5	.04	<.04	.8	2.3	E7	50	<.08

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
AUG 2003								
27...	.06	20.4	28	1	<2	95	2	.14
SEP								
22...	.07	11.4	19	<1	E1	94	2	.22

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12324680--CLARK FORK AT GOLDCREEK, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (°C)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
15...	1210	1,340	8.1	345	3.0	140	39.9	8.67	12.3
APR									
03...	0900	718	8.4	447	4.0	190	56.7	12.9	10.4
29...	0750	870	8.2	308	5.0	130	39.7	8.66	7.4
MAY									
27...	1000	1,760	8.0	206	11.0	90	27.0	5.43	10.2
JUN									
03...	1105	1,820	8.1	239	10.5	100	30.9	6.22	13.3
16...	1645	747	8.7	306	19.5	140	40.1	8.72	12.1
JUL									
29...	0825	146	8.3	432	16.0	200	59.9	11.5	13.3
AUG									
26...	0740	146	8.2	492	15.5	220	65.3	13.8	11.7

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
15...	26	.14	.59	13.8	122	47	2,650	.35
APR								
03...	15	.06	.20	7.1	42.4	28	750	.14
29...	10	E.03	.14	4.3	21.3	28	640	.10
MAY								
27...	19	.04	.43	7.4	78.0	71	2,020	.26
JUN								
03...	24	.06	.50	11.1	98.7	38	1,630	.35
16...	13	.04	.11	7.0	20.8	14	300	E.06
JUL								
29...	12	E.03	.09	4.4	13.0	44	520	<.08
AUG								
26...	15	E.03	.08	4.2	11.2	E4	230	E.05

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
15...	20.2	35.2	348	11	122	66	129	467
APR								
03...	5.96	28.6	106	11	44	76	35	68
29...	3.24	14.0	84	3	24	69	32	75
MAY								
27...	13.1	11.2	234	2	83	64	123	584
JUN								
03...	13.8	19.2	223	6	91	60	93	457
16...	2.40	16.4	57	2	17	79	12	24
JUL								
29...	1.56	16.2	90	2	15	94	22	8.7
AUG								
26...	.97	13.8	78	2	10	89	13	5.1

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12331500--FLINT CREEK NEAR DRUMMOND, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (^oC)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
AUG 2003									
26...	0855	26	8.3	529	12.5	250	70.0	19.0	11.3
SEP									
22...	1110	46	8.5	484	9.5	230	62.3	17.7	8.5

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
AUG 2003								
26...	13	<.04	<.04	1.3	2.1	18	90	.09
SEP								
22...	10	E.02	E.02	1.1	2.1	9	80	E.06

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
AUG 2003								
26...	.65	89.9	120	1	3	50	10	.70
SEP								
22...	.75	50.7	75	1	3	94	3	.37

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12331800--CLARK FORK NEAR DRUMMOND, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (°C)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
15...	1330	2,290	7.9	309	3.0	110	32.2	7.52	12.8
APR									
03...	1025	1,020	8.4	437	5.5	190	54.7	12.8	9.3
29...	0925	1,180	8.3	331	7.0	140	41.8	9.73	7.9
MAY									
27...	1225	2,310	8.1	237	13.0	100	30.8	6.68	11.6
JUN									
03...	0940	2,540	8.1	258	11.0	110	33.8	7.31	14.4
17...	1020	969	8.3	370	17.5	160	46.6	11.1	12.1
JUL									
29...	1035	232	8.3	555	19.5	260	75.1	18.0	14.0
AUG									
26...	1055	238	8.3	589	17.0	280	77.9	19.7	11.4

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
15...	37	.14	1.17	19.6	215	88	5,770	.66
APR								
03...	14	.07	.22	7.0	42.1	17	780	.19
29...	12	.05	.20	4.9	28.6	18	750	.11
MAY								
27...	32	.05	.89	10.8	145	40	--	.39
JUN								
03...	27	.10	.54	12.6	105	39	2,130	.42
17...	14	.06	.16	7.1	21.5	10	350	E.06
JUL								
29...	13	E.03	.04	4.7	7.2	<8	40	<.08
AUG								
26...	14	E.03	.08	3.7	9.4	<8	130	<.08

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
15...	43.9	38.4	570	13	276	68	294	1,820
APR								
03...	6.86	27.5	118	7	50	62	46	127
29...	4.95	16.0	96	3	38	66	45	143
MAY								
27...	26.1	15.7	420	4	211	63	224	1,400
JUN								
03...	17.5	16.4	264	9	121	65	133	912
17...	2.89	19.7	70	5	25	78	17	44
JUL								
29...	.34	9.9	26	3	6	87	3	1.9
AUG								
26...	.98	10.4	79	3	12	58	18	12

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12334510--ROCK CREEK NEAR CLINTON, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (^oC)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
AUG 2003									
26...	1120	206	8.2	152	14.5	73	18.5	6.58	.7
SEP									
22...	1245	195	8.4	160	10.5	74	19.0	6.39	.7

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
AUG 2003								
26...	E1	<.04	<.04	.4	.8	10	40	<.08
SEP								
22...	<2	<.04	<.04	.3	E.6	E6	30	<.08

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
AUG 2003								
26...	<.06	2.0	5	<1	<2	80	2	1.1
SEP								
22...	E.03	1.7	4	<1	<2	82	1	.53

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12334550--CLARK FORK AT TURAH BRIDGE, NEAR BONNER, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (^oC)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
16...	0850	2,440	8.1	308	4.0	130	37.1	8.95	10.3
APR									
03...	1350	1,620	8.5	318	6.0	140	39.0	9.89	6.1
29...	1140	2,300	8.3	236	6.5	100	29.1	7.42	4.8
MAY									
27...	1615	5,780	8.0	139	12.0	54	14.9	3.97	5.6
*29...	1300	5,810	8.0	148	14.0	69	18.8	5.28	3.5
*30...	1345	6,820	7.8	141	13.5	60	17.4	4.07	7.0
*31...	1000	6,700	7.8	138	11.0	61	17.5	4.18	7.0
JUN									
*01...	1330	6,430	7.7	149	13.0	64	18.6	4.35	8.0
02...	0820	6,200	8.0	156	11.5	68	19.8	4.60	7.8
*02...	1530	5,950	7.8	159	13.0	68	19.5	4.66	8.1
17...	0840	2,320	8.2	226	15.0	96	26.6	7.15	5.8
JUL									
29...	1215	590	8.5	316	18.5	140	39.8	10.6	5.8
AUG									
26...	1300	476	8.6	360	17.5	160	42.7	12.3	5.6

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
15...	21	.07	.56	11.6	104	57	2,460	.33
APR								
03...	8	.04	.16	5.1	25.3	28	580	.16
29...	7	E.03	.12	3.8	17.6	29	530	.10
MAY								
27...	13	.04	.53	6.5	68.8	62	2,680	.31
*29...	7	E.03	.24	4.1	34.2	31	1,470	.22
*30...	14	.06	.46	9.2	73.1	54	2,720	.30
*31...	16	.05	.56	9.8	79.3	61	2,910	.33
JUN								
* 01...	15	.06	.45	11.3	73.7	51	2,380	.31
02...	15	.05	.38	9.0	64.0	58	1,840	.35
*02...	13	.06	.27	10.2	53.1	39	1,560	.28
17...	7	.04	.10	4.0	12.1	17	270	E.04
JUL								
29...	6	E.02	E.03	2.4	3.7	<8	150	<.08
AUG								
26...	7	<.04	E.03	2.4	4.3	<8	40	<.08

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12334550--CLARK FORK AT TURAH BRIDGE, NEAR BONNER, MONT.—Continued

Date	Lead, unfiltered recoverable (µg/L)	Manganese, filtered (µg/L)	Manganese, unfiltered recoverable (µg/L)	Zinc, filtered (µg/L)	Zinc, unfiltered recoverable (µg/L)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
15...	17.5	14.6	278	9	135	78	131	863
APR								
03...	4.02	10.1	69	3	35	77	30	131
29...	3.19	6.4	58	2	27	68	31	193
MAY								
27...	14.9	15.4	248	2	121	55	218	3,400
*29...	6.52	2.1	126	4	62	--	316	4,960
*30...	14.2	2.0	247	6	118	--	295	5,430
*31...	15.8	2.4	278	8	143	--	281	5,080
JUN								
*01...	14.0	2.3	231	6	115	--	222	3,850
02...	10.8	10.2	186	6	88	64	134	2,240
*02...	9.33	2.3	153	6	75	--	146	2,350
17...	1.54	12.8	39	4	16	66	16	100
JUL								
29...	.18	5.4	13	1	4	84	3	4.8
AUG								
26...	.21	4.1	16	2	4	90	3	3.9

*Supplemental samples collected by observer during high flow. Samples were collected by depth integration at a single vertical near midstream.

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12340000--BLACKFOOT RIVER NEAR BONNER, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (°C)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
AUG 2003									
26...	1440	512	8.6	268	18.0	140	33.8	13.0	1.4
SEP									
22...	1425	489	8.6	271	12.5	140	34.3	12.8	1.2

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
AUG 2003								
26...	E2	<.04	<.04	.5	E.6	E4	20	<.08
SEP								
22...	E1	<.04	<.04	.4	.6	<8	10	<.08

Date	Lead, unfiltered recoverable ($\mu g/L$)	Manganese, filtered ($\mu g/L$)	Manganese, unfiltered recoverable ($\mu g/L$)	Zinc, filtered ($\mu g/L$)	Zinc, unfiltered recoverable ($\mu g/L$)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
AUG 2003								
26...	<.06	1.4	4	<1	<2	79	1	1.4
SEP								
22...	<.06	1.1	3	3	<2	82	1	1.3

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12340500--CLARK FORK ABOVE MISSOULA, MONT.

Date	Time	Streamflow, instantaneous (ft^3/s)	pH, Onsite (standard units)	Specific conductance, onsite ($\mu S/cm$)	Temperature, water (^oC)	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered ($\mu g/L$)
MAR 2003									
15...	1540	5,140	7.9	233	4.0	93	25.9	6.78	9.0
APR									
04...	0800	3,290	8.3	271	5.0	120	32.2	9.15	3.6
29...	1350	6,150	8.3	193	7.0	89	23.9	7.07	2.3
MAY									
28...	0910	12,800	8.0	148	12.0	71	19.4	5.34	3.4
*29...	1215	13,500	7.9	140	14.0	61	17.6	4.25	6.2
*30...	1300	14,700	7.9	147	13.0	67	18.6	5.01	4.0
*31...	1100	15,100	7.9	145	11.0	67	18.6	5.06	4.2
JUN									
*01...	1230	14,700	7.8	151	11.5	69	19.1	5.11	4.8
02...	0945	13,500	8.1	156	11.5	74	20.7	5.54	4.6
*02...	1400	13,400	7.8	159	12.0	73	20.3	5.54	4.8
17...	0720	5,470	8.3	200	15.5	91	23.8	7.57	3.3
JUL									
29...	1335	1,280	8.6	278	21.0	130	34.6	10.9	4.0
AUG									
26...	1600	999	8.5	311	19.5	150	38.0	12.7	3.6

Date	Arsenic, unfiltered recoverable ($\mu g/L$)	Cadmium, filtered ($\mu g/L$)	Cadmium, unfiltered recoverable ($\mu g/L$)	Copper, filtered ($\mu g/L$)	Copper, unfiltered recoverable ($\mu g/L$)	Iron, filtered ($\mu g/L$)	Iron, unfiltered recoverable ($\mu g/L$)	Lead, filtered ($\mu g/L$)
MAR 2003								
15...	19	.08	.64	12.6	107	77	3,040	.34
APR								
04...	5	E.02	.11	3.4	18.6	47	490	.15
29...	3	E.02	.09	2.3	10.5	26	420	.08
MAY								
28...	8	E.02	.27	3.8	39.8	40	1,680	.17
*29...	13	.04	.40	7.6	68.0	49	2,430	.29
*30...	7	E.03	.20	4.9	35.4	32	1,610	.17
*31...	9	.04	.29	5.0	45.7	38	1,910	.23
JUN								
*01...	9	E.03	.29	6.2	46.1	34	1,740	.20
02...	9	E.03	.32	5.1	46.0	41	1,480	.22
*02...	9	.05	.22	5.7	36.9	26	1,320	.17
17...	4	E.02	.07	2.8	8.5	13	230	<.08
JUL								
29...	4	<.04	E.02	1.9	3.5	<8	70	<.08
AUG								
26...	4	<.04	E.03	2.0	4.3	E5	70	<.08

Table 4. Water-quality data for the upper Clark Fork basin, Montana, October 2002 through September 2003—Continued

12340500--CLARK FORK ABOVE MISSOULA, MONT. —Continued

Date	Lead, unfiltered recoverable (µg/L)	Manganese, filtered (µg/L)	Manganese, unfiltered recoverable (µg/L)	Zinc, filtered (µg/L)	Zinc, unfiltered recoverable (µg/L)	Sediment, suspended, percent finer than 0.062 mm	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
MAR 2003								
15...	17.8	21.2	314	8	155	85	169	2,350
APR								
04...	2.97	22.6	53	3	28	82	26	231
29...	1.78	13.2	42	1	16	85	29	482
MAY								
28...	7.50	13.2	143	1	77	75	137	4,730
*29...	12.8	3.1	218	4	105	--	137	4,990
*30...	6.87	1.6	136	3	68	--	169	6,710
*31...	9.14	2.0	157	8	85	--	174	7,090
JUN								
*01...	8.65	1.9	154	6	81	--	168	6,670
02...	7.93	14.2	137	4	79	68	123	4,480
*02...	6.72	1.7	119	4	64	--	122	4,410
17...	1.17	13.5	33	3	12	89	14	207
JUL								
29...	.32	15.9	28	1	4	82	5	17
AUG								
26...	.39	14.5	28	1	5	89	3	8.1

*Supplemental samples collected by observer during high flow. Samples were collected by depth integration at a single vertical near midstream.

Table 5. Daily streamflow and suspended-sediment data for Clark Fork at Deer Lodge, Montana, October 2002 through September 2003

[Abbreviations: ft^3/s, cubic feet per second; e, estimated; mg/L, milligrams per liter; ton/d, tons per day. Symbol: --, no data]

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
	OCTOBER			NOVEMBER			DECEMBER		
1	134	10	3.6	e110	19	5.6	199	20	11
2	141	18	6.9	e115	18	5.6	199	22	12
3	170	38	17	e125	17	5.7	199	26	14
4	173	37	17	e135	16	5.8	199	29	16
5	172	37	17	e160	15	6.5	202	29	16
6	168	37	17	e180	16	7.8	201	27	15
7	165	37	16	205	16	8.9	e170	25	11
8	159	37	16	218	17	10	e160	24	10
9	161	37	16	220	18	11	e160	23	9.9
10	160	37	16	220	18	11	e170	24	11
11	164	37	16	201	19	10	e180	26	13
12	160	35	15	198	21	11	190	27	14
13	155	32	13	213	24	14	196	25	13
14	152	30	12	213	25	14	210	23	13
15	148	29	12	205	24	13	236	21	13
16	152	29	12	198	21	11	218	20	12
17	154	27	11	197	18	9.6	204	19	10
18	152	25	10	193	15	7.8	173	21	9.8
19	156	22	9.3	189	15	7.7	e160	25	11
20	156	20	8.4	191	16	8.3	e160	27	12
21	161	20	8.7	191	18	9.3	177	26	12
22	159	19	8.2	191	18	9.3	181	23	11
23	153	18	7.4	205	19	11	179	20	9.7
24	152	17	7.0	e170	19	8.7	e150	18	7.3
25	158	16	6.8	e150	19	7.7	e130	17	6.0
26	166	16	7.2	e160	20	8.6	e140	20	7.6
27	168	16	7.3	e170	20	9.2	e150	27	11
28	172	16	7.4	e180	20	9.7	189	30	15
29	169	16	7.3	e190	20	10	192	29	15
30	139	16	6.0	203	20	11	178	28	13
31	e120	18	5.8	--	--	--	190	27	14
TOTAL	4,869	--	340.3	5,496	--	278.8	5,642	--	368.3
MEAN	157	26	11	183	19	9.3	182	24	12
MAX	173	38	17	220	25	14	236	30	16
MIN	120	10	3.6	110	15	5.6	130	17	6.0

Table 5. Daily streamflow and suspended-sediment data for Clark Fork at Deer Lodge, Montana, October 2002 through September 2003—Continued

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
		JANUARY			FEBRUARY			MARCH	
1	186	26	13	416	50	56	165	55	25
2	187	24	12	353	45	43	176	55	26
3	199	23	12	287	40	31	177	31	15
4	207	21	12	269	37	27	176	34	16
5	219	20	12	250	32	22	189	39	20
6	199	18	9.7	229	29	18	186	38	19
7	180	16	7.8	201	27	15	186	33	17
8	e170	15	6.9	223	28	17	188	34	17
9	e150	13	5.3	220	28	17	189	37	19
10	e140	12	4.5	214	28	16	242	59	39
11	e130	13	4.6	200	32	17	417	170	191
12	e140	16	6.0	197	35	19	601	252	409
13	185	18	9.0	191	29	15	661	197	352
14	186	19	9.5	196	23	12	634	127	217
15	188	18	9.1	191	23	12	589	163	259
16	172	16	7.4	191	26	13	560	104	157
17	e160	15	6.5	192	29	15	481	45	58
18	e170	15	6.9	189	31	16	344	51	47
19	e180	16	7.8	178	32	15	283	43	33
20	193	16	8.3	179	32	15	245	47	31
21	e150	17	6.9	179	32	15	237	33	21
22	e130	18	6.3	196	31	16	233	32	20
23	e160	28	12	e140	31	12	237	28	18
24	227	38	23	e100	38	10	228	27	17
25	202	41	22	e120	48	16	214	26	15
26	249	66	44	e140	57	22	218	24	14
27	520	300	421	e160	52	22	217	19	11
28	315	87	74	e170	52	24	217	17	10
29	266	51	37	--	--	--	213	22	13
30	262	44	31	--	--	--	208	24	13
31	311	42	35	--	--	--	210	22	12
TOTAL	6,333	--	882.5	5,771	--	548	9,121	--	2,131
MEAN	204	35	28	206	35	20	294	61	69
MAX	520	300	421	416	57	56	661	252	409
MIN	130	12	4.5	100	23	10	165	17	10

Table 5. Daily streamflow and suspended-sediment data for Clark Fork at Deer Lodge, Montana, October 2002 through September 2003—Continued

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
		APRIL			MAY			JUNE	
1	283	--	--	323	--	--	1,020	--	--
2	330	--	--	322	--	--	968	--	--
3	343	--	--	312	--	--	806	--	--
4	312	--	--	361	--	--	650	--	--
5	280	--	--	452	--	--	555	--	--
6	263	--	--	424	--	--	471	--	--
7	248	--	--	400	--	--	424	--	--
8	240	--	--	356	--	--	374	--	--
9	234	--	--	324	--	--	370	--	--
10	218	--	--	301	--	--	381	--	--
11	219	--	--	291	--	--	449	--	--
12	228	--	--	286	--	--	426	--	--
13	234	--	--	277	--	--	367	--	--
14	253	--	--	267	--	--	390	--	--
15	256	--	--	268	--	--	364	--	--
16	242	--	--	270	--	--	339	--	--
17	232	--	--	275	--	--	326	--	--
18	232	--	--	274	--	--	318	--	--
19	223	--	--	271	--	--	309	--	--
20	202	--	--	247	--	--	350	--	--
21	195	--	--	234	--	--	413	--	--
22	197	--	--	215	--	--	374	--	--
23	237	--	--	201	--	--	337	--	--
24	300	--	--	234	--	--	311	--	--
25	312	--	--	303	--	--	285	--	--
26	338	--	--	428	--	--	258	--	--
27	313	--	--	526	--	--	241	--	--
28	285	--	--	607	--	--	230	--	--
29	289	--	--	722	--	--	231	--	--
30	335	--	--	818	--	--	219	--	--
31	--	--	--	961	--	--	--	--	--
TOTAL	7,873	--	--	11,550	--	--	12,556	--	--
MEAN	262	--	--	373	--	--	419	--	--
MAX	343	--	--	961	--	--	1,020	--	--
MIN	195	--	--	201	--	--	219	--	--

Table 5. Daily streamflow and suspended-sediment data for Clark Fork at Deer Lodge, Montana, October 2002 through September 2003—Continued

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
	JULY			AUGUST			SEPTEMBER		
1	198	--	--	38	3	.31	92	10	2.5
2	190	--	--	37	4	.40	89	10	2.4
3	182	--	--	37	4	.40	86	10	2.3
4	169	--	--	40	7	.76	88	10	2.4
5	161	--	--	45	9	1.1	87	10	2.3
6	154	--	--	45	10	1.2	88	10	2.4
7	148	--	--	52	10	1.4	92	10	2.5
8	137	--	--	53	11	1.6	93	8	2.0
9	138	--	--	51	11	1.5	87	8	1.9
10	120	--	--	46	10	1.2	88	8	1.9
11	104	--	--	43	9	1.0	88	8	1.9
12	92	--	--	45	9	1.1	87	9	2.1
13	86	--	--	49	10	1.3	91	9	2.2
14	84	--	--	49	12	1.6	94	9	2.3
15	75	--	--	49	13	1.7	94	9	2.3
16	65	--	--	49	14	1.9	93	8	2.0
17	59	--	--	45	14	1.7	106	10	2.9
18	55	--	--	57	16	2.5	114	16	4.9
19	54	--	--	64	15	2.6	109	19	5.6
20	56	--	--	62	11	1.8	104	20	5.6
21	53	--	--	63	11	1.9	109	19	5.6
22	48	--	--	63	11	1.9	107	20	5.8
23	44	--	--	85	11	2.5	111	20	6.0
24	42	--	--	81	12	2.6	113	20	6.1
25	40	--	--	81	14	3.1	137	20	7.4
26	42	--	--	74	13	2.6	130	21	7.4
27	45	--	--	76	10	2.1	117	21	6.6
28	46	--	--	88	10	2.4	114	22	6.8
29	40	--	--	85	10	2.3	112	22	6.7
30	38	--	--	94	10	2.5	111	23	6.9
31	36	--	--	95	10	2.6	--	--	--
TOTAL	2,801	--	--	1,841	--	53.57	3,031	--	119.7
MEAN	90.4	--	--	59.4	10	1.7	101	14	4.0
MAX	198	--	--	95	16	3.1	137	23	7.4
MIN	36	--	--	37	3	.31	86	8	1.9

TOTAL FOR WATER YEAR 2003:

STREAMFLOW--76,884 ft^3/s
SEDIMENT LOAD--4,722.17 tons (partial year)

Table 6. Daily streamflow and suspended-sediment data for Clark Fork at Turah Bridge, near Bonner, Montana, October 2002 through September 2003

[Abbreviations: ft^3/s, cubic feet per second; e, estimated; mg/L, milligrams per liter; ton/d, tons per day. Symbol: --, no data]

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
	OCTOBER			NOVEMBER			DECEMBER		
1	642	2	3.5	e600	7	11	692	7	13
2	639	3	5.2	e600	7	11	691	7	13
3	641	4	6.9	e600	8	13	736	7	14
4	661	4	7.1	649	8	14	722	7	14
5	664	5	9.0	677	8	15	714	7	13
6	669	6	11	702	9	17	705	7	13
7	683	6	11	741	10	20	671	6	11
8	674	6	11	768	10	21	e600	6	9.7
9	671	6	11	775	10	21	593	7	11
10	698	6	11	764	10	21	582	8	13
11	703	6	11	765	9	19	627	8	14
12	717	6	12	749	9	18	654	8	14
13	712	6	12	765	9	19	657	8	14
14	715	6	12	779	9	19	720	9	17
15	721	6	12	770	8	17	704	9	17
16	721	7	14	756	8	16	700	8	15
17	723	7	14	754	8	16	696	5	9.4
18	725	7	14	746	8	16	638	3	5.2
19	715	7	14	737	7	14	e550	2	3.0
20	708	6	11	736	7	14	541	3	4.4
21	702	6	11	742	7	14	605	4	6.5
22	699	6	11	748	7	14	614	6	9.9
23	710	6	12	776	8	17	607	6	9.8
24	715	6	12	e700	9	17	593	5	8.0
25	708	6	11	e600	9	15	535	4	5.8
26	690	6	11	624	9	15	494	4	5.3
27	707	6	11	658	8	14	558	6	9.0
28	729	6	12	678	7	13	651	9	16
29	e750	7	14	703	7	13	657	9	16
30	e700	7	13	722	7	14	592	8	13
31	e650	7	12	--	--	--	601	6	9.7
TOTAL	21,562	--	342.7	21,384	--	478	19,700	--	346.7
MEAN	696	6	11	713	8	16	635	6	11
MAX	750	7	14	779	10	21	736	9	17
MIN	639	2	3.5	600	7	11	494	2	3.0

Table 6. Daily streamflow and suspended-sediment data for Clark Fork at Turah Bridge, near Bonner, Montana, October 2002 through September 2003—Continued

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
		JANUARY			FEBRUARY			MARCH	
1	640	6	10	2,150	244	1,420	643	9	16
2	599	6	9.7	1,820	109	536	648	8	14
3	651	5	8.8	1,240	39	131	e650	6	11
4	651	5	8.8	1,040	21	59	e650	8	14
5	663	5	9.0	943	17	43	e650	5	8.8
6	636	5	8.6	e850	15	34	650	5	8.8
7	573	5	7.7	e750	14	28	676	6	11
8	e550	4	5.9	766	12	25	e650	4	7.0
9	537	4	5.8	804	11	24	e700	5	9.5
10	e500	4	5.4	792	11	24	749	10	20
11	e450	4	4.9	758	11	23	850	16	37
12	e500	3	4.0	713	11	21	1,150	75	233
13	609	11	18	686	10	19	2,600	380	2,670
14	711	16	31	723	10	20	4,620	790	9,850
15	662	9	16	738	10	20	3,400	323	2,970
16	609	5	8.2	718	12	23	2,410	141	917
17	e550	4	5.9	722	14	27	2,280	112	689
18	490	4	5.3	708	11	21	1,780	64	308
19	502	5	6.8	691	8	15	1,510	41	167
20	585	5	7.9	679	7	13	1,360	31	114
21	e550	5	7.4	687	7	13	1,320	25	89
22	e450	6	7.3	727	7	14	1,280	23	79
23	e400	5	5.4	e650	7	12	1,410	34	129
24	e500	5	6.8	e400	7	7.6	1,430	42	162
25	585	7	11	e350	7	6.6	1,270	19	65
26	680	10	18	e450	7	8.5	1,220	16	53
27	1,530	186	768	e500	6	8.1	1,180	15	48
28	1,840	230	1,140	578	7	11	1,120	14	42
29	1,080	85	248	--	--	--	1,090	14	41
30	904	35	85	--	--	--	1,070	15	43
31	1,070	72	208	--	--	--	1,200	18	58
TOTAL	21,257	--	2,692.6	22,633	--	2,606.8	42,216	--	18,884.1
MEAN	686	25	87	808	23	93	1,362	73	609
MAX	1,840	230	1,140	2,150	244	1,420	4,620	790	9,850
MIN	400	3	4.0	350	6	6.6	643	4	7.0

Table 6. Daily streamflow and suspended-sediment data for Clark Fork at Turah Bridge, near Bonner, Montana, October 2002 through September 2003—Continued

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
		APRIL			MAY			JUNE	
1	1,520	--	--	2,400	--	--	6,430	227	3,940
2	1,650	--	--	2,410	--	--	5,950	141	2,270
3	1,600	--	--	2,420	--	--	5,210	--	--
4	1,510	--	--	2,520	--	--	4,590	--	--
5	1,410	--	--	2,930	--	--	3,960	--	--
6	1,360	--	--	2,940	--	--	3,560	--	--
7	1,310	--	--	2,760	--	--	3,270	--	--
8	1,250	--	--	2,670	--	--	3,080	--	--
9	1,250	--	--	2,560	--	--	2,980	--	--
10	1,360	--	--	2,430	--	--	2,980	--	--
11	1,530	--	--	2,300	--	--	3,200	--	--
12	1,720	--	--	2,270	--	--	2,990	--	--
13	1,940	--	--	2,300	--	--	2,810	--	--
14	2,180	--	--	2,280	--	--	2,700	--	--
15	2,220	--	--	2,350	--	--	2,610	--	--
16	2,110	--	--	2,610	--	--	2,500	--	--
17	1,950	--	--	2,770	--	--	2,370	--	--
18	1,870	--	--	2,680	--	--	2,240	--	--
19	1,810	--	--	2,590	--	--	2,120	--	--
20	1,720	--	--	2,400	--	--	2,190	--	--
21	1,700	--	--	2,210	--	--	2,450	--	--
22	1,760	--	--	2,130	--	--	2,360	--	--
23	1,990	--	--	2,240	--	--	2,160	--	--
24	2,390	--	--	2,710	--	--	1,980	--	--
25	2,730	--	--	3,790	--	--	1,850	--	--
26	2,970	--	--	5,200	--	--	1,720	--	--
27	2,730	--	--	5,830	205	3,230	1,600	--	--
28	2,510	--	--	5,680	272	4,170	1,490	--	--
29	2,340	--	--	5,910	311	4,960	1,430	--	--
30	2,370	--	--	6,590	300	5,340	1,360	--	--
31	--	--	--	6,790	276	5,060	--	--	--
TOTAL	56,760	--	--	99,670	--	--	86,140	--	--
MEAN	1,892	--	--	3,215	--	--	2,871	--	--
MAX	2,970	--	--	6,790	--	--	6,430	--	--
MIN	1,250	--	--	2,130	--	--	1,360	--	--

Table 6. Daily streamflow and suspended-sediment data for Clark Fork at Turah Bridge, near Bonner, Montana, October 2002 through September 2003—Continued

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
	JULY			AUGUST			SEPTEMBER		
1	1,280	--	--	501	4	5.4	479	14	18
2	1,200	--	--	487	4	5.3	468	11	14
3	1,160	--	--	484	4	5.2	452	7	8.5
4	1,130	--	--	499	4	5.4	448	4	4.8
5	1,080	--	--	498	4	5.4	443	4	4.8
6	1,040	--	--	488	4	5.3	448	3	3.6
7	987	--	--	501	4	5.4	454	5	6.1
8	985	--	--	496	4	5.4	462	6	7.5
9	1,100	--	--	509	3	4.1	477	6	7.7
10	1,030	--	--	495	3	4.0	471	5	6.4
11	963	--	--	483	3	3.9	463	4	5.0
12	911	--	--	466	3	3.8	503	6	8.1
13	903	--	--	480	3	3.9	514	5	6.9
14	926	--	--	463	3	3.8	506	5	6.8
15	927	--	--	432	3	3.5	503	6	8.1
16	892	--	--	439	3	3.6	510	6	8.3
17	852	--	--	441	3	3.6	523	6	8.5
18	754	--	--	448	3	3.6	545	6	8.8
19	746	--	--	458	3	3.7	553	7	10
20	734	--	--	480	3	3.9	550	7	10
21	688	--	--	460	3	3.7	538	7	10
22	674	--	--	453	3	3.7	534	7	10
23	657	--	--	495	4	5.3	539	7	10
24	641	--	--	519	5	7.0	527	7	10
25	655	--	--	502	4	5.4	522	6	8.5
26	661	--	--	475	3	3.8	518	6	8.4
27	647	--	--	475	3	3.8	508	6	8.2
28	637	--	--	480	4	5.2	504	6	8.2
29	597	--	--	472	6	7.6	505	6	8.2
30	561	--	--	470	8	10	507	6	8.2
31	532	4	5.7	468	11	14	--	--	--
TOTAL	26,550	--	--	14,817	--	157.7	14,974	--	251.6
MEAN	856	--	--	478	4	5.1	499	6	8.4
MAX	1,280	--	--	519	11	14	553	14	18
MIN	532	--	--	432	3	3.5	443	3	3.6

TOTAL FOR WATER YEAR 2003:

STREAMFLOW--447,663 ft^3/s
SEDIMENT LOAD--54,735.9 tons (partial year)

Table 7. Daily streamflow and suspended-sediment data for Clark Fork above Missoula, Montana, October 2002 through September 2003

[Abbreviations: ft^3/s, cubic feet per second; e, estimated; mg/L, milligrams per liter; ton/d, tons per day. Symbol: --, no data]

Day	OCTOBER			NOVEMBER			DECEMBER		
	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
1	1,180	8	25	942	4	10	1,110	4	12
2	1,130	6	18	1,040	4	11	1,100	4	12
3	1,130	6	18	1,160	4	13	1,100	10	30
4	1,150	6	19	1,150	4	12	1,100	5	15
5	1,160	7	22	1,200	4	13	1,070	8	23
6	1,150	8	25	1,190	4	13	1,120	6	18
7	1,170	8	25	1,190	5	16	1,090	4	12
8	1,160	7	22	1,260	8	27	1,010	4	11
9	1,150	7	22	1,270	10	34	953	4	10
10	1,160	7	22	1,260	9	31	927	3	7.5
11	1,160	7	22	1,230	8	27	1,010	3	8.2
12	1,180	6	19	1,210	7	23	1,090	3	8.8
13	1,180	6	19	1,210	6	20	1,090	4	12
14	1,190	5	16	1,230	6	20	1,140	9	28
15	1,180	5	16	1,220	6	20	1,090	8	24
16	1,180	6	19	1,190	5	16	1,120	5	15
17	1,170	6	19	1,170	6	19	1,100	4	12
18	1,180	6	19	1,170	7	22	1,060	3	8.6
19	1,180	6	19	1,170	8	25	916	2	4.9
20	1,160	7	22	1,160	10	31	862	2	4.7
21	1,160	7	22	1,180	9	29	e900	2	4.9
22	1,150	6	19	1,190	8	26	1,020	3	8.3
23	1,140	6	18	1,230	7	23	1,040	3	8.4
24	1,170	5	16	1,250	6	20	999	3	8.1
25	1,110	5	15	1,090	5	15	948	3	7.7
26	1,130	4	12	1,050	5	14	913	4	9.9
27	1,140	4	12	1,090	5	15	969	3	7.8
28	1,160	5	16	1,080	4	12	1,090	3	8.8
29	1,190	5	16	1,090	4	12	1,110	3	9.0
30	1,130	5	15	1,140	4	12	1,030	3	8.3
31	986	4	11	--	--	--	972	3	7.9
TOTAL	35,766	--	580	35,012	--	581	32,049	--	365.8
MEAN	1,154	6	19	1,167	6	19	1,034	4	12
MAX	1,190	8	25	1,270	10	34	1,140	10	30
MIN	986	4	11	942	4	10	862	2	4.7

Table 7. Daily streamflow and suspended-sediment data for Clark Fork above Missoula, Montana October 2002 through September 2003—Continued

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
		JANUARY			FEBRUARY			MARCH	
1	1,050	3	8.5	3,130	161	1,360	1,130	3	9.2
2	1,020	4	11	3,090	88	734	1,130	3	9.2
3	1,060	3	8.6	2,200	26	154	1,100	4	12
4	1,080	3	8.7	1,760	16	76	1,060	4	11
5	1,070	3	8.7	1,580	11	47	1,050	3	8.5
6	1,060	3	8.6	1,430	9	35	1,080	5	15
7	995	4	11	1,290	7	24	1,110	6	18
8	902	5	12	1,290	7	24	1,050	3	8.5
9	e800	4	8.6	1,310	7	25	1,000	3	8.1
10	e700	4	7.6	1,320	6	21	1,160	7	22
11	e750	3	6.1	1,200	5	16	1,390	9	34
12	877	4	9.5	1,160	5	16	1,680	20	91
13	1,070	5	14	1,130	5	15	3,430	188	1,740
14	1,190	5	16	1,160	6	19	5,740	372	5,770
15	1,110	4	12	1,190	7	22	5,170	160	2,230
16	1,040	3	8.4	1,160	8	25	3,900	82	863
17	859	2	4.6	1,170	9	28	3,940	63	670
18	797	3	6.5	1,160	9	28	3,180	53	455
19	835	3	6.8	1,130	10	31	2,620	40	283
20	954	4	10	1,120	8	24	2,370	22	141
21	1,020	4	11	1,120	7	21	2,300	20	124
22	843	5	11	1,180	6	19	2,280	20	123
23	737	68	135	1,090	5	15	2,580	23	160
24	772	8	17	769	4	8.3	2,730	27	199
25	1,020	11	30	677	3	5.5	2,430	19	125
26	1,180	15	48	846	3	6.9	2,310	16	100
27	1,820	66	324	946	4	10	2,230	15	90
28	2,550	170	1,170	1,050	5	14	2,110	14	80
29	1,530	47	194	--	--	--	2,000	14	76
30	1,420	19	73	--	--	--	2,000	15	81
31	1,610	20	87	--	--	--	2,200	16	95
TOTAL	33,721	--	2,287.2	37,658	--	2,823.7	69,460	--	13,651.5
MEAN	1,088	16	74	1,345	16	101	2,241	40	440
MAX	2,550	170	1,170	3,130	161	1,360	5,740	372	5,770
MIN	700	2	4.6	677	3	5.5	1,000	3	8.1

Table 7. Daily streamflow and suspended-sediment data for Clark Fork above Missoula, Montana, October 2002 through September 2003—Continued

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
		APRIL			MAY			JUNE	
1	2,980	--	--	5,980	--	--	14,900	169	6,800
2	3,470	--	--	5,880	--	--	13,500	124	4,520
3	3,420	--	--	5,890	--	--	11,900	--	--
4	3,200	--	--	5,990	--	--	10,400	--	--
5	3,040	--	--	6,620	--	--	9,160	--	--
6	2,830	--	--	6,670	--	--	8,200	--	--
7	2,740	--	--	6,370	--	--	7,570	--	--
8	2,610	--	--	6,040	--	--	7,090	--	--
9	2,610	--	--	5,700	--	--	6,910	--	--
10	2,850	--	--	e5,400	--	--	6,980	--	--
11	3,410	--	--	e5,200	--	--	7,130	--	--
12	4,040	--	--	e5,000	--	--	6,950	--	--
13	4,830	--	--	5,090	--	--	6,350	--	--
14	5,660	--	--	5,110	--	--	6,100	--	--
15	6,060	--	--	5,410	--	--	5,950	--	--
16	5,870	--	--	6,110	--	--	5,680	--	--
17	5,540	--	--	6,430	--	--	5,400	--	--
18	5,270	--	--	6,190	--	--	5,140	--	--
19	4,950	--	--	5,880	--	--	4,980	--	--
20	4,750	--	--	5,490	--	--	5,080	--	--
21	4,760	--	--	5,180	--	--	5,420	--	--
22	5,040	--	--	5,040	--	--	5,140	--	--
23	5,710	--	--	5,300	--	--	4,720	--	--
24	6,670	--	--	6,220	--	--	4,340	--	--
25	7,600	--	--	8,020	--	--	4,070	--	--
26	8,080	--	--	10,800	--	--	3,870	--	--
27	7,660	--	--	12,700	--	--	3,560	--	--
28	6,990	--	--	12,900	136	4,740	3,390	--	--
29	6,360	--	--	13,500	139	5,070	3,200	--	--
30	6,150	--	--	14,500	164	6,420	3,060	--	--
31	--	--	--	15,100	178	7,260	--	--	--
TOTAL	145,150	--	--	225,710	--	--	196,140	--	--
MEAN	4,838	--	--	7,281	--	--	6,538	--	--
MAX	8,080	--	--	15,100	--	--	14,900	--	--
MIN	2,610	--	--	5,000	--	--	3,060	--	--

Table 7. Daily streamflow and suspended-sediment data for Clark Fork above Missoula, Montana, October 2002 through September 2003—Continued

Day	Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment		Mean streamflow (ft^3/s)	Suspended sediment	
		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)		Mean concentration (mg/L)	Discharge (ton/d)
		JULY			AUGUST			SEPTEMBER	
1	2,860	--	--	1,090	5	15	984	5	13
2	2,760	--	--	1,090	5	15	979	5	13
3	2,630	--	--	1,080	5	15	960	5	13
4	2,550	--	--	1,070	4	12	941	5	13
5	2,500	--	--	1,090	4	12	933	5	13
6	2,500	--	--	1,090	4	12	927	5	13
7	2,350	--	--	1,110	4	12	927	5	13
8	2,260	--	--	1,110	6	18	950	6	15
9	2,410	--	--	1,210	8	26	962	8	21
10	2,320	--	--	1,190	10	32	972	8	21
11	2,220	--	--	1,120	11	33	964	7	18
12	2,080	--	--	1,090	11	32	1,010	6	16
13	2,000	--	--	1,070	10	29	1,090	6	18
14	2,010	--	--	1,050	9	26	1,080	6	17
15	1,860	--	--	995	8	21	1,050	5	14
16	1,760	--	--	914	7	17	1,050	5	14
17	1,730	--	--	905	7	17	1,070	5	14
18	1,620	--	--	933	7	18	1,090	5	15
19	1,590	--	--	1,010	7	19	1,100	5	15
20	1,580	--	--	995	8	21	1,080	5	15
21	1,420	--	--	974	7	18	1,050	5	14
22	1,460	--	--	963	6	16	1,040	5	14
23	1,370	--	--	1,000	6	16	1,040	5	14
24	1,380	--	--	1,060	5	14	1,030	7	19
25	1,350	--	--	1,050	4	11	1,020	8	22
26	1,360	--	--	1,010	3	8.2	1,040	8	22
27	1,320	--	--	990	3	8.0	1,020	8	22
28	1,290	--	--	994	5	13	999	8	22
29	1,260	5	17	1,000	5	14	996	7	19
30	1,180	5	16	986	5	13	989	7	19
31	1,140	5	15	972	5	13	--	--	--
TOTAL	58,120	--	--	32,211	--	546.2	30,343	--	491
MEAN	1,875	--	--	1,039	6	18	1,011	6	16
MAX	2,860	--	--	1,210	11	33	1,100	8	22
MIN	1,140	--	--	905	3	8.0	927	5	13

TOTAL FOR WATER YEAR 2003:

STREAMFLOW--931,340 ft^3/s
SEDIMENT LOAD--56,184.4 tons (partial year)

Table 8. Chemical and suspended-sediment analyses of field replicates for water samples, upper Clark Fork basin, Montana

[The terms "filtered" and "unfiltered recoverable" replace the former terms "dissolved" and "total recoverable," respectively. Abbreviations: E, estimated; µg/L, micrograms per liter; mg/L, milligrams per liter; mm, millimeter. Symbol: <, less than analytical detection limit]

Station number	Station name	Date	Time	Hardness, filtered (mg/L as $CaCO_3$)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered (µg/L)	Arsenic, unfiltered recoverable (µg/L)
12324200	Clark Fork at Deer Lodge	03-18-03	1215	220	64.6	13.5	16.2	27
	Clark Fork at Deer Lodge	03-18-03	1220	220	64.9	13.8	16.3	27
12323230	Blacktail Creek at Harrison Avenue, at Butte	04-02-03	0850	77	21.4	5.66	4.4	6
	Blacktail Creek at Harrison Avenue, at Butte	04-02-03	0855	78	21.6	5.72	4.3	6
12323750	Silver Bow Creek at Warm Springs	04-02-03	1435	200	58.6	12.3	15.8	19
	Silver Bow Creek at Warm Springs	04-02-03	1440	200	59.2	12.3	16.1	20
12334550	Clark Fork at Turah Bridge, near Bonner	04-29-03	1140	100	29.1	7.42	4.8	7
	Clark Fork at Turah Bridge, near Bonner	04-29-03	1145	100	29.1	7.40	4.9	7
12340500	Clark Fork above Missoula	05-28-03	0910	71	19.4	5.34	3.4	8
	Clark Fork above Missoula	05-28-03	0915	72	19.9	5.47	3.4	8
12323600	Silver Bow Creek at Opportunity	06-03-03	1430	130	40.5	7.25	9.5	14
	Silver Bow Creek at Opportunity	06-03-03	1435	130	40.6	7.27	9.9	13
12331800	Clark Fork near Drummond	08-26-03	1055	280	77.9	19.7	11.4	14
	Clark Fork near Drummond	08-26-03	1100	280	79.7	20.1	11.6	14

Station number	Date	Cadmium, filtered (µg/L)	Cadmium, unfiltered recoverable (µg/L)	Copper, filtered (µg/L)	Copper, unfiltered recoverable (µg/L)	Iron, filtered (µg/L)	Iron, unfiltered recoverable (µg/L)	Lead, filtered (µg/L)
12324200	03-18-03	0.12	0.41	14.0	95.8	12	1,420	0.25
	03-18-03	.12	.42	14.2	89.6	13	1,370	.25
12323230	04-02-03	.10	.11	6.8	16.9	312	1,450	.62
	04-02-03	.06	.10	6.9	16.5	314	1,430	.56
12323750	04-02-03	.04	.11	7.0	18.4	15	340	.14
	04-02-03	.04	.12	7.1	18.4	16	350	.15
12334550	04-29-03	E.03	.12	3.8	17.6	29	530	.10
	04-29-03	E.03	.13	3.7	17.7	26	510	.10
12340500	05-28-03	E.02	.27	3.8	39.8	40	1,680	.17
	05-28-03	E.02	.29	3.9	40.6	38	1,720	.18
12323600	06-03-03	.29	.58	25.4	60.6	38	620	.27
	06-03-03	.30	.57	25.8	60.6	40	610	.28
12331800	08-26-03	E.03	.08	3.7	9.4	<8	130	<.08
	08-26-03	E.02	.07	3.8	9.1	<8	130	E.05

Table 8. Chemical and suspended-sediment analyses of field replicates for water samples, upper Clark Fork basin, Montana—Continued

Station number	Date	Lead, unfiltered recoverable (µg/L)	Manganese, filtered (µg/L)	Manganese, unfiltered recoverable (µg/L)	Zinc, filtered (µg/L)	Zinc, unfiltered recoverable (µg/L)	Sediment, suspended, diameter, percent finer than 0.062 mm	Sediment, suspended (mg/L)
12324200	03-18-03	22.1	83.9	259	19	102	68	60
	03-18-03	20.9	87.0	253	20	97	65	64
12323230	04-02-03	4.86	39.7	72	8	27	82	31
	04-02-03	4.76	39.9	71	7	26	86	35
12323750	04-02-03	5.13	122	172	7	32	92	7
	04-02-03	5.05	122	151	7	32	89	8
12334550	04-29-03	3.19	6.4	58	2	27	68	31
	04-29-03	2.97	6.2	58	2	26	67	29
12340500	05-28-03	7.50	13.2	143	1	77	75	137
	05-28-03	7.45	12.9	146	1	74	75	135
12323600	06-03-03	10.2	172	211	40	119	84	17
	06-03-03	10.3	177	211	40	119	83	17
12331800	08-26-03	.98	10.4	79	3	12	58	18
	08-26-03	.93	10.3	77	3	12	51	23

Table 9. Precision of chemical and suspended-sediment analyses of field replicates for water samples, upper Clark Fork basin, Montana

[The terms "filtered" and "unfiltered recoverable" replace the former terms "dissolved" and "total recoverable," respectively. Abbreviations: µg/L, micrograms per liter; mg/L, milligrams per liter; mm, millimeter]

Constituent and reporting unit	Number of replicate pairs	Standard deviation, in listed units	Relative standard deviation, in percent
Calcium, filtered, mg/L	7	0.53	1.2
Magnesium, filtered, mg/L	7	.14	1.4
Arsenic, unfiltered recoverable, µg/L	7	.38	2.8
Arsenic, filtered, µg/L	7	.15	1.6
Cadmium, unfiltered recoverable, µg/L	7	.01	3.5
Cadmium, filtered, µg/L	7	.01	13
Copper, unfiltered recoverable, µg/L	7	1.7	4.6
Copper, filtered, µg/L	7	.13	1.4
Iron, unfiltered recoverable, µg/L	7	19	2.2
Iron, filtered, µg/L	7	1.3	2.0
Lead, unfiltered recoverable, µg/L	7	.33	4.3
Lead, filtered, µg/L	7	.02	7.5
Manganese, unfiltered recoverable, µg/L	7	5.9	4.2
Manganese, filtered, µg/L	7	1.6	2.4
Zinc, unfiltered recoverable, µg/L	7	1.6	2.9
Zinc, filtered, µg/L	7	.38	3.3
Sediment, suspended, mg/L	7	2.2	5.0
Sediment, suspended, percent finer than 0.062 mm	7	2.5	3.3

Table 10. Precision of chemical analyses of laboratory replicates for water samples, upper Clark Fork basin, Montana

[The terms "filtered" and "unfiltered recoverable" replace the former terms "dissolved" and "total recoverable," respectively. Abbreviations: µg/L, micrograms per liter; mg/L, milligrams per liter]

Constituent and reporting unit	Number of replicate pairs	Standard deviation,[1] in listed units	Relative standard deviation, in percent	Within limits of data-quality objective
Calcium, filtered, mg/L	10	0.93	2.1	Yes
Magnesium, filtered, mg/L	10	.17	1.6	Yes
Arsenic, unfiltered recoverable, µg/L	10	.67	4.3	Yes
Arsenic, filtered, µg/L	10	.16	1.1	Yes
Cadmium, unfiltered recoverable, µg/L	10	.01	4.8	Yes
Cadmium, filtered, µg/L	10	.00	5.0	Yes
Copper, unfiltered recoverable, µg/L	10	.56	2.8	Yes
Copper, filtered, µg/L	10	.08	1.5	Yes
Iron, unfiltered recoverable, µg/L	10	5.1	1.1	Yes
Iron, filtered, µg/L	10	1.6	5.8	Yes
Lead, unfiltered recoverable, µg/L	10	.06	2.2	Yes
Lead, filtered, µg/L	10	.02	11	Yes
Manganese, unfiltered recoverable, µg/L	10	.84	1.4	Yes
Manganese, filtered, µg/L	10	1.9	9.4	Yes
Zinc, unfiltered recoverable, µg/L	10	.42	1.3	Yes
Zinc, filtered, µg/L	10	.24	1.7	Yes

[1]Statistics calculated using laboratory reporting level for censored values less than the detection capability of the instrument.

Table 11. Recovery efficiency for trace-element analyses of laboratory-spiked deionized-water blanks

[The terms "filtered" and "unfiltered recoverable" replace the former terms "dissolved" and "total recoverable," respectively. Abbreviation: µg/L, micrograms per liter]

Constituent and reporting unit	Number of samples	95-percent confidence interval for spike recovery, in percent	Mean spike recovery, in percent	Within limits of data-quality objective
Arsenic, unfiltered recoverable, µg/L	4	78.5-115	96.6	Yes
Arsenic, filtered, µg/L	4	71.3-104	87.9	Yes
Cadmium, unfiltered recoverable, µg/L	4	94.1-101	97.5	Yes
Cadmium, filtered, µg/L	4	92.6-105	98.6	Yes
Copper, unfiltered recoverable, µg/L	3	93.2-102	97.6	Yes
Copper, filtered, µg/L	4	93.0-108	100.4	Yes
Iron, unfiltered recoverable, µg/L	4	96.4-107	101.6	Yes
Iron, filtered, µg/L	4	87.4-98.8	93.1	Yes
Lead, unfiltered recoverable, µg/L	4	93.9-98.1	96.0	Yes
Lead, filtered, µg/L	3	92.3-102	97.2	Yes
Manganese, unfiltered recoverable, µg/L	4	90.7-101	95.8	Yes
Manganese, filtered, µg/L	4	79.7-114	96.6	Yes
Zinc, unfiltered recoverable, µg/L	4	93.2-105	99.1	Yes
Zinc, filtered, µg/L	4	89.8-113	101.4	Yes

Table 12. Recovery efficiency for trace-element analyses of laboratory-spiked stream samples, upper Clark Fork basin, Montana

[The terms "filtered" and "unfiltered recoverable" replace the former terms "dissolved" and "total recoverable," respectively. Abbreviation: µg/L, micrograms per liter]

Constituent and reporting unit	Number of samples	95-percent confidence interval for spike recovery, in percent	Mean spike recovery, in percent	Within limits of data-quality objective
Arsenic, unfiltered recoverable, µg/L	4	100-117	108.6	Yes
Arsenic, filtered, µg/L	4	80.2-109	94.6	Yes
Cadmium, unfiltered recoverable, µg/L	4	94.4-104	99.0	Yes
Cadmium, filtered, µg/L	4	91.4-110	100.5	Yes
Copper, unfiltered recoverable, µg/L	4	89.7-93.5	91.6	Yes
Copper, filtered, µg/L	4	88.9-103	95.8	Yes
Iron, unfiltered recoverable, µg/L	4	100-113	106.4	Yes
Iron, filtered, µg/L	4	91.6-102	96.7	Yes
Lead, unfiltered recoverable, µg/L	4	93.7-99.9	96.8	Yes
Lead, filtered, µg/L	4	90.2-102	96.0	Yes
Manganese, unfiltered recoverable, µg/L	4	78.8-109	93.9	Yes
Manganese, filtered, µg/L	4	86.2-112	99.3	Yes
Zinc, unfiltered recoverable, µg/L	4	87.5-98.5	93.0	Yes
Zinc, filtered, µg/L	4	93.6-103	98.4	Yes

Table 13. Chemical analyses of field blanks for water samples

[The terms "filtered" and "unfiltered recoverable" replace the former terms "dissolved" and "total recoverable," respectively. Abbreviations: °C, degrees Celsius; E, estimated; µg/L, micrograms per liter; µS/cm, microsiemens per centimeter at 25 °C; mg/L, milligrams per liter. Symbols: <, less than analytical detection limit]

Date	Time	pH, onsite (standard units)	Specific conductance, onsite (µS/cm)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Arsenic, filtered (µg/L)	Arsenic, unfiltered recoverable (µg/L)	Cadmium, filtered (µg/L)	Cadmium, unfiltered recoverable (µg/L)
FEB 2003									
28...	1200	5.6	2	E0.01	<0.008	<0.3	<2	0.34	<0.04
APR									
03...	1500	5.5	3	.02	<.008	<.3	<2	<.04	<.04
29...	1330	5.6	2	.01	<.008	<.3	<2	<.04	<.04
MAY									
27...	1200	5.6	2	.02	<.008	<.3	<2	<.04	<.04
JUN									
01...	1800	5.7	2	.01	<.008	<.3	<2	<.04	<.04
16...	1100	5.6	3	E.01	<.008	<.3	<2	<.04	<.04
JUL									
28...	1800	5.8	1	E.01	E.003	<.3	<2	<.04	<.04
AUG									
25...	1930	5.7	1	.01	<.008	<.3	<2	<.04	<.04

Date	Copper, filtered (µg/L)	Copper, unfiltered recoverable (µg/L)	Iron, filtered (µg/L)	Iron, unfiltered recoverable (µg/L)	Lead, filtered (µg/L)	Lead, unfiltered recoverable (µg/L)	Manganese, filtered (µg/L)	Manganese, unfiltered recoverable (µg/L)	Zinc, filtered (µg/L)	Zinc, unfiltered recoverable (µg/L)
FEB 2003										
28...	0.2	<0.6	<10	<20	<0.08	<0.06	<0.2	<0.22	2	<2
APR										
03...	<.2	<.6	<10	<20	<.08	<.06	<.2	<.22	4	2
29...	<.2	<.6	<10	<20	<.08	<.06	<.2	<.22	4	<2
MAY										
27...	<.2	<.6	<8	<20	<.08	<.06	<.2	<.22	4	E1
JUN										
01...	<.2	<.6	<8	<6	E.05	<.06	<.2	<.22	2	<2
16...	<.2	<.6	<8	<6	<.08	<.06	<.2	<.22	<1	<2
JUL										
28...	<.2	<.6	<8	<6	<.08	<.06	<.2	<.22	<1	<2
AUG										
25...	<.2	<.6	<8	<6	<.08	<.06	<.2	<.22	<1	<2

Table 14. Trace-element analyses of fine-grained bed sediment, upper Clark Fork basin, Montana, September 2003

[Fine-grained sediment is material less than 0.064 millimeter in diameter. Reported concentrations are the mean of all analyses for replicate aliquots from each composite sample. Abbreviation: µg/g, micrograms per gram of dry sample weight]

Station number (fig. 1)	Station name	Number of composite samples	Concentration, in µg/g								
			Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Nickel	Silver	Zinc
12323600	Silver Bow Creek at Opportunity	3	186	41.9	3,400	32,200	581	5,220	15.3	11.3	7,630
12323750	Silver Bow Creek at Warm Springs	3	103	7.4	196	19,100	73	14,400	13.0	4.4	726
12323800	Clark Fork near Galen	3	111	10.0	1,030	26,200	137	12,600	18.3	5.5	1,130
461415112450801	Clark Fork below Lost Creek, near Galen	3	204	9.4	1,600	30,300	218	9,670	16.3	7.6	1,560
461559112443301	Clark Fork near Racetrack	3	101	8.7	1,310	28,100	178	6,310	15.6	5.8	1,380
461903112440701	Clark Fork at Dempsey Creek diversion, near Racetrack	3	80	9.0	1,090	25,200	155	8,370	12.9	5.7	1,230
12324200	Clark Fork at Deer Lodge	3	77	9.6	1,080	24,300	148	3,980	13.6	4.7	1,260
12324680	Clark Fork at Goldcreek	3	32	5.8	438	19,500	68	2,180	12.2	2.4	669
12331500	Flint Creek near Drummond	3	113	6.2	47	23,200	175	5,720	11.4	6.3	626
12331800	Clark Fork near Drummond	3	33	5.3	321	17,400	68	3,090	10.8	2.7	761
12334510	Rock Creek near Clinton	3	5	2.8	6	16,800	11	490	11.3	.8	23
12334550	Clark Fork at Turah Bridge, near Bonner	3	19	3.9	211	12,600	48	1,410	8.7	1.7	663
12340000	Blackfoot River near Bonner	3	2	1.8	11	14,800	11	605	9.8	.7	39
12340500	Clark Fork above Missoula	3	23	5.8	326	19,200	54	1,420	12.7	2.1	716
12353000	Clark Fork below Missoula[1]	3	6	3.0	69	13,100	24	1,420	8.4	1.0	239

[1]Samples collected about 30 miles downstream from streamflow-gaging station to conform to previous sampling location.

Table 15. Trace-element analyses of bulk bed sediment, upper Clark Fork basin, Montana, September 2003

[Bulk bed sediment collected in this study generally is material smaller than about 10 millimeters in diameter. Reported concentrations are the mean of all analyses for replicate aliquots of each composite sample. Abbreviation: µg/g, micrograms per gram of dry sample weight. Symbol: <, less than]

Station number (fig. 1)	Station name	Number of composite samples	Concentration, in µg/g								
			Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Nickel	Silver	Zinc
12323600	Silver Bow Creek at Opportunity	1	148	21.7	1,850	25,700	392	2,900	9.8	5.9	3,480
12323750	Silver Bow Creek at Warm Springs	1	36	3.4	60	13,200	30	1,990	10.3	.9	220
12323800	Clark Fork near Galen	1	97	4.7	540	15,100	94	3,130	7.2	1.7	510
461415112450801	Clark Fork below Lost Creek, near Galen	1	82	5.2	420	18,300	71	3,720	8.4	2.0	560
461559112443301	Clark Fork near Racetrack	1	90	10.5	600	15,700	85	4,170	9.9	2.5	1,000
461903112440701	Clark Fork at Dempsey Creek diversion, near Racetrack	1	82	5.6	640	16,700	94	3,070	7.9	2.3	610
12324200	Clark Fork at Deer Lodge	1	84	8.3	820	22,000	122	3,560	11.8	3.5	950
12324680	Clark Fork at Goldcreek	1	15	3.2	170	11,900	56	930	8.3	1.0	310
12331500	Flint Creek near Drummond	1	80	3.6	20	14,700	111	2,690	7.1	4.3	360
12331800	Clark Fork near Drummond	1	31	5.1	310	16,000	65	3,280	10.3	2.6	680
12334510	Rock Creek near Clinton	1	1	.5	<.6	5,300	2	60	4.0	.4	.3
12334550	Clark Fork at Turah Bridge, near Bonner	1	18	5.5	250	15,400	46	2,620	10.9	1.8	590
12340000	Blackfoot River near Bonner	1	<.5	2.5	10	13,000	5	330	8.7	.8	20
12340500	Clark Fork above Missoula	1	4	2.4	80	11,100	20	570	8.1	.9	290
12353000	Clark Fork below Missoula[1]	1	1.1	1.2	10	8,400	5	220	4.6	.3	40

[1]Samples collected about 30 miles downstream from streamflow-gaging station to conform to previous sampling location.

Table 16. Recovery efficiency for trace-element analyses of standard reference materials for bed sediment

[Abbreviations: µg/g, micrograms per gram of dry sample weight; SRM, standard reference material. Symbol: --, recovery could not be determined because all analyses were less than the analytical detection limit]

Constituent	Number of measure-ments	Dilution ratio	Certified concentration (µg/g)	Mean SRM recovery (percent)	95-percent confidence interval for SRM recovery (percent)
			SRM sample 2709		
Arsenic	7	1:5	17.7	68.1	67.8-68.4
Cadmium	7	1:5	.4	--	--
Copper	7	1:5	35	50.4	48.8-52.3
Iron	7	1:5	35,000	88.4	87.5-89.4
Lead	7	1:5	19	83.1	79.2-87.0
Manganese	7	1:5	538	94.4	93.4-95.4
Nickel	7	1:5	88	90.6	89.6-91.6
Silver	7	1:5	.4	--	--
Zinc	7	1:5	106	76.2	72.2-80.0
			SRM sample 2711		
Arsenic	7	1:10	105	84.4	80.7-88.1
Cadmium	7	1:10	41.7	115.6	110-121
Copper	7	1:10	114	66.2	64.0-68.3
Iron	7	1:10	28,900	86.5	83.4-89.6
Lead	7	1:10	1,160	108.4	104-112
Manganese	7	1:10	638	88.2	85.1-91.4
Nickel	7	1:10	20.6	90.7	86.8-94.6
Silver	7	1:10	4.6	78.5	75.9-79.6
Zinc	7	1:10	350	88.0	84.3-91.7

Table 17. Trace-element analyses of procedural blanks for bed sediment

[Abbreviation: µg/mL, micrograms per milliliter. Dilution ratio is the proportion of initial volume of concentrated nitric acid used as a digesting reagent to final volume of solution after addition of 0.6 N (normal) hydrochloric acid used for reconstituting dried residue. Symbol: <, less than]

Station number	Station name	Dilution ratio	Trace-element concentration, in µg/mL								
			Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Nickel	Silver	Zinc
12323600	Silver Bow Creek at Opportunity	1:1	<0.003	0.0001	<0.003	<0.004	<0.004	<0.001	<0.001	<0.001	<0.002
12323750	Silver Bow Creek at Warm Springs	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
12323800	Clark Fork near Galen	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
461415112450801	Clark Fork below Lost Creek, near Galen	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
461559112443301	Clark Fork near Racetrack	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
461903112440701	Clark Fork at Dempsey Creek diversion, near Racetrack	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
12324200	Clark Fork at Deer Lodge	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
12324680	Clark Fork at Goldcreek	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
12331500	Flint Creek near Drummond	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
12331800	Clark Fork near Drummond	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
12334510	Rock Creek near Clinton	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
12334550	Clark Fork at Turah Bridge, near Bonner	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
12340000	Blackfoot River near Bonner	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
12340500	Clark Fork above Missoula	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002
12353000	Clark Fork below Missoula	1:1	<.003	<.0001	<.003	<.004	<.004	<.001	<.001	<.001	<.002

Table 18. Trace-element analyses of biota, upper Clark Fork basin, Montana, September 2003

[Analyses are of whole-body tissue of aquatic insects. Composite samples made by combining similar-sized insects of the same species into a sample of sufficient mass for analysis. Concentrations for biota samples composed of two or more composite samples are the means of all analyses. Abbreviations: µg/g, micrograms per gram of dry sample weight; spp., species. Symbol: <, less than analytical detection limit]

Taxon	Number of composite samples	Concentration, in µg/g								
		Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Zinc
12323600 Silver Bow Creek at Opportunity										
Hydropsyche cockerelli	1	20.4	7.8	4.8	477	1,820	39.4	3,030	2.7	1,590
Hydropsyche spp.	3	20.1	5.4	3.0	465	2,100	37.9	1,320	2.4	1,100
12323750 Silver Bow Creek at Warm Springs										
Hydropsyche cockerelli	2	17.8	.5	4.1	27.2	1,080	2.4	2,270	1.5	159
Hydropsyche occidentalis	2	26.2	.7	6.2	35.6	1,740	4.2	3,450	2.4	194
12323800 Clark Fork near Galen										
Hydropsyche cockerelli	1	13.6	.7	4.4	89.8	1,350	7.7	2,140	1.2	166
Hydropsyche occidentalis	3	16.1	.8	4.3	120	1,790	9.6	1,660	1.4	181
461415112450801 Clark Fork below Lost Creek, near Galen										
Claassenia sabulosa	1	1.5	.4	.4	67.1	209	.7	90	<.2	208
Hydropsyche cockerelli	3	11.5	1.1	2.7	98.4	1,030	8.5	1,380	.9	173
Hydropsyche occidentalis	2	12.8	1.4	2.8	115	1,270	8.5	1,240	1.0	188
Hydropsyche spp.	1	12.0	1.6	1.2	103	1,050	8.7	1,230	1.0	163
461559112443301 Clark Fork near Racetrack										
Hydropsyche cockerelli	2	11.6	1.4	2.6	100	1,160	8.2	1,050	.9	171
Hydropsyche occidentalis	2	14.0	2.1	3.4	139	1,770	11.0	1,440	1.3	218
Hydropsyche spp.	1	11.8	2.4	1.1	113	1,290	9.6	1,130	1.3	181
461903112440701 Clark Fork at Dempsey Creek diversion, near Racetrack										
Hydropsyche cockerelli	1	18.8	1.3	4.0	190	2,310	17.7	1,530	1.7	275
Hydropsyche occidentalis	1	24.0	1.8	6.2	238	3,390	21.8	2,150	2.3	355
12324200 Clark Fork at Deer Lodge										
Hydropsyche cockerelli	1	10.1	.9	1.0	105	1,250	13.1	1,060	1.1	192
Hydropsyche occidentalis	2	11.8	1.2	2.8	135	1,620	12.7	1,090	1.2	218
12324680 Clark Fork at Goldcreek										
Arctopsyche grandis	6	6.1	.7	2.0	43.4	789	3.6	729	.9	156
Claassenia sabulosa	3	.9	.5	.3	62.8	123	.5	107	.2	272
Hydropsyche cockerelli	4	5.9	.5	2.7	52.7	999	5.2	963	1.0	146
Hydropsyche occidentalis	1	5.8	.5	2.3	64.8	1,120	5.6	809	1.1	169
12331500 Flint Creek near Drummond										
Arctopsyche grandis	3	8.1	.4	5.8	18.6	1,700	8.6	2,690	1.4	234
Hydropsyche cockerelli	2	17.0	.7	8.5	21.3	4,070	19.9	2,940	3.2	218
12331800 Clark Fork near Drummond										
Arctopsyche grandis	3	3.3	.5	1.5	27.0	529	3.3	645	.6	147
Claassenia sabulosa	2	.7	.4	.3	59.3	128	.6	129	<.2	261
Hydropsyche cockerelli	2	4.4	.5	2.4	43.7	989	5.6	859	1.0	155
Hydropsyche occidentalis	2	4.3	.4	2.4	45.0	1,170	5.6	871	1.0	179

Table 18. Trace-element analyses of biota, upper Clark Fork basin, Montana, September 2003—Continued

Taxon	Number of composite samples	Concentration, in µg/g								
		Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Zinc
12334510 Rock Creek near Clinton										
Arctopsyche grandis	4	2.0	.2	<.2	8.3	464	.2	165	.8	109
Claassenia sabulosa	1	1.1	.1	<.2	21.3	103	<.2	43	.3	139
Hydropsyche cockerelli	1	2.4	.3	.3	8.2	825	.4	266	.9	96.4
Hydropsyche occidentalis	1	2.2	.4	<2.0	5.1	973	<2.1	295	1.3	99.4
12334550 Clark Fork at Turah Bridge, near Bonner										
Arctopsyche grandis	4	4.7	.4	<.2	24.8	464	2.1	382	.7	130
Claassenia sabulosa	2	.8	.3	<.3	38.6	65	<.3	76	<.3	172
Hydropsyche cockerelli	3	3.9	.3	<.2	30.3	618	2.8	566	.8	128
Hydropsyche occidentalis	1	3.6	.4	<.2	27.4	741	3.3	612	.9	157
12340000 Blackfoot River near Bonner										
Arctopsyche grandis	1	2.8	<.2	<.3	12.4	769	.5	476	1.2	138
Hydropsyche occidentalis	1	3.2	<.4	<.5	12.8	1,500	1.3	577	1.4	142
12340500 Clark Fork above Missoula										
Arctopsyche grandis	3	4.2	.5	3.2	48.1	1,340	6.2	1,350	1.7	207
Claassenia sabulosa	2	.9	.3	.7	42.4	265	1.3	373	.3	240
Hydropsyche cockerelli	2	6.4	.5	5.9	61.1	2,340	9.5	1,800	2.2	234
Hydropsyche occidentalis	2	6.2	.5	5.4	59.9	2,340	10.0	1,950	2.3	254
12353000 Clark Fork below Missoula[1]										
Arctopsyche grandis	3	2.5	.2	<.4	15.8	535	1.4	595	.8	124
Claassenia sabulosa	2	.8	.1	<.2	47.1	82	.2	102	<.2	212
Hydropsyche cockerelli	5	2.4	.2	.6	19.9	678	1.4	793	.7	101
Hydropsyche occidentalis	1	2.5	.1	<.6	13.5	728	1.9	727	.8	133

[1]Samples collected about 30 miles downstream from streamflow-gaging station to conform to previous sampling location.

Table 19. Recovery efficiency for trace-element analyses of standard reference material for biota

[Abbreviations: µg/g, micrograms per gram of dry sample weight; µg/mL, micrograms per milliliter; SRM, standard reference material]

Constituent	Number of measurements	Certified concentration (µg/g)	Mean SRM recovery (percent)	95-percent confidence interval for SRM recovery (percent)
		SRM sample TORT-2		
Arsenic	12	21.6	101	98.8-104
Cadmium	12	26.7	88.8	85.2-92.4
Chromium	[1]12	.77	74.3	19.1-129
Copper	12	106	92.5	90.4-94.7
Iron	12	105	94.9	90.2-100
Lead	[2]12	.35	48.4	17.2-79.7
Manganese	12	13.6	88.3	83.7-92.8
Nickel	12	2.5	80.4	73.5-87.4
Zinc	12	180	93.3	89.4-97.2

[1]Chromium concentrations in six samples were less than the analytical detection limit (0.03 µg/mL).
[2]Lead concentrations in seven samples were less than the analytical detection limit (0.01 µg/mL).

Table 20. Trace-element analyses of procedural blanks for biota

[Procedural blanks were not diluted prior to analysis. Abbreviation: µg/mL, micrograms per milliliter. Symbol: <, less than]

Station number	Station name	Dilution ratio	Trace-element concentration, in µg/mL								
			Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Zinc
12323600	Silver Bow Creek at Opportunity	1:1	<0.01	<0.002	<0.03	<0.01	<0.06	<0.01	<0.01	<0.01	<0.01
12323750	Silver Bow Creek at Warm Springs	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
12323800	Clark Fork near Galen	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
461415112450801	Clark Fork below Lost Creek, near Galen	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
461559112443301	Clark Fork near Racetrack	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
461903112440701	Clark Fork at Dempsey Creek diversion, near Racetrack	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
12324200	Clark Fork at Deer Lodge	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
12324680	Clark Fork at Goldcreek	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
12331500	Flint Creek near Drummond	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
12331800	Clark Fork near Drummond	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
12334510	Rock Creek near Clinton	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
12334550	Clark Fork at Turah Bridge, near Bonner	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
12340000	Blackfoot River near Bonner	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
12340500	Clark Fork above Missoula	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01
12353000	Clark Fork below Missoula	1:1	<.01	<.002	<.03	<.01	<.06	<.01	<.01	<.01	<.01

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003

[The terms "filtered" and "unfiltered recoverable" replace the former terms "dissolved" and "total recoverable," respectively. Abbreviations: ft^3/s, cubic feet per second; °C, degrees Celsius; E, estimated; µg/L, micrograms per liter; µS/cm, microsiemens per centimeter at 25 °C; mg/L, milligrams per liter; mm, millimeter; ton/d, tons per day. Symbols: <, less than analytical detection limit[1]; --, indicates insufficient data greater than the analytical detection limit to compute statistiC]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323230--BLACKTAIL CREEK AT HARRISON AVENUE, AT BUTTE, MONT.					
Period of record for water-quality data: March 1993-August 1995, December 1996-August 2003					
Streamflow, instantaneous (ft^3/s)	83	156	1.9	14	7.9
Specific conductance, onsite (µS/cm)	83	412	116	267	271
Temperature, water (°C)	83	17.5	1.5	8.2	8.0
pH, onsite (standard units)	83	8.4	7.3	7.8	7.8
Hardness, filtered (mg/L as $CaCO_3$)	83	150	38	105	110
Calcium, filtered (mg/L)	83	41.8	10.6	30	31
Magnesium, filtered (mg/L)	83	11.0	2.71	7.3	7.4
Arsenic, unfiltered recoverable (µg/L)	83	18	<2	[2]5	4
Arsenic, filtered (µg/L)	83	13	1	4	3
Cadmium, unfiltered recoverable (µg/L)	83	.11	<.04	[2]<.1	<1
Cadmium, filtered (µg/L)	83	.5	<.1	[2]<.1	<.1
Copper, unfiltered recoverable (µg/L)	83	52	1.5	7	6
Copper, filtered (µg/L)	83	10	E.8	[2]4	3
Iron, unfiltered recoverable (µg/L)	83	4,220	140	700	550
Iron, filtered (µg/L)	83	478	15	163	157
Lead, unfiltered recoverable (µg/L)	83	47	<1	[2]2	1
Lead, filtered (µg/L)	83	1	<.08	[2].2	<.5
Manganese, unfiltered recoverable (µg/L)	83	240	24	62	53
Manganese, filtered (µg/L)	83	144	17	44	39
Zinc, unfiltered recoverable (µg/L)	83	130	<10	[2]11	3
Zinc, filtered (µg/L)	83	11	<1	[2]4	3
Sediment, suspended concentration (mg/L)	83	139	2	15	7
Sediment, suspended discharge (ton/d)	83	59	.02	1.4	.14
Sediment, suspended (percent finer than 0.062 mm)	83	97	50	83	84

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323250--SILVER BOW CREEK BELOW BLACKTAIL CREEK, AT BUTTE, MONT.					
Period of record for water-quality data: March 1993-August 1995, December 1996-September 2003					
Streamflow, instantaneous (ft^3/s)	83	134	13	30	24
Specific conductance, onsite (µS/cm)	83	691	226	469	478
Temperature, water (°C)	83	20.0	1.0	10.3	9.5
pH, onsite (standard units)	83	8.1	7.2	7.6	7.6
Hardness, filtered (mg/L as $CaCO_3$)	83	180	66	148	150
Calcium, filtered (mg/L)	83	51.6	19.0	42	43
Magnesium, filtered (mg/L)	83	13.0	4.51	10	11
Arsenic, unfiltered recoverable (µg/L)	83	45	4	13	11
Arsenic, filtered (µg/L)	83	13	4	7	7
Cadmium, unfiltered recoverable (µg/L)	83	6	.11	2.0	1.8
Cadmium, filtered (µg/L)	83	6.2	.09	1.5	1.2
Copper, unfiltered recoverable (µg/L)	83	550	13.5	116	82
Copper, filtered (µg/L)	83	303	4.5	50	32
Iron, unfiltered recoverable (µg/L)	83	7,400	90	1,100	700
Iron, filtered (µg/L)	83	270	E10	[2]86	74
Lead, unfiltered recoverable (µg/L)	83	250	.65	18	7
Lead, filtered (µg/L)	83	2.4	<.5	[2].6	.12
Manganese, unfiltered recoverable (µg/L)	83	1,600	26	514	470
Manganese, filtered (µg/L)	83	1,700	21.4	463	394
Zinc, unfiltered recoverable (µg/L)	83	2,200	45	602	460
Zinc, filtered (µg/L)	83	2,200	34	496	358
Sediment, suspended concentration (mg/L)	82	405	2	29	12
Sediment, suspended discharge (ton/d)	82	70	.09	3.5	.92
Sediment, suspended (percent finer than 0.062 mm)	82	98	42	84	86

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323600--SILVER BOW CREEK AT OPPORTUNITY, MONT.					
Period of record for water-quality data: March 1993-August 1995, December 1996-September 2003					
Streamflow, instantaneous (ft^3/s)	86	361	13	77	52
Specific conductance, onsite (µS/cm)	85	616	202	400	388
Temperature, water (°C)	85	22.5	0.0	9.3	9.5
pH, onsite (standard units)	85	9.5	7.2	8.4	8.4
Hardness, filtered (mg/L as $CaCO_3$)	85	220	60	143	140
Calcium, filtered (mg/L)	85	62.7	18.5	42	41
Magnesium, filtered (mg/L)	85	15.0	3.42	9.1	8.7
Arsenic, unfiltered recoverable (µg/L)	85	235	11	30	18
Arsenic, filtered (µg/L)	85	34	1	11	10
Cadmium, unfiltered recoverable (µg/L)	85	49	.52	[2]2.6	1.8
Cadmium, filtered (µg/L)	85	41	.1	1.5	.9
Copper, unfiltered recoverable (µg/L)	85	3,900	54.3	258	140
Copper, filtered (µg/L)	85	450	19.4	55	43
Iron, unfiltered recoverable (µg/L)	85	24,100	260	1,770	830
Iron, filtered (µg/L)	85	307	3	[2]48	26
Lead, unfiltered recoverable (µg/L)	85	650	5.38	47	16
Lead, filtered (µg/L)	85	5.1	<.5	[2].8	<1
Manganese, unfiltered recoverable (µg/L)	85	10,000	117	672	490
Manganese, filtered (µg/L)	85	9,300	68	545	421
Zinc, unfiltered recoverable (µg/L)	85	15,000	97	671	460
Zinc, filtered (µg/L)	85	13,000	27	396	220
Sediment, suspended concentration (mg/L)	86	801	5	58	18
Sediment, suspended discharge (ton/d)	86	781	.18	26	3.0
Sediment, suspended (percent finer than 0.062 mm)	86	95	37	78	82

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323700--MILL CREEK AT OPPORTUNITY, MONT.					
Period of record for water-quality data: March 2003-September 2003					
Streamflow, instantaneous (ft^3/s)	8	261	2.1	63	18
Specific conductance, onsite (µS/cm)	8	207	59	139	149
Temperature, water (°C)	8	18.5	3.0	9.5	9.2
pH, onsite (standard units)	8	8.2	7.8	8.0	8.0
Hardness, filtered (mg/L as $CaCO_3$)	8	85	24	58	62
Calcium, filtered (mg/L)	8	23.5	7.01	16.1	17.2
Magnesium, filtered (mg/L)	8	6.57	1.57	4.25	4.55
Arsenic, unfiltered recoverable (µg/L)	8	50	22	36	36
Arsenic, filtered (µg/L)	8	37.0	20.5	29.8	30.7
Cadmium, unfiltered recoverable (µg/L)	8	.85	.06	.25	.12
Cadmium, filtered (µg/L)	8	.10	.05	.07	.08
Copper, unfiltered recoverable (µg/L)	8	38.8	3.2	12.2	7.2
Copper, filtered (µg/L)	8	6.0	2.2	4.2	4.2
Iron, unfiltered recoverable (µg/L)	8	1,960	100	539	205
Iron, filtered (µg/L)	8	60	37	47	48
Lead, unfiltered recoverable (µg/L)	8	12.7	.17	3.21	1.14
Lead, filtered (µg/L)	8	.32	.11	.20	.20
Manganese, unfiltered recoverable (µg/L)	8	113	6	31	13
Manganese, filtered (µg/L)	8	15.7	3.6	7.8	6.7
Zinc, unfiltered recoverable (µg/L)	8	41	2	13	8
Zinc, filtered (µg/L)	8	6	2	3	3
Sediment, suspended concentration (mg/L)	8	107	1	26	6
Sediment, suspended discharge (ton/d)	8	55	.01	11	.26
Sediment, suspended (percent finer than 0.062 mm)	8	88	49	70	78

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323720--WILLOW CREEK AT OPPORTUNITY, MONT.					
Period of record for water quality data: March 2003-September 2003					
Streamflow, instantaneous (ft^3/s)	8	46	6.3	19	14
Specific conductance, onsite (µS/cm)	8	333	181	270	284
Temperature, water (°C)	8	17.0	3.5	10.4	11.5
pH, onsite (standard units)	8	8.3	7.9	8.0	8.0
Hardness, filtered (mg/L as $CaCO_3$)	8	150	73	116	120
Calcium, filtered (mg/L)	8	42.6	22.0	33.3	34.4
Magnesium, filtered (mg/L)	8	9.89	4.37	7.88	8.54
Arsenic, unfiltered recoverable (µg/L)	8	104	16	48	40
Arsenic, filtered (µg/L)	8	101	13.2	45.8	37.8
Cadmium, unfiltered recoverable (µg/L)	8	.30	.04	.11	.10
Cadmium, filtered (µg/L)	8	.08	E.03	.05	.05
Copper, unfiltered recoverable (µg/L)	8	36.9	4.4	14.0	11.2
Copper, filtered (µg/L)	8	14.1	2.4	6.3	5.0
Iron, unfiltered recoverable (µg/L)	8	840	80	300	235
Iron, filtered (µg/L)	8	87	8	45	48
Lead, unfiltered recoverable (µg/L)	8	8.41	.71	2.62	2.05
Lead, filtered (µg/L)	8	.50	.06	.26	.26
Manganese, unfiltered recoverable (µg/L)	8	70	14	38	34
Manganese, filtered (µg/L)	8	49.3	10.6	25.7	21.6
Zinc, unfiltered recoverable (µg/L)	8	41	4	15	14
Zinc, filtered (µg/L)	8	10	2	6	6
Sediment, suspended concentration (mg/L)	8	51	2	14	8
Sediment, suspended discharge (ton/d)	8	6.3	.04	1.2	.28
Sediment, suspended (percent finer than 0.062 mm)	8	96	76	88	90

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323750--SILVER BOW CREEK AT WARM SPRINGS, MONT.					
Period of record for water-quality data: March 1993-September 2003					
Streamflow, instantaneous (ft^3/s)	92	662	16	148	105
Specific conductance, onsite (µS/cm)	90	783	249	460	466
Temperature, water (°C)	91	25.0	.5	11.2	11.5
pH, onsite (standard units)	90	9.3	8.0	8.8	8.8
Hardness, filtered (mg/L as $CaCO_3$)	90	310	97	190	190
Calcium, filtered (mg/L)	90	90.4	27.9	55	56
Magnesium, filtered (mg/L)	90	21.4	5.94	13	12
Arsenic, unfiltered recoverable (µg/L)	90	94	10	26	24
Arsenic, filtered (µg/L)	90	60	6.8	22	21
Cadmium, unfiltered recoverable (µg/L)	90	.56	<.1	[2]<.12	<1
Cadmium, filtered (µg/L)	90	.3	<.1	[2].08	<.1
Copper, unfiltered recoverable (µg/L)	90	96.8	3.4	20	14
Copper, filtered (µg/L)	90	40	1.9	10	8
Iron, unfiltered recoverable (µg/L)	90	3,000	70	376	300
Iron, filtered (µg/L)	90	93	<5	[2]17	15
Lead, unfiltered recoverable (µg/L)	90	41.8	<1	[2]3	2
Lead, filtered (µg/L)	90	1.0	<.08	[2].1	<.5
Manganese, unfiltered recoverable (µg/L)	90	899	55	194	150
Manganese, filtered (µg/L)	90	875	11.8	126	80
Zinc, unfiltered recoverable (µg/L)	90	180	<10	[2]42	30
Zinc, filtered (µg/L)	90	73	<1	[2]10	6
Sediment, suspended concentration (mg/L)	92	229	1	13	7
Sediment, suspended discharge (ton/d)	92	279	.11	8.7	1.8
Sediment, suspended (percent finer than 0.062 mm)	91	97	43	82	85

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323770--WARM SPRINGS CREEK AT WARM SPRINGS, MONT. **Period of record for water quality data: March 1993-September 2003**					
Streamflow, instantaneous (ft^3/s)	66	420	2.8	101	57
Specific conductance, onsite (µS/cm)	65	795	139	297	283
Temperature, water (°C)	66	20.0	.5	9.3	9.2
pH, onsite (standard units)	65	8.7	7.4	8.3	8.3
Hardness, filtered (mg/L as $CaCO_3$)	65	420	40	143	130
Calcium, filtered (mg/L)	65	130	10.5	44	40
Magnesium, filtered (mg/L)	65	22.0	3.29	8.3	7.5
Arsenic, unfiltered recoverable (µg/L)	65	27	3	8	6
Arsenic, filtered (µg/L)	65	14	2	5	5
Cadmium, unfiltered recoverable (µg/L)	65	.36	<.1	[2].08	<1
Cadmium, filtered (µg/L)	65	E.1	<.1	[2].04	<.1
Copper, unfiltered recoverable (µg/L)	65	96.7	2.3	21	10
Copper, filtered (µg/L)	65	16	1	4	3
Iron, unfiltered recoverable (µg/L)	65	1,670	40	326	120
Iron, filtered (µg/L)	65	30	<5	[2]11	9
Lead, unfiltered recoverable (µg/L)	65	14	<1	[2]2	.4
Lead, filtered (µg/L)	65	1.8	<.08	[2].1	<.5
Manganese, unfiltered recoverable (µg/L)	65	1,400	57	228	190
Manganese, filtered (µg/L)	65	570	22.6	135	110
Zinc, unfiltered recoverable (µg/L)	65	60	<10	[2]11	3
Zinc, filtered (µg/L)	65	10	<1	[2]2	<20
Sediment, suspended concentration (mg/L)	66	100	2	19	8
Sediment, suspended discharge (ton/d)	66	87	.05	10	1.2
Sediment, suspended (percent finer than 0.062 mm)	66	88	55	73	74

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323800--CLARK FORK NEAR GALEN, MONT.					
Period of record for water-quality data: July 1988-September 2003					
Streamflow, instantaneous (ft^3/s)	133	1,050	14	215	129
Specific conductance, onsite (µS/cm)	121	720	197	425	435
Temperature, water (°C)	132	22.5	0.0	10.0	10.0
pH, onsite (standard units)	120	9.0	7.5	8.5	8.5
Hardness, filtered (mg/L as $CaCO_3$)	119	370	81	185	190
Calcium, filtered (mg/L)	119	110	24.2	55	57
Magnesium, filtered (mg/L)	119	22.0	5.08	12	12
Arsenic, unfiltered recoverable (µg/L)	119	78	3	20	17
Arsenic, filtered (µg/L)	119	53	4	15	13
Cadmium, unfiltered recoverable (µg/L)	119	3	<.1	[2].2	<1
Cadmium, filtered (µg/L)	119	1	<.1	[2].07	<.1
Copper, unfiltered recoverable (µg/L)	118	240	4.8	32	19
Copper, filtered (µg/L)	119	50	2.3	10	8
Iron, unfiltered recoverable (µg/L)	119	9,200	60	548	290
Iron, filtered (µg/L)	119	110	<3	[2]16	11
Lead, unfiltered recoverable (µg/L)	119	31.0	<1	[2]4	2
Lead, filtered (µg/L)	119	3	<.08	[2].2	<1
Manganese, unfiltered recoverable (µg/L)	119	1,400	47	253	200
Manganese, filtered (µg/L)	119	460	25.2	116	82
Zinc, unfiltered recoverable (µg/L)	119	360	<10	[2]48	30
Zinc, filtered (µg/L)	119	110	<1	[2]12	7
Sediment, suspended concentration (mg/L)	133	338	2	20	9
Sediment, suspended discharge (ton/d)	133	459	.12	23	2.8
Sediment, suspended (percent finer than 0.062 mm)	132	97	41	78	78

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323850--LOST CREEK NEAR GALEN, MONT.					
Period of record for water-quality data: March 2003-September 2003					
Streamflow, instantaneous (ft^3/s)	8	59	1.3	20	14
Specific conductance, onsite (µS/cm)	8	861	540	633	626
Temperature, water (°C)	8	26.5	4.5	15.6	16.2
pH, onsite (standard units)	8	8.7	8.4	8.6	8.6
Hardness, filtered (mg/L as $CaCO_3$)	8	420	200	296	290
Calcium, filtered (mg/L)	8	117	48.5	83.2	82.0
Magnesium, filtered (mg/L)	8	32.3	18.0	21.7	20.6
Arsenic, unfiltered recoverable (µg/L)	8	43	9	18	15
Arsenic, filtered (µg/L)	8	41.8	10.3	17.2	14.0
Cadmium, unfiltered recoverable (µg/L)	8	.11	E.02	.05	.04
Cadmium, filtered (µg/L)	8	.05	E.02	.03	.03
Copper, unfiltered recoverable (µg/L)	8	22.5	4.4	8.6	6.3
Copper, filtered (µg/L)	8	6.7	2.5	3.5	3.1
Iron, unfiltered recoverable (µg/L)	8	280	10	105	70
Iron, filtered (µg/L)	8	18	<8	[2]7	6
Lead, unfiltered recoverable (µg/L)	8	1.30	E.04	.46	.31
Lead, filtered (µg/L)	8	.33	<.08	--	<.08
Manganese, unfiltered recoverable (µg/L)	8	33	2	15	13
Manganese, filtered (µg/L)	8	23.6	1.9	10.4	8.6
Zinc, unfiltered recoverable (µg/L)	8	9	<2	[2]4	3
Zinc, filtered (µg/L)	8	2	<1	--	<1
Sediment, suspended concentration (mg/L)	8	24	2	11	9
Sediment, suspended discharge (ton/d)	8	3.8	.01	.89	.28
Sediment, suspended (percent finer than 0.062 mm)	8	77	18	53	55

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12324200--CLARK FORK AT DEER LODGE, MONT.					
Period of record for water-quality data: March 1985-September 2003					
Streamflow, instantaneous (ft^3/s)	185	1,920	23	296	225
Specific conductance, onsite (µS/cm)	168	642	234	485	506
Temperature, water (°C)	184	23.0	0.0	9.8	10.0
pH, onsite (standard units)	133	8.9	7.4	8.3	8.3
Hardness, filtered (mg/L as $CaCO_3$)	125	270	95	204	210
Calcium, filtered (mg/L)	125	81.0	28.2	60	63
Magnesium, filtered (mg/L)	125	18	5.9	13	14
Arsenic, unfiltered recoverable (µg/L)	135	215	8	25	18
Arsenic, filtered (µg/L)	135	39	6	14	13
Cadmium, unfiltered recoverable (µg/L)	135	5	<.1	[2].5	<1
Cadmium, filtered (µg/L)	135	2	<.1	[2].09	<1
Copper, unfiltered recoverable (µg/L)	134	1,500	8.2	94	41
Copper, filtered (µg/L)	135	120	3.2	12	9
Iron, unfiltered recoverable (µg/L)	135	29,000	30	1,770	660
Iron, filtered (µg/L)	135	190	<3	[2]15	9
Lead, unfiltered recoverable (µg/L)	135	200	<1	[2]12	5
Lead, filtered (µg/L)	135	6	<.08	[2].4	<1
Manganese, unfiltered recoverable (µg/L)	135	4,600	12	277	160
Manganese, filtered (µg/L)	135	400	1	44	33
Zinc, unfiltered recoverable (µg/L)	135	1,700	4	104	53
Zinc, filtered (µg/L)	135	230	<10	[2]14	10
Sediment, suspended concentration (mg/L)	185	2,250	2	79	23
Sediment, suspended discharge (ton/d)	185	8,690	.29	175	12
Sediment, suspended (percent finer than 0.062 mm)	176	99	40	71	72

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12324590--LITTLE BLACKFOOT RIVER NEAR GARRISON, MONT.					
Period of record for water-quality data: March 1985-September 2003					
Streamflow, instantaneous (ft^3/s)	104	2,080	15	283	178
Specific conductance, onsite (µS/cm)	92	347	120	231	222
Temperature, water (°C)	103	22	0.0	8.5	9.0
pH, onsite (standard units)	91	8.6	7.0	8.1	8.1
Hardness, filtered (mg/L as $CaCO_3$)	86	170	51	106	100
Calcium, filtered (mg/L)	86	49.3	14.0	31	30
Magnesium, filtered (mg/L)	86	11.9	3.30	7.1	7.0
Arsenic, unfiltered recoverable (µg/L)	91	17	4	7	6
Arsenic, filtered (µg/L)	91	7	3	5	5
Cadmium, unfiltered recoverable (µg/L)	91	2	<.04	[2].1	<1
Cadmium, filtered (µg/L)	91	.2	<.04	--	<.1
Copper, unfiltered recoverable (µg/L)	90	45	<1	[2]4	2
Copper, filtered (µg/L)	91	7	<1	[2]2	1
Iron, unfiltered recoverable (µg/L)	91	25,000	20	1,090	260
Iron, filtered (µg/L)	91	120	<3	[2]35	23
Lead, unfiltered recoverable (µg/L)	91	25	<1	[2]2	<5
Lead, filtered (µg/L)	90	6	<.08	[2].4	<1
Manganese, unfiltered recoverable (µg/L)	91	1,100	<10	[2]67	30
Manganese, filtered (µg/L)	91	45.2	1.0	9	8
Zinc, unfiltered recoverable (µg/L)	91	140	<1	[2]12	<40
Zinc, filtered (µg/L)	91	24	<1	[2]3	<20
Sediment, suspended concentration (mg/L)	104	1,410	1	49	9
Sediment, suspended discharge (ton/d)	104	7,920	.08	134	4.4
Sediment, suspended (percent finer than 0.062 mm)	104	97	32	75	80

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12324680--CLARK FORK AT GOLDCREEK, MONT.					
Period of record for water-quality data: March 1993-September 2003					
Streamflow, instantaneous (ft^3/s)	91	3,920	87	774	529
Specific conductance, onsite (µS/cm)	90	510	206	370	386
Temperature, water (°C)	91	21.5	0.0	9.7	10.0
pH, onsite (standard units)	90	8.8	7.9	8.3	8.3
Hardness, filtered (mg/L as $CaCO_3$)	90	230	86	162	170
Calcium, filtered (mg/L)	90	68.0	25.9	48	50
Magnesium, filtered (mg/L)	90	15.0	5.15	10	11
Arsenic, unfiltered recoverable (µg/L)	90	75	7	16	13
Arsenic, filtered (µg/L)	90	20	5.8	10	10
Cadmium, unfiltered recoverable (µg/L)	90	2	<.1	[2].2	<1
Cadmium, filtered (µg/L)	90	.2	<.1	[2].05	<.1
Copper, unfiltered recoverable (µg/L)	89	440	5.2	46	29
Copper, filtered (µg/L)	89	36	2.1	7	6
Iron, unfiltered recoverable (µg/L)	90	12,000	30	999	530
Iron, filtered (µg/L)	90	100	<3	[2]20	13
Lead, unfiltered recoverable (µg/L)	89	73	<1	[2]7	4
Lead, filtered (µg/L)	89	.8	<.08	[2].1	<.5
Manganese, unfiltered recoverable (µg/L)	90	1,100	10	140	100
Manganese, filtered (µg/L)	90	57.3	4.0	20	19
Zinc, unfiltered recoverable (µg/L)	90	510	2	54	35
Zinc, filtered (µg/L)	90	26	<1	[2]7	4
Sediment, suspended concentration (mg/L)	91	752	2	58	24
Sediment, suspended discharge (ton/d)	91	7,960	.94	261	37
Sediment, suspended (percent finer than 0.062 mm)	91	94	43	75	78

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12331500--FLINT CREEK NEAR DRUMMOND, MONT.					
Period of record for water-quality data: March 1985-September 2003					
Streamflow, instantaneous (ft^3/s)	133	892	2.8	179	119
Specific conductance, onsite (µS/cm)	122	529	134	307	304
Temperature, water (°C)	131	21.0	0.0	9.1	9.5
pH, onsite (standard units)	119	8.8	7.5	8.3	8.3
Hardness, filtered (mg/L as $CaCO_3$)	112	260	59	144	140
Calcium, filtered (mg/L)	112	73.0	16.4	39	38
Magnesium, filtered (mg/L)	112	20	4.3	11	12
Arsenic, unfiltered recoverable (µg/L)	119	57	7	17	13
Arsenic, filtered (µg/L)	119	20	5	9	9
Cadmium, unfiltered recoverable (µg/L)	119	3	<.04	[2].2	<1
Cadmium, filtered (µg/L)	119	.1	<.04	--	<.1
Copper, unfiltered recoverable (µg/L)	118	32	1	6	4
Copper, filtered (µg/L)	119	7	<1	[2]2	2
Iron, unfiltered recoverable (µg/L)	119	7,200	60	872	450
Iron, filtered (µg/L)	119	240	<3	[2]38	21
Lead, unfiltered recoverable (µg/L)	119	87	<1	[2]11	7
Lead, filtered (µg/L)	119	7	<.5	[2].6	<1
Manganese, unfiltered recoverable (µg/L)	119	1,600	50	207	130
Manganese, filtered (µg/L)	119	139	14	42	37
Zinc, unfiltered recoverable (µg/L)	119	290	<10	[2]37	20
Zinc, filtered (µg/L)	119	27	<1	[2]5	3
Sediment, suspended concentration (mg/L)	133	556	3	50	26
Sediment, suspended discharge (ton/d)	133	904	.02	44	7.8
Sediment, suspended (percent finer than 0.062 mm)	133	98	28	80	84

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003 —Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12331800--CLARK FORK NEAR DRUMMOND, MONT.					
Period of record for water-quality data: March 1993-September 2003					
Streamflow, instantaneous (ft^3/s)	91	3,860	149	1,080	817
Specific conductance, onsite (µS/cm)	90	630	189	406	420
Temperature, water (°C)	91	22.5	.5	10.6	11.0
pH, onsite (standard units)	90	8.5	7.8	8.3	8.3
Hardness, filtered (mg/L as $CaCO_3$)	90	300	74	182	185
Calcium, filtered (mg/L)	90	83	21	52	54
Magnesium, filtered (mg/L)	90	22	5.2	12	13
Arsenic, unfiltered recoverable (µg/L)	90	62	8	17	14
Arsenic, filtered (µg/L)	90	20	6.6	11	10
Cadmium, unfiltered recoverable (µg/L)	90	2	<.1	[2].2	<1
Cadmium, filtered (µg/L)	90	.2	<.1	[2]<.1	<.1
Copper, unfiltered recoverable (µg/L)	88	360	4.6	50	26
Copper, filtered (µg/L)	88	21	1	7	6
Iron, unfiltered recoverable (µg/L)	89	8,800	20	1,150	560
Iron, filtered (µg/L)	90	150	<3	[2]20	9
Lead, unfiltered recoverable (µg/L)	86	56	<1	[2]9	4
Lead, filtered (µg/L)	86	1.2	<.08	[2].2	<.5
Manganese, unfiltered recoverable (µg/L)	90	880	8	164	105
Manganese, filtered (µg/L)	90	60.7	4.5	18	15
Zinc, unfiltered recoverable (µg/L)	90	490	3	73	40
Zinc, filtered (µg/L)	90	21	<3	[2]7	5
Sediment, suspended concentration (mg/L)	91	530	2	74	30
Sediment, suspended discharge (ton/d)	91	4,720	1.7	380	66
Sediment, suspended (percent finer than 0.062 mm)	91	92	38	73	74

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12334510--ROCK CREEK NEAR CLINTON, MONT.					
Period of record for water-quality data: March 1985-September 2003					
Streamflow, instantaneous (ft^3/s)	103	5,060	113	970	548
Specific conductance, onsite (µS/cm)	94	160	53	107	102
Temperature, water (°C)	103	18	0.0	8.3	8.5
pH, onsite (standard units)	93	8.8	6.9	8.0	8.0
Hardness, filtered (mg/L as $CaCO_3$)	85	90	22	50	50
Calcium, filtered (mg/L)	85	23.0	5.92	13	13
Magnesium, filtered (mg/L)	85	8.00	1.86	4.3	4.3
Arsenic, unfiltered recoverable (µg/L)	91	5	<1	[2].9	<1
Arsenic, filtered (µg/L)	91	1	<1	[2].6	<1
Cadmium, unfiltered recoverable (µg/L)	91	3	<.04	[2].1	<1
Cadmium, filtered (µg/L)	91	1	<.04	--	<.1
Copper, unfiltered recoverable (µg/L)	89	41	<.6	[2]4	2
Copper, filtered (µg/L)	90	6	<1	[2]1	<1
Iron, unfiltered recoverable (µg/L)	91	2,100	20	298	130
Iron, filtered (µg/L)	91	163	5	[2]34	28
Lead, unfiltered recoverable (µg/L)	89	19	<.06	[2]2	<1
Lead, filtered (µg/L)	89	5	<.08	[2].4	<1
Manganese, unfiltered recoverable (µg/L)	91	90	<10	[2]15	7
Manganese, filtered (µg/L)	91	8	<1	[2]2	2
Zinc, unfiltered recoverable (µg/L)	91	60	<1	[2]6	<10
Zinc, filtered (µg/L)	91	15	<1	[2]2	<3
Sediment, suspended concentration (mg/L)	103	223	1	21	5
Sediment, suspended discharge (ton/d)	103	3,050	.31	142	9.8
Sediment, suspended (percent finer than 0.062 mm)	103	95	35	70	71

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12334550--CLARK FORK AT TURAH BRIDGE, NEAR BONNER, MONT.					
Period of record for water-quality data: March 1985-September 2003					
Streamflow, instantaneous (ft^3/s)	188	9,560	296	1,890	1,140
Specific conductance, onsite (µS/cm)	163	483	139	304	318
Temperature, water (°C)	187	22.0	0.0	9.3	9.5
pH, onsite (standard units)	134	8.8	7.4	8.2	8.3
Hardness, filtered (mg/L as $CaCO_3$)	124	210	54	132	130
Calcium, filtered (mg/L)	124	59.0	14.9	37	38
Magnesium, filtered (mg/L)	124	14.0	3.94	9.4	9.4
Arsenic, unfiltered recoverable (µg/L)	133	110	3	11	7
Arsenic, filtered (µg/L)	133	17	2.7	6	5
Cadmium, unfiltered recoverable (µg/L)	133	4	<.1	[2].3	<1
Cadmium, filtered (µg/L)	133	.11	<.04	[2].04	<.1
Copper, unfiltered recoverable (µg/L)	131	500	3	41	19
Copper, filtered (µg/L)	132	25	E1.1	5	4
Iron, unfiltered recoverable (µg/L)	133	19,000	40	1,210	480
Iron, filtered (µg/L)	133	190	<3	[2]26	15
Lead, unfiltered recoverable (µg/L)	129	100	<1	[2]9	4
Lead, filtered (µg/L)	129	7	<.08	[2].4	<1
Manganese, unfiltered recoverable (µg/L)	133	2,000	10	143	71
Manganese, filtered (µg/L)	133	37.4	1.0	8	7
Zinc, unfiltered recoverable (µg/L)	133	1,100	<10	[2]71	36
Zinc, filtered (µg/L)	132	39	<3	[2]7	5
Sediment, suspended concentration (mg/L)	188	1,370	2	63	22
Sediment, suspended discharge (ton/d)	188	34,700	3.5	704	64
Sediment, suspended (percent finer than 0.062 mm)	177	98	27	73	74

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12340000--BLACKFOOT RIVER NEAR BONNER, MONT.					
Period of record for water-quality data: March 1985-September 2003					
Streamflow, instantaneous (ft^3/s)	134	13,400	344	2,720	1,310
Specific conductance, onsite (µS/cm)	111	294	131	207	205
Temperature, water (°C)	134	21.0	0.0	9.2	9.5
pH, onsite (standard units)	94	8.7	7.5	8.3	8.3
Hardness, filtered (mg/L as $CaCO_3$)	87	140	55	102	97
Calcium, filtered (mg/L)	87	37	14	26	25
Magnesium, filtered (mg/L)	87	13	4.9	9.0	8.6
Arsenic, unfiltered recoverable (µg/L)	94	4	<1	[2]1	1
Arsenic, filtered (µg/L)	94	2	<1	[2].9	1
Cadmium, unfiltered recoverable (µg/L)	94	2	<.04	[2].2	<1
Cadmium, filtered (µg/L)	94	1	<.04	--	<.1
Copper, unfiltered recoverable (µg/L)	91	34	<1	[2]6	3
Copper, filtered (µg/L)	92	7	<1	[2]2	1
Iron, unfiltered recoverable (µg/L)	94	3,600	10	503	230
Iron, filtered (µg/L)	94	100	<3	[2]19	12
Lead, unfiltered recoverable (µg/L)	90	25	<.06	[2]3	<1
Lead, filtered (µg/L)	90	8	<.08	[2].5	<1
Manganese, unfiltered recoverable (µg/L)	94	180	<10	[2]33	20
Manganese, filtered (µg/L)	94	11	<1	[2]3	2
Zinc, unfiltered recoverable (µg/L)	94	60	<1	[2]7	<10
Zinc, filtered (µg/L)	94	15	<1	[2]3	<3
Sediment, suspended concentration (mg/L)	134	271	1	32	9
Sediment, suspended discharge (ton/d)	134	7,670	1.1	575	31
Sediment, suspended (percent finer than 0.062 mm)	132	98	42	80	82

Table 21. Statistical summary of water-quality data for the upper Clark Fork basin, Montana, March 1985 through September 2003—Continued

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12340500--CLARK FORK ABOVE MISSOULA, MONT.					
Period of record for water-quality data: July 1986-September 2003					
Streamflow, instantaneous (ft^3/s)	154	21,600	720	4,510	2,400
Specific conductance, onsite (µS/cm)	131	399	142	253	261
Temperature, water (°C)	151	21.0	0.0	9.3	8.5
pH, onsite (standard units)	111	8.7	7.9	8.3	8.3
Hardness, filtered (mg/L as $CaCO_3$)	111	170	61	116	120
Calcium, filtered (mg/L)	111	46	14	31	32
Magnesium, filtered (mg/L)	111	13.0	5.28	9.2	9.2
Arsenic, unfiltered recoverable (µg/L)	111	69	1	5	4
Arsenic, filtered (µg/L)	111	9	1	3	3
Cadmium, unfiltered recoverable (µg/L)	111	5	<.1	[2].2	<1
Cadmium, filtered (µg/L)	111	.2	<.04	[2].03	<.1
Copper, unfiltered recoverable (µg/L)	109	400	2	17	8
Copper, filtered (µg/L)	110	12.6	.7	3	2
Iron, unfiltered recoverable (µg/L)	111	13,000	40	643	250
Iron, filtered (µg/L)	111	200	<3	[2]23	16
Lead, unfiltered recoverable (µg/L)	106	78	<1	[2]3	2
Lead, filtered (µg/L)	106	1.2	<.08	[2].2	<.6
Manganese, unfiltered recoverable (µg/L)	111	1,100	10	68	40
Manganese, filtered (µg/L)	111	230	6.2	18	14
Zinc, unfiltered recoverable (µg/L)	111	1,100	<10	[2]33	13
Zinc, filtered (µg/L)	111	16	<1	[2]4	2
Sediment, suspended concentration (mg/L)	154	824	2	39	12
Sediment, suspended discharge (ton/d)	154	21,900	5.8	1,010	81
Sediment, suspended (percent finer than 0.062 mm)	149	99	44	87	90

[1]Differing less-than (<) values for an individual constituent are the result of changes in the analytical detection limit during the period of record.
[2]Value is estimated by using a log-probability regression to predict the values of data less than the laboratory reporting level (Helsel and Cohn, 1988).

Table 22. Statistical summary of fine-grained bed-sediment data for the upper Clark Fork basin, Montana, August 1986 through September 2003

[Fine-grained bed sediment is material less than 0.064 millimeter in diameter. Reported concentrations are in micrograms per gram dry weight. Number of samples represents the number of years that the constituent was analyzed, with each year represented by a single mean concentration of composite samples. Symbols: <, less than the analytical detection limit; --, indicates insufficient data to compute statistic]

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12323600--SILVER BOW CREEK AT OPPORTUNITY, MONT.					
Period of record for fine-grained bed-sediment data: 1992-2003					
Arsenic	1	--	--	186	--
Cadmium	12	42.0	23.7	33.1	32.4
Chromium	10	32.4	16.8	25.7	26.2
Copper	12	9,020	3,390	5,090	4,740
Iron	12	41,200	28,200	36,300	37,500
Lead	12	1,030	381	762	815
Manganese	12	9,220	1,690	3,430	2,680
Nickel	11	21.4	12.7	15.7	15.5
Silver	12	20.0	8.3	15.5	15.8
Zinc	12	13,400	5,620	8,460	7,820
12323750--SILVER BOW CREEK AT WARM SPRINGS, MONT.					
Period of record for fine-grained bed-sediment data: 1992-2003					
Arsenic	1	--	--	103	--
Cadmium	12	12.2	4.2	7.5	7.1
Chromium	10	34.1	12.3	20.8	21.2
Copper	12	769	169	366	279
Iron	12	27,200	15,400	20,900	20,600
Lead	12	100	50	72	70
Manganese	12	17,700	1,470	7,890	7,690
Nickel	11	19.1	9.2	14.6	14.6
Silver	12	4.4	.3	[1]1.9	[1]1.8
Zinc	12	2,220	620	1,060	830
12323770--WARM SPRINGS CREEK AT WARM SPRINGS, MONT.					
Period of record for fine-grained bed-sediment data: 1995, 1997, 1999, 2002					
Cadmium	4	5.8	1.3	3.4	3.2
Chromium	4	33.4	27.5	30.8	31.1
Copper	4	892	779	850	864
Iron	4	22,400	16,800	20,400	21,200
Lead	4	86	67	81	85
Manganese	4	11,000	2,020	6,950	7,410
Nickel	4	21.9	17.6	19.2	18.6
Silver	4	5.1	3.1	3.8	3.5
Zinc	4	421	372	391	385
12323800--CLARK FORK NEAR GALEN, MONT.					
Period of record for fine-grained bed-sediment data: 1987, 1991-2003					
Arsenic	1	--	--	111	--
Cadmium	14	20.1	4.0	10.0	9.3
Chromium	10	33.9	19.1	27.0	26.7
Copper	14	2,300	991	1,280	1,180
Iron	14	39,800	22,600	28,200	27,400
Lead	14	235	113	145	137
Manganese	14	15,600	2,780	8,840	8,510
Nickel	11	23.2	15.4	18.7	18.3
Silver	14	7.3	<3.2	[1]4.4	[1]4.5
Zinc	14	3,560	1,090	1,690	1,300

Table 22. Statistical summary of fine-grained bed-sediment data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of samples	Maximum	Minimum	Mean	Median
461415112450801--CLARK FORK BELOW LOST CREEK, NEAR GALEN, MONT.					
Period of record for fine-grained bed-sediment data: 1996-2003					
Arsenic	1	--	--	204	--
Cadmium	8	10.5	6.5	8.2	8.3
Chromium	7	34.5	22.3	29.5	31.8
Copper	8	2,050	1,350	1,580	1,520
Iron	8	32,800	26,300	30,600	31,100
Lead	8	218	167	187	186
Manganese	8	9,670	3,540	5,550	5,380
Nickel	8	19.9	13.4	17.1	17.1
Silver	8	7.8	4.2	6.5	6.7
Zinc	8	1,680	1,120	1,420	1,470
461559112443301--CLARK FORK NEAR RACETRACK, MONT.					
Period of record for fine-grained bed-sediment data: 1996-2003					
Arsenic	1	--	--	101	--
Cadmium	8	8.7	5.0	7.3	7.8
Chromium	7	33.3	19.1	26.7	29.2
Copper	8	1,610	933	1,240	1,280
Iron	8	31,700	23,100	27,300	28,400
Lead	8	186	128	151	148
Manganese	8	6,310	2,100	3,460	3,020
Nickel	8	18.4	10.5	14.7	16.0
Silver	8	6.1	<3.3	[1]5.0	[1]5.4
Zinc	8	1,550	1,030	1,250	1,180
461903112440701--CLARK FORK AT DEMPSEY CREEK DIVERSION, NEAR RACETRACK, MONT.					
Period of record for fine-grained bed-sediment data: 1996-2003					
Arsenic	1	--	--	80	--
Cadmium	8	10.3	4.3	7.2	7.5
Chromium	7	34.1	16.0	26.3	26.4
Copper	8	1,550	766	1,070	1,060
Iron	8	33,700	22,000	27,100	26,800
Lead	8	155	115	135	134
Manganese	8	8,370	1,810	3,870	2,660
Nickel	8	16.9	9.5	13.5	14.0
Silver	8	6.2	2.7	4.9	5.0
Zinc	8	1,570	900	1,160	1,150
12324200--CLARK FORK AT DEER LODGE, MONT.					
Period of record for fine-grained bed-sediment data: 1986-87, 1990-2003					
Arsenic	1	--	--	77	--
Cadmium	16	10.0	4.4	6.9	6.8
Chromium	10	43.9	19.5	32.0	33.9
Copper	16	4,180	837	1,380	1,070
Iron	16	35,300	22,600	27,900	27,600
Lead	16	242	121	155	150
Manganese	16	6,020	1,460	2,850	2,420
Nickel	11	21.1	12.2	16.1	15.3
Silver	16	7.9	2.4	4.7	4.5
Zinc	16	1,730	940	1,290	1,290

Table 22. Statistical summary of fine-grained bed-sediment data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12324590--LITTLE BLACKFOOT RIVER NEAR GARRISON, MONT.					
Period of record for fine-grained bed-sediment data: 1986-87, 1994, 1998, 2001					
Cadmium	5	2.3	.2	1.1	.9
Chromium	3	54.4	22.1	43.1	52.9
Copper	5	85	38	56	40
Iron	5	30,700	16,100	24,200	24,200
Lead	5	53	36	40	37
Manganese	5	2,700	905	1,420	1,040
Nickel	3	21.9	13.6	17.7	17.6
Silver	5	.9	<.5	[1].6	[1].8
Zinc	5	204	161	176	170
12324680--CLARK FORK AT GOLDCREEK, MONT.					
Period of record for fine-grained bed-sediment data: 1992-2003					
Arsenic	1	--	--	32	--
Cadmium	12	8.1	3.5	5.4	5.7
Chromium	10	48.9	24.9	33.7	32.6
Copper	12	1,080	393	726	757
Iron	12	30,600	19,500	24,200	24,400
Lead	12	152	61	101	106
Manganese	12	2,610	1,160	1,840	1,810
Nickel	11	18.6	10.9	15.2	15.9
Silver	12	4.8	2.3	3.3	3.2
Zinc	12	1,320	590	1,020	1,100
12331500--FLINT CREEK NEAR DRUMMOND, MONT.					
Period of record for fine-grained bed-sediment data: 1986, 1989, 1992-2003					
Arsenic	1	--	--	113	--
Cadmium	14	7.0	<.2	[1]3.5	[1]3.2
Chromium	10	29.2	20.4	25.0	25.2
Copper	14	73	47	60	61
Iron	14	28,100	19,800	23,400	23,300
Lead	14	240	126	173	171
Manganese	14	5,720	2,370	3,930	4,040
Nickel	11	14.9	10.4	12.4	11.7
Silver	13	7.8	5.0	6.4	6.4
Zinc	14	777	503	635	646
12331800--CLARK FORK NEAR DRUMMOND, MONT.					
Period of record for fine-grained bed-sediment data: 1986-87, 1991-2003					
Arsenic	1	--	--	33	--
Cadmium	15	7.7	2.6	4.9	4.8
Chromium	10	35.4	17.0	30.1	32.1
Copper	15	747	321	512	499
Iron	15	27,000	16,500	21,800	23,200
Lead	15	135	68	94	94
Manganese	15	3,090	1,150	1,860	1,740
Nickel	11	16.8	10.8	14.2	15.0
Silver	15	4.7	<3.2	[1]3.0	[1]2.9
Zinc	15	1,230	761	1,020	1,030

Table 22. Statistical summary of fine-grained bed-sediment data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12334510--ROCK CREEK NEAR CLINTON, MONT.					
Period of record for fine-grained bed-sediment data: 1986-87, 1989, 1991-99, 2001-03					
Arsenic	1	--	--	5	--
Cadmium	15	3.7	<.2	[1].9	[1]<.8
Chromium	9	27.9	16.5	22.2	21.3
Copper	15	16	3	12	13
Iron	15	21,400	13,100	17,600	17,600
Lead	15	16	<3	[1]9	[1]10
Manganese	15	724	126	382	382
Nickel	10	14.8	9.5	12.1	12.1
Silver	14	1.9	<.3	[1].5	[1]<.5
Zinc	15	58	23	44	47
12334550--CLARK FORK AT TURAH BRIDGE, NEAR BONNER, MONT.					
Period of record for fine-grained bed-sediment data: 1986, 1991-2003					
Arsenic	1	--	--	19	--
Cadmium	14	7.3	3.1	4.2	3.9
Chromium	10	34.7	15.3	26.0	28.4
Copper	14	635	211	376	338
Iron	14	24,400	12,600	19,000	17,400
Lead	14	115	47	73	68
Manganese	14	2,270	671	1,200	1,110
Nickel	11	19.1	8.7	13.3	12.0
Silver	14	3.9	<1.9	[1]2.1	[1]1.9
Zinc	14	1,160	586	874	861
12340000--BLACKFOOT RIVER NEAR BONNER, MONT.					
Period of record for fine-grained bed-sediment data: 1986-87, 1991, 1993-96, 1998-2001, 2003					
Arsenic	1	--	--	2	--
Cadmium	12	2.0	<.2	[1].7	[1]<1.2
Chromium	8	25.8	15.1	20.5	21.8
Copper	12	27	11	20	21
Iron	12	20,200	12,400	16,800	16,800
Lead	12	20	<13	[1]12	[1]12
Manganese	12	683	298	531	538
Nickel	9	14.3	9.4	11.9	12.5
Silver	12	1.0	<.3	[1].5	[1].3
Zinc	12	73	35	58	61
12340500--CLARK FORK ABOVE MISSOULA, MONT.					
Period of record for fine-grained bed-sediment data: 1997-2003					
Arsenic	1	--	--	23	--
Cadmium	7	5.8	1.5	3.5	3.7
Chromium	6	30.6	19.0	26.6	29.3
Copper	7	543	166	326	282
Iron	7	24,300	18,100	20,600	20,400
Lead	7	78	37	55	54
Manganese	7	1,420	480	1,040	1,160
Nickel	7	15.8	11.8	13.5	13.3
Silver	7	2.9	.8	[1]2.0	[1]2.1
Zinc	7	1,090	438	703	696

Table 22. Statistical summary of fine-grained bed-sediment data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12353000--CLARK FORK BELOW MISSOULA, MONT.[2]					
Period of record for fine-grained bed-sediment data: 1986, 1990-2003					
Arsenic	1	--	--	6	--
Cadmium	15	6.0	1.1	2.4	1.9
Chromium	10	27.6	12.3	21.9	22.6
Copper	15	293	69	148	138
Iron	15	21,100	13,100	18,000	18,600
Lead	15	58	12	36	36
Manganese	15	2,530	446	1,320	1,260
Nickel	11	14.1	8.4	12.0	12.5
Silver	15	3.0	.4	[1]1.3	[1]1.3
Zinc	15	675	239	391	380

[1]Value determined by arbitrarily substituting one-half of the analytical detection limit for censored (<) values when both uncensored and censored values were used in determining the mean and (or) median. When all data were less than the analytical detection limit, the median was determined by ranking the censored values in order of magnitude.

[2] Samples collected about 30 miles downstream from streamflow-gaging station to conform to previous sampling location.

Table 23. Statistical summary of bulk bed-sediment data for the upper Clark Fork basin, Montana, August 1993 through September 2003

[Bulk bed sediment is material smaller than about 10 millimeters in diameter. Reported concentrations are in micrograms per gram dry weight. Number of samples represents the number of years that the constituent was analyzed, with each year represented by a single mean concentration of composite samples. Symbols: <, less than the analytical detection limit; --, indicates insufficient data to compute statistic]

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12323600--SILVER BOW CREEK AT OPPORTUNITY, MONT.					
Period of record for bulk bed-sediment data: 1993-95, 1997-2003					
Arsenic	1	--	--	148	--
Cadmium	10	30.2	4.2	13.7	10.6
Chromium	9	18.1	9.6	13.5	12.7
Copper	10	3,800	670	1,580	1,260
Iron	10	29,300	18,300	23,500	23,300
Lead	10	398	198	289	270
Manganese	10	5,480	504	1,870	1,210
Nickel	10	12.7	6.0	8.1	7.7
Silver	10	8.0	3.2	5.1	4.4
Zinc	10	5,930	1,720	3,310	2,840
12323750--SILVER BOW CREEK AT WARM SPRINGS, MONT.					
Period of record for bulk bed-sediment data: 1993, 1995-2003					
Arsenic	1	--	--	36	--
Cadmium	10	3.4	<.9	[1]1.3	[1]1.3
Chromium	9	4.8	5.2	8.7	9.2
Copper	10	111	9	48	37
Iron	10	13,200	6,100	9,700	9,800
Lead	10	33	<10	[1]15	[1]12
Manganese	10	2,100	209	1,000	857
Nickel	10	10.3	4.8	6.4	5.5
Silver	10	1.3	<.3	[1].7	[1].8
Zinc	10	303	93	160	134
12323770--WARM SPRINGS CREEK AT WARM SPRINGS, MONT.					
Period of record for bulk bed-sediment data: 1995, 1997, 1999, 2002					
Cadmium	4	1.5	<.8	[1].6	[1]<.9
Chromium	4	12.0	7.4	10.2	10.7
Copper	4	238	127	193	204
Iron	4	12,700	8,010	10,200	10,000
Lead	4	38	18	29	29
Manganese	4	4,240	1,220	2,640	2,540
Nickel	4	8.5	5.7	7.2	7.4
Silver	4	1.3	<.8	[1].9	[1]1.0
Zinc	4	275	146	183	155
12323800--CLARK FORK NEAR GALEN, MONT.					
Period of record for bulk bed-sediment data: 1993-2003					
Arsenic	1	--	--	97	--
Cadmium	11	8.2	<.9	[1]4.0	[1]4.0
Chromium	10	23.7	4.2	15.5	15.4
Copper	11	902	223	500	542
Iron	11	31,300	9,930	19,900	19,500
Lead	11	158	41	82	79
Manganese	11	9,490	900	3,450	1,900
Nickel	11	15.2	4.9	8.8	8.8
Silver	11	5.2	.7	[1]2.1	[1]1.6
Zinc	11	1,280	417	706	653

Table 23. Statistical summary of bulk bed-sediment data for the upper Clark Fork basin, Montana, August 1993 through September 2003—Continued

Constituent	Number of samples	Maximum	Minimum	Mean	Median
461415112450801--CLARK FORK BELOW LOST CREEK, NEAR GALEN, MONT					
Period of record for bulk bed-sediment data: 1996-2003					
Arsenic	1	--	--	82	--
Cadmium	8	5.2	<.9	[1]2.7	[1]2.8
Chromium	7	17.5	6.8	11.7	12.0
Copper	8	763	238	427	411
Iron	8	21,000	12,300	16,600	16,700
Lead	8	104	41	70	71
Manganese	8	3,720	1,260	1,750	1,420
Nickel	8	8.4	4.2	6.5	6.8
Silver	8	2.8	.8	[1]1.7	[1]1.6
Zinc	8	787	339	527	539
461559112443301--CLARK FORK NEAR RACETRACK, MONT.					
Period of record for bulk bed-sediment data: 1996-2003					
Arsenic	1	--	--	90	--
Cadmium	8	10.5	<.9	[1]4.2	[1]3.0
Chromium	7	19.7	10.1	15.0	14.7
Copper	8	757	361	526	535
Iron	8	25,900	15,700	19,000	18,200
Lead	8	101	59	80	81
Manganese	8	4,170	759	1,680	1,430
Nickel	8	9.9	5.5	7.8	8.2
Silver	8	3.3	1.4	[1]2.4	[1]2.6
Zinc	8	997	472	678	679
461903112440701--CLARK FORK AT DEMPSEY CREEK DIVERSION, NEAR RACETRACK, MONT.					
Period of record for bulk bed-sediment data: 1996-2003					
Arsenic	1	--	--	82	--
Cadmium	8	9.2	1.5	4.3	3.4
Chromium	7	21.1	13.0	17.2	17.3
Copper	8	1,000	244	553	592
Iron	8	25,400	16,400	21,500	22,200
Lead	8	115	47	81	88
Manganese	8	4,930	825	2,030	1,740
Nickel	8	12.8	5.5	8.5	8.4
Silver	8	4.4	<.8	[1]2.4	[1]2.5
Zinc	8	1,240	368	658	608
12324200--CLARK FORK AT DEER LODGE, MONT.					
Period of record for bulk bed-sediment data: 1993-2003					
Arsenic	1	--	--	84	--
Cadmium	11	8.3	1.0	[1]3.6	[1]2.4
Chromium	10	29.2	12.1	19.1	19.6
Copper	11	906	281	525	440
Iron	11	25,000	13,200	19,800	20,200
Lead	11	122	45	81	82
Manganese	11	3,560	607	1,430	1,050
Nickel	11	12.3	7.7	10.2	10.2
Silver	11	3.9	<.7	[1]2.0	[1]1.6
Zinc	11	1,060	456	665	599

Table 23. Statistical summary of bulk bed-sediment data for the upper Clark Fork basin, Montana, August 1993 through September 2003—Continued

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12324590--LITTLE BLACKFOOT RIVER NEAR GARRISON, MONT.					
Period of record for bulk bed-sediment data: 1994, 1998, 2001					
Cadmium	3	<1.5	<1.2	[1].7	[1].7
Chromium	3	33.2	14.7	26.7	32.1
Copper	3	20	12	17	19
Iron	3	21,000	15,600	18,000	17,300
Lead	3	18	12	15	14
Manganese	3	420	308	354	333
Nickel	3	15.2	8.6	11.8	11.7
Silver	3	<1.6	<.7	[1].6	[1].8
Zinc	3	86	65	75	73
12324680--CLARK FORK AT GOLDCREEK, MONT.					
Period of record for bulk bed-sediment data: 1993-2003					
Arsenic	1	--	--	15	--
Cadmium	11	7.6	1.1	[1]3.3	[1]3.2
Chromium	10	33.2	15.0	22.1	21.3
Copper	11	858	175	419	282
Iron	11	24,900	11,900	18,400	18,300
Lead	11	92	37	62	56
Manganese	11	2,930	377	1,230	930
Nickel	11	15.9	8.3	11.3	10.5
Silver	11	3.7	<.7	[1]1.8	[1]1.5
Zinc	11	1,020	305	648	623
12331500--FLINT CREEK NEAR DRUMMOND, MONT.					
Period of record for bulk bed-sediment data: 1993-2003					
Arsenic	1	--	--	80	--
Cadmium	11	3.8	<.2	[1]1.9	[1]1.7
Chromium	10	13.9	4.9	9.8	10.9
Copper	11	40	16	24	23
Iron	11	15,700	8,630	13,000	13,400
Lead	11	120	51	80	80
Manganese	11	3,200	1,150	2,220	2,250
Nickel	11	8.0	4.5	6.0	5.9
Silver	11	5.8	2.5	4.3	4.3
Zinc	11	429	178	285	284
12331800--CLARK FORK NEAR DRUMMOND, MONT.					
Period of record for bulk bed-sediment data: 1993-2003					
Arsenic	1	--	--	31	--
Cadmium	11	5.1	<1.6	[1]2.7	[1]2.5
Chromium	10	29.5	6.9	18.4	17.2
Copper	11	605	114	265	223
Iron	11	21,800	12,100	16,000	15,900
Lead	11	78	31	49	47
Manganese	11	3,280	409	1,190	980
Nickel	11	14.2	7.7	10.3	9.8
Silver	11	3.5	.5	[1]1.7	[1]<3.2
Zinc	11	939	381	586	515

Table 23. Statistical summary of bulk bed-sediment data for the upper Clark Fork basin, Montana, August 1993 through September 2003—Continued

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12334510--ROCK CREEK NEAR CLINTON, MONT.					
Period of record for bulk bed-sediment data: 1993-99, 2001-03					
Arsenic	1	--	--	1	--
Cadmium	10	3.0	<.2	[1].8	[1].5
Chromium	9	22.6	.6.4	10.5	8.8
Copper	10	10	.6	[1]5	[1]5
Iron	10	14,800	5,290	8,360	7,340
Lead	10	12	1	[1]5	[1]5
Manganese	10	270	60	150	144
Nickel	10	10.2	3.6	5.7	5.0
Silver	10	<1.6	.1	[1].4	[1].4
Zinc	10	37	.3	17	17
12334550--CLARK FORK AT TURAH BRIDGE, NEAR BONNER, MONT.					
Period of record for bulk bed-sediment data: 1993-2003					
Arsenic	1	--	--	18	--
Cadmium	11	5.5	.4	[1]2.4	[1]2.3
Chromium	10	23.8	6.9	15.3	16.0
Copper	11	336	75	192	186
Iron	11	19,100	9,270	13,500	13,200
Lead	11	67	21	39	37
Manganese	11	2,620	234	860	642
Nickel	11	14.0	6.4	9.3	8.8
Silver	11	2.9	<.3	[1]1.3	[1]1.2
Zinc	11	769	271	482	501
12340000--BLACKFOOT RIVER NEAR BONNER, MONT.					
Period of record for bulk bed-sediment data: 1993-94, 1999-2001, 2003					
Arsenic	1	--	--	<.5	--
Cadmium	6	2.5	<.2	[1].9	[1]<1.5
Chromium	5	19.2	6.7	13.0	12.5
Copper	6	19	6	14	15
Iron	6	17,000	10,300	13,800	13,800
Lead	6	11	5	9	9
Manganese	6	650	179	340	316
Nickel	6	9.8	7.5	8.8	9.0
Silver	6	<1.9	<.4	[1].5	[1].6
Zinc	6	58	23	38	35
12340500--CLARK FORK ABOVE MISSOULA, MONT.					
Period of record for bulk bed-sediment data: 1997-2003					
Arsenic	1	--	--	4	--
Cadmium	7	5.2	<.8	[1]1.9	[1]<1.1
Chromium	6	31.5	9.7	17.0	16.1
Copper	7	630	43	165	84
Iron	7	21,500	11,100	15,300	16,000
Lead	7	84	7	30	20
Manganese	7	888	228	572	570
Nickel	7	14.4	8.1	10.1	9.2
Silver	7	3.4	<.4	[1]1.2	[1].9
Zinc	7	1,210	145	408	295

Table 23. Statistical summary of bulk bed-sediment data for the upper Clark Fork basin, Montana, August 1993 through September 2003—Continued

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12353000--CLARK FORK BELOW MISSOULA, MONT.[2]					
Period of record for bulk bed-sediment data: 1993-2003					
Arsenic	1	--	--	1.1	--
Cadmium	11	3.0	<.2	[1]1.0	[1]<1.1
Chromium	10	12.7	4.4	7.7	7.1
Copper	11	77	10	38	30
Iron	11	13,300	5,830	8,910	8,830
Lead	11	23	5	[1]10	[1]8
Manganese	11	560	150	338	364
Nickel	11	8.1	3.5	5.4	4.9
Silver	11	<1.9	<.3	[1].5	[1].5
Zinc	11	183	39	110	101

[1]Value determined by arbitrarily substituting one-half of the analytical detection limit for censored (<) values when both uncensored and censored values were used in determining the mean and (or) median. When all data were less than the analytical detection level, the median was determined by ranking the censored values in order of magnitude.

[2]Samples collected about 30 miles downstream from streamflow-gaging station to conform to previous sampling location.

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003

[Concentrations are in micrograms per gram dry weight. Number of composite samples represents the total of all individual composite samples collected for every year that the constituent was analyzed. Values for single samples are arbitrarily listed in the "Mean" column. Because *Hydropsyche* insects were not sorted to the species level during 1986-89, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics for the *Hydropsyche morosa* group are based on the combined results for two or more species. Insects collected during 1986-98 were depurated prior to analysis; depuration was discontinued in 1999. Abbreviation: spp., species. Symbols: <, less than analytical detection limit; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12323600--SILVER BOW CREEK AT OPPORTUNITY, MONT.					
Period of record for biological data: 1992, 1994-95, 1997-2003					
Brachycentrus spp.					
Cadmium	5	12.5	5.8	10.1	11.6
Chromium	5	5.9	.7	2.1	.9
Copper	5	846	235	587	592
Iron	5	1,190	335	617	469
Lead	5	21.5	7.4	13.7	13.8
Manganese	5	817	231	515	503
Nickel	5	2.1	<.1	[1]1.3	[1]1.6
Zinc	5	995	629	803	815
Hydropsyche cockerelli					
Arsenic	1	--	--	20.4	--
Cadmium	7	9.7	4.1	6.0	5.2
Chromium	7	8.0	1.0	3.6	3.1
Copper	7	1,090	269	485	439
Iron	7	2,660	689	1,300	1,000
Lead	7	47.2	19.0	26.9	21.0
Manganese	7	3,030	180	928	591
Nickel	7	3.6	.7	2.1	2.1
Zinc	7	1,590	749	1,010	871
Hydropsyche spp.					
Arsenic	3	23.1	18.4	20.1	18.9
Cadmium	8	10.6	5.0	7.5	7.1
Chromium	8	4.7	.6	2.2	2.2
Copper	8	930	352	655	652
Iron	8	2,290	1,270	1,870	1,990
Lead	8	50.8	34.7	39.5	38.2
Manganese	8	1,340	712	1,080	1,060
Nickel	8	2.5	1.6	2.3	2.4
Zinc	8	1,290	1,070	1,120	1,100
Hydropsyche tana					
Cadmium	6	9.2	4.8	6.8	6.9
Chromium	6	11.5	.9	4.5	1.8
Copper	6	456	10.5	236	298
Iron	6	1,520	857	1,100	1,050
Lead	6	21.0	15.6	18.6	18.3
Manganese	6	969	307	634	675
Nickel	6	1.8	.7	1.4	1.6
Zinc	6	1,070	760	961	1,020

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12323750--SILVER BOW CREEK AT WARM SPRINGS, MONT.					
Period of record for biological data: 1992-2003					
		Hydropsyche cockerelli			
Arsenic	2	18.2	17.4	17.8	--
Cadmium	28	2.1	.2	.7	.6
Chromium	28	4.3	.4	1.0	.8
Copper	28	97.0	22.4	41.0	38.1
Iron	28	1,240	351	734	744
Lead	28	5.7	.3	3.0	2.8
Manganese	28	2,520	491	1,200	914
Nickel	28	1.8	.3	.9	.8
Zinc	28	276	115	178	168
		Hydropsyche occidentalis			
Arsenic	2	26.8	25.6	26.2	--
Cadmium	17	1.6	.2	.6	.4
Chromium	17	6.8	.3	1.6	1.0
Copper	17	48.9	11.0	32.9	31.2
Iron	17	2,960	372	1,150	980
Lead	17	8.2	<1.7	[1]3.9	[1]3.6
Manganese	17	3,540	1,200	2,400	2,160
Nickel	17	2.7	.7	1.5	1.5
Zinc	17	211	141	180	181
		Hydropsyche spp.			
Cadmium	4	2.3	.4	1.1	.9
Chromium	4	1.4	.5	.8	1.2
Copper	4	47.6	34.9	40.9	40.6
Iron	4	773	561	680	693
Lead	4	5.1	1.9	2.9	4.7
Manganese	4	1,100	443	725	678
Nickel	4	1.9	<.4	[1].8	[1].5
Zinc	4	285	141	195	177
12323770--WARM SPRINGS CREEK AT WARM SPRINGS, MONT.					
Period of record for biological data: 1995, 1997, 1999, 2002					
		Arctopsyche grandis			
Cadmium	4	3.0	1.9	2.4	2.2
Chromium	4	2.9	.8	1.7	1.6
Copper	4	102	78.3	93.7	97.2
Iron	4	1,040	684	839	815
Lead	4	5.6	3.0	[1]4.3	4.3
Manganese	4	3,560	1,340	2,250	2,040
Nickel	4	2.3	1.8	[1]2.1	2.2
Zinc	4	222	181	196	190

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12323770--WARM SPRINGS CREEK AT WARM SPRINGS, MONT.—Continued					
Period of record for biological data: 1995, 1997, 1999, 2002					
Hydropsyche occidentalis					
Cadmium	2	.8	.7	.8	--
Chromium	2	3.2	3.2	3.2	--
Copper	2	183	181	182	--
Iron	2	2,070	1,950	2,010	--
Lead	2	8.2	6.7	7.4	--
Manganese	2	2,480	2,400	2,440	--
Nickel	2	3.3	3.0	3.2	--
Zinc	2	172	166	169	--
Hydropsyche spp.					
Cadmium	2	1.1	.6	.9	--
Chromium	2	1.6	1.4	1.5	--
Copper	2	95.9	94.8	95.3	--
Iron	2	1,220	1,150	1,190	--
Lead	2	5.9	5.2	5.6	--
Manganese	2	3,390	956	2,170	--
Nickel	2	2.0	1.8	1.9	--
Zinc	2	129	125	127	--
12323800--CLARK FORK NEAR GALEN, MONT.					
Period of record for biological data: 1987, 1991-2003					
Hydropsyche cockerelli					
Arsenic	1	--	--	13.6	--
Cadmium	26	2.7	.7	1.5	1.5
Chromium	26	4.4	.8	1.8	1.6
Copper	26	181	48.7	98.0	95.0
Iron	26	2,460	816	1,380	1,340
Lead	26	11.7	1.2	7.5	7.6
Manganese	26	3,620	1,070	2,240	2,250
Nickel	26	3.1	.9	1.6	1.4
Zinc	26	299	136	210	208
Hydropsyche morosa group					
Cadmium	5	3.2	2.4	2.5	2.4
Chromium	5	4.6	1.8	2.6	2.2
Copper	5	185	156	173	175
Iron	5	1,890	1,360	1,510	1,430
Lead	5	12.4	7.1	8.5	7.9
Manganese	5	3,960	2,360	3,500	3,860
Nickel	5	3.6	1.9	2.3	2.1
Zinc	5	349	292	309	303
Hydropsyche occidentalis					
Arsenic	3	16.5	15.9	16.1	16.1
Cadmium	35	1.7	.6	1.1	1.0
Chromium	35	6.6	.4	2.0	1.5
Copper	35	121	49.2	82.0	80.8
Iron	35	1,920	642	1,260	1,200
Lead	35	13.5	1.6	7.0	6.5
Manganese	35	6,170	1,220	2,560	2,240
Nickel	35	3.5	.8	1.6	1.5
Zinc	35	286	168	199	191

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12323800--CLARK FORK NEAR GALEN, MONT.—Continued					
Period of record for biological data: 1987, 1991-2003					
Hydropsyche tana					
Cadmium	1	--	--	1.5	--
Chromium	1	--	--	1.4	--
Copper	1	--	--	92.9	--
Iron	1	--	--	1,340	--
Lead	1	--	--	9.0	--
Manganese	1	--	--	2,160	--
Nickel	1	--	--	2.1	--
Zinc	1	--	--	206	--
Hydropsyche spp.					
Cadmium	4	3.5	2.6	3.0	3.0
Chromium	0	--	--	--	--
Copper	4	154	135	148	152
Iron	4	1,540	1,190	1,400	1,450
Lead	4	13.5	10.5	12.2	12.4
Manganese	0	--	--	--	--
Nickel	0	--	--	--	--
Zinc	4	329	279	308	313
461415112450801--CLARK FORK BELOW LOST CREEK, NEAR GALEN, MONT.					
Period of record for biological data: 1996-2003					
Claassenia sabulosa					
Arsenic	1	--	--	1.5	--
Cadmium	2	.4	.3	.4	--
Chromium	2	1.9	.4	1.2	--
Copper	2	70.1	67.1	68.6	--
Iron	2	209	189	199	--
Lead	2	1.2	.7	1.0	--
Manganese	2	238	90.4	164	--
Nickel	2	1.9	<.2	[1]1.0	--
Zinc	2	245	208	226	--
Hydropsyche cockerelli					
Arsenic	3	11.8	11.2	11.5	11.6
Cadmium	14	2.8	1.1	1.8	1.9
Chromium	14	2.7	.8	2.0	2.2
Copper	14	147	48.8	104	97.0
Iron	14	2,570	691	1,330	1,180
Lead	14	15.2	4.5	10.3	9.8
Manganese	14	3,160	1,230	1,890	1,700
Nickel	14	1.9	.9	1.3	1.1
Zinc	14	321	151	214	226
Hydropsyche occidentalis					
Arsenic	2	12.9	12.7	12.8	--
Cadmium	16	1.8	.9	1.3	1.5
Chromium	16	3.3	1.3	2.0	2.0
Copper	16	157	52.1	104	98.2
Iron	16	1,920	963	1,380	1,270
Lead	16	12.4	6.6	9.6	9.8

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
461415112450801--CLARK FORK BELOW LOST CREEK, NEAR GALEN, MONT.—Continued					
Period of record for biological data: 1996-2003					
Hydropsyche occidentalis—Continued					
Manganese	16	3,440	1,220	2,150	1,850
Nickel	16	1.7	.9	1.3	1.3
Zinc	16	283	174	224	226
Hydropsyche spp.					
Arsenic	1	--	--	12.0	--
Cadmium	5	1.8	1.2	1.5	1.4
Chromium	5	2.4	.9	1.5	1.5
Copper	5	122	45.1	91.8	103
Iron	5	1,410	533	1,110	1,200
Lead	5	20.5	4.1	10.0	8.7
Manganese	5	1,980	799	1,440	1,230
Nickel	5	2.8	1.0	1.6	1.4
Zinc	5	225	143	179	179
461559112443301--CLARK FORK NEAR RACETRACK, MONT.					
Period of record for biological data: 1996-2003					
Claassenia sabulosa					
Cadmium	1	--	--	.4	--
Chromium	1	--	--	.3	--
Copper	1	--	--	40.3	--
Iron	1	--	--	113	--
Lead	1	--	--	.8	--
Manganese	1	--	--	172	--
Nickel	1	--	--	.2	--
Zinc	1	--	--	213	--
Hydropsyche cockerelli					
Arsenic	2	11.7	11.5	11.6	--
Cadmium	13	1.9	1.0	1.4	1.4
Chromium	13	2.7	.6	1.6	1.4
Copper	13	109	50.0	78.2	74.1
Iron	13	1,370	657	955	981
Lead	13	10.5	3.7	6.7	6.4
Manganese	13	2,010	646	1,390	1,530
Nickel	13	1.4	.7	1.0	1.0
Zinc	13	199	139	172	171
Hydropsyche occidentalis					
Arsenic	2	14.3	13.7	14.0	--
Cadmium	15	2.2	.7	1.4	1.4
Chromium	15	3.7	1.1	2.1	2.0
Copper	15	160	59.5	107	107
Iron	15	1,880	1,030	1,510	1,520
Lead	15	11.7	4.3	9.6	10.1
Manganese	15	3,770	1,090	2,070	2,050
Nickel	15	1.9	1.1	1.3	1.3
Zinc	15	255	181	225	220

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
461559112443301--CLARK FORK NEAR RACETRACK, MONT.—Continued					
Period of record for biological data: 1996-2003					
		Hydropsyche spp.			
Arsenic	1	--	--	11.9	--
Cadmium	3	2.4	1.0	1.6	1.5
Chromium	3	1.7	.7	1.2	1.1
Copper	3	113	82.9	93.7	85.2
Iron	3	1,290	1,140	1,210	1,200
Lead	3	9.6	5.7	7.5	7.4
Manganese	3	1,600	910	1,210	1,130
Nickel	3	1.4	1.1	1.3	1.3
Zinc	3	208	151	180	181
461903112440701--CLARK FORK AT DEMPSEY CREEK DIVERSION, NEAR RACETRACK, MONT.					
Period of record for biological data: 1996-2003					
		Arctopsyche grandis			
Cadmium	1	--	--	1.7	--
Chromium	1	--	--	<2.4	--
Copper	1	--	--	30.8	--
Iron	1	--	--	340	--
Lead	1	--	--	<14.5	--
Manganese	1	--	--	510	--
Nickel	1	--	--	1.0	--
Zinc	1	--	--	87	--
		Hydropsyche cockerelli			
Arsenic	1	--	--	18.8	--
Cadmium	10	1.6	.7	1.2	1.3
Chromium	10	4.0	.4	1.3	1.0
Copper	10	190	60.7	91.3	76.7
Iron	10	2,310	552	973	841
Lead	10	17.7	3.5	7.1	5.9
Manganese	10	1,530	487	1,010	1,140
Nickel	10	1.9	.5	1.0	.8
Zinc	10	275	162	187	179
		Hydropsyche occidentalis			
Arsenic	1	--	--	24.0	--
Cadmium	18	1.8	.7	1.2	1.1
Chromium	18	6.2	.8	2.1	1.8
Copper	18	238	74.9	103	88.3
Iron	18	3,390	940	1,520	1,500
Lead	18	21.8	6.1	11.6	11.4
Manganese	18	3,990	826	2,420	2,280
Nickel	18	2.4	1.2	1.5	1.4
Zinc	18	355	222	252	236

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
461903112440701--CLARK FORK AT DEMPSEY CREEK DIVERSION, NEAR RACETRACK, MONT.—Continued					
Period of record for biological data: 1996-2003					
		Hydropsyche spp.			
Cadmium	2	1.7	1.6	1.6	--
Chromium	2	2.1	1.4	1.8	--
Copper	2	140	104	122	--
Iron	2	1,610	1,070	1,340	--
Lead	2	13.2	10.5	11.8	--
Manganese	2	1,150	638	892	--
Nickel	2	1.6	1.6	1.6	--
Zinc	2	212	191	202	--
12324200--CLARK FORK AT DEER LODGE, MONT.					
Period of record for biological data: 1986-87, 1990-2003					
		Arctopsyche grandis			
Cadmium	2	2.4	<4.2	[1]2.2	--
Chromium	2	1.0	<1.3	[1].8	--
Copper	2	69.1	34.9	52.0	--
Iron	2	676	537	606	--
Lead	2	<7.8	3.8	[1]3.8	--
Manganese	2	727	380	554	--
Nickel	2	<1.7	<1.3	[1]--	--
Zinc	2	178	140	159	--
		Hydropsyche cockerelli			
Arsenic	1	--	--	10.1	--
Cadmium	24	2.3	.6	1.4	1.3
Chromium	24	3.2	.4	1.6	1.7
Copper	24	136	54.7	94.5	98.0
Iron	24	3,340	490	1,140	1,050
Lead	24	18.2	4.3	9.7	8.9
Manganese	24	1,490	396	817	710
Nickel	24	2.4	.3	1.2	1.0
Zinc	24	391	132	186	188
		Hydropsyche occidentalis			
Arsenic	2	12.4	11.3	11.8	--
Cadmium	39	2.7	.8	1.3	1.3
Chromium	39	3.6	.6	1.9	1.9
Copper	39	162	49.4	113	110
Iron	39	2,060	557	1,420	1,430
Lead	39	18.6	3.5	11.0	10.8
Manganese	39	2,840	649	1,670	1,710
Nickel	39	12.9	1.0	1.8	1.4
Zinc	39	329	166	237	231
		Hydropsyche spp.			
Cadmium	3	2.0	1.2	1.6	1.6
Chromium	0	--	--	--	--
Copper	3	222	103	145	111
Iron	3	2,220	1,110	1,520	1,240
Lead	3	15.0	5.6	8.8	5.7
Manganese	0	--	--	--	--

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12324200--CLARK FORK AT DEER LODGE, MONT.—Continued					
Period of record for biological data: 1986-87, 1990-2003					
Hydropsyche spp.—Continued					
Nickel	0	--	--	--	--
Zinc	3	203	185	195	197
12324590--LITTLE BLACKFOOT RIVER NEAR GARRISON, MONT.					
Period of record for biological data: 1987, 1994, 1998, 2001					
Arctopsyche grandis					
Cadmium	15	.7	.2	.4	.4
Chromium	15	1.6	.6	.9	.8
Copper	15	14.2	9.0	12.2	13.0
Iron	15	677	177	384	313
Lead	15	1.3	.5	.8	.8
Manganese	15	1,140	318	678	551
Nickel	15	1.4	.4	.7	.6
Zinc	15	214	113	165	162
Claassenia sabulosa					
Cadmium	7	.5	.1	.2	.2
Chromium	7	.9	.3	.6	.7
Copper	7	36.1	20.0	29.4	30.3
Iron	7	319	98	175	156
Lead	7	<.8	<.1	[1].4	[1].3
Manganese	7	90.5	46.7	63.8	61.6
Nickel	7	.7	.4	.5	.5
Zinc	7	233	172	203	202
Hydropsyche cockerelli					
Cadmium	1	--	--	.6	--
Chromium	1	--	--	1.6	--
Copper	1	--	--	28.4	--
Iron	1	--	--	478	--
Lead	1	--	--	3.6	--
Manganese	1	--	--	399	--
Nickel	1	--	--	1.2	--
Zinc	1	--	--	123	--
Hydropsyche occidentalis					
Cadmium	2	<.7	.3	[1].3	--
Chromium	2	2.3	1.3	1.8	--
Copper	2	15.2	15.1	15.2	--
Iron	2	1,340	426	883	--
Lead	2	2.3	<3.7	[1]2.1	--
Manganese	2	554	434	494	--
Nickel	2	1.1	.8	1.0	--
Zinc	2	137	110	124	--

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12324680--CLARK FORK AT GOLDCREEK, MONT.					
Period of record for biological data: 1992-2003					
Arctopsyche grandis					
Arsenic	6	6.4	5.8	6.1	6.1
Cadmium	35	6.6	.6	2.2	2.0
Chromium	35	3.3	.4	1.4	1.1
Copper	35	129	21.4	48.0	40.8
Iron	35	2,360	339	769	624
Lead	35	10.9	2.0	4.0	3.6
Manganese	35	1,580	592	851	803
Nickel	35	1.8	.2	.8	.7
Zinc	35	326	149	204	186
Claassenia sabulosa					
Arsenic	3	1.0	.7	.9	.9
Cadmium	23	3.5	.3	1.2	.8
Chromium	23	1.6	.2	.6	.5
Copper	23	81.7	33.0	56.7	56.3
Iron	23	567	63.0	192	171
Lead	23	1.8	.4	1.0	1.0
Manganese	23	279	50.6	123	106
Nickel	23	.7	.1	.3	.3
Zinc	23	351	166	263	261
Hydropsyche cockerelli					
Arsenic	4	6.1	5.7	5.9	6.0
Cadmium	23	2.6	.5	1.4	1.3
Chromium	23	4.7	.5	2.2	2.0
Copper	23	188	17.1	73.5	58.6
Iron	23	3,250	522	1,220	1,010
Lead	23	16.2	2.4	7.2	5.5
Manganese	23	1,670	538	862	900
Nickel	23	2.3	.3	1.2	1.2
Zinc	23	249	106	183	186
Hydropsyche morosa group					
Cadmium	4	1.7	1.1	1.4	1.4
Chromium	4	1.4	1.3	1.4	1.4
Copper	4	72.9	43.8	60.5	62.7
Iron	4	1,320	612	1,050	1,130
Lead	4	6.9	2.4	4.6	4.6
Manganese	4	1,030	538	804	822
Nickel	4	1.4	.9	1.2	1.2
Zinc	4	190	137	167	170
Hydropsyche occidentalis					
Arsenic	1	--	--	5.8	--
Cadmium	16	1.7	.5	1.2	1.3
Chromium	16	3.9	.4	1.6	1.7
Copper	16	156	26.4	64.4	59.8
Iron	16	2,720	466	1,140	1,070
Lead	16	15.7	2.9	7.2	6.0
Manganese	16	2,210	530	1,140	1,020
Nickel	16	2.5	.8	1.2	1.1
Zinc	16	277	97	193	190

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12331500--FLINT CREEK NEAR DRUMMOND, MONT.					
Period of record for biological data: 1986, 1992-2003					
Arctopsyche grandis					
Arsenic	3	9.0	7.4	8.1	7.8
Cadmium	42	.8	.1	.4	.4
Chromium	42	7.1	.3	2.1	1.7
Copper	42	22.2	8.9	15.2	15.3
Iron	42	2,460	412	1,360	1,360
Lead	42	17.5	3.7	8.9	8.2
Manganese	42	3,160	424	1,570	1,400
Nickel	42	2.7	.6	1.4	1.3
Zinc	42	275	93	199	195
Hydropsyche cockerelli					
Arsenic	2	17.1	16.8	17.0	--
Cadmium	13	.9	.1	.5	.4
Chromium	13	9.1	.9	2.9	2.0
Copper	13	28.3	9.5	18.2	18.1
Iron	13	4,400	996	2,440	2,180
Lead	13	28.4	3.1	15.5	16.3
Manganese	13	3,020	401	1,590	1,230
Nickel	13	4.0	.9	2.2	2.3
Zinc	13	224	85	177	183
Hydropsyche occidentalis					
Cadmium	7	1.1	.2	.6	.6
Chromium	7	17.6	.7	4.5	2.1
Copper	7	27.3	15.1	20.6	18.6
Iron	7	2,990	912	1,900	1,870
Lead	7	29.8	5.8	19.4	24.0
Manganese	7	4,790	1,400	2,270	1,780
Nickel	7	6.9	.8	3.0	2.4
Zinc	7	243	128	185	188
Hydropsyche spp.					
Cadmium	1	--	--	<.3	--
Chromium	1	--	--	1.4	--
Copper	1	--	--	12.5	--
Iron	1	--	--	1,440	--
Lead	1	--	--	4.5	--
Manganese	1	--	--	1,320	--
Nickel	1	--	--	1.3	--
Zinc	1	--	--	130	--
Hydropsyche tana					
Cadmium	2	<1.2	<.1	[1]--	--
Chromium	2	10.3	.6	5.4	--
Copper	2	16.0	5.4	10.7	--
Iron	2	1,320	729	1,020	--
Lead	2	15.3	5.0	10.2	--
Manganese	2	1,400	1,180	1,290	--
Nickel	2	3.1	.5	1.8	--
Zinc	2	139	107	123	--

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12331800--CLARK FORK NEAR DRUMMOND, MONT.					
Period of record for biological data: 1986, 1991-2003					
Arctopsyche grandis					
Arsenic	3	3.6	3.2	3.3	3.3
Cadmium	35	3.8	.5	1.4	1.3
Chromium	35	2.5	.2	1.0	1.0
Copper	35	89.2	16.9	33.8	28.2
Iron	35	1,660	240	604	547
Lead	35	11.8	2.1	4.6	4.1
Manganese	35	2,010	462	840	733
Nickel	35	1.9	.2	.7	.6
Zinc	35	308	140	190	189
Claassenia sabulosa					
Arsenic	2	.7	.7	.7	--
Cadmium	38	2.8	.2	1.1	1.1
Chromium	38	3.3	.1	.7	.5
Copper	38	165	18.0	64.9	55.9
Iron	38	387	45.4	159	135
Lead	38	2.9	.2	.9	.8
Manganese	38	410	33.1	157	135
Nickel	38	1.1	.1	.3	.2
Zinc	38	567	103	273	253
Hydropsyche cockerelli					
Arsenic	2	4.5	4.4	4.4	--
Cadmium	31	2.3	.4	1.2	.9
Chromium	31	3.5	.4	1.6	1.6
Copper	31	156	30.0	59.9	50.7
Iron	31	2,500	506	1,180	984
Lead	31	15.0	5.1	8.6	7.7
Manganese	31	1,680	549	946	901
Nickel	31	2.0	.5	1.1	1.1
Zinc	31	248	134	192	184
Hydropsyche morosa group					
Cadmium	6	1.3	1.1	1.2	1.2
Chromium	6	2.8	1.9	2.3	2.2
Copper	6	57.4	50.2	55.2	55.8
Iron	6	1,730	1,380	1,570	1,600
Lead	6	10.8	7.0	8.9	9.0
Manganese	6	1,940	1,260	1,610	1,620
Nickel	6	1.7	1.3	1.5	1.5
Zinc	6	250	227	239	240
Hydropsyche occidentalis					
Arsenic	2	4.3	4.3	4.3	--
Cadmium	18	2.0	.4	1.1	1.1
Chromium	18	8.1	.4	2.4	2.3
Copper	18	118	13.3	54.6	54.1
Iron	18	2,060	424	1,270	1,190
Lead	18	14.0	2.9	9.0	8.7
Manganese	18	2,920	619	1,480	1,210
Nickel	18	2.4	.5	1.4	1.4
Zinc	18	293	157	221	222

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12331800--CLARK FORK NEAR DRUMMOND, MONT.—Continued					
Period of record for biological data: 1986, 1991-2003					
Hydropsyche spp.					
Cadmium	1	--	--	2.6	--
Chromium	0	--	--	--	--
Copper	1	--	--	85.0	--
Iron	1	--	--	940	--
Lead	1	--	--	9.1	--
Manganese	0	--	--	--	--
Nickel	0	--	--	--	--
Zinc	1	--	--	260	--
12334510--ROCK CREEK NEAR CLINTON, MONT.					
Period of record for biological data: 1987, 1991-99, 2001-03					
Arctopsyche grandis					
Arsenic	4	2.2	1.9	2.0	2.0
Cadmium	42	.4	.06	.2	.2
Chromium	42	2.9	.5	1.2	1.0
Copper	42	15.7	4.7	8.6	8.5
Iron	42	1,090	191	582	506
Lead	42	1.1	.05	[1].4	[1].4
Manganese	42	454	113	250	227
Nickel	42	1.8	.2	.9	.9
Zinc	42	189	84	127	130
Claassenia sabulosa					
Arsenic	1	--	--	1.1	--
Cadmium	20	.3	.05	.2	.2
Chromium	20	1.8	.1	.7	.6
Copper	20	40.7	18.1	28.4	27.9
Iron	20	129	49.8	93.2	102
Lead	20	1.0	.1	.4	.3
Manganese	20	76.3	15.7	35.0	33.6
Nickel	20	.9	.1	.4	.3
Zinc	20	264	139	195	191
Hydropsyche cockerelli					
Arsenic	1	--	--	2.4	--
Cadmium	4	.3	<.2	[1].2	<.2
Chromium	4	1.0	.3	.8	.9
Copper	4	13.1	6.0	8.5	7.4
Iron	4	825	485	604	553
Lead	4	<1.1	.4	[1].5	<1.1
Manganese	4	266	192	231	233
Nickel	4	1.0	.4	.6	.6
Zinc	4	99	82	91	91
Hydropsyche occidentalis					
Arsenic	1	--	--	2.2	--
Cadmium	5	.4	<.3	[1].2	.14
Chromium	5	2.4	.9	1.6	1.6
Copper	5	17.6	5.1	10.6	10.2
Iron	5	973	520	709	652
Lead	5	6.0	1.2	3.0	1.8

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12334510--ROCK CREEK NEAR CLINTON, MONT.—Continued					
Period of record for biological data: 1987, 1991-99, 2001-03					
Hydropsyche occidentalis—Continued					
Manganese	5	295	169	242	262
Nickel	5	1.7	.6	1.2	1.4
Zinc	5	144	99	116	117
Hydropsyche spp.					
Cadmium	3	.3	<.5	[1].2	.2
Chromium	3	2.1	1.1	1.6	1.7
Copper	3	16.2	11.6	14.3	15.0
Iron	3	1,140	837	1,000	1,030
Lead	3	<3.1	<1.8	[1]--	<2.9
Manganese	3	462	299	399	437
Nickel	3	1.3	.8	1.1	1.1
Zinc	3	135	117	126	126
12334550--CLARK FORK AT TURAH BRIDGE, NEAR BONNER, MONT.					
Period of record for biological data: 1986, 1991-2003					
Arctopsyche grandis					
Arsenic	4	5.0	4.5	4.7	--
Cadmium	46	2.7	.3	1.2	.9
Chromium	46	4.1	.6	1.7	1.5
Copper	46	125	20.1	38.8	30.4
Iron	46	2,870	372	979	827
Lead	46	13.2	1.6	4.5	3.8
Manganese	46	893	324	615	626
Nickel	46	2.7	.4	1.1	.9
Zinc	46	276	111	196	196
Claassenia sabulosa					
Arsenic	2	.8	.8	.8	--
Cadmium	28	2.5	.2	1.0	.8
Chromium	28	2.0	.2	.7	.6
Copper	28	79.2	37.5	55.7	52.5
Iron	28	181	58.6	102	101
Lead	28	1.6	.2	.6	.6
Manganese	28	139	37.2	76.2	68.5
Nickel	28	.6	.1	.2	.2
Zinc	28	283	144	218	218
Hydropsyche cockerelli					
Arsenic	3	4.1	3.7	3.9	3.9
Cadmium	31	1.8	.3	.8	.7
Chromium	31	8.0	.16	1.9	1.6
Copper	31	118	26.4	47.7	42.5
Iron	31	2,530	566	1,210	1,090
Lead	31	12.1	2.2	5.2	5.0
Manganese	31	788	426	596	575
Nickel	31	2.6	.6	1.2	1.2
Zinc	31	228	119	182	180

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12334550--CLARK FORK AT TURAH BRIDGE, NEAR BONNER, MONT.—Continued					
Period of record for biological data: 1986, 1991-2003					
Hydropsyche morosa group					
Cadmium	2	1.3	1.1	1.2	--
Chromium	2	4.6	2.4	3.5	--
Copper	2	84.1	26.8	55.4	--
Iron	2	1,800	986	1,390	--
Lead	2	6.6	<7.8	[1]5.2	--
Manganese	2	1,320	537	928	--
Nickel	2	1.7	1.3	1.5	--
Zinc	2	231	171	201	--
Hydropsyche occidentalis					
Arsenic	1	--	--	3.6	--
Cadmium	21	1.8	.3	.9	.8
Chromium	21	3.2	.6	1.9	1.7
Copper	21	102	27.4	49.0	43.7
Iron	21	2,310	472	1,200	1,130
Lead	21	14.2	3.0	6.5	5.7
Manganese	21	1,600	454	807	712
Nickel	21	3.2	.6	1.2	1.1
Zinc	21	416	145	205	194
Hydropsyche spp.					
Cadmium	1	--	--	1.3	--
Chromium	1	--	--	2.4	--
Copper	1	--	--	84.1	--
Iron	1	--	--	1,800	--
Lead	1	--	--	<7.8	--
Manganese	1	--	--	537	--
Nickel	1	--	--	1.3	--
Zinc	1	--	--	171	--
12340000--BLACKFOOT RIVER NEAR BONNER, MONT.					
Period of record for biological data: 1986-87, 1991, 1993, 1996, 1998, 2000, 2003					
Arctopsyche grandis					
Arsenic	1	--	--	2.8	--
Cadmium	11	.4	<.1	[1].2	[1].2
Chromium	5	1.8	.8	1.3	1.2
Copper	11	13.4	9.9	12.0	12.0
Iron	11	1,230	108	606	617
Lead	11	2.1	.5	1.0	.6
Manganese	5	517	286	413	398
Nickel	5	1.2	.8	1.0	1.0
Zinc	11	143	123	135	136
Claassenia sabulosa					
Cadmium	11	.2	.1	.1	.1
Chromium	5	.9	.3	.5	.5
Copper	11	88.5	19.0	45.2	44.0
Iron	11	158	46.2	100	99.0
Lead	11	.6	.4	.3	.4
Manganese	5	127	26.3	57.1	44.7

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12340000--BLACKFOOT RIVER NEAR BONNER, MONT.—Continued					
Period of record for biological data: 1986-87, 1991, 1993, 1996, 1998, 2000, 2003					
Claassenia sabulosa—Continued					
Nickel	5	.3	.1	.2	.2
Zinc	11	329	117	209	194
Hydropsyche occidentalis					
Arsenic	1	--	--	3.2	--
Cadmium	13	.5	.1	.2	.2
Chromium	13	2.7	.8	1.8	1.7
Copper	13	20.6	12.0	14.4	14.4
Iron	13	1,930	1,060	1,410	1,470
Lead	13	1.9	.8	1.3	1.3
Manganese	13	577	414	480	466
Nickel	13	1.8	.9	1.3	1.2
Zinc	13	150	116	135	130
Hydropsyche spp.					
Cadmium	1	--	--	.6	--
Chromium	1	--	--	1.6	--
Copper	1	--	--	13.9	--
Iron	1	--	--	1,140	--
Lead	1	--	--	2.9	--
Manganese	1	--	--	525	--
Nickel	1	--	--	2.8	--
Zinc	1	--	--	132	--
12340500--CLARK FORK ABOVE MISSOULA, MONT.					
Period of record for biological data: 1997-2003					
Arctopsyche grandis					
Arsenic	3	4.5	4.0	4.2	4.2
Cadmium	22	1.8	.4	.7	.6
Chromium	22	3.4	.6	1.6	1.5
Copper	22	77.6	19.5	34.4	28.2
Iron	22	2,340	476	1,030	953
Lead	22	6.8	1.2	3.7	3.3
Manganese	22	1,400	476	902	887
Nickel	22	2.0	.5	1.2	1.0
Zinc	22	260	133	189	195
Claassenia sabulosa					
Arsenic	2	1.1	.7	.9	--
Cadmium	11	2.0	.2	.7	.4
Chromium	11	1.1	.3	.7	.7
Copper	11	71.7	33.0	48.9	46.0
Iron	11	402	95.3	247	246
Lead	11	3.1	.5	[1]1.3	[1]1.2
Manganese	11	683	75.2	261	270
Nickel	11	<.4	<.3	[1].4	[1].4
Zinc	11	363	191	268	250
Hydropsyche cockerelli					
Arsenic	2	6.5	6.4	6.4	--
Cadmium	11	1.3	.4	.8	.8

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12340500--CLARK FORK ABOVE MISSOULA, MONT.—Continued					
Period of record for biological data: 1997-2003					
Hydropsyche cockerelli—Continued					
Chromium	11	6.0	1.8	3.3	3.2
Copper	11	96.1	29.9	57.2	46.0
Iron	11	3,590	1,400	2,160	2,070
Lead	11	10.0	4.2	6.2	5.7
Manganese	11	1,890	781	1,190	1,130
Nickel	11	2.4	1.4	1.9	1.9
Zinc	11	237	156	197	194
Hydropsyche occidentalis					
Arsenic	2	6.2	6.2	6.2	--
Cadmium	8	1.1	.4	.7	.6
Chromium	8	5.5	2.1	3.4	3.0
Copper	8	76.5	30.3	51.4	52.9
Iron	8	2,400	1,450	2,060	2,220
Lead	8	10.2	4.0	6.8	6.6
Manganese	8	2,460	939	1,840	1,950
Nickel	8	2.4	1.6	2.0	2.2
Zinc	8	257	192	227	230
12353000--CLARK FORK BELOW MISSOULA, MONT.[2]					
Period of record for biological data: 1986, 1990-2003					
Arctopsyche grandis					
Arsenic	3	2.6	2.4	2.5	2.5
Cadmium	28	1.5	.2	.7	.6
Chromium	28	2.7	.5	1.3	1.4
Copper	28	38.0	9.4	21.1	19.8
Iron	28	1,590	343	804	718
Lead	28	3.9	.9	1.9	1.8
Manganese	28	1,090	511	701	675
Nickel	28	1.6	.4	.9	.9
Zinc	28	217	106	152	148
Claassenia sabulosa					
Arsenic	2	.8	.8	.8	--
Cadmium	41	1.3	.1	.5	.4
Chromium	41	1.2	.05	.5	.5
Copper	41	74.8	31.1	48.1	46.9
Iron	41	239	66.6	111	103
Lead	41	1.3	.1	.4	.3
Manganese	41	168	48.9	102	99.0
Nickel	41	.3	.1	.2	.2
Zinc	41	286	146	215	210
Hydropsyche cockerelli					
Arsenic	5	2.4	2.2	2.4	2.4
Cadmium	43	1.1	.2	.5	.5
Chromium	43	3.4	.3	1.8	1.8
Copper	43	54.1	12.4	30.1	27.5
Iron	43	2,220	584	1,290	1,320
Lead	43	6.6	1.2	2.5	2.3
Manganese	43	1,210	353	752	684

Table 24. Statistical summary of biological data for the upper Clark Fork basin, Montana, August 1986 through September 2003—Continued

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12353000--CLARK FORK BELOW MISSOULA, MONT.[2]—Continued					
Period of record for biological data: 1986, 1990-2003					
Hydropsyche cockerelli—Continued					
Nickel	43	1.9	.5	1.2	1.3
Zinc	43	187	77.4	142	147
Hydropsyche occidentalis					
Arsenic	1	--	--	2.5	--
Cadmium	17	1.1	.1	.4	.3
Chromium	17	3.5	.1	1.4	1.5
Copper	17	38.2	13.5	23.8	20.9
Iron	17	1,420	482	941	907
Lead	17	4.2	.7	2.1	1.9
Manganese	17	1,460	491	841	812
Nickel	17	2.2	.5	1.0	.9
Zinc	17	193	112	143	144
Hydropsyche spp.					
Cadmium	1	--	--	.5	--
Chromium	1	--	--	.8	--
Copper	1	--	--	20.8	--
Iron	1	--	--	894	--
Lead	1	--	--	1.1	--
Manganese	1	--	--	756	--
Nickel	1	--	--	1.1	--
Zinc	1	--	--	124	--

[1]Values determined by arbitrarily substituting one-half of the analytical detection limit for censored (<) values when both uncensored and censored values were used in determining the mean and median. When all data were less than the analytical detection limit, the median was determined by ranking the censored values in order of detection. No mean is reported when all values were below the analytical detection limit.

[2]Samples collected about 30 miles downstream from streamflow-gaging station to conform to previous sampling location.

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