

Prepared in cooperation with the U.S. Environmental Protection Agency

Water-Quality, Bed-Sediment, and Biological Data (October 2016 through September 2017) and Statistical Summaries of Data for Streams in the Clark Fork Basin, Montana



Open-File Report 2019–1060

Cover. The Little Blackfoot River entering the Clark Fork, just downstream from the sampling site Clark Fork above the Little Blackfoot River near Garrison, Montana. Photograph by Hannah Nilges, U.S. Geological Survey.

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By Thomas E. Cleasby, Michelle I. Hornberger, Terry L. Heinert, and Matthew A. Turner

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Conversion Factors

U.S. customary units to International System of Units

Multiply	By	To obtain
	Length	
mile (mi)	1.609	kilometer (km)
	Area	
square mile (mi ²)	2.590	square kilometer (km ²)

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

$$^{\circ}\text{F}=(1.8\times^{\circ}\text{C})+32$$

Datum

Horizontal coordinate information is referenced to the North American Datum of 1927 (NAD 27).

Supplemental Information

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter ($\mu\text{g/L}$).

Pore size is given in micrometers (μm).

Suspended-sediment sizes are given in millimeters (mm) and weights are given in grams (g).

Bottle capacities or liquid measurements are given in milliliters (mL).

Liquid-phase trace-element concentrations are given in micrograms per milliliter ($\mu\text{g/mL}$), and solid-phase concentrations are given in micrograms per gram ($\mu\text{g/g}$).

A water year is the 12-month period from October 1 through September 30 and is designated by the calendar year in which it ends. For example, water year 2017 is the period from October 1, 2016, through September 30, 2017.

Abbreviations

CRM	certified reference material
ICP-MS	inductively coupled plasma-mass spectrometry
LRL	laboratory reporting level
MRL	minimum reporting level
NIST	National Institute of Standards and Technology
NRP	National Research Program
NWIS	National Water Information System
NWQL	National Water Quality Laboratory
RSD	relative standard deviation
spp.	species
SRM	standard reference material
USGS	U.S. Geological Survey

Water-Quality, Bed-Sediment, and Biological Data (October 2016 through September 2017) and Statistical Summaries of Data for Streams in the Clark Fork Basin, Montana

By Thomas E. Cleasby, Michelle I. Hornberger, Terry L. Heinert, and Matthew A. Turner

Abstract

Water, bed sediment, and biota were sampled in selected streams from Butte to near Missoula, Montana, as part of a monitoring program in the Clark Fork Basin of western Montana. The sampling program was led by the U.S. Geological Survey, in cooperation with the U.S. Environmental Protection Agency, to characterize aquatic resources in the Clark Fork Basin and emphasize trace elements associated with historic mining and smelting activities. Sampling sites were on the Clark Fork and selected tributaries. Water samples were collected periodically at 20 sites from October 2016 through September 2017. Bed-sediment and biota samples were collected once at 13 sites during August 2017.

This report presents the analytical results and quality-assurance data for water-quality, bed-sediment, and biota samples collected at sites from October 2016 through September 2017. Water-quality data include concentrations of selected major ions, dissolved organic carbon, turbidity, nitrogen (nitrate plus nitrite), trace elements, and suspended sediment. Seasonal daily values of turbidity were determined at four sites. Bed-sediment data include trace-element concentrations in the fine-grained (less than 0.063 millimeter) fraction. Biological data include trace-element concentrations in whole-body tissue of aquatic benthic insects. Statistical summaries of water-quality, bed-sediment, and biological data for sites in the Clark Fork Basin are provided for the period of record.

Introduction

The Clark Fork originates near the town of Warm Springs in western Montana at the confluence of Silver Bow and Warm Springs Creeks (fig. 1). Along the 148-mile (mi) reach of stream from Silver Bow Creek in Butte to the Clark Fork near Missoula, six major tributaries enter: Blacktail Creek, Warm Springs Creek, Little Blackfoot River, Flint Creek, Rock Creek, and Blackfoot River. Principal surface-water uses in

the 6,000-square-mile (mi²) Clark Fork Basin above Missoula include irrigation, stock watering, small-scale industry (Cannon and Johnson, 2004), and habitat for trout fisheries. Current (as of 2018) land uses are primarily cattle production, logging, mining, residential development, and recreation. Large-scale mining and smelting were prevalent land uses in the basin for more than 100 years but are now either discontinued or substantially reduced in scale.

Copper, gold, silver, and lead ores were extensively mined, milled, and smelted in the drainages of Silver Bow and Warm Springs Creeks from about the 1860s to the 1980s (U.S. Environmental Protection Agency, 2004). Moderate- and small-scale mining also took place in the basins of most of the major tributaries to the upper Clark Fork. Tailings produced during past mineral processing commonly contained large quantities of trace elements such as arsenic, cadmium, copper, lead, and zinc. Eroded tailings mixed with stream sediment and deposited downstream in stream channels, on flood plains, in the Warm Springs Ponds, and at the former Milltown Reservoir (fig. 1; Andrews, 1987), whose dam (Milltown Dam, not shown in figure) was breached on March 28, 2008. The presence of elevated trace-element concentrations in water and bed sediment can pose a health risk to aquatic biota and humans (U.S. Environmental Protection Agency, 2004).

Concern about the toxicity of trace elements to aquatic biota and human health has resulted in a comprehensive effort by State, Federal, Tribal, and private entities to characterize the aquatic resources in the Clark Fork Basin. This effort was designed to guide and monitor remedial cleanup activities and to evaluate the effectiveness of remediation. Water-quality data have been collected by the U.S. Geological Survey (USGS) at selected sites in the Clark Fork Basin since 1985 (Lambing, 1987–1991; Lambing and others, 1994, 1995; Dodge and others, 1996–2010, 2012, 2013, 2014a, 2014b, 2017, 2018; Dodge and Hornberger, 2015). Trace-element data for bed sediment and biota (aquatic benthic insects) have been collected intermittently at selected sites since 1986 as part of studies on the contamination of bed-sediment quality and bioaccumulation of metals led by the USGS National Research Program

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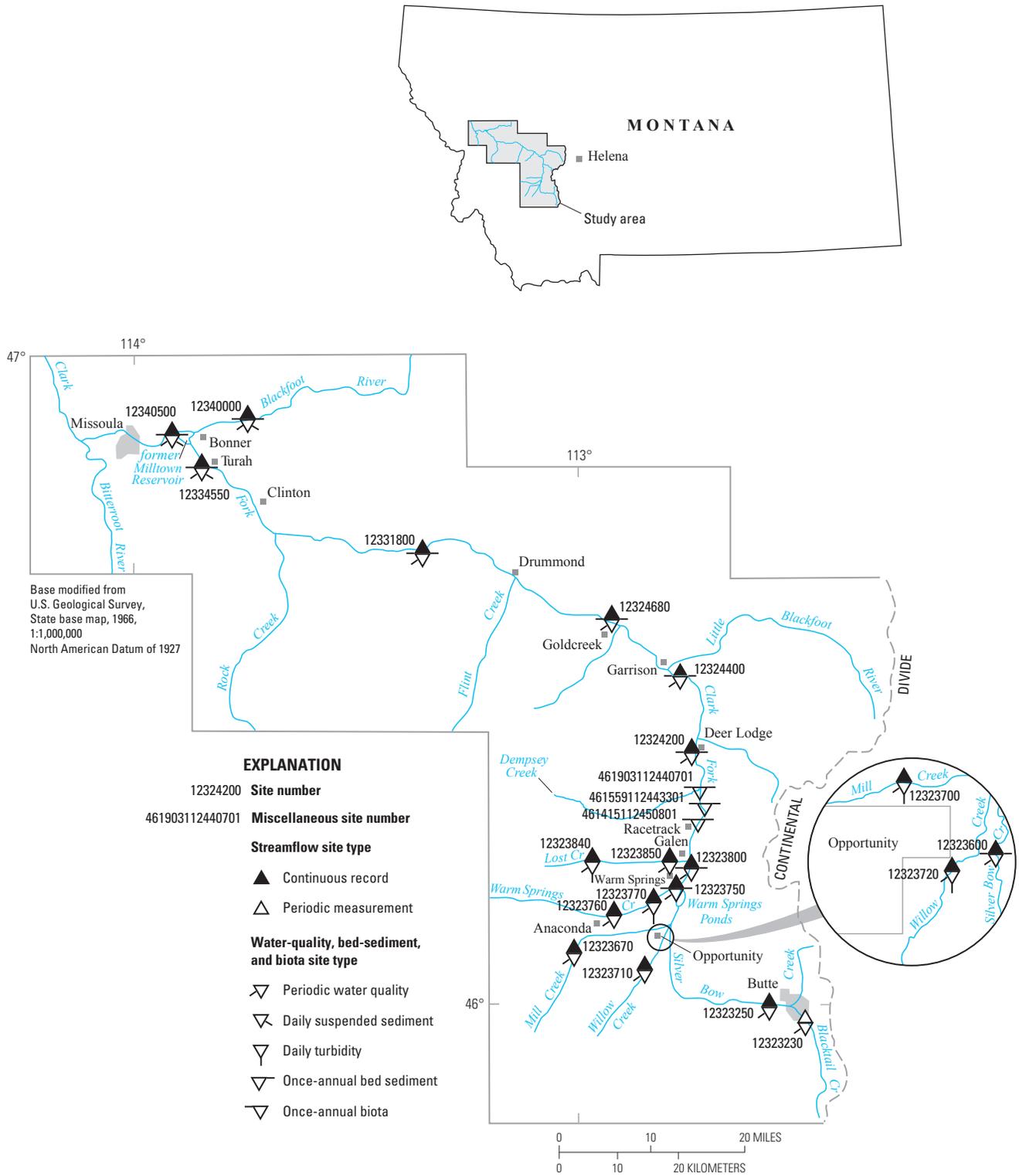


Figure 1. Location of the study area in the Clark Fork Basin, Montana.

(NRP; Axtmann and Luoma, 1991; Cain and others, 1992, 1995; Axtmann and others, 1997; Hornberger and others, 1997). In March 1993, a long-term monitoring program for water, bed sediment, and biota in the basin was implemented by the USGS, in cooperation with the U.S. Environmental Protection Agency, to systematically quantify the seasonal and annual variability in selected constituents.

The purpose of this report is to present water-quality data from samples collected at 20 sites and bed-sediment and biological data from samples collected at 13 sites in the Clark Fork Basin from October 2016 through September 2017 (fig. 1). Quality-assurance data are presented for water-quality, bed-sediment, and biota samples collected during the same period. Statistical summaries also are provided for all data collected for the period of record.

Sampling Locations and Types of Data

Sampling sites for the monitoring program in the Clark Fork Basin from Butte to near Missoula (fig. 1) are on the Clark Fork main stem (including Silver Bow Creek), three major tributaries (Blacktail Creek, Warm Springs Creek, and Blackfoot River), and three smaller tributaries (Mill Creek, Willow Creek, and Lost Creek). The sites, types of data collected, and period of record for each data type are listed in table 1. Main-stem sampling sites were selected to divide the Clark Fork into reaches of approximate uniform length and to have each reach encompassing either a major tributary or depositional environment (that is, Warm Springs Ponds or the former Milltown Reservoir). Major tributaries were sampled to describe water-quality, bed-sediment, and biological characteristics of important hydrologic sources in the Clark Fork Basin and to provide reference comparisons to the main stem. The three smaller tributaries were sampled to gain better spatial resolution on sources of trace elements entering the Clark Fork in an area of historical metal-processing activities near Anaconda, Montana. Water-quality samples were collected at 20 sites, 6 to 8 times a year on a schedule designed to describe seasonal and hydrological variability. Seasonal daily turbidity values were computed using data measured by continuous turbidity monitors recording every 15 minutes at four sites. Bed-sediment and biological samples were collected annually at 13 sites, and 1 additional site (Warm Springs [12323770]) was sampled every 3 years. Continuous streamflow data were collected at 19 sites.

Properties measured onsite and constituents for which water, bed-sediment, and biota samples were analyzed are listed in table 2. Data-quality objectives for analyses of water samples are listed in table 3. Results of onsite measurements of stream properties; laboratory analyses of water-quality, bed-sediment, and biota samples; and quality-assurance data for water year 2017 (October 1, 2016, through September 30, 2017) are listed in tables 4 through 23 at the back of the report. Statistical summaries of long-term water-quality,

bed-sediment, and biological data collected between March 1985 and September 2017 are listed in tables 21 through 23 at the back of the report.

Quality assurance of data was maintained using documented procedures described in the following sections. These quality-assurance data were designed to provide environmentally representative data. Acceptable results of the procedures were 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 onsite measurements of selected stream properties and laboratory determination of concentrations of chemical and physical constituents (listed in table 2) in periodically collected stream samples. Water samples were collected at 20 sites in the Clark Fork Basin 6 to 8 times per year on a schedule designed to describe seasonal and hydrologic variability. Continuous turbidity monitors were operated seasonally (March to September 2017) at four sites; turbidity data (recorded every 15 minutes) were used to compute daily mean turbidity values (table 1). Water-quality data are available through the USGS National Water Information System (NWIS) database at <https://waterdata.usgs.gov/nwis/qw> (U.S. Geological Survey, 2018).

Methods

Water samples were collected and composited from vertical transits throughout the entire stream depth at multiple locations across the stream using depth- and width-integration methods described by Ward and Harr (1990), Edwards and Glysson (1999), and the U.S. Geological Survey (variously dated). These methods provided vertically and laterally discharge-weighted composite samples that represent the entire flow passing through the cross section of the stream. Samples were collected with isokinetic depth-integrating water-quality samplers (Davis and the Federal Interagency Sedimentation Project, 2005) constructed of plastic or coated with a nonmetallic rubber-coating paint and equipped with polytetrafluoroethylene nozzles.

Instantaneous streamflow was determined at the time of water sampling either by direct measurement or from stage-discharge rating tables (Rantz and others, 1982). Daily mean streamflow values during ice periods were labeled as estimated because backwater affected the stage-discharge relation. Onsite measurements of pH, specific conductance, and water temperature were measured during water sample collection. Sample processing, including filtration and preservation, was completed according to procedures described by Ward and Harr (1990), Horowitz and others (1994), and the U.S. Geological Survey (variously dated).

Table 1. Type and period of data collection at sampling sites in the Clark Fork Basin, Montana.

[--, no data; P, present; D, discontinued]

Site number (fig. 1)	Site name	Continuous-record streamflow	Periodic water quality ¹	Daily suspended sediment	Daily turbidity (seasonal)	Fine-grained bed sediment ²	Benthic aquatic insects ²
12323230	Blacktail Creek at Harrison Avenue, at Butte	--	03/1993–08/1995, 12/1996–08/2003, 12/2004–P	--	--	--	--
12323250	Silver Bow Creek below Blacktail Creek, at Butte	10/1983–P	03/1993–08/1995, 12/1996–P	--	--	--	--
12323600	Silver Bow Creek at Opportunity	07/1988–P	03/1993–08/1995, 12/1996–P	03/1993–09/1995, D	--	07/1992–P	07/1992, 08/1994–08/1995, 08/1997–P
12323670	Mill Creek near Anaconda	10/2004–P	12/2004–P	--	06/2006–09/2012, D	--	--
12323700	Mill Creek at Opportunity	04/2003–P	03/2003–P	--	04/2013–P	--	--
12323710	Willow Creek near Anaconda	03/2005–P	12/2004–P	--	06/2006–09/2012, D	--	--
12323720	Willow Creek at Opportunity	04/2003–P	03/2003–P	--	04/2013–P	--	--
12323750	Silver Bow Creek at Warm Springs	03/1972–09/1979, 04/1993–P	03/1993–P	04/1993–09/1995, D	--	07/1992–P	07/1992–P
12323760	Warm Springs Creek near Anaconda	10/1997–P	10/2005–P	--	05/2006–09/2012, D	--	--
12323770	Warm Springs Creek at Warm Springs	10/1983–P	03/1993–P	--	04/2013–P	08/1995, 08/1997, 08/1999, 08/2002, 08/2005, 08/2008, 08/2011, 08/2014, 08/2017	08/1995, 08/1997, 08/1999, 08/2002, 08/2005, 08/2008, 08/2011, 08/2014, 08/2017
12323800	Clark Fork near Galen	07/1988–P	07/1988–P	--	--	08/1987, 08/1991–P	08/1987, 08/1991–P
12323840	Lost Creek near Anaconda	10/2004–P	12/2004–P	--	05/2006–P	--	--
12323850	Lost Creek near Galen	04/2003–P	03/2003–P	--	--	--	--
461415112450801	Clark Fork below Lost Creek, near Galen	--	--	--	--	08/1996–P	08/1996–P
461559112443301	Clark Fork at county bridge, near Race-track	--	--	--	--	08/1996–P	08/1996–P

Table 1. Type and period of data collection at sampling sites in the Clark Fork Basin, Montana.—Continued

[--, no data; P, present; D, discontinued]

Site number (fig. 1)	Site name	Continuous- record streamflow	Periodic water quality ¹	Daily suspended sediment	Daily turbidity (seasonal)	Fine-grained bed sediment ²	Benthic aquatic insects ²
461903112440701	Clark Fork at Dempsey Creek diversion, near Racetrack	--	--	--	--	08/1996–P	08/1996–P
12324200	Clark Fork at Deer Lodge	10/1978–P	03/1985–P	03/1985–08/1986, 04/1987–03/2003, 08/2003–2014, D	03/2016–09/2016, D	08/1986–08/1987, 08/1990–P	08/1986–08/1987, 08/1990–P
12324400	Clark Fork above Little Blackfoot River, near Garrison	02/2009–P	03/2009–P	--	--	08/2009–P	08/2009–P
12324680	Clark Fork at Goldcreek	10/1977–P	03/1993–P	--	--	07/1992–P	07/1992–P
12331800	Clark Fork near Drum- mond	04/1993–P	03/1993–P	--	--	08/1986, 08/1987, 08/1991–P	08/1986, 08/1991–P
12334550	Clark Fork at Turah Bridge, near Bonner	03/1985–P	03/1985–P	03/1985–03/2003, 08/2003–09/2016, D	--	08/1986, 08/1991–P	08/1986, 08/1991–P
12340000	Blackfoot River near Bonner	10/1939–P	03/1985–P	07/1986–04/1987, 06/1988–09/1995, 10/2005–09/216, D	--	08/1986–08/1987, 08/1991, 08/1993–08/1996, 08/1998–08/2001, 09/2003, 08/2006–P	08/1986–08/1987, 08/1991, 08/1993, 08/1996, 08/1998, 09/2000, 09/2003, 08/2006–P
12340500	Clark Fork above Mis- soula	03/1929–P	07/1986–P ³	07/1986–04/1987, 06/1988–01/1996, 03/1996–03/2003, 08/2003–09/216, D	04/2007–09/2007, D	08/1997–P	08/1997–P

¹Onsite measurements of physical properties and laboratory analyses for selected major ions, trace elements, and suspended sediment. Before March 1993, laboratory analyses included only trace elements and suspended sediment. In 2012, dissolved organic carbon and turbidity analyses were included at select sites. In 2013, nutrient sample analyses were included for two sites near Butte, Montana.

²Laboratory analyses of fine-grained bed sediment and aquatic benthic insects for trace elements.

³Before October 1989, water-quality data for Clark Fork above Missoula included only suspended-sediment data.

Table 2. Properties and constituents measured onsite or analyzed in water, bed-sediment, and biota samples from the Clark Fork Basin, Montana.

Property	Water	Bed sediment	Benthic aquatic insects
	Constituent	Constituent	Constituent
Streamflow	Hardness (calculated)	Arsenic	Arsenic
pH	Calcium	Cadmium	Cadmium
Specific conductance	Magnesium	Chromium	Chromium
Temperature	Potassium	Copper	Copper
Turbidity	Sodium	Iron	Iron
	Alkalinity	Lead	Lead
	Chloride	Manganese	Manganese
	Fluoride	Nickel	Nickel
	Silica	Zinc	Zinc
	Sulfate		
	Nitrate plus nitrite		
	Cadmium		
	Copper		
	Iron		
	Lead		
	Manganese		
	Zinc		
	Arsenic		
	Dissolved organic carbon		
	Suspended sediment		

Concentrations of arsenic, cadmium, copper, lead, manganese, and zinc in filtered samples (0.45-micrometer [μm] pore size) were measured using inductively coupled plasma-mass spectrometry (ICP-MS; Garbarino and others, 2006). Concentrations of calcium, magnesium, and iron in filtered samples were measured using inductively coupled plasma-atomic emission spectrometry (Fishman and Friedman, 1989). Calcium and magnesium concentrations were used to calculate water hardness. Concentrations of potassium, sodium, alkalinity, chloride, fluoride, silica, sulfate, nitrogen (nitrate plus nitrite), and dissolved organic carbon were measured in filtered samples collected at select sites in the upper Clark Fork Basin. Potassium was measured by Standard Method 3120 (American Public Health Association, 1998); sodium and silica were analyzed by inductively coupled plasma-atomic emission spectrometry (Fishman, 1993); alkalinity was measured by electrometric titration (Fishman and Friedman, 1989); chloride, fluoride, and sulfate were measured by ion chromatography (Fishman and Friedman, 1989); nitrogen (nitrate plus nitrite) was measured by colorimetric enzymatic reduction (Patton and Kryskalla, 2011); and dissolved organic carbon was measured by persulfate oxidation and infrared

spectrometry (Brenton and Arnett, 1993). Recoverable concentrations of trace elements were measured in unfiltered samples that were first digested with dilute hydrochloric acid (Hoffman and others, 1996). For cadmium, iron, lead, and manganese, the digested samples were analyzed by ICP-MS as described by Garbarino and Struzeski (1998). For arsenic, copper, and zinc, the digested samples were analyzed by ICP-MS as described by Garbarino and others (2006). Turbidity was measured using Standard Method 2130 (American Public Health Association, 1998) in selected unfiltered samples. All samples were analyzed at the USGS National Water Quality Laboratory (NWQL) in Denver, Colorado.

Water samples for analysis of suspended sediment also were collected from multiple vertical transits when periodic water samples were collected. Water samples were analyzed for suspended-sediment concentration and the percentage of suspended-sediment mass finer than 0.062-millimeter (mm) diameter (silt size and smaller) by the USGS Wyoming-Montana Water Science Center Sediment Laboratory (hereinafter referred to as the "Wyoming-Montana Sediment Laboratory") in Helena, Mont., according to methods described by Guy (1969) and Dodge and Lambing (2006).

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

[lab, laboratory; NTRU, nephelometric turbidity ratio unit; --, not determined; mg/L, milligram per liter; µg/L, microgram per liter; mm, millimeter]

Constituent	Data-quality objectives		
	Detectability	Precision	Bias
	Laboratory reporting level	Maximum relative standard deviation of replicate analyses (percent)	Maximum deviation of spike recovery (percent)
Turbidity, unfiltered, lab, NTRU	2.0 units	20	--
Calcium, filtered	0.022 mg/L	20	--
Magnesium, filtered	0.011 mg/L	20	--
Potassium, filtered	0.03–0.1 mg/L	20	--
Sodium, filtered	0.06–0.1 mg/L	20	--
Alkalinity, filtered, lab	4.0 mg/L	20	--
Chloride, filtered	0.02 mg/L	20	--
Fluoride, filtered	0.01 mg/L	20	--
Silica, filtered	0.018 mg/L	20	--
Sulfate, filtered	0.02 mg/L	20	--
Nitrate plus nitrite, filtered	0.01 mg/L	20	--
Cadmium, filtered	0.03 µg/L	20	25
Cadmium, unfiltered recoverable	0.03 µg/L	20	25
Copper, filtered	0.2 µg/L	20	25
Copper, unfiltered recoverable	0.2 µg/L	20	25
Iron, filtered	4-10 µg/L	20	25
Iron, unfiltered recoverable	4.6-10 µg/L	20	25
Lead, filtered	0.02 µg/L	20	25
Lead, unfiltered recoverable	0.02 µg/L	20	25
Manganese, filtered	0.4 µg/L	20	25
Manganese, unfiltered recoverable	0.4 µg/L	20	25
Zinc, filtered	2 µg/L	20	25
Zinc, unfiltered recoverable	2 µg/L	20	25
Arsenic, filtered	0.05 µg/L	20	25
Arsenic, unfiltered recoverable	0.05 µg/L	20	25
Organic carbon, filtered	0.23 mg/L	20	--
Sediment, suspended, percent finer than 0.062 mm	1 percent	20	--
Sediment, suspended	1 mg/L	20	--

Real-time turbidity was measured from early spring (after ice breakup) to early fall (before stream freezeup) using model 6136 turbidity sensors (Yellow Springs Instruments, Yellow Springs, Ohio) at four tributary sites in the upper Clark Fork Basin near Anaconda (table 1). Turbidity values were recorded every 15 minutes and are stored in the USGS NWIS database (U.S. Geological Survey, 2018) at <https://waterdata.usgs.gov/mt/nwis/current?type=quality>. The in situ values differ from the results of laboratory-measured

turbidity in discrete water-quality samples because of differences in the instrumentation and sampling procedures. Continuous recordings enable determination of the minimum and maximum turbidity values for each day as well as a daily mean turbidity, which is based on the average of all values in a 24-hour period. Procedures for the operation of continuous turbidity monitors and for daily record computations are described by Wagner and others (2006).

Results

Water-quality data from samples collected periodically during water year 2017 (October 1, 2016, through September 30, 2017) are listed in table 4. In water year 2017, there was one water-quality sample at Mill Creek near Anaconda (12323670) on April 17, 2017, with missing values for filtered and unfiltered copper. These copper values did not pass review because the filtered value was greater than the unfiltered value, and this issue could not be resolved by reruns. Daily maximum, minimum, and mean turbidity at four sites are listed in tables 5 through 8 along with monthly summary statistics. Water-quality data are available in the USGS NWIS database (U.S. Geological Survey, 2018).

Quality Assurance

Quality-assurance procedures used for the collection and field processing of water samples were described by Ward and Harr (1990), Horowitz and others (1994), Edwards and Glysson (1999), Lambing (2006), and the U.S. Geological Survey (variously dated). Standard procedures used by the NWQL for internal sample handling and quality assurance were described by Friedman and Erdmann (1982), Jones (1987), and Pritt and Raese (1995). Quality-assurance procedures used by the Wyoming-Montana Sediment Laboratory were described by Dodge and Lambing (2006). Standard procedures used for the calibration, measurement, and quality assurance of turbidity monitors were described by Anderson (2005).

The quality of analytical results reported for water samples was evaluated using quality-control samples that were sampled and analyzed concurrently with primary environmental samples. These quality-control samples consisted of replicates, spikes, and blanks that provided quantitative information on the precision and bias of the overall field and laboratory processes. Each type of quality-control sample was submitted at a proportion equivalent to about 5 percent of the total number of water samples; therefore, the total number of quality-control samples represented about 15 percent of the total number of water samples.

Replicate data can be collected in different ways to provide an assessment of the precision (reproducibility) of analytical results. Replicate samples are two or more samples considered to be essentially identical in composition. Replicate samples can be collected in the field (field replicate) either by repeating the collection process (sequential or concurrent replicate) to obtain two or more independent composite samples or by splitting a single composite sample into two or more subsamples (split replicate). 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 precision (laboratory replicate).

Precision of analytical results for field replicates can be affected by numerous sources of variability within the field and laboratory environments, including sample collection,

processing, and analysis. Data on overall precision for samples exposed to field and laboratory sources of variability were provided by obtaining replicate stream samples for chemical analysis by splitting a composite stream sample. Replicate stream samples for suspended-sediment analysis were obtained in the field by collecting two independent cross-sectional samples. Analyses of field replicate samples indicate the reproducibility of environmental data that are affected by the combined potential variability introduced by field and laboratory processes.

In addition to analyzing quality-control samples submitted from the field, internal quality-assurance practices are performed systematically by the NWQL to provide quality control of analytical procedures (D.L. Stevenson, U.S. Geological Survey, written commun., 2012). These internal practices include analyses of quality-control samples such as calibration standard samples, standard reference water samples, replicate samples, deionized-water blank samples, or spiked samples at a proportion equivalent to at least 10 percent of the sample load. The NWQL participates in a blind-sample program in which 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 and audits with the National Environmental Laboratory Accreditation Program, the U.S. Environmental Protection Agency, Environment Canada, and the USGS Branch of Quality Systems to assess analytical performance.

Precision of analytical results for laboratory replicates, which exclude field sources of variability, was determined using two independent chemical analyses of aliquots from a single sample selected from the group of samples constituting 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 variability caused by field sample collection and processing. Laboratory replicates of suspended-sediment samples were not obtainable because the samples were consumed during the analysis.

Spiked samples (Boughton, 2019) were used to evaluate bias, which measures the ability of an analytical method to accurately quantify a known amount of analyte added to a sample. In the laboratory, deionized-water blank samples and aliquots of stream samples were spiked with known amounts of the same trace elements for which water samples were being analyzed. Analyses of spiked blanks indicate if the spiking procedure and analytical method are within control for water 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 if these interferences could contribute substantial bias to reported trace-element concentrations for stream samples.

Field blank samples were submitted for every field trip and analyzed to identify the presence and magnitude of contamination that could potentially bias analytical results. Field

blanks consist of deionized water that is certified as constituent free and is processed in the field through clean sampling equipment used to collect stream samples. These blanks then are 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 stream samples to detect contamination.

All water samples were handled in accordance with chain-of-custody procedures that provide documentation of sample identity, shipment, receipt, and laboratory handling (Driscoll and Hatcher, 2010). All environmental and quality-control samples submitted from a sampling episode were stored in a secure area of the NWQL and analyzed as a discrete sample group, independent of other samples submitted to the NWQL. Therefore, the quality-control data apply solely to the analytical results for stream samples reported herein and provide a direct measure of data quality for this study.

Data-quality objectives (table 3) were established by the USGS and U.S. Environmental Protection Agency as part of the study plan for the expanded long-term monitoring program started in 1993. The objectives identify the 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 were used to evaluate if sampling and analytical procedures produced environmentally representative data in a consistent manner. Data that did not meet the objectives were evaluated for acceptability; if necessary, additional quality-control samples were submitted and corrective action was taken.

The precision of analytical results was determined by calculating the standard deviation of the differences in concentrations between replicate analyses. These replicate analyses consisted of pairs of field replicate samples and laboratory replicates. Standard deviations were calculated according to the following equation (Taylor, 1987):

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

where

- S is the standard deviation of the difference in concentration between replicate analyses,
- d is the difference in concentration between each pair of replicate analyses, and
- k is the number of pairs of replicate analyses.

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

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

where

- RSD is the relative standard deviation,
- S is the standard deviation, and
- \bar{x} is the mean concentration for all replicate analyses.

Sample results and the corresponding field replicate data are listed in table 9, and the precision for each constituent estimated from field replicate analyses is listed in table 10. Precision estimates for the analytical results of field replicates were within the acceptable RSD limit of 20 percent for all constituents except filtered cadmium (table 10), which was 21 percent. This one exceedance of the data-quality objective resulted from a statistical artifact of calculating the difference between one replicate sample pair for which one value is less than the laboratory reporting level (LRL).

The precision for each constituent estimated from laboratory replicate analyses is listed in table 11. Statistics summarizing the precision of analytical results for laboratory replicates were calculated using unrounded values stored in laboratory data files. Precision estimates for the laboratory replicates were within the acceptable 20-percent RSD limit for all constituents (table 11), so no adjustments were made to analytical data based on replicate analyses precision. Recovery efficiencies for analyses of constituents was determined by comparing a sample and a spiked aliquot of the same sample. The data-quality objective for acceptable spike recoveries of trace elements in water samples was a maximum deviation of 25 percent from a theoretical 100-percent recovery of an added constituent (table 3). At NWQL, a spiked deionized-water blank sample 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:

$$R = \frac{D}{C} \times 100 \quad (3)$$

where

- R is the spike recovery, in percent;
- D is the difference between the spiked and unspiked sample concentrations; and
- C is the concentration of material used to spike the sample.

If the spike recovery of a trace element was outside a range of 75 to 125 percent, the instrument was recalibrated and the entire sample set and all spiked samples were reanalyzed for that element until recoveries were improved to the extent possible. Recovery efficiency for individual trace elements in

spiked blank samples and in spiked stream samples is listed in tables 12 and 13, respectively. The mean recovery for spiked blank samples (table 12) ranged from 81.5 to 108 percent. The smallest individual constituent recovery was lead, filtered, at 53.4 percent, and the largest was cadmium, filtered, at 122 percent. The 95-percent confidence intervals (Taylor, 1987) for the mean recovery for each constituent for which spiked blank samples were analyzed (table 12) did not exceed a 25-percent deviation from an expected 100-percent recovery except for lead, filtered (53.4 percent). The mean recovery for spiked stream samples (table 13) ranged from 85.9 to 106 percent. The smallest constituent recovery was arsenic, unfiltered recoverable, at 43.4 percent, and the largest was arsenic, unfiltered recoverable, at 128 percent. The 95-percent confidence intervals for the mean spike recovery for each constituent for which stream water samples were analyzed (table 13) did not exceed a 25-percent deviation from an expected 100-percent recovery except for arsenic, filtered (63.9 percent) and arsenic, unfiltered recoverable (43.4 and 128 percent). No adjustments were made to analytical data based on the mean spike recovery.

High or low bias is indicated if the 95-percent confidence interval does not include 100-percent recovery, thereby indicating a consistent deviation or bias, either high or low. Confidence intervals for percent recovery include 100 percent for all laboratory-spiked blank samples (table 12). Confidence intervals for percent recovery include 100 percent for all laboratory-spiked stream samples (table 13) except for iron, filtered (96.6–99.8 percent) and iron, unfiltered recoverable (79.3–96.3 percent). No adjustments were made to analytical results for stream samples based on spike recoveries.

Analytical results for field blanks are listed in table 14. Field blanks with constituent concentrations less than or equal to the LRL indicate that the entire process of sample collection, field processing, and laboratory analysis is presumably free of contamination. If detectable concentrations of trace elements in field blanks were greater than or equal to twice the LRL, the concentrations were noted during data review. Analytical results from the field blank were evaluated for evidence of a consistent trend that could indicate systematic contamination. Sporadic, infrequent, nonconsecutive exceedances of twice the LRL most likely represented random contamination or laboratory-instrument calibration error that was not persistent in the process and was not likely to cause 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, additional blank samples were collected and submitted for analysis to identify the source of contamination.

Constituent concentrations in field blanks (table 14) almost always were less than the LRL. Three sample concentrations of copper, filtered (0.22, 0.21, and 0.26 micrograms per liter [$\mu\text{g/L}$]) exceeded the LRL of 0.20 $\mu\text{g/L}$. One sample concentration of copper, unfiltered recoverable (0.2 $\mu\text{g/L}$) matched the LRL of 0.2 $\mu\text{g/L}$. No adjustments were made to water-quality sample data based on a review of these results.

Bed-Sediment Data

Bed-sediment data for the long-term monitoring program in the Clark Fork Basin consist of trace-element concentrations in the fine-grained (less than 0.063 mm) fraction of bed-sediment samples. Bed-sediment samples were collected once annually at 13 sites (fig. 1; table 1) during low, stable flow conditions at about the same time of year as previous samples (typically in August) to facilitate data comparisons among years. Warm Springs Creek at Warm Springs is sampled once every 3 years rather than once annually and was sampled during water year 2017. The 2017 bed-sediment data are available in a machine-readable data release (Boughton, 2019). For prior years, bed-sediment data can be obtained in a Microsoft Excel format from the authors.

Methods

Fine-grained bed-sediment samples were collected in August 2017 using protocols described by Axtmann and Luoma (1991). Samples were collected from the surfaces of streambed deposits in areas near the edge of the stream using an acid-washed polypropylene scoop. Whenever possible, samples were collected from both sides of the stream.

Individual samples of bed sediment were collected by scooping material from the surfaces of three to five randomly selected deposits along pools 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 0.063-mm polyester-mesh sieve using ambient stream water. The fraction of bed sediment in each composite sample that was finer than 0.063 mm was collected in an acid-washed 500-milliliter (mL) polyethylene bottle and transported to the laboratory on ice.

Bed-sediment samples were processed and analyzed at the USGS NRP Ecology and Contaminants Project Laboratory in Menlo Park, California. Bed-sediment samples were oven-dried at 60 degrees Celsius ($^{\circ}\text{C}$) and ground into smaller particle sizes using an acid-washed, ceramic mortar and pestle. Single aliquots of about 0.5–0.6 gram (g) of sediment from each of the three composite bed-sediment samples were digested using a hot, concentrated nitric acid reflux according to methods described by Luoma and Bryan (1981). Laboratory replicates were analyzed by taking an aliquot from one of the three sieved replicate samples at each site. After a 2-week digestion period, the aliquots were evaporated to dryness on a hot plate. The dry residue was reconstituted in 10 mL of 0.6 N (normal) hydrochloric acid. The reconstituted aliquots were then filtered through a 0.45- μm pore-size filter using a syringe and an in-line disposable filter cartridge. The filtrate was diluted to a 1–10 ratio with 0.6 N hydrochloric acid. These final solutions were analyzed for arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc using inductively coupled plasma-optical emission spectrometry

(Hornberger and others, 1997). The smallest concentration of a constituent that can be reliably reported for analyses of bed sediment is termed the minimum reporting level (MRL).

Results

Solid-phase concentrations of trace elements measured in samples of fine-grained bed sediment collected during August 2017 are listed in table 15. Liquid-phase concentrations, measured in micrograms per milliliter, were analyzed in the reconstituted aliquots of digested bed sediment. Solid-phase concentrations, measured in micrograms per gram, were calculated using the following equation:

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

where

$\mu\text{g/g}$ is micrograms of trace element per gram,
 $\mu\text{g/mL}$ is micrograms per milliliter of liquid-phase trace element, and
 mL is milliliters.

The reported solid-phase concentrations (table 15) are the means of all analyses for replicate aliquots from each composite bed-sediment sample collected at the site. Because the conversion from liquid-phase to solid-phase concentration is dependent on the dilution ratio and the dry weight of the sample, MRLs for some trace elements might differ among sites and among years.

Quality Assurance

The USGS protocols for field collection and processing of bed-sediment samples are designed to prevent contamination from metal sources. Nonmetallic sampling and processing equipment (white plastic scoop, funnel-frame apparatus, and 500-mL sample bottles) were acid-washed and rinsed with deionized water before the collection of the first sample. Polyester-mesh sieves were washed in laboratory-grade detergent and rinsed with deionized water. All equipment received a field rinse onsite with stream water. Sampling equipment used at more than one site was field rinsed thoroughly between sites with site-specific stream water. Separate sieves were used at each site and, therefore, did not require between-site cleaning. Bed-sediment samples were collected sequentially at sites along a general increasing concentration gradient (that is, downstream sites have lower concentrations of contaminated bed sediments compared to upstream sites) to minimize effects from potential site-to-site carryover contamination (Axtmann and Luoma, 1991).

Quality assurance of analytical results for bed-sediment samples included laboratory-instrument calibration with standard solutions and analysis of quality-control samples designed to identify the presence and magnitude of bias (Ellen V. Axtmann, U.S. Geological Survey, written commun., 1994).

Quality-control samples consisted of standard reference materials (SRMs) issued by the National Institute of Standards and Technology (NIST) and procedural blanks. In total, 10 low-concentration SRMs, 10 high-concentration SRMs, and 13 procedural blanks were analyzed.

SRMs are commercially prepared materials that have certified concentrations of trace elements. Analyses of SRMs are used to indicate the ability of the method to accurately measure a known quantity of a constituent. Multiple analyses of SRMs are made to derive a mean and 95-percent confidence interval for recovery. Recovery efficiency for trace-element analyses of SRMs for bed sediment is listed in table 16. Two SRMs, consisting of agricultural soils and representing low and high concentrations of trace elements, were analyzed to test recovery efficiency for a range of concentrations like those discovered in the bed sediment in streams 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 for 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 if analytical recovery is consistent between multiple sets of analyses.

Although data-quality objectives have not been established for bed sediment, percent recoveries for individual trace elements (table 16) illustrate analytical performance. Metal recoveries of sediment digests were evaluated with NIST 2709a San Joaquin soils (hereinafter referred to as “SRM sample 2709A”) and NIST 2711a Montana soil II (hereinafter referred to as “SRM sample 2711a”). Mean recoveries in SRM sample 2709a ranged from 45.0 to 90.0 percent of the certified concentrations (table 16). The mean recoveries were within 22 percent of the 95-percent confidence interval for copper, iron, manganese, nickel, and zinc. Elements with low certified concentrations (cadmium, 0.371 $\mu\text{g/g}$) or with a strong association with crystalline lattices (arsenic, chromium, lead) had lower percent recoveries (from 45.0 to 67.6 percent). Mean recoveries in SRM sample 2711a ranged from 55.6 to 97.7 percent (table 16). The percent recoveries were within 15.2 percent of the 95-percent confidence interval for arsenic, cadmium, copper, iron, lead, nickel, and zinc; and 19.1 percent for manganese. Chromium had the lowest mean recovery (55.6 percent) because of the strong binding nature of the crystalline lattice of chromium-bearing minerals. No adjustments were made to trace-element concentrations in bed-sediment samples based on recovery efficiencies.

Procedural blanks for bed-sediment samples consisted of the analysis 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, 0.6 N hydrochloric acid was added to reconstitute the dry residue. Analytical results of procedural blanks for bed sediment (table 17) are reported as a liquid-phase

concentration, in micrograms per milliliter. A procedural blank was prepared and analyzed concurrently with bed-sediment samples for each site. Concentrations of trace elements in all procedural blanks were less than the MRL for all elements. No adjustments were made to analytical data based on procedural blanks.

Biological Data

Biological data for the long-term monitoring program in the Clark Fork Basin consist of trace-element concentrations in the whole-body tissue of aquatic benthic insects. Insect samples are collected once annually at the same 13 sites and on the same dates as bed-sediment samples (fig. 1; table 1), 10 of which have streamgages, allowing for a direct comparison of biological data with bed-sediment data and water-quality data through the years. Warm Springs Creek at Warm Springs is sampled once every 3 years rather than once annually and was sampled during water year 2017. Biological data for water year 2017 are available in a machine-readable data release (Boughton, 2019). Biological data for prior years are available by request in Microsoft Excel format from the authors.

Methods

Insect samples were collected using protocols described in Hornberger and others (1997). Benthic insects at immature stages were collected with a large nylon-mesh kick net. A single riffle at each site was sampled repeatedly until an adequate number of individual insects were collected to provide sufficient mass for analysis (for example, about 10 stoneflies, about 100–200 caddisflies). Two caddisfly species of the genus *Hydropsyche* (*Hydropsyche cockerelli* and *Hydropsyche occidentalis*) were targeted for collection in this study because of their occurrence at most sites. *Hydropsyche* species (spp.) that could not be positively identified were categorized as *Hydropsyche* spp. or *Hydropsyche morosa* group. On the few occasions when *Hydropsyche* were not present, other caddisflies, including *Brachycentrus* spp. and *Rhyacophila* spp., were collected. The caddisfly *Arctopsyche grandis* and the stoneflies *Claassenia sabulosa* and *Hesperoperla* spp. were collected where available to represent additional insect taxa commonly distributed in the Clark Fork Basin but with different feeding traits.

Samples of each taxon were sorted by genus in the field and placed in acid-washed plastic containers. Samples were frozen in a small amount of ambient stream water on dry ice within 30 minutes of collection. Between 1986 and 1998, macroinvertebrate containers were kept on ice to allow the insects to evacuate their gut contents (depurate) for 6 to 8 hours. Excess water was drained and insects were frozen for transport to the laboratory. Since 1999, samples were immediately frozen on dry ice in the field to reduce the possibility of metal

loss through intracellular breakdown during depuration. A comparison of immediately frozen to depurated samples indicated that although no substantial difference occurred for most metals, concentrations of copper were about 20 percent lower in the depurated samples than in the samples that were immediately frozen. The data were not adjusted for this difference.

Insect samples were processed and analyzed at the USGS NRP Ecology and Contaminants Project Laboratory in Menlo Park, Calif. Insects were thawed and rinsed with ultrapure deionized water to remove particulate matter and then sorted to their lowest possible taxonomic level. If large numbers of specimens were collected at a site, 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 0.6 N hydrochloric acid, filtered through a 0.45- μ m pore-size filter, and analyzed undiluted by using inductively coupled plasma-optical emission spectrometry (Hornberger and others, 1997) for arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc. The smallest concentration of a constituent that can be reliably reported for analyses of biota is termed the MRL.

Results

Concentrations of trace elements in whole-body tissue of aquatic insects collected during August 2017 are listed in table 18. The variability in the number of composite samples among species and among sites reflects differences in insect abundance (the number of composite samples increases with the relative abundance of insects). Liquid-phase concentrations, in micrograms per milliliter, analyzed in the reconstituted samples were converted to solid-phase concentrations, in micrograms per gram, using equation 4 (used earlier in this report to calculate solid-phase concentrations of trace elements in bed sediment). All tissue samples were analyzed undiluted (the dilution ratio was 1–1). As with MRLs for trace elements in bed sediment, MRLs for trace elements in insects may differ among sites because of varied sample weights. In general, the smaller the biological-sample weight (primarily a function of insect abundance), the higher the MRL; therefore, higher MRLs do not necessarily imply a higher trace-element concentration in tissue.

Quality Assurance

The USGS protocols for field collection and processing of biota samples are designed to prevent contamination from metal sources. Nonmetallic nets, sampling equipment, and processing equipment were used in all sample collection. Equipment was acid-washed and rinsed in ultrapure deionized water before the first sample collection. Nets and equipment

were thoroughly rinsed in stream water at each main-stem site. Clean nets were used at each tributary site. Biota samples were collected sequentially at sites along an increasing concentration gradient, which was from downstream sites to upstream sites, to minimize effects from potential site-to-site carryover contamination (Hornberger and others, 1997).

Quality control 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 12 replicates of the certified reference material (CRM) TORT-3 (lobster hepatopancreas) purchased from the National Research Council Canada. Quality-control samples were analyzed in a proportion equivalent to about 20 percent of the total number of biota samples.

Recovery efficiencies for trace-element analyses of the TORT-3 CRM are listed in table 19. Data-quality objectives have not been established for analytical recovery in biota, but percent recoveries indicate analytical performance. Mean CRM recoveries for TORT-3 ranged from 80.4 to 185 percent for all constituents. The mean recoveries were within 14 percent (based on the 95-percent confidence interval) for arsenic, cadmium, chromium, copper, iron, manganese, and zinc; 20 percent for nickel; and 185 percent for lead (likely because of the low certified concentrations in the standard). No adjustments were made to trace-element concentrations in biota samples based on recovery efficiencies.

Procedural blanks for biota consisted of undiluted aliquots of the same reagents used to digest and reconstitute tissue of aquatic insects. Analytical results of procedural blanks for biota (table 20) are reported as a liquid-phase concentration, in micrograms per milliliter. A procedural blank was prepared and analyzed concurrently with biota samples for each site. Concentrations of trace elements in all procedural blanks were less than the MRL; therefore, no adjustments to the data were necessary.

Statistical Summaries of Data

Statistical summaries of long-term water-quality, bed-sediment, and biological data for the Clark Fork Basin are listed in tables 21 through 23 for the period of record at each site. The summaries include the period of record; number of samples; and maximum, minimum, mean, and median concentrations.

Statistical summaries of water-quality data (table 21) are based on results of cross-section samples collected periodically by the USGS for the long-term monitoring program in

the Clark Fork Basin during the period of record for each site. The summaries do not include data for supplemental samples collected at selected sites that targeted high-flow conditions or maintenance drawdowns of Milltown Reservoir, which might disproportionately skew the long-term statistics relative to the other sites in the network. Sample results at sites that have been sampled for other projects can be accessed in the NWIS database at <https://waterdata.usgs.gov/mt/nwis/qw>. Statistical summaries of long-term bed-sediment (table 22) and biological data (table 23) are based on results of samples collected once each year during the indicated years. Because not all sites were sampled for bed sediment and biota every year, the data for some sites do not represent a consecutive annual record. Statistical summaries are not presented for discontinued sites.

Statistics for long-term bed-sediment data (table 22) are based on the mean trace-element concentrations determined for each year from the mean of the analyses of composite samples; therefore, the number of samples for bed sediment represents the number of years that the constituent was analyzed. The number of samples for arsenic for bed sediment is smaller than the number for other trace elements because sampling for arsenic began in September 2003. In addition, the number of samples analyzed for silver in bed sediment is smaller because analysis for this constituent was discontinued in 2004.

In contrast, statistics for long-term biological data (table 23) are based on individual analyses for each composite sample collected rather than on a single mean concentration for each year. Differences in the number of composited insect samples among species reflect differences in species abundance, both within and between sites and among years. As a result, the statistics for insects describe a wider range of variation in trace-element concentrations than would be evident if results from individual composite samples were averaged. Also, the number of samples for arsenic in insect samples is smaller than the number for other trace elements because sampling for arsenic began in September 2003. The abundance of aquatic insects at a site in a given year limits the biomass of the sample, which in turn, may result in varied MRLs. When MRLs vary among years, differences in concentration with time are difficult to determine, especially when a large percentage of the samples have concentrations less than MRLs.

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 sites 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 clearly be identified to the species level, but the individual insects had *morosa* characteristics.

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Data

20 Water-Quality, Bed-Sediment, and Biological Data and Statistical Summaries of Data, Clark Fork Basin, Montana

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323230—Blacktail Creek at Harrison Avenue, at Butte									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μS/cm)	Water temperature (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/17/2016	0915	13	7.5	209	5.5	25	83.7	23.8	5.91
03/20/2017	1015	34	7.6	198	2.0	E3.9	76.5	21.7	5.40
04/17/2017	0840	19	7.6	266	5.0	E2.3	98.0	27.9	6.88
05/08/2017	0855	21	7.6	217	5.0	E3.5	84.5	24.1	5.88
05/22/2017	0945	43	7.5	207	8.0	E6.3	76.3	21.8	5.34
06/12/2017	0850	15	7.5	239	8.5	E5.4	93.7	27.0	6.41
07/10/2017	0845	7.7	7.6	296	11.5	E3.2	120	34.6	8.10
08/14/2017	0830	4.1	7.6	343	10.0	<2.0	135	38.6	9.37

Date	Nitrate plus nitrite, filtered (mg/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)	Lead, unfiltered recoverable (μg/L)
10/17/2016	0.58	0.040	0.11	4.2	20.7	90.9	1,370	0.240	6.23
03/20/2017	0.23	0.034	0.08	4.5	6.6	322	778	0.256	0.89
04/17/2017	0.39	<0.030	0.05	2.9	3.7	233	448	0.110	0.33
05/08/2017	0.32	<0.030	0.05	4.7	6.4	255	621	0.148	0.56
05/22/2017	0.15	<0.030	0.07	6.5	9.2	211	720	0.219	1.02
06/12/2017	0.50	<0.030	0.05	3.9	5.8	394	880	0.224	0.71
07/10/2017	0.92	<0.030	0.03	2.1	2.9	185	405	0.105	0.28
08/14/2017	0.96	<0.030	0.03	2.3	3.2	85.2	236	0.050	0.21

Date	Manganese, filtered (μg/L)	Manganese, unfiltered recoverable (μg/L)	Zinc, filtered (μg/L)	Zinc, unfiltered recoverable (μg/L)	Arsenic, filtered (μg/L)	Arsenic, unfiltered recoverable (μg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/17/2016	24.7	67.1	7.2	36	2.5	4.1	94	30	1.1
03/20/2017	36.7	50.0	3.0	5	3.7	4.7	78	9	0.83
04/17/2017	31.8	35.9	2.3	3	2.3	2.9	84	3	0.15
05/08/2017	38.9	48.0	2.1	4	3.3	4.1	90	6	0.34
05/22/2017	27.7	48.1	2.6	6	4.7	5.8	82	10	1.2
06/12/2017	34.8	53.0	<2.0	<6	5.0	6.2	85	7	0.28
07/10/2017	33.1	38.6	<2.0	2	4.2	4.8	85	2	0.04
08/14/2017	33.8	43.3	2.4	4	2.6	3.0	78	1	0.01

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323250—Silver Bow Creek below Blacktail Creek, at Butte									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/17/2016	1045	24	7.6	406	6.0	E18	143	39.9	10.6
03/20/2017	1155	48	7.7	319	3.0	E4.0	114	32.3	8.16
04/17/2017	1015	34	7.8	424	5.5	E2.4	149	41.6	10.8
05/08/2017	1025	37	7.8	373	8.0	E4.2	129	37.1	8.85
05/22/2017	1125	58	7.8	325	10.0	E5.7	109	31.3	7.52
06/12/2017	1030	30	8.2	420	10.5	E5.3	147	41.4	10.7
07/10/2017	1015	21	8.0	550	15.0	<2.0	187	52.5	13.5
08/14/2017	1005	18	7.8	575	11.0	<2.0	187	52.3	13.6
Date	Nitrate plus nitrite, filtered (mg/L)	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)
10/17/2016	0.97	0.100	0.19	6.0	18.5	54.3	961	0.390	9.40
03/20/2017	0.59	0.053	0.14	5.7	12.5	250	728	0.315	2.12
04/17/2017	0.96	<0.090	0.12	5.0	8.8	147	426	0.137	1.03
05/08/2017	1.01	0.052	0.10	5.9	10.1	178	575	0.189	1.82
05/22/2017	0.51	0.060	0.13	7.3	14.2	157	716	0.277	3.78
06/12/2017	0.87	0.066	0.12	5.2	10.2	202	658	0.666	1.47
07/10/2017	1.00	0.083	0.10	4.3	6.4	49.3	167	0.139	0.53
08/14/2017	1.00	<0.030	0.11	4.1	6.5	22.8	93.7	0.141	0.67
Date	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/17/2016	58.3	120	45.3	90	3.3	5.0	98	22	1.4
03/20/2017	78.6	101	17.5	29	4.1	5.5	77	9	1.2
04/17/2017	83.7	102	24.9	32	3.0	4.1	79	7	0.65
05/08/2017	61.1	85.5	16.7	25	3.8	4.8	86	8	0.80
05/22/2017	42.5	79.0	15.7	33	4.6	6.4	83	12	1.9
06/12/2017	59.5	82.3	14.5	30	4.9	6.5	91	7	0.56
07/10/2017	52.6	65.2	28.4	36	4.6	5.4	70	2	0.11
08/14/2017	58.5	72.9	<2.0	50	3.5	3.8	84	2	0.10

22 Water-Quality, Bed-Sediment, and Biological Data and Statistical Summaries of Data, Clark Fork Basin, Montana

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323600—Silver Bow Creek at Opportunity									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (µS/cm)	Water temperature (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/17/2016	1215	43	8.5	472	6.0	E5.4	183	55.2	11.0
03/20/2017	1330	93	8.0	346	3.5	E10	127	38.0	7.77
04/17/2017	1145	79	8.5	419	5.5	E4.5	146	43.7	9.03
05/08/2017	1155	111	8.5	320	7.0	E9.4	122	37.8	6.75
05/22/2017	1255	139	8.5	308	10.5	E9.0	111	34.0	6.47
06/12/2017	1205	121	8.6	332	10.5	E4.2	128	38.9	7.42
07/10/2017	1145	61	8.5	453	16.0	<2.0	163	48.6	10.1
08/14/2017	1145	21	8.5	589	16.5	E3.4	206	60.2	13.6

Date	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (µg/L)	Cadmium, filtered (µg/L)	Cadmium, unfiltered recoverable (µg/L)
10/17/2016	4.53	21.8	98.4	37.4	0.42	23.4	75.7	0.100	0.22
03/20/2017	4.54	17.0	82.0	22.1	0.28	22.4	50.1	0.165	0.37
04/17/2017	3.69	22.2	92.9	28.1	0.34	19.8	65.7	0.188	0.32
05/08/2017	2.83	14.6	87.2	13.7	0.26	21.2	46.0	0.095	0.26
05/22/2017	2.92	14.1	83.7	13.3	0.25	23.8	44.3	0.111	0.28
06/12/2017	2.59	14.9	93.9	16.5	0.24	21.9	44.5	0.089	0.18
07/10/2017	4.20	25.3	113	28.5	0.37	24.5	68.6	0.147	0.18
08/14/2017	5.79	34.5	122	43.6	0.50	24.6	105	0.145	0.31

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)
10/17/2016	6.8	13.7	20.8	287	0.130	1.80	49.6	111
03/20/2017	13.1	26.5	165	877	0.346	3.71	83.0	157
04/17/2017	11.1	18.7	66.2	355	0.177	1.41	111	137
05/08/2017	9.1	18.8	58.8	594	0.178	2.46	48.8	125
05/22/2017	13.1	23.5	115	638	0.332	2.95	42.7	109
06/12/2017	8.9	12.8	54.3	318	0.164	1.15	44.2	68.0
07/10/2017	10.4	13.6	25.1	105	0.117	0.53	36.4	56.5
08/14/2017	9.3	16.5	<10.0	308	0.139	1.67	34.2	115

Date	Zinc, filtered (µg/L)	Zinc, unfiltered recoverable (µg/L)	Arsenic, filtered (µg/L)	Arsenic, unfiltered recoverable (µg/L)	Organic carbon, filtered (mg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/17/2016	28.0	54	5.1	5.3	3.64	93	8	0.92
03/20/2017	56.6	93	7.2	8.9	5.77	85	22	5.5
04/17/2017	47.4	80	4.9	5.9	5.35	90	10	2.1
05/08/2017	23.0	59	6.3	7.4	7.96	89	23	6.9
05/22/2017	26.6	65	8.2	9.5	9.07	89	19	7.1
06/12/2017	17.6	30	6.7	7.0	7.38	93	7	2.3
07/10/2017	18.7	29	8.3	9.1	5.98	91	3	0.49
08/14/2017	21.4	48	7.6	7.9	4.04	85	8	0.46

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323670—Mill Creek near Anaconda									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/17/2016	1610	17	7.9	158	6.0	<2.0	78.3	21.7	5.87
03/20/2017	1630	37	7.7	125	3.0	E4.9	54.2	15.3	3.91
04/17/2017	1455	30	7.8	144	7.5	E2.5	60.4	16.6	4.63
05/08/2017	1515	120	7.6	84	8.5	E5.5	35.4	10.4	2.31
05/22/2017	1620	78	7.9	102	11.5	E3.4	42.7	12.3	2.91
06/12/2017	1535	119	7.7	82	8.0	E2.6	35.5	10.4	2.31
07/10/2017	1445	55	7.9	106	14.0	<2.0	48.4	14.0	3.25
08/14/2017	1545	21	7.9	160	14.0	<2.0	74.9	20.6	5.69
Date	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (μ g/L)	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)
10/17/2016	0.84	3.96	73.6	0.42	0.33	12.8	7.98	0.050	0.07
03/20/2017	0.79	5.11	54.5	0.47	0.35	16.0	8.93	0.043	0.10
04/17/2017	0.71	5.72	62.6	0.41	0.31	15.5	8.69	0.038	0.10
05/08/2017	0.63	3.70	36.8	0.29	0.27	14.7	4.48	0.038	0.15
05/22/2017	0.62	3.66	46.0	0.25	0.28	14.8	4.83	0.038	0.09
06/12/2017	0.45	2.45	37.5	0.17	0.29	10.9	3.54	0.032	0.07
07/10/2017	0.52	2.64	48.9	0.17	0.29	10.0	4.44	0.037	0.06
08/14/2017	0.66	3.40	75.1	0.24	0.32	12.2	6.20	<0.030	0.06
Date	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	
10/17/2016	1.5	1.9	70.6	111	0.090	0.25	8.62	11.1	
03/20/2017	4.6	6.1	128	332	0.256	0.80	5.99	12.5	
04/17/2017	--	--	43.4	178	0.280	0.57	6.62	12.1	
05/08/2017	4.2	8.1	70.3	395	0.221	1.57	6.37	23.9	
05/22/2017	3.2	4.6	43.6	162	0.170	0.65	4.72	10.4	
06/12/2017	2.3	3.4	34.0	169	0.180	0.48	5.26	11.0	
07/10/2017	2.0	3.0	49.1	132	0.118	0.40	8.73	14.0	
08/14/2017	1.5	2.2	80.0	147	0.119	0.36	10.0	13.7	
Date	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Organic carbon, filtered (mg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)	
10/17/2016	<2.0	2	13.2	13.6	1.59	75	1	0.05	
03/20/2017	2.5	4	18.0	19.9	4.06	97	2	0.2	
04/17/2017	<2.0	3	18.8	20.5	2.89	81	4	0.32	
05/08/2017	2.7	7	15.4	17.6	5.10	75	14	4.5	
05/22/2017	<2.0	3	17.6	18.3	4.08	86	4	0.84	
06/12/2017	<2.0	3	10.1	11.3	2.58	76	6	1.9	
07/10/2017	<2.0	<2	13.3	14.2	2.11	60	3	0.45	
08/14/2017	<2.0	<2	15.9	16.0	1.40	62	2	0.11	

24 Water-Quality, Bed-Sediment, and Biological Data and Statistical Summaries of Data, Clark Fork Basin, Montana

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323700—Mill Creek at Opportunity									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μS/cm)	Water temperature, (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/17/2016	1700	5.2	7.9	181	7.0	<2.0	83.3	23.2	6.17
03/20/2017	1720	31	7.8	138	3.0	E4.5	59.6	16.8	4.29
04/17/2017	1545	27	8.1	159	6.5	<2.0	65.9	18.2	4.99
05/08/2017	1620	79	7.6	92	9.0	E8.9	39.2	11.4	2.61
05/22/2017	1725	64	8.0	111	12.5	E3.7	45.8	13.3	3.08
06/12/2017	1645	62	7.8	86	8.5	E4.0	37.1	10.9	2.41
07/10/2017	1540	27	8.0	115	15.0	<2.0	52.0	15.0	3.53
08/14/2017	1700	4.8	8.2	177	15.0	<2.0	79.7	22.2	5.91

Date	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (μg/L)	Cadmium, filtered (μg/L)	Cadmium, unfiltered recoverable (μg/L)
10/17/2016	0.86	5.23	76.2	0.57	0.35	13.2	15.5	0.070	0.07
03/20/2017	0.81	5.66	56.4	0.54	0.35	15.1	13.1	0.045	0.12
04/17/2017	0.75	6.40	65.3	0.49	0.32	15.3	13.0	0.035	0.10
05/08/2017	0.67	4.00	38.6	0.33	0.29	14.8	6.24	0.037	0.31
05/22/2017	0.65	4.06	48.1	0.30	0.29	14.5	6.88	0.043	0.10
06/12/2017	0.47	2.57	38.1	0.19	0.29	10.8	4.58	0.040	0.13
07/10/2017	0.55	3.10	51.2	0.22	0.30	10.2	6.30	0.039	0.08
08/14/2017	0.79	4.59	77.1	0.38	0.34	12.3	11.8	0.038	0.05

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)
10/17/2016	1.9	2.1	77.9	115	0.122	0.19	6.93	7.9
03/20/2017	4.6	6.7	102	360	0.249	1.08	4.05	17.5
04/17/2017	3.1	4.3	44.5	164	0.089	0.53	4.33	11.3
05/08/2017	4.6	14.0	67.6	811	0.241	3.45	7.26	61.7
05/22/2017	3.5	6.1	43.6	220	0.215	0.94	4.54	13.9
06/12/2017	2.7	5.3	39.3	325	0.209	1.17	5.68	16.5
07/10/2017	2.4	3.6	62.5	158	0.174	0.53	6.30	13.4
08/14/2017	1.8	2.2	75.8	132	0.134	0.26	5.62	7.3

Date	Zinc, filtered (μg/L)	Zinc, unfiltered recoverable (μg/L)	Arsenic, filtered (μg/L)	Arsenic, unfiltered recoverable (μg/L)	Organic carbon, filtered (mg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/17/2016	2.9	3	21.0	21.9	2.44	61	1	0.01
03/20/2017	2.7	6	19.8	23.0	3.52	61	5	0.41
04/17/2017	<2.0	3	21.2	23.6	2.44	78	4	0.3
05/08/2017	2.3	14	18.4	26.0	4.86	64	31	6.6
05/22/2017	<2.0	6	20.9	23.3	3.59	71	8	1.4
06/12/2017	<2.0	5	13.2	15.5	2.61	56	12	2.0
07/10/2017	<2.0	2	20.6	21.5	2.01	77	3	0.22
08/14/2017	<2.0	<2	30.4	30.9	1.86	56	3	0.04

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323710—Willow Creek near Anaconda									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/17/2016	1425	2.1	7.7	121	5.0	E2.2	46.5	15.5	1.90
03/20/2017	1525	10	7.6	107	2.0	E12	42.2	14.1	1.71
04/17/2017	1345	11	7.7	100	4.0	E7.4	36.8	12.2	1.52
05/08/2017	1355	33	7.5	70	6.5	E11	24.1	8.06	0.96
05/22/2017	1505	35	7.6	73	10.0	E9.9	24.7	8.24	1.00
06/12/2017	1420	14	7.7	92	7.0	E3.0	35.4	12.1	1.29
07/10/2017	1340	5.0	7.8	105	12.0	<2.0	40.7	13.8	1.50
08/14/2017	1420	2.1	7.9	109	13.0	<2.0	40.3	13.7	1.50
Date	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (μ g/L)	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)
10/17/2016	1.09	7.17	51.2	0.85	0.07	25.4	8.34	0.040	0.06
03/20/2017	1.05	6.23	42.1	0.67	0.07	25.4	10.1	<0.030	0.09
04/17/2017	0.91	6.06	38.3	0.52	0.07	26.6	8.47	<0.030	0.05
05/08/2017	0.72	4.46	29.2	0.34	0.06	23.4	4.75	<0.030	0.18
05/22/2017	0.78	4.33	30.2	0.32	0.06	25.3	4.92	<0.030	0.08
06/12/2017	0.76	4.84	40.0	0.27	0.06	23.4	5.30	<0.030	0.05
07/10/2017	0.89	5.83	46.6	0.29	0.07	25.1	5.60	<0.030	0.04
08/14/2017	0.99	6.54	48.1	0.34	0.07	26.7	5.75	0.040	0.04
Date	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	
10/17/2016	2.9	3.3	119	203	0.200	0.37	12.5	17.2	
03/20/2017	3.7	5.3	194	807	0.347	1.17	20.9	43.2	
04/17/2017	3.0	3.7	178	526	0.240	0.64	10.6	20.2	
05/08/2017	3.4	6.2	96.5	666	0.256	1.85	13.6	55.8	
05/22/2017	3.2	4.7	160	469	0.311	1.21	7.89	24.8	
06/12/2017	2.1	2.7	75.1	207	0.190	0.46	9.76	15.2	
07/10/2017	2.0	2.4	89.7	191	0.220	0.45	7.44	14.1	
08/14/2017	1.7	2.4	107	247	0.259	0.58	9.93	13.8	
Date	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Organic carbon, filtered (mg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)	
10/17/2016	<2.0	<2	17.6	18.3	4.21	94	2	0.01	
03/20/2017	2.3	4	18.1	20.1	6.65	92	9	0.25	
04/17/2017	<2.0	3	17.2	19.0	5.94	84	5	0.14	
05/08/2017	<2.0	8	15.2	17.9	7.19	69	26	2.3	
05/22/2017	<2.0	5	15.8	16.8	7.06	62	17	1.60	
06/12/2017	<2.0	<2	14.2	13.9	4.49	85	3	0.11	
07/10/2017	<2.0	<2	18.6	18.7	4.63	93	3	0.04	
08/14/2017	<2.0	<2	16.9	22.8	0.25	93	3	0.02	

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323720—Willow Creek at Opportunity									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/17/2016	1300	6.8	8.1	262	7.0	E4.1	118	34.9	7.58
03/20/2017	1410	16	7.9	212	4.0	E11	86.2	25.9	5.24
04/17/2017	1230	14	7.9	181	5.5	E8.1	72.3	21.8	4.30
05/08/2017	1235	27	7.8	128	7.0	E10	50.4	15.6	2.75
05/22/2017	1340	28	8.0	153	12.0	E6.7	60.5	18.6	3.43
06/12/2017	1245	21	8.0	254	11.0	E4.1	111	32.5	7.31
07/10/2017	1225	11	8.0	275	13.0	E2.6	126	37.0	8.04
08/14/2017	1240	7.1	8.2	259	14.0	E2.9	113	32.7	7.57
Date	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (μ g/L)	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)
10/17/2016	1.58	10.6	113	2.09	0.36	24.3	21.0	0.090	0.05
03/20/2017	1.88	9.84	81.3	2.17	0.22	24.2	23.3	<0.030	0.12
04/17/2017	1.12	8.59	70.9	1.35	0.19	25.1	16.8	<0.030	0.11
05/08/2017	1.06	6.42	51.6	0.81	0.12	24.4	10.3	<0.030	0.13
05/22/2017	1.03	6.92	63.1	0.97	0.17	24.9	11.4	0.032	0.09
06/12/2017	1.50	9.24	116	1.17	0.43	26.1	13.0	0.035	0.09
07/10/2017	1.23	7.96	128	1.47	0.45	23.6	13.3	<0.030	0.05
08/14/2017	1.36	8.73	112	1.88	0.41	21.8	18.0	<0.030	0.05
Date	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	
10/17/2016	2.3	4.2	42.9	247	0.229	1.12	20.8	29.5	
03/20/2017	5.2	10.0	130	626	0.328	2.20	60.2	75.6	
04/17/2017	3.8	9.0	92.8	500	0.246	2.32	33.3	50.9	
05/08/2017	6.6	12.5	97.7	542	0.350	2.11	31.7	50.9	
05/22/2017	8.8	13.0	89.0	340	0.332	1.52	21.6	32.7	
06/12/2017	6.3	8.3	62.9	258	0.215	1.13	30.2	40.5	
07/10/2017	3.6	5.6	46.9	172	0.203	0.84	19.4	23.6	
08/14/2017	2.3	4.4	27.0	202	0.185	1.06	10.1	15.6	
Date	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Organic carbon, filtered (mg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)	
10/17/2016	3.8	5	18.3	20.4	2.85	98	5	0.09	
03/20/2017	4.0	11	23.3	28.0	5.75	98	16	0.69	
04/17/2017	3.0	11	17.6	20.7	4.95	93	13	0.49	
05/08/2017	4.8	12	21.8	24.4	7.79	91	19	1.4	
05/22/2017	4.1	10	31.1	32.5	7.51	94	11	0.83	
06/12/2017	4.4	8	72.8	72.4	7.72	96	5	0.28	
07/10/2017	3.4	6	67.2	67.9	5.27	91	5	0.15	
08/14/2017	<2.0	4	15.9	17.8	2.90	98	5	0.1	

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323750—Silver Bow Creek at Warm Springs									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/18/2016	1035	35	8.6	495	6.0	E2.3	204	57.1	14.8
03/21/2017	0930	161	8.7	407	3.5	E6.4	160	46.3	10.7
04/18/2017	1035	121	8.3	431	6.0	E3.8	165	48.1	10.9
05/09/2017	1045	189	9.0	324	8.0	E5.1	123	36.4	7.87
05/23/2017	1035	249	9.2	341	11.0	E3.5	132	39.9	7.80
06/13/2017	0945	385	7.9	406	9.5	E7.7	167	48.4	11.1
07/11/2017	1010	89	9.2	317	14.0	E2.8	134	39.3	8.60
08/15/2017	1150	29	9.4	418	15.0	<2.0	180	52.2	12.0
Date	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (μ g/L)	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)
10/18/2016	4.09	21.2	106	22.1	0.80	13.4	111	<0.030	0.05
03/21/2017	3.91	18.7	90.3	23.2	0.55	11.5	75.2	0.036	0.15
04/18/2017	3.94	18.4	97.7	21.5	0.58	14.1	79.5	<0.030	0.12
05/09/2017	2.97	14.5	77.0	15.6	0.47	15.3	55.6	0.037	0.14
05/23/2017	2.88	14.2	89.7	15.6	0.43	15.6	57.8	0.103	0.21
06/13/2017	3.76	15.5	98.1	10.2	0.54	17.1	88.1	0.065	0.21
07/11/2017	1.91	11.7	89.2	8.97	0.48	13.5	56.8	<0.030	0.05
08/15/2017	2.46	15.2	102	11.9	0.63	17.8	94.8	<0.090	0.04
Date	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	
10/18/2016	1.9	3.1	16.9	105	0.030	0.45	5.03	66.0	
03/21/2017	4.1	12.8	52.1	391	0.213	2.88	33.8	88.1	
04/18/2017	2.8	7.6	31.2	274	0.127	1.60	116	150	
05/09/2017	4.8	9.6	39.2	365	0.151	1.81	86.5	134	
05/23/2017	9.1	13.5	31.5	246	0.144	1.25	77.3	107	
06/13/2017	8.2	16.1	103	583	0.391	3.15	110	146	
07/11/2017	4.1	5.2	30.0	101	0.115	0.39	39.2	57.8	
08/15/2017	2.4	2.8	24.7	85.3	0.088	0.29	31.0	64.9	
Date	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Organic carbon, filtered (mg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)	
10/18/2016	<2.0	4	17.8	18.8	4.04	84	1	0.1	
03/21/2017	4.5	22	11.7	14.9	3.84	95	10	4.3	
04/18/2017	3.8	15	10.9	13.9	4.76	92	7	2.3	
05/09/2017	2.2	12	18.0	20.7	5.23	82	12	6.1	
05/23/2017	12	23	17.4	19.5	6.08	89	5	3.4	
06/13/2017	7.1	21	47.5	48.0	9.29	83	20	21	
07/11/2017	<2.0	3	26.8	27.6	4.89	90	2	0.48	
08/15/2017	<6.0	2	25.9	26.9	4.71	35	6	0.46	

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323760—Warm Springs Creek near Anaconda									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/18/2016	0840	64	8.2	262	4.5	<2.0	132	38.7	8.56
04/18/2017	0845	52	8.4	275	4.0	E2.1	133	39.1	8.65
05/09/2017	0855	123	8.2	213	5.0	E3.0	103	31.6	5.92
05/23/2017	0840	135	8.2	200	6.0	E2.6	95.6	29.4	5.39
07/11/2017	0820	156	8.3	202	9.5	<2.0	98.6	29.9	5.82
08/15/2017	0905	78	8.4	251	8.5	<2.0	122	36.3	7.66
Date	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (μ g/L)	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)
10/18/2016	1.36	3.42	120	1.21	0.41	11.1	16.9	0.035	0.04
04/18/2017	1.24	3.60	126	1.43	0.39	10.5	15.4	<0.030	0.05
05/09/2017	1.03	2.15	98.5	0.84	0.33	9.94	10.8	<0.030	0.06
05/23/2017	0.89	1.95	92.6	0.78	0.31	9.47	9.99	<0.030	0.06
07/11/2017	0.95	2.16	88.5	0.87	0.38	9.60	14.3	0.034	0.05
08/15/2017	1.19	2.90	114	1.22	0.39	11.1	13.8	0.040	0.04
Date	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	
10/18/2016	0.70	1.3	4.6	37.9	0.020	0.11	0.68	1.9	
04/18/2017	0.68	1.6	<5.0	58.1	<0.020	0.20	0.50	2.9	
05/09/2017	1.3	3.4	12.8	154	0.022	0.42	1.18	8.7	
05/23/2017	1.00	3.7	<10.0	118	<0.020	0.35	1.28	7.4	
07/11/2017	0.97	2.2	<10.0	63.2	<0.020	0.18	3.86	8.4	
08/15/2017	0.70	1.8	<10.0	56.1	<0.020	0.19	0.92	4.2	
Date	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Organic carbon, filtered (mg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)	
10/18/2016	<2.0	3	1.9	2.1	0.90	75	2	0.35	
04/18/2017	<2.0	2	2.0	2.3	0.83	70	4	0.56	
05/09/2017	<2.0	6	1.6	2.1	3.19	74	9	3.0	
05/23/2017	<2.0	6	2.1	2.3	2.31	74	7	2.6	
07/11/2017	4.4	10	2.1	2.4	1.56	79	2	0.84	
08/15/2017	<2.0	3	1.9	2.1	1.04	63	2	0.42	

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323770—Warm Springs Creek at Warm Springs									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/18/2016	0950	28	8.2	338	4.5	<2.0	171	51.2	10.5
03/21/2017	0845	46	8.1	333	3.0	<2.0	170	50.7	10.5
04/18/2017	0955	36	8.2	346	5.0	<2.0	168	50.1	10.5
05/09/2017	1005	84	8.1	262	6.0	E6.2	128	39.5	7.17
05/23/2017	0950	86	8.2	257	8.0	E3.7	122	37.5	6.80
06/13/2017	1055	366	7.8	173	7.0	E13	81.5	25.0	4.62
07/11/2017	0925	97	8.0	232	11.0	E2.7	112	34.2	6.46
08/15/2017	1035	37	8.3	306	10.5	<2.0	148	44.8	8.87
Date	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (μ g/L)	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)
10/18/2016	1.60	3.96	135	1.58	0.44	11.9	41.3	<0.030	0.04
03/21/2017	1.43	4.09	137	1.84	0.41	10.8	37.6	<0.030	0.06
04/18/2017	1.41	4.14	138	1.70	0.42	10.4	38.6	0.031	0.06
05/09/2017	1.23	2.74	111	1.09	0.36	10.4	21.9	0.030	0.12
05/23/2017	1.11	2.53	109	1.07	0.34	9.54	22.8	<0.030	0.08
06/13/2017	1.32	1.84	61.4	0.87	0.33	9.21	22.6	0.046	0.18
07/11/2017	1.06	2.45	96.1	1.48	0.39	9.84	20.6	0.036	0.07
08/15/2017	1.33	3.44	126	1.42	0.42	11.1	30.1	0.034	0.04
Date	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	
10/18/2016	1.7	3.7	13.4	55.4	0.026	0.21	42.2	64.3	
03/21/2017	1.9	4.7	13.9	67.7	<0.020	0.29	57.1	77.6	
04/18/2017	2.1	4.7	15.2	61.8	<0.020	0.28	46.6	76.9	
05/09/2017	4.6	31.0	13.8	389	0.069	2.00	29.2	130	
05/23/2017	2.7	11.5	<10.0	167	0.031	1.00	36.2	92.3	
06/13/2017	7.1	39.0	28.7	893	0.102	4.58	25.6	111	
07/11/2017	2.3	8.3	20.2	128	0.047	0.61	34.3	52.4	
08/15/2017	2.1	4.8	14.1	69.6	0.054	0.30	28.1	40.9	
Date	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Organic carbon, filtered (mg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)	
10/18/2016	<2.0	2	5.1	5.3	1.10	74	1	0.08	
03/21/2017	<2.0	3	4.0	4.3	1.35	78	2	0.25	
04/18/2017	<2.0	3	4.0	4.6	1.59	72	3	0.29	
05/09/2017	<2.0	13	4.7	7.8	3.07	81	17	3.9	
05/23/2017	<2.0	6	4.5	5.7	2.35	74	8	1.9	
06/13/2017	4.8	23	6.5	11.3	4.27	70	42	42	
07/11/2017	3.0	7	5.2	6.1	1.91	75	3	0.79	
08/15/2017	<2.0	3	5.2	5.6	1.14	87	1	0.10	

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323800—Clark Fork near Galen									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	
10/18/2016	1205	80	8.4	434	6.0	190	55.0	12.9	
03/21/2017	1115	203	8.5	391	4.5	161	47.3	10.4	
04/18/2017	1210	155	8.3	405	7.0	168	49.3	10.9	
05/09/2017	1220	278	8.6	286	10.0	119	35.6	7.21	
05/23/2017	1215	337	8.9	315	13.0	127	38.5	7.40	
06/13/2017	1220	725	7.9	319	9.0	131	38.8	8.37	
07/11/2017	1150	186	8.9	273	15.5	123	36.8	7.48	
08/15/2017	1400	69	9.0	363	16.5	163	47.7	10.6	
Date	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	
10/18/2016	0.030	0.04	4.2	5.40	9.60	57.7	0.04	0.29	
03/21/2017	0.037	0.14	4.1	12.6	26.8	376	0.127	2.56	
04/18/2017	<0.030	0.11	2.9	11.8	23.5	315	0.093	1.77	
05/09/2017	0.035	0.16	4.7	17.7	26.1	468	0.117	2.68	
05/23/2017	0.076	0.17	6.9	16.2	15.6	288	0.084	1.53	
06/13/2017	0.052	0.27	8.0	41.9	66.8	1,270	0.252	5.74	
07/11/2017	0.032	0.06	3.9	6.8	17.8	95.5	0.070	0.42	
08/15/2017	<0.090	0.05	3.4	5.5	13.7	77.3	0.087	0.43	
Date	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/18/2016	10.1	25.8	<2.0	4	9.9	12.5	78	1	0.22
03/21/2017	39.5	107	3.9	18	10.0	12.6	84	12	6.6
04/18/2017	74.6	140	3.4	15	9.8	12.7	85	9	3.8
05/09/2017	47.0	142	<2.0	17	14.1	17.3	76	21	16
05/23/2017	49.3	98.7	3.1	19	14.6	16.9	75	9	8.2
06/13/2017	65.8	179	5.4	35	26.3	33.8	55	59	115
07/11/2017	25.6	45.6	<2.0	5	15.5	16.5	90	3	1.5
08/15/2017	23.5	48.9	<6.0	3	15.3	15.8	76	4	0.75

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323840—Lost Creek near Anaconda									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/18/2016	0745	6.1	8.0	230	5.0	<2.0	114	34.0	7.04
03/21/2017	0745	5.2	8.1	213	3.0	<2.0	104	31.2	6.31
04/18/2017	0745	4.9	8.0	225	4.0	<2.0	107	31.8	6.73
05/09/2017	0735	2.7	7.7	174	5.0	E2.5	82.6	24.9	4.94
05/23/2017	0740	4.8	7.9	183	7.0	E2.7	85.6	26.2	4.91
06/13/2017	0740	35	7.8	139	6.5	23	66.3	20.3	3.81
07/11/2017	0740	4.1	8.0	223	10.0	<2.0	109	33.7	6.11
08/15/2017	0750	9.1	8.2	234	9.0	<2.0	114	34.5	6.73
Date	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (μ g/L)	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)
10/18/2016	1.46	3.52	111	0.82	0.44	13.0	9.29	0.030	0.03
03/21/2017	1.27	2.73	102	0.75	0.43	11.3	9.95	<0.030	0.06
04/18/2017	1.27	2.95	105	0.79	0.45	11.4	10.2	<0.030	0.06
05/09/2017	1.19	2.35	81.3	0.56	0.35	11.4	7.19	<0.030	0.06
05/23/2017	1.07	2.38	85.6	0.56	0.36	11.1	7.21	<0.030	0.06
06/13/2017	1.38	2.27	63.3	0.56	0.30	10.7	5.77	<0.030	0.27
07/11/2017	1.24	3.18	108	0.74	0.39	11.9	7.41	<0.030	0.03
08/15/2017	1.33	2.92	112	0.72	0.40	12.4	7.97	<0.030	0.04
Date	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	
10/18/2016	1.6	2.2	13.6	41.2	0.040	0.13	0.98	1.8	
03/21/2017	1.6	5.4	9.4	128	0.023	0.60	0.77	6.7	
04/18/2017	1.5	4.6	11.8	108	0.023	0.47	1.17	5.5	
05/09/2017	3.3	8.2	14.1	136	0.045	0.67	1.47	5.5	
05/23/2017	2.3	5.6	14.1	127	0.033	0.57	1.04	6.0	
06/13/2017	7.7	56.6	78.6	2,040	0.234	7.85	7.11	51.2	
07/11/2017	2.3	3.6	16.3	50.2	0.054	0.19	1.38	3.1	
08/15/2017	1.7	5.0	20.5	129	<0.020	0.43	0.96	7.4	
Date	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Organic carbon, filtered (mg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)	
10/18/2016	<2.0	<2	6.3	6.3	1.40	63	1	0.02	
03/21/2017	<2.0	3	3.8	4.3	1.39	78	8	0.11	
04/18/2017	<2.0	2	3.7	4.4	1.24	69	5	0.07	
05/09/2017	<2.0	4	4.7	5.1	3.78	75	5	0.04	
05/23/2017	<2.0	3	4.6	4.9	2.92	78	6	0.08	
06/13/2017	2.5	28	10.7	17.1	7.10	39	130	12	
07/11/2017	<2.0	<2	7.8	7.6	2.36	64	1	0.01	
08/15/2017	<2.0	<2	1.9	7.2	1.40	74	4	0.1	

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Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12323850—Lost Creek near Galen									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μS/cm)	Water temperature, (°C)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)
10/18/2016	1125	54	8.1	537	5.0	<2.0	267	77.7	17.6
03/21/2017	1030	45	8.1	621	4.0	E3.2	318	92.8	20.9
04/18/2017	1130	40	8.2	621	5.5	E3.0	308	89.6	20.4
05/09/2017	1140	17	8.3	647	9.5	E2.8	319	94.2	20.3
05/23/2017	1130	16	8.4	705	12.0	E2.2	355	102	24.1
06/13/2017	0850	45	8.0	667	8.5	E13	320	90.3	23.0
07/11/2017	1115	1.7	8.3	593	16.0	E3.1	247	64.2	20.9
08/15/2017	1315	1.7	8.4	594	16.5	<2.0	244	62	21.7

Date	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (μg/L)	Cadmium, filtered (μg/L)	Cadmium, unfiltered recoverable (μg/L)
10/18/2016	2.09	10.3	174	3.96	0.49	15.4	108	<0.030	0.03
03/21/2017	2.44	12.8	192	4.89	0.48	16.5	139	<0.030	0.09
04/18/2017	2.17	12.9	186	4.69	0.46	15.8	137	<0.030	0.08
05/09/2017	2.23	13.1	181	4.60	0.45	16.1	159	<0.030	0.06
05/23/2017	2.46	14.1	193	4.96	0.50	16.6	183	<0.090	0.05
06/13/2017	3.81	17.1	184	5.32	0.58	18.7	167	<0.090	0.19
07/11/2017	3.80	32.2	232	5.90	0.88	23.5	84.1	<0.030	0.04
08/15/2017	3.75	33.3	226	5.47	0.90	20.6	88.4	<0.030	0.05

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)
10/18/2016	1.5	2.9	10.2	53.6	<0.020	0.17	5.09	5.90
03/21/2017	1.9	7.7	22.4	193	0.048	0.75	20.3	26.6
04/18/2017	1.3	6.5	16.7	176	0.031	0.74	14.0	22.2
05/09/2017	1.5	5.4	14.6	152	0.039	0.58	19.7	26.2
05/23/2017	3.3	4.0	22.2	97.8	0.087	0.32	25.7	27.3
06/13/2017	5.7	22.4	55.0	760	0.108	2.55	28.8	74.3
07/11/2017	2.2	3.8	24.4	107	0.223	0.32	18.3	22.2
08/15/2017	2.0	3.4	<10.0	66.5	0.048	0.22	4.92	10.9

Date	Zinc, filtered (μg/L)	Zinc, unfiltered recoverable (μg/L)	Arsenic, filtered (μg/L)	Arsenic, unfiltered recoverable (μg/L)	Organic carbon, filtered (mg/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/18/2016	<2.0	2	9.3	9.9	1.41	69	2	0.29
03/21/2017	<2.0	5	11	13	1.89	74	13	1.6
04/18/2017	<2.0	4	8.5	9.9	1.99	81	8	0.86
05/09/2017	<2.0	4	8.7	10.1	1.99	63	17	0.78
05/23/2017	<6.0	2	14.2	18.6	2.78	47	24	1.0
06/13/2017	<6.0	13	26.3	26.7	7.18	71	43	5.2
07/11/2017	<2.0	<2	11.5	11.5	3.36	74	6	0.03
08/15/2017	<2.0	<2	7.6	7.4	2.80	65	4	0.02

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12324200—Clark Fork at Deer Lodge									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	
10/18/2016	1320	212	8.4	506	7.0	233	67.9	15.5	
03/21/2017	1225	342	8.2	435	5.5	197	58.1	12.5	
04/18/2017	1335	295	8.5	470	8.0	202	58.8	13.5	
05/09/2017	1345	351	8.3	356	12.0	148	44.6	8.97	
05/23/2017	1355	369	8.3	395	15.5	165	48.4	10.7	
06/13/2017	1440	1,180	7.9	344	10.0	139	41.1	8.73	
07/11/2017	1310	200	8.6	356	18.0	156	47.1	9.31	
08/15/2017	1545	83	8.3	477	18.5	204	60.1	13.1	
Date	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	
10/18/2016	0.030	0.11	5.3	16.3	7.1	214	0.040	1.78	
03/21/2017	0.062	0.28	8.1	56.9	19.1	922	0.136	7.37	
04/18/2017	0.060	0.17	6.2	26.3	16.3	417	0.081	3.40	
05/09/2017	0.060	0.29	9.2	60.3	24.1	883	0.181	6.88	
05/23/2017	0.080	0.32	11.3	72.4	18.6	937	0.201	7.76	
06/13/2017	0.145	1.86	41.2	538	91.4	9,990	0.753	85.1	
07/11/2017	0.061	0.10	10.1	19.0	11.7	158	0.162	1.34	
08/15/2017	0.051	0.09	8.4	15.0	16.3	122	0.154	0.97	
Date	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/18/2016	9.60	70.5	4.3	15	11.7	12.8	87	8	4.6
03/21/2017	29.4	127	7.0	49	9.9	17.6	71	37	34
04/18/2017	28.6	93.0	4.6	23	11.4	14.5	80	16	13
05/09/2017	23.4	157	4.9	47	14.6	22.7	82	36	34
05/23/2017	21.1	127	7.1	57	18.7	27.1	69	37	37
06/13/2017	91.4	714	21.8	434	22.8	91.5	53	469	1,490
07/11/2017	23.9	39.7	3.5	12	17.9	18.7	87	6	3.2
08/15/2017	19.5	44.0	4.9	11	14.8	15.0	86	5	1.1

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12324400—Clark Fork above Little Blackfoot River, near Garrison									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	
10/18/2016	1440	226	8.7	496	8.0	227	65.8	15.2	
03/21/2017	1340	370	8.4	435	6.0	197	58.2	12.5	
04/18/2017	1440	280	8.8	471	9.5	204	59.3	13.6	
05/09/2017	1505	329	8.6	365	14.0	154	46.2	9.28	
05/23/2017	1520	387	8.5	409	17.0	171	50.1	11.2	
06/13/2017	1640	1,640	8.0	360	11.0	145	40.5	10.6	
07/11/2017	1425	205	8.4	394	20.0	173	51.3	11.0	
08/15/2017	1700	78	8.5	461	20.0	190	53.9	13.6	
Date	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	
10/18/2016	0.050	0.08	5.8	13.8	5.6	175	0.060	1.35	
03/21/2017	0.054	0.34	8.5	71.2	20.5	1,150	0.170	9.98	
04/18/2017	0.048	0.18	7.4	34.5	14.5	450	0.104	3.90	
05/09/2017	0.049	0.30	10.5	62.8	15.9	872	0.172	7.87	
05/23/2017	0.076	0.32	12.1	75.5	16.5	0	0.220	8.18	
06/13/2017	0.102	3.25	36.6	869	105	17,300	0.955	132	
07/11/2017	0.082	0.14	11.5	23.6	17.2	224	0.132	2.40	
08/15/2017	<0.030	<0.03	8.3	10.2	<10.0	21.9	0.059	0.16	
Date	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/18/2016	28.0	81.9	2.6	11	12.9	13.7	88	6	3.7
03/21/2017	34.7	170	6.6	61	10.9	19.0	73	51	51
04/18/2017	29.4	94.8	3.3	27	11.8	15.6	82	20	15
05/09/2017	24.0	166	3.0	49	16.4	22.9	88	37	33
05/23/2017	25.5	141	6.0	58	20.8	28.1	83	38	40
06/13/2017	164	1,060	17.8	800	27.4	138	61	836	3,700
07/11/2017	29.9	58.5	8.4	18	19.6	20.4	74	8	4.4
08/15/2017	2.7	6.4	<2.0	<2	16.8	17.1	89	7	1.5

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12324680—Clark Fork at Goldcreek									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	
10/18/2016	1545	306	8.7	444	8.0	205	60.0	13.5	
03/21/2017	1450	617	8.3	352	5.5	155	45.4	10.0	
04/18/2017	1535	519	8.8	363	9.0	158	46.4	10.1	
05/09/2017	1605	784	8.5	281	13.5	122	36.8	7.39	
05/23/2017	1640	1170	8.4	282	15.0	119	35.6	7.23	
06/14/2017	0815	3,370	7.9	305	9.5	121	35.1	8.09	
07/11/2017	1520	403	8.5	375	20.0	169	51.0	10.1	
08/16/2017	0730	161	8.1	442	13.0	191	56.2	12.2	
Date	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	
10/18/2016	0.040	0.05	4.6	8.5	<4.0	87.2	0.040	0.68	
03/21/2017	0.038	0.24	6.1	45.8	49.4	906	0.216	8.03	
04/18/2017	<0.030	0.12	4.5	18.6	11.2	354	0.054	2.35	
05/09/2017	0.032	0.21	6.3	36.2	27.8	833	0.152	4.89	
05/23/2017	0.037	0.20	6.5	34.0	47.0	870	0.220	4.86	
06/14/2017	0.102	1.35	30.9	295	106	8,760	0.734	44.1	
07/11/2017	0.051	0.09	7.6	14.2	15.8	184	0.094	1.13	
08/16/2017	<0.030	0.06	5.0	17.3	16.4	123	0.070	0.71	
Date	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/18/2016	10.4	33.0	<2.0	7	9.9	10.4	88	4	3.3
03/21/2017	22.3	122	4.7	42	7.8	13.2	77	37	62
04/18/2017	13.9	58.3	<2.0	17	7.8	9.9	84	16	22
05/09/2017	14.0	121	2.1	35	9.8	13.8	87	36	76
05/23/2017	14.1	95.0	3.2	32	10.6	14.2	74	41	130
06/14/2017	46.6	647	13.4	317	19.3	49.9	60	394	3,590
07/11/2017	18.2	45.6	<6.0	12	13.8	13.8	89	8	8.7
08/16/2017	17.7	53.1	2.5	8	10.8	11.8	85	9	3.9

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

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12331800—Clark Fork near Drummond									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	
10/19/2016	0805	520	8.2	473	7.0	220	62.6	15.4	
03/22/2017	0830	868	8.1	383	6.0	174	50.4	11.8	
04/19/2017	0750	742	8.3	391	8.0	171	48.6	12.1	
05/10/2017	0805	1120	8.1	282	11.0	124	36.6	8.02	
05/24/2017	0745	1,350	8.0	298	13.0	125	36.8	7.92	
06/14/2017	0945	5,500	7.8	276	9.5	113	32.7	7.62	
07/12/2017	0745	593	8.2	432	17.0	199	58.3	13.0	
08/16/2017	0835	241	8.1	542	15.0	244	68.9	17.6	
Date	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	
10/19/2016	0.030	0.08	2.9	9.4	<4.0	206	0.040	1.37	
03/22/2017	<0.030	0.27	5.4	45.4	38.4	1120	0.211	7.67	
04/19/2017	<0.030	0.16	4.1	22.8	12.0	553	0.075	4.22	
05/10/2017	<0.030	0.26	5.9	37.1	42.6	1,080	0.301	8.18	
05/24/2017	0.037	0.28	6.7	46.6	42.5	1,380	0.287	8.74	
06/14/2017	0.067	2.20	18.8	330	177	14,000	1.54	78.2	
07/12/2017	0.050	0.10	6.6	15.4	11.0	248	0.098	1.53	
08/16/2017	<0.030	0.05	4.4	8.3	<10.0	103	0.078	0.59	
Date	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/19/2016	9.25	50.4	3.5	13	8.9	9.1	81	10	14
03/22/2017	14.7	142	5.7	55	8.2	14.0	62	60	141
04/19/2017	12.2	90.4	3.7	29	8.2	11.4	72	33	66
05/10/2017	9.33	181	4.7	56	9.4	16.0	80	57	172
05/24/2017	8.96	160	4.7	60	10.4	16.2	54	86	313
06/14/2017	77.0	1,240	14.7	575	26.5	79.1	55	759	11,300
07/12/2017	13.4	60.0	3.6	17	14.0	15.4	85	11	18
08/16/2017	13.7	40.7	3.1	9	11.6	12.2	87	6	3.9

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12334550—Clark Fork at Turah Bridge, near Bonner									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	
10/19/2016	0935	820	8.1	370	7.0	171	47.9	12.4	
03/22/2017	1010	2,110	8.0	251	5.0	109	30.8	7.71	
04/19/2017	1230	1,670	8.4	258	9.0	111	31.2	7.99	
05/10/2017	0955	3,840	7.8	144	9.0	63.0	17.8	4.50	
05/24/2017	0945	3,860	8.0	174	11.5	73.1	21.0	5.04	
06/14/2017	1120	8,670	7.8	170	9.0	71.4	20.3	5.00	
07/12/2017	1050	1,400	8.3	273	15.5	124	35.6	8.51	
08/16/2017	0945	540	8.2	327	13.0	149	41.2	11.3	
Date	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	
10/19/2016	<0.030	0.05	1.8	6.2	4.7	191	0.030	0.89	
03/22/2017	<0.030	0.18	3.3	25.3	72.6	799	0.188	4.30	
04/19/2017	<0.030	0.08	2.7	11.4	23.4	306	0.072	1.68	
05/10/2017	<0.030	0.15	3.1	22.9	56.6	820	0.172	3.83	
05/24/2017	<0.030	0.15	3.7	22.4	47.2	713	0.174	3.82	
06/14/2017	0.057	1.71	10.9	244	203	10,700	0.977	50.5	
07/12/2017	<0.030	0.05	3.4	6.5	11.0	128	0.051	0.52	
08/16/2017	<0.030	0.04	2.3	3.7	<10.0	56.9	0.034	0.22	
Date	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/19/2016	3.36	30.3	2.3	12	5.7	6.3	84	10	22
03/22/2017	7.96	85.6	4.1	33	4.2	7.2	70	40	228
04/19/2017	6.09	37.3	<2.0	14	4.2	5.4	77	16	72
05/10/2017	7.63	81.5	3.4	34	3.4	5.9	50	67	695
05/24/2017	8.02	72.6	3.3	32	4.4	7.0	53	56	584
06/14/2017	48.3	871	11.3	430	10.2	37.4	54	692	16,200
07/12/2017	8.08	25.2	2.1	8	6.6	6.8	79	6	23
08/16/2017	4.59	14.8	2.0	5	5.5	5.4	77	4	5.8

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12340000—Blackfoot River near Bonner									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH, (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	
10/19/2016	1120	615	8.3	252	7.5	131	33.1	11.8	
04/19/2017	1430	3,240	8.4	182	8.0	87.9	22.7	7.55	
05/10/2017	1200	7,210	8.1	164	9.0	82.3	21.7	6.85	
05/24/2017	1340	6,930	8.2	164	11.5	80.7	21.5	6.57	
07/12/2017	1255	1,330	8.5	239	17.5	121	30.9	10.6	
08/16/2017	1120	672	8.5	264	14.0	134	33.0	12.4	
Date	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	
10/19/2016	<0.030	<0.03	--	--	5.3	53.8	--	--	
04/19/2017	<0.030	<0.03	0.80	1.1	30.8	218	0.025	0.21	
05/10/2017	<0.030	<0.03	0.80	3.3	28.8	829	0.038	1.07	
05/24/2017	<0.030	<0.03	0.79	2.6	22.4	714	0.033	0.95	
07/12/2017	<0.030	<0.03	0.81	0.6	<10.0	48.5	0.022	0.05	
08/16/2017	<0.030	<0.03	0.38	0.5	<10.0	31.2	0.021	0.04	
Date	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/19/2016	1.51	5.1	<2.0	<2	1.1	1.1	80	3	5
04/19/2017	3.75	15.2	<2.0	<2	0.72	0.9	86	11	96
05/10/2017	3.63	52.4	<2.0	5	0.84	1.5	83	69	1,340
05/24/2017	3.27	43.0	<2.0	<8	0.85	1.5	85	61	1,140
07/12/2017	1.84	6.1	<2.0	<2	1.3	1.3	90	4	14
08/16/2017	1.54	4.8	<2.0	<2	1.2	1.4	82	3	5.4

Table 4. Water-quality data for the Clark Fork Basin, Montana, October 2016 through September 2017.—Continued

[hh, hours; mm, minutes; ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; E, estimated; <, less than laboratory reporting level; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

12340500—Clark Fork above Missoula									
Date	Time (hhmm)	Streamflow, instantaneous (ft ³ /s)	pH (standard units)	Specific conductance (μ S/cm)	Water temperature, (°C)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	
10/19/2016	1320	1,480	8.4	318	7.5	155	41.8	12.3	
03/22/2017	1240	5,490	8.0	207	5.0	94.2	25.6	7.36	
04/19/2017	1030	5,070	8.2	209	6.5	95.2	25.6	7.60	
05/10/2017	1350	10,900	8.0	157	10.0	75.1	20.5	5.82	
05/24/2017	1145	10,400	8.1	170	11.0	79.1	21.6	6.14	
06/14/2017	1345	15,400	7.9	173	10.5	78.6	21.6	5.96	
07/12/2017	0930	2,730	8.2	255	15.5	122	33.4	9.34	
08/16/2017	1225	1170	8.5	287	14.5	134	35.0	11.4	
Date	Cadmium, filtered (μ g/L)	Cadmium, unfiltered recoverable (μ g/L)	Copper, filtered (μ g/L)	Copper, unfiltered recoverable (μ g/L)	Iron, filtered (μ g/L)	Iron, unfiltered recoverable (μ g/L)	Lead, filtered (μ g/L)	Lead, unfiltered recoverable (μ g/L)	
10/19/2016	<0.030	0.03	1.5	3.5	7.0	120	0.020	0.48	
03/22/2017	<0.030	0.08	2.0	10.4	87.5	559	0.144	1.89	
04/19/2017	<0.030	0.05	1.4	4.4	24.2	260	0.041	0.75	
05/10/2017	<0.030	0.08	1.8	9.2	38.4	848	0.093	1.94	
05/24/2017	<0.030	0.08	2.2	9.8	31.6	707	0.088	1.92	
06/14/2017	0.033	1.02	8.0	155	150	5,770	0.724	27.8	
07/12/2017	<0.030	0.03	2.2	4.3	10.9	95.2	0.037	0.33	
08/16/2017	<0.030	<0.03	1.5	2.1	<10.0	70.8	0.036	0.14	
Date	Manganese, filtered (μ g/L)	Manganese, unfiltered recoverable (μ g/L)	Zinc, filtered (μ g/L)	Zinc, unfiltered recoverable (μ g/L)	Arsenic, filtered (μ g/L)	Arsenic, unfiltered recoverable (μ g/L)	Sediment, suspended (percent finer than 0.062 mm)	Sediment, suspended (mg/L)	Sediment discharge, suspended (ton/d)
10/19/2016	5.36	19.8	<2.0	6	3.7	4.0	82	6	24
03/22/2017	7.94	49.6	2.3	15	2.5	3.4	76	28	415
04/19/2017	5.34	24.5	<2.0	7	1.9	2.4	81	14	192
05/10/2017	6.80	62.9	<2.0	15	1.9	3.1	76	65	1,910
05/24/2017	5.50	50.6	<2.0	19	2.4	3.5	75	50	1,400
06/14/2017	44.6	479	8.6	259	7.2	23.7	65	350	14,600
07/12/2017	6.28	18.6	<2.0	5	4.0	4.0	86	6	44
08/16/2017	5.62	12.6	<2.0	3	3.1	3.4	84	2	6.3

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Table 5. Seasonal daily maximum, minimum, and mean turbidity, with monthly summary statistics, at Mill Creek at Opportunity, Montana (12323700), March through September 2017.

[Turbidity values are based on near-infrared monochrome light emitted at wavelengths of 780 to 900 nanometers with a detection angle of 90 plus or minus 2.5 degrees to incident beam, reported in formazin nephelometric units (FNU). --, no data]

Day	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
	March			April			May			June		
1	--	--	--	5.1	4.2	4.5	6.1	4.3	4.8	25	16	19
2	--	--	--	5.7	4.3	4.7	5.8	4.3	4.9	33	14	21
3	--	--	--	6.2	4.3	4.6	6.5	4.1	4.7	45	31	38
4	--	--	--	7.2	4.2	4.6	6.5	4.4	5.1	224	31	59
5	--	--	--	5.3	4.0	4.4	13	5.7	7.3	616	129	354
6	--	--	--	5.1	4.2	4.5	33	13	18	--	--	--
7	--	--	--	6.4	4.5	5.0	64	26	38	--	--	--
8	--	--	--	5.8	4.3	4.8	--	--	--	--	--	--
9	--	--	--	6.8	4.1	4.6	16	7.9	9.5	--	--	--
10	--	--	--	4.8	3.8	4.2	58	7.4	16	8.5	5.8	6.5
11	--	--	--	4.6	3.9	4.1	95	18	32	6.7	4.9	5.6
12	--	--	--	6.4	4.0	4.5	211	41	123	19	4.4	7.7
13	--	--	--	5.5	4.2	4.6	74	17	32	48	12	24
14	--	--	--	5.3	4.3	4.7	42	8.4	18	33	7.8	11
15	--	--	--	4.8	4.0	4.4	56	7.0	16	9.9	5.5	7.0
16	--	--	--	5.7	3.9	4.4	16	7.0	10	7.5	4.9	5.8
17	--	--	--	5.7	3.8	4.4	15	6.0	8.2	11	5.4	7.4
18	--	--	--	5.4	3.9	4.5	8.2	5.8	6.3	10	4.4	6.0
19	--	--	--	6.0	4.2	4.7	8.2	6.2	6.9	7.6	3.5	4.6
20	--	--	--	5.8	4.5	5.0	15	6.1	8.1	21	5.0	11
21	--	--	--	5.9	4.4	4.9	11	4.7	6.7	--	--	--
22	--	--	--	6.2	4.3	4.9	12	4.3	5.7	--	--	--
23	--	--	--	6.0	4.6	5.2	8.0	4.8	5.9	--	--	--
24	--	--	--	6.7	4.9	5.7	12	6.4	8.0	--	--	--
25	--	--	--	6.3	4.6	5.3	11	6.7	7.9	--	--	--
26	--	--	--	5.9	4.4	5.1	9.1	5.2	6.1	--	--	--
27	--	--	--	5.7	4.0	4.5	7.1	4.5	5.4	--	--	--
28	--	--	--	5.2	3.8	4.2	7.2	4.1	5.1	--	--	--
29	--	--	--	4.7	3.7	4.2	8.4	5.1	6.1	--	--	--
30	5.4	4.5	4.9	5.5	4.3	4.8	13	6.3	8.5	--	--	--
31	5.3	4.3	4.7	--	--	--	21	8.4	13	--	--	--
Month¹	5.4	4.3	4.8	7.2	3.7	4.7	211	4.1	15	616	3.5	37

Table 5. Seasonal daily maximum, minimum, and mean turbidity, with monthly summary statistics, at Mill Creek at Opportunity, Montana (12323700), March through September 2017.—Continued

[Turbidity values are based on near-infrared monochrome light emitted at wavelengths of 780 to 900 nanometers with a detection angle of 90 plus or minus 2.5 degrees to incident beam, reported in formazin nephelometric units (FNU). --, no data]

Day	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
	July			August			September		
1	--	--	--	4.0	1.5	1.9	3.8	1.6	1.8
2	--	--	--	4.0	1.7	2.0	3.5	1.7	2.3
3	--	--	--	3.1	1.8	2.2	4.6	2.1	2.4
4	--	--	--	4.3	1.9	2.2	3.6	2.1	2.4
5	--	--	--	3.7	1.8	2.1	2.5	1.9	2.1
6	--	--	--	2.5	1.6	1.9	2.7	1.7	1.8
7	5.5	2.5	3.2	4.9	1.7	1.9	3.7	1.5	1.8
8	4.5	2.2	3.0	2.5	1.5	1.8	3.3	1.7	2.0
9	3.9	2.5	3.1	3.5	1.6	1.8	3.5	1.7	1.9
10	4.5	2.3	3.0	2.8	1.6	1.8	2.6	1.7	1.9
11	4.1	2.3	2.9	2.3	1.6	1.8	2.5	1.8	2.0
12	4.3	2.3	3.0	2.5	1.6	1.8	2.7	1.8	2.1
13	4.2	2.2	3.0	4.1	1.7	2.1	2.4	1.2	2.1
14	5.1	2.3	3.1	2.6	1.6	2.0	3.3	2.1	2.5
15	4.9	2.4	3.1	2.2	1.6	1.7	4.1	2.2	3.1
16	4.6	2.1	2.8	3.0	1.6	1.8	3.6	2.1	2.6
17	3.6	2.1	2.7	4.4	1.6	1.8	3.3	1.4	2.3
18	3.1	1.8	2.4	2.9	1.4	1.7	3.4	1.9	2.2
19	3.7	1.8	2.3	2.7	1.4	1.6	4.7	1.9	2.3
20	3.1	1.9	2.3	2.6	1.4	1.6	9.8	2.2	3.9
21	3.0	1.8	2.3	3.9	1.4	1.8	6.7	1.5	3.0
22	3.1	1.6	2.0	2.8	1.5	1.8	3.7	1.6	2.1
23	2.8	1.6	2.0	2.7	1.4	2.1	3.7	1.6	2.0
24	2.9	1.5	2.1	3.3	1.8	2.3	2.5	1.1	1.8
25	3.4	1.5	2.1	4.4	2.0	2.4	3.7	1.4	1.7
26	9.0	1.5	3.1	4.5	1.9	2.2	2.8	1.6	2.0
27	8.5	1.4	2.7	4.7	2.0	2.5	3.0	1.8	2.2
28	3.8	1.4	1.9	14	2.1	4.3	3.4	1.9	2.4
29	3.1	1.3	1.8	7.7	2.0	2.6	3.2	2.0	2.5
30	2.6	1.3	1.8	2.2	1.6	1.8	3.1	1.4	2.0
31	2.9	1.2	1.7	2.7	1.5	1.7	--	--	--
Month¹	9.0	1.2	2.5	14	1.4	2.0	9.8	1.1	2.2

¹For months with missing daily values, the means are calculated using available values.

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Table 6. Seasonal daily maximum, minimum, and mean turbidity, with monthly summary statistics, at Willow Creek at Opportunity, Montana (12323720), March through September 2017.

[Turbidity values are based on near-infrared monochrome light emitted at wavelengths of 780 to 900 nanometers with a detection angle of 90 plus or minus 2.5 degrees to incident beam, reported in formazin nephelometric units (FNU). --, no data]

Day	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
	March			April			May			June		
1	--	--	--	14	10	12	11	7.8	8.8	8.0	5.9	6.8
2	--	--	--	15	10	12	19	7.6	9.4	9.7	6.1	7.3
3	--	--	--	15	10	12	14	7.7	9.3	7.8	6.0	6.7
4	--	--	--	16	11	12	13	7.8	8.7	16	6.0	8.5
5	--	--	--	14	11	11	12	8.4	9.7	14	6.3	8.8
6	--	--	--	14	10	11	19	11	14	8.1	5.0	6.5
7	--	--	--	14	9.9	11	20	14	15	7.7	5.3	6.3
8	--	--	--	15	9.9	11	18	12	14	8.5	5.2	6.6
9	--	--	--	16	9.8	11	13	9.8	11	8.3	5.4	6.4
10	--	--	--	14	9.8	11	11	8.2	8.9	44	5.2	7.6
11	--	--	--	13	9.3	11	10	8.0	8.5	8.0	4.9	5.8
12	--	--	--	13	9.3	10	10	7.6	8.3	38	4.6	10
13	--	--	--	12	8.8	9.8	11	8.4	9.3	38	7.1	15
14	--	--	--	14	9.2	10	12	8.0	9.0	8.8	5.8	6.6
15	--	--	--	13	9.0	10	9.6	7.5	8.1	7.5	5.6	6.3
16	--	--	--	12	9.0	10	8.5	6.4	7.1	7.6	5.9	6.6
17	--	--	--	13	9.2	10	10	7.5	8.6	8.7	5.2	6.5
18	--	--	--	15	9.0	11	9.0	5.7	7.0	8.7	5.5	6.3
19	--	--	--	15	9.2	11	19	4.8	6.3	20	5.6	7.8
20	--	--	--	24	9.2	11	7.6	5.6	6.2	9.0	4.7	6.4
21	--	--	--	15	9.9	11	8.9	6.6	7.4	9.3	4.6	6.0
22	--	--	--	16	9.4	11	12	7.5	8.1	11	4.3	6.2
23	--	--	--	19	9.2	11	8.8	7.4	8.0	16	4.0	5.7
24	--	--	--	13	9.5	11	9.0	7.4	8.1	39	4.1	5.7
25	--	--	--	14	9.4	11	9.2	7.8	8.5	39	4.0	6.5
26	--	--	--	13	9.2	10	13	7.0	7.9	11	4.0	5.7
27	--	--	--	13	9.0	10	11	6.7	7.5	14	4.0	6.3
28	--	--	--	12	8.6	9.9	12	6.4	7.4	16	5.2	8.3
29	--	--	--	12	8.4	9.5	11	5.9	7.2	15	3.2	8.2
30	13	10	11	14	8.1	9.2	8.7	6.0	7.0	11	3.2	6.3
31	16	11	12	--	--	--	9.2	6.2	6.7	--	--	--
Month¹	16	10	12	24	8.1	11	20	4.8	8.7	44	3.2	7.1

Table 6. Seasonal daily maximum, minimum, and mean turbidity, with monthly summary statistics, at Willow Creek at Opportunity, Montana (12323720), March through September 2017.—Continued

[Turbidity values are based on near-infrared monochrome light emitted at wavelengths of 780 to 900 nanometers with a detection angle of 90 plus or minus 2.5 degrees to incident beam, reported in formazin nephelometric units (FNU). --, no data]

Day	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
	July			August			September		
1	13	3.6	6.1	5.3	3.2	4.1	4.9	2.3	3.1
2	--	--	--	5.3	3.7	4.4	4.2	2.5	3.1
3	8.1	3.5	4.4	6.7	3.7	4.9	4.6	2.4	3.1
4	7.8	3.4	5.1	6.8	3.5	4.6	4.1	2.2	2.9
5	14	3.3	6.2	5.9	3.6	4.5	4.4	2.5	3.2
6	9.6	3.2	4.3	5.5	3.7	4.4	5.8	2.4	3.5
7	4.9	3.0	3.8	5.9	3.3	4.5	5.8	2.3	3.5
8	6.3	3.1	3.9	6.2	3.2	4.4	7.7	2.4	3.6
9	6.4	2.8	4.4	6.8	3.4	4.1	4.4	2.3	3.0
10	7.0	2.9	4.0	4.8	2.9	3.7	4.6	2.4	3.1
11	5.9	3.1	4.2	8.7	2.9	4.1	5.1	2.8	3.5
12	6.7	2.7	4.2	5.7	3.2	4.2	5.2	2.4	3.5
13	5.2	2.5	3.6	6.0	3.0	4.1	5.3	2.6	3.4
14	4.2	2.8	3.3	6.5	2.9	3.6	5.2	3.0	3.7
15	5.4	3.1	4.1	6.0	2.7	3.7	6.7	3.7	4.8
16	6.1	2.8	4.0	4.4	2.9	3.5	5.6	3.2	4.3
17	7.8	2.7	4.2	5.1	3.1	3.8	4.5	3.3	3.8
18	5.8	2.6	3.9	5.0	2.9	3.3	6.0	3.1	4.0
19	6.5	3.9	4.7	4.5	2.8	3.3	8.6	3.3	4.3
20	--	--	--	4.9	2.9	3.5	5.9	3.5	4.3
21	--	--	--	5.7	3.0	3.6	6.7	3.3	4.3
22	--	--	--	4.5	2.9	3.4	8.3	3.2	4.6
23	--	--	--	3.7	2.6	3.1	6.8	3.3	4.3
24	--	--	--	4.9	2.6	3.1	7.0	3.4	4.8
25	--	--	--	6.3	2.6	3.2	7.0	3.5	4.5
26	9.0	4.4	6.0	5.9	3.0	3.5	6.2	3.5	4.9
27	9.0	3.9	5.3	4.3	2.6	3.1	7.6	4.1	5.5
28	11	3.5	5.0	5.4	2.6	3.3	6.3	3.5	5.1
29	9.2	3.4	4.8	4.6	2.5	3.2	8.1	4.9	6.0
30	11	3.5	5.3	3.8	2.2	2.9	8.8	4.7	6.4
31	9.7	3.3	5.1	4.0	2.4	2.9	--	--	--
Month¹	14	2.5	4.6	8.7	2.2	3.7	8.8	2.2	4.1

¹For months with missing daily values, the means are calculated using available values.

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Table 7. Seasonal daily maximum, minimum, and mean turbidity, with monthly summary statistics, at Warm Springs Creek at Warm Springs, Montana (12323770), March through September 2017.

[Turbidity values are based on near-infrared monochrome light emitted at wavelengths of 780 to 900 nanometers with a detection angle of 90 plus or minus 2.5 degrees to incident beam, reported in formazin nephelometric units (FNU). --, no data]

Day	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
	March			April			May			June		
1	--	--	--	2.5	1.4	1.8	5.1	3.6	4.2	32	16	24
2	--	--	--	2.8	1.5	1.8	6.7	3.7	4.4	--	--	--
3	--	--	--	2.1	1.5	1.8	5.8	3.5	4.0	--	--	--
4	--	--	--	3.0	1.5	1.8	5.2	3.4	4.1	--	--	--
5	--	--	--	3.3	1.5	1.8	4.9	3.7	4.2	--	--	--
6	--	--	--	2.0	1.5	1.7	9.1	4.3	6.3	--	--	--
7	--	--	--	2.3	1.6	1.9	29	9.1	21	21	11	13
8	--	--	--	2.2	1.6	1.8	18	7.3	11	12	9.6	11
9	--	--	--	2.4	1.6	1.9	11	6.1	7.5	12	8.3	9.3
10	--	--	--	2.3	1.6	1.9	12	6.5	7.8	9.5	7.4	8.0
11	--	--	--	2.6	1.5	1.8	18	7.9	13	8.1	6.3	7.0
12	--	--	--	2.9	1.8	2.2	23	10	15	23	5.8	8.6
13	--	--	--	2.9	1.8	2.2	26	13	18	47	13	25
14	--	--	--	3.1	1.9	2.3	13	6.6	8.6	44	15	24
15	--	--	--	2.5	1.8	2.1	7.3	5.0	6.0	16	10	12
16	--	--	--	2.9	1.6	2.1	6.1	4.3	5.0	12	8.4	9.4
17	--	--	--	2.9	2.0	2.3	6.0	4.2	5.2	8.8	7.3	7.7
18	--	--	--	3.5	2.0	2.4	5.7	3.5	4.2	7.8	6.1	6.7
19	--	--	--	3.8	1.9	2.4	5.0	3.2	4.0	8.1	6.0	6.5
20	--	--	--	3.3	1.9	2.4	4.7	3.0	3.7	7.4	5.8	6.4
21	--	--	--	3.0	1.8	2.4	4.5	2.8	3.5	7.6	5.5	6.2
22	--	--	--	3.6	1.9	2.6	4.5	3.0	3.7	6.2	4.8	5.5
23	--	--	--	4.3	3.1	3.6	5.2	3.6	4.4	6.0	4.5	5.2
24	--	--	--	7.8	3.5	4.1	49	4.4	12	6.0	4.3	4.9
25	--	--	--	5.1	3.1	3.8	20	9.0	14	5.7	3.9	4.6
26	--	--	--	5.1	3.2	3.7	9.1	5.7	6.8	5.8	4.0	4.7
27	--	--	--	5.3	3.4	3.8	6.4	4.3	5.2	5.9	3.8	4.4
28	--	--	--	4.7	3.5	3.9	6.0	4.6	5.2	4.8	3.5	3.9
29	--	--	--	4.7	3.4	3.9	9.4	5.7	7.4	8.6	3.3	4.3
30	2.9	1.7	2.1	4.6	3.4	3.8	18	8.0	13	5.7	3.3	3.9
31	3.1	1.5	1.9	--	--	--	31	13	20	--	--	--
Month¹	3.1	1.5	2.0	7.8	1.4	2.5	49	2.8	8.1	47	3.3	9.0

Table 7. Seasonal daily maximum, minimum, and mean turbidity, with monthly summary statistics, at Warm Springs Creek at Warm Springs, Montana (12323770), March through September 2017.—Continued

[Turbidity values are based on near-infrared monochrome light emitted at wavelengths of 780 to 900 nanometers with a detection angle of 90 plus or minus 2.5 degrees to incident beam, reported in formazin nephelometric units (FNU). --, no data]

Day	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
	July			August			September		
1	5.0	3.1	3.8	2.6	1.1	1.6	3.1	1.3	2.1
2	--	--	--	2.4	1.2	1.5	2.6	1.1	1.9
3	--	--	--	2.3	0.8	1.4	3.2	1.1	1.7
4	--	--	--	2.6	0.8	1.3	3.0	1.0	1.5
5	--	--	--	2.1	0.8	1.2	2.7	0.9	1.6
6	--	--	--	1.8	0.8	1.2	2.3	0.9	1.4
7	13	2.6	3.8	2.1	0.7	1.2	2.9	0.6	1.2
8	3.5	2.3	2.9	--	--	--	--	--	--
9	3.6	2.3	2.8	--	--	--	--	--	--
10	--	--	--	3.2	1.0	1.7	--	--	--
11	4.5	2.2	2.9	2.6	1.0	1.5	2.8	1.0	1.4
12	3.5	2.0	2.5	2.4	0.9	1.4	2.5	1.0	1.5
13	4.0	1.7	2.5	2.2	1.0	1.4	2.6	0.9	1.6
14	3.7	1.8	2.5	3.3	0.8	1.8	3.2	1.0	1.7
15	980	1.8	22	4.9	0.8	1.5	3.8	1.0	1.8
16	1,070	6.2	91	2.3	0.9	1.5	2.2	0.7	1.3
17	7.5	4.2	5.6	2.0	0.8	1.3	2.2	0.6	1.1
18	5.8	3.3	4.1	2.0	0.7	1.2	--	--	--
19	4.9	2.7	3.6	2.7	0.7	1.3	--	--	--
20	5.6	2.6	3.8	2.0	0.7	1.2	--	--	--
21	4.8	2.1	2.9	2.3	0.7	1.3	--	--	--
22	4.2	1.6	2.6	3.9	1.2	2.2	--	--	--
23	4.0	1.6	2.4	4.1	0.9	1.6	--	--	--
24	5.1	2.3	2.8	1.9	0.7	1.2	--	--	--
25	5.1	2.0	3.0	2.2	0.6	1.1	2.4	0.6	1.2
26	10	2.4	3.5	1.9	0.5	1.0	4.1	0.7	1.7
27	5.9	2.5	3.6	--	--	--	6.1	0.9	1.7
28	3.3	1.5	2.2	--	--	--	2.3	0.7	1.2
29	2.9	1.3	1.9	--	--	--	2.0	0.5	1.0
30	2.8	1.3	1.8	1.9	0.5	0.9	1.9	0.6	1.1
31	2.6	1.3	1.7	3.8	0.7	1.6	--	--	--
Month¹	1,070	1.3	7.3	4.9	0.5	1.4	6.1	0.5	1.5

¹For months with missing daily values, the means are calculated using available values.

Table 8. Seasonal daily maximum, minimum, and mean turbidity, with monthly summary statistics, at Lost Creek near Anaconda, Montana (12323840), March through September 2017.

[Turbidity values are based on near-infrared monochrome light emitted at wavelengths of 780 to 900 nanometers with a detection angle of 90 plus or minus 2.5 degrees to incident beam, reported in formazin nephelometric units (FNU). --, no data]

Day	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
	March			April			May			June		
1	--	--	--	17	3.5	5.8	6.1	1.7	3.1	70	6.9	12
2	--	--	--	--	--	--	7.9	1.5	2.7	14	5.9	8.8
3	--	--	--	9.4	2.5	4.2	5.3	1.6	2.6	15	6.0	8.5
4	--	--	--	15	2.8	5.1	7.7	1.4	2.7	23	5.3	8.4
5	--	--	--	6.8	3.2	3.8	7.3	1.7	3.3	90	9.7	20
6	--	--	--	9.1	3.3	4.6	8.9	2.5	4.2	12	5.4	8.3
7	--	--	--	6.7	2.8	3.7	259	5.2	18	8.1	4.1	6.3
8	--	--	--	9.7	2.6	4.0	18	4.6	8.9	9.1	4.7	5.9
9	--	--	--	16	2.8	5.0	13	1.9	4.1	17	4.9	7.8
10	--	--	--	7.3	2.4	3.3	9.5	2.2	5.1	11	3.9	5.9
11	--	--	--	6.9	2.5	3.3	8.3	2.4	4.6	16	3.8	6.5
12	--	--	--	12	2.9	4.3	81	4.8	9.9	168	4.2	21
13	--	--	--	12	3.2	6.1	44	5.4	9.8	88	26	51
14	--	--	--	4.7	2.9	3.7	12	3.4	5.2	29	12	18
15	--	--	--	8.6	2.4	4.0	6.3	3.2	4.1	12	7.2	9.4
16	--	--	--	6.3	2.5	3.4	4.7	2.7	3.4	12	5.7	7.9
17	--	--	--	6.7	2.7	3.9	13	3.2	5.3	17	6.0	8.5
18	--	--	--	--	--	--	23	2.4	4.9	14	5.4	7.1
19	--	--	--	7.7	2.7	3.5	4.1	1.4	2.6	13	4.6	6.8
20	--	--	--	8.1	2.9	4.1	3.6	2.2	2.8	--	--	--
21	--	--	--	8.7	3.3	4.8	5.5	2.1	2.9	7.9	2.1	3.8
22	--	--	--	9.1	3.9	5.1	5.1	2.3	3.4	6.1	1.8	3.1
23	--	--	--	12	3.3	5.9	12	2.5	5.1	9.4	1.6	2.9
24	--	--	--	6.4	2.5	4.1	46	5.8	11	8.7	1.7	3.1
25	--	--	--	6.5	2.1	3.5	21	6.2	9.9	9.0	2.4	3.5
26	--	--	--	8.9	2.8	4.2	13	4.3	6.2	6.7	2.7	3.5
27	--	--	--	107	3.3	11	28	3.8	6.7	6.2	1.6	3.4
28	--	--	--	24	4.4	12	12	2.8	4.4	4.0	1.4	2.5
29	--	--	--	25	2.7	4.6	8.1	3.4	4.9	5.2	1.8	3.3
30	21	4.1	8.0	7.9	3.3	4.3	8.8	1.7	5.6	6.6	0.5	3.3
31	11	3.6	5.5	--	--	--	14	3.9	6.4	--	--	--
Month¹	21	3.6	6.8	107	2.1	4.8	259	1.4	5.6	168	0.5	9.0

Table 8. Seasonal daily maximum, minimum, and mean turbidity, with monthly summary statistics, at Lost Creek near Anaconda, Montana (12323840), March through September 2017.—Continued

[Turbidity values are based on near-infrared monochrome light emitted at wavelengths of 780 to 900 nanometers with a detection angle of 90 plus or minus 2.5 degrees to incident beam, reported in formazin nephelometric units (FNU). --, no data]

Day	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
	July			August			September		
1	4.3	1.4	2.2	3.7	2.4	2.9	2.4	0.5	1.5
2	4.9	1.9	2.6	75	2.2	6.9	2.0	1.0	1.6
3	4.8	1.8	2.6	3.9	2.2	2.8	2.2	0.5	1.1
4	3.3	1.1	2.2	91	2.2	8.5	2.4	0.5	1.1
5	3.9	1.9	2.5	7.1	4.1	5.4	3.3	0.5	1.1
6	3.3	1.8	2.4	8.9	3.4	4.1	2.2	0.5	0.9
7	4.3	1.4	2.2	6.6	3.3	3.9	1.9	0.5	1.1
8	3.4	1.3	1.9	5.4	3.0	3.6	--	--	--
9	4.4	1.2	2.1	5.7	3.2	3.7	--	--	--
10	2.6	1.3	1.8	4.5	2.8	3.3	--	--	--
11	3.9	1.0	2.0	5.8	3.1	3.8	--	--	--
12	3.0	1.9	2.2	13	3.3	4.1	--	--	--
13	3.3	2.0	2.3	5.4	3.3	3.9	--	--	--
14	3.3	1.6	2.3	4.4	3.0	3.5	--	--	--
15	1,080	1.8	148	6.1	3.1	3.7	--	--	--
16	125	8.6	18	5.3	2.9	3.7	--	--	--
17	28	4.0	7.8	5.5	3.2	3.7	--	--	--
18	5.9	2.9	4.0	4.5	3.1	3.6	--	--	--
19	15	2.1	5.6	4.9	3.1	3.6	--	--	--
20	5.6	1.2	3.4	4.6	2.9	3.5	--	--	--
21	5.2	2.7	3.2	5.7	3.2	3.9	--	--	--
22	6.0	2.0	2.7	5.8	3.1	4.0	--	--	--
23	6.1	2.0	2.7	6.4	2.7	3.7	--	--	--
24	3.4	1.9	2.4	3.8	2.3	2.9	8.3	0.5	1.1
25	4.3	1.9	2.3	5.8	2.2	2.7	5.5	0.7	1.2
26	3.1	1.4	2.1	3.5	2.2	2.6	2.4	1.1	1.4
27	3.0	1.5	1.9	2.6	2.0	2.3	2.2	1.5	1.8
28	5.2	1.3	1.8	3.3	1.9	2.2	3.0	1.7	2.0
29	3.8	1.8	2.0	3.5	1.8	2.1	4.4	2.1	2.3
30	6.1	1.7	2.3	2.6	1.2	1.8	2.9	2.1	2.2
31	6.0	2.3	3.2	2.1	1.1	1.5	--	--	--
Month¹	1,080	1.0	7.9	91	1.1	3.6	8.3	0.5	1.5

¹For months with missing daily values, the means are calculated using available values.

Table 9. Analyses of field replicates for water samples, Clark Fork Basin, Montana.

[hh, hours; mm, minutes; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; --, no data; <, less than laboratory reporting level; E, estimated]

Site number (fig. 1)	Site name	Date	Time (hhmm)	Turbidity, unfiltered, lab (NTRU)	Hardness, filtered (mg/L as CaCO ₃)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, filtered, lab (mg/L as CaCO ₃)
12324680	Clark Fork at Goldcreek	10/18/2016	1545	--	205	60.0	13.5	--	--	--
		10/18/2016	1550	--	210	61.6	13.6	--	--	--
12323250	Silver Bow Creek below Blacktail Creek	03/20/2017	1155	E4.0	114	32.3	8.16	--	--	--
		03/20/2017	1200	E4.4	116	32.8	8.26	--	--	--
12324400	Clark Fork above Little Blackfoot, near Garrison	03/21/2017	1340	--	197	58.2	12.5	--	--	--
		03/21/2017	1345	--	191	56.0	12.5	--	--	--
12323840	Lost Creek near Anaconda	04/18/2017	0745	<2.0	107	31.8	6.73	1.27	2.95	105
		04/18/2017	0750	<2.0	108	32.2	6.79	1.29	2.96	105
12324200	Clark Fork at Deer Lodge	05/09/2017	1345	--	148	44.6	8.97	--	--	--
		05/09/2017	1350	--	152	46.2	8.97	--	--	--
12334550	Clark Fork at Turah Bridge, near Bonner	05/24/2017	0945	--	73.1	21.0	5.04	--	--	--
		05/24/2017	0950	--	74.3	21.2	5.19	--	--	--
12340500	Clark Fork above Missoula	06/14/2017	1345	--	78.6	21.6	5.96	--	--	--
		06/14/2017	1350	--	78.0	21.6	5.84	--	--	--
12323750	Silver Bow Creek at Warm Springs	07/11/2017	1010	E2.8	134	39.3	8.60	1.91	11.7	89.2
		07/11/2017	1015	E3.0	137	40.2	8.80	1.98	11.9	89.5
12323700	Mill Creek at Opportunity	08/14/2017	1700	<2.0	79.7	22.2	5.91	0.79	4.59	77.1
		08/14/2017	1705	<2.0	79.2	22.1	5.85	0.80	4.48	76.9

Table 9. Analyses of field replicates for water samples, Clark Fork Basin, Montana.—Continued

[hh, hours; mm, minutes; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; --, no data; <, less than laboratory reporting level; E, estimated]

Site number (fig. 1)	Site name	Date	Time (hhmm)	Chloride, filtered (mg/L)	Fluoride, filtered (mg/L)	Silica, filtered (mg/l)	Sulfate, filtered (mg/L)	Nitrate plus nitrite, filtered (mg/L)	Cadmium, filtered (µg/L)	Cadmium, unfiltered recoverable (µg/L)	Copper, filtered (µg/L)	Copper, unfiltered recoverable (µg/L)
12324680	Clark Fork at Goldcreek	10/18/2016	1545	--	--	--	--	--	0.040	0.05	4.6	8.5
		10/18/2016	1550	--	--	--	--	--	<0.030	0.05	4.7	8.8
12323250	Silver Bow Creek below Blacktail Creek	03/20/2017	1155	--	--	--	--	0.59	--	--	--	--
		03/20/2017	1200	--	--	--	--	0.58	--	--	--	--
12324400	Clark Fork above Little Blackfoot, near Garrison	03/21/2017	1340	--	--	--	--	--	0.054	0.34	8.5	71.2
		03/21/2017	1345	--	--	--	--	--	0.057	0.33	8.4	76.0
12323840	Lost Creek near Anaconda	04/18/2017	0745	0.79	0.45	11.4	10.2	--	<0.030	0.06	1.5	4.6
		04/18/2017	0750	0.79	0.45	11.4	10.2	--	<0.030	0.07	1.5	5.2
12324200	Clark Fork at Deer Lodge	05/09/2017	1345	--	--	--	--	--	0.060	0.29	9.2	60.3
		05/09/2017	1350	--	--	--	--	--	0.053	0.28	9.3	55.8
12334550	Clark Fork at Turah Bridge, near Bonner	05/24/2017	0945	--	--	--	--	--	<0.030	0.15	3.7	22.4
		05/24/2017	0950	--	--	--	--	--	<0.030	0.17	3.6	24.6
12340500	Clark Fork above Missoula	06/14/2017	1345	--	--	--	--	--	0.033	1.02	8.0	155
		06/14/2017	1350	--	--	--	--	--	0.031	1.03	7.3	144
12323750	Silver Bow Creek at Warm Springs	07/11/2017	1010	8.97	0.48	13.5	56.8	--	<0.030	0.05	4.1	5.2
		07/11/2017	1015	8.97	0.48	13.7	56.8	--	<0.030	0.08	4.0	5.3
12323700	Mill Creek at Opportunity	08/14/2017	1700	0.38	0.34	12.3	11.8	--	0.038	0.05	1.8	2.2
		08/14/2017	1705	0.38	0.34	11.8	11.8	--	0.036	0.06	1.8	2.3

Table 9. Analyses of field replicates for water samples, Clark Fork Basin, Montana.—Continued

[hh, hours; mm, minutes; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; --, no data; <, less than laboratory reporting level; E, estimated]

Site number (fig. 1)	Site name	Date	Time (hhmm)	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)
12324680	Clark Fork at Goldcreek	10/18/2016	1545	<4.0	87.2	0.040	0.68	10.4	33.0	--	--
		10/18/2016	1550	4.1	88.6	<0.020	0.68	10.4	35.1	--	--
12323250	Silver Bow Creek below Blacktail Creek	03/20/2017	1155	--	--	--	--	--	--	--	--
		03/20/2017	1200	--	--	--	--	--	--	--	--
12324400	Clark Fork above Little Blackfoot, near Garrison	03/21/2017	1340	20.5	1,150	0.170	9.98	34.7	170	6.6	61
		03/21/2017	1345	19.1	1,190	0.160	9.73	35.1	161	6.5	63
12323840	Lost Creek near Anaconda	04/18/2017	0745	11.8	108	0.023	0.47	1.17	5.5	<2.0	2
		04/18/2017	0750	11.6	105	0.025	0.63	1.15	7.0	<2.0	2
12324200	Clark Fork at Deer Lodge	05/09/2017	1345	24.1	883	0.181	6.88	23.4	157	4.9	47
		05/09/2017	1350	28.2	897	0.189	6.95	23.5	157	5.1	46
12334550	Clark Fork at Turah Bridge, near Bonner	05/24/2017	0945	47.2	713	0.174	3.82	8.02	72.6	3.3	32
		05/24/2017	0950	47.6	754	0.179	4.08	7.36	71.9	3.3	32
12340500	Clark Fork above Missoula	06/14/2017	1345	150	5,770	0.724	27.8	44.6	479	8.6	259
		06/14/2017	1350	144	6,030	0.678	27.6	43.0	481	7.9	257
12323750	Silver Bow Creek at Warm Springs	07/11/2017	1010	30.0	101	0.115	0.39	39.2	57.8	<2.0	3
		07/11/2017	1015	34.6	106	0.112	0.40	39.3	57.8	<2.0	4
12323700	Mill Creek at Opportunity	08/14/2017	1700	75.8	132	0.134	0.26	5.62	7.30	<2.0	<2
		08/14/2017	1705	79.2	136	0.139	0.26	5.38	7.50	<2.0	<2

Table 9. Analyses of field replicates for water samples, Clark Fork Basin, Montana.—Continued

[hh, hours; mm, minutes; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; --, no data; <, less than laboratory reporting level; E, estimated]

Site number (fig. 1)	Site name	Date	Time (hhmm)	Arsenic, filtered (µg/L)	Arsenic, unfiltered recoverable (µg/L)	Organic carbon, filtered (mg/L)	Sediment suspended (percent finer than 0.062 mm)	Sediment suspended (mg/L)
12324680	Clark Fork at Goldcreek	10/18/2016 10/18/2016	1545 1550	9.9 10.1	10.4 10.7	-- --	88 87	4 4
12323250	Silver Bow Creek below Blacktail Creek	03/20/2017 03/20/2017	1155 1200	-- --	-- --	-- --	77 75	9 9
12324400	Clark Fork above Little Blackfoot, near Garrison	03/21/2017 03/21/2017	1340 1345	10.9 10.9	19.0 19.9	-- --	73 76	51 48
12323840	Lost Creek near Anaconda	04/18/2017 04/18/2017	0745 0750	3.7 3.6	4.4 4.3	1.24 1.24	69 72	5 4
12324200	Clark Fork at Deer Lodge	05/09/2017 05/09/2017	1345 1350	14.6 14.9	22.7 21.7	-- --	82 83	36 35
12334550	Clark Fork at Turah Bridge, near Bonner	05/24/2017 05/24/2017	0945 0950	4.4 4.4	7.0 7.3	-- --	53 55	56 54
12340500	Clark Fork above Missoula	06/14/2017 06/14/2017	1345 1350	7.2 7.0	23.7 23.4	-- --	65 65	350 345
12323750	Silver Bow Creek at Warm Springs	07/11/2017 07/11/2017	1010 1015	26.8 27.7	27.6 29.1	4.89 5.07	90 88	2 1
12323700	Mill Creek at Opportunity	08/14/2017 08/14/2017	1700 1705	30.4 28.9	30.9 30.1	1.86 1.81	56 64	3 1

Table 10. Precision of analyses of field replicates for stream water samples, Clark Fork Basin, Montana.

[lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L, milligram per liter; µg/L, microgram per liter; mm, millimeter]

Constituent and reporting unit	Number of replicate pairs	Standard deviation ¹ (listed units)	Relative standard deviation (percent)	Within limits ² of data-quality objective
Turbidity, unfiltered, lab, NTRU	4	0.16	7.0	Yes
Calcium, filtered, mg/L	9	0.79	2.1	Yes
Magnesium, filtered, mg/L	9	0.08	0.91	Yes
Potassium, filtered, mg/L	3	0.03	2.2	Yes
Sodium, filtered, mg/L	3	0.09	1.5	Yes
Alkalinity, filtered, lab, mg/L	3	0.15	0.16	Yes
Chloride, filtered, mg/L	3	0.00	0.00	Yes
Fluoride, filtered, mg/L	3	0.00	0.00	Yes
Silica, filtered, mg/L	3	0.22	1.8	Yes
Sulfate, filtered, mg/L	3	0.00	0.00	Yes
Cadmium, filtered, µg/L	8	0.01	21	No ³
Cadmium, unfiltered recoverable, µg/L	8	0.01	4.2	Yes
Copper, filtered, µg/L	8	0.18	3.6	Yes
Copper, unfiltered recoverable, µg/L	8	3.3	8.0	Yes
Iron, filtered, µg/L	8	2.4	5.3	Yes
Iron, unfiltered recoverable, µg/L	8	66	5.8	Yes
Lead, filtered, µg/L	8	0.01	7.5	Yes
Lead, unfiltered recoverable, µg/L	8	0.11	1.8	Yes
Manganese, filtered, µg/L	8	0.45	2.2	Yes
Manganese, unfiltered recoverable, µg/L	8	2.4	2.0	Yes
Zinc, filtered, µg/L	7	0.20	5.3	Yes
Zinc, unfiltered recoverable, µg/L	7	0.85	1.5	Yes
Arsenic, filtered, µg/L	8	0.45	3.3	Yes
Arsenic, unfiltered recoverable, µg/L	8	0.56	3.1	Yes
Organic carbon, filtered, mg/L	3	0.08	2.8	Yes
Sediment, suspended, percent finer than 0.062 mm	9	2.3	3.2	Yes
Sediment, suspended, mg/L	9	1.6	2.5	Yes

¹Standard deviation is calculated using one-half of the laboratory reporting level for censored values (less than the laboratory reporting level).²The data-quality objective for an acceptable level of precision is a maximum relative standard deviation of 20 percent for field replicate analyses (table 3).³Exceedence of the data-quality objective resulted from a statistical artifact of calculating the difference between one replicate sample pair for which one value is less than the laboratory reporting level. Because analytical variation, in percent, can be large at very low concentrations, the precision may not be representative of analytical performance at detectable concentrations.

Table 11. Precision of analyses of laboratory replicates for stream water samples, Clark Fork Basin, Montana.

[mg/L, milligram per liter; µg/L, microgram per liter]

Constituent and reporting unit	Number of replicate pairs	Standard deviation, in listed units	Relative standard deviation, in percent	Within limits ¹ of data-quality objective
Calcium, filtered, mg/L	7	0.22	0.65	Yes
Magnesium, filtered, mg/L	7	0.04	0.58	Yes
Cadmium, filtered, µg/L	8	0.00	10	Yes
Cadmium, unfiltered recoverable, µg/L	8	0.00	1.94	Yes
Copper, filtered, µg/L	8	0.07	1.37	Yes
Copper, unfiltered recoverable, µg/L	8	1.7	4.34	Yes
Iron, filtered, µg/L	7	1.4	2.60	Yes
Iron, unfiltered recoverable, µg/L	8	7.8	0.67	Yes
Lead, filtered, µg/L	8	0.00	1.33	Yes
Lead, unfiltered recoverable, µg/L	8	0.07	1.14	Yes
Manganese, filtered, µg/L	7	0.19	0.90	Yes
Manganese, unfiltered recoverable, µg/L	8	0.73	0.59	Yes
Zinc, filtered, µg/L	8	0.17	4.94	Yes
Zinc, unfiltered recoverable, µg/L	8	1.1	2.21	Yes
Arsenic, filtered, µg/L	8	0.14	1.07	Yes
Arsenic, unfiltered recoverable, µg/L	8	0.22	1.21	Yes

¹The data-quality objective for an acceptable level of precision is a maximum relative standard deviation of 20 percent for laboratory replicate analyses (table 3).

Table 12. Recovery efficiency for analyses of laboratory-spiked deionized-water blank samples.

[µg/L, microgram 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 ¹ of data-quality objective
Cadmium, filtered, µg/L	5	94.0–122	108	Yes
Cadmium, unfiltered recoverable, µg/L	5	97.8–104	101	Yes
Copper, filtered, µg/L	5	87.3–117	102	Yes
Copper, unfiltered recoverable, µg/L	5	99.8–114	107	Yes
Iron, filtered, µg/L	5	97.3–103	100	Yes
Iron, unfiltered recoverable, µg/L	5	99.4–107	103	Yes
Lead, filtered, µg/L	5	53.4–110	81.5	No ²
Lead, unfiltered recoverable, µg/L	5	95.3–103	99.2	Yes
Manganese, filtered, µg/L	5	88.9–104	96.3	Yes
Manganese, unfiltered recoverable, µg/L	5	96.4–106	101	Yes
Zinc, filtered, µg/L	5	97.2–109	103	Yes
Zinc, unfiltered recoverable, µg/L	5	95.3–109	102	Yes
Arsenic, filtered, µg/L	5	93.6–103	98.5	Yes
Arsenic, unfiltered recoverable, µg/L	5	96.0–102	99.1	Yes

¹The data-quality objective for acceptable bias is a maximum deviation of 25 percent from a theoretical 100-percent recovery (table 3).

²Exceedance of the data-quality objective resulted from two samples having low recoveries of 60.0 and 59.8 percent.

Table 13. Recovery efficiency for analyses of laboratory-spiked stream samples, Clark Fork Basin, Montana.

[µg/L, microgram 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 ¹ of data-quality objective
Cadmium, filtered, µg/L	5	85.6–108	96.6	Yes
Cadmium, unfiltered recoverable, µg/L	5	95.1–100	97.8	Yes
Copper, filtered, µg/L	5	90.3–108	99.2	Yes
Copper, unfiltered recoverable, µg/L	5	79.0–106	92.3	Yes
Iron, filtered, µg/L	5	96.6–99.8	98.2	Yes
Iron, unfiltered recoverable, µg/L	5	79.3–96.3	87.8	Yes
Lead, filtered, µg/L	5	91.9–105	98.3	Yes
Lead, unfiltered recoverable, µg/L	5	86.2–101	93.4	Yes
Manganese, filtered, µg/L	5	88.0–106	97.1	Yes
Manganese, unfiltered recoverable, µg/L	5	92.2–105	98.5	Yes
Zinc, filtered, µg/L	5	96.1–116	106	Yes
Zinc, unfiltered recoverable, µg/L	5	95.0–103	99.0	Yes
Arsenic, filtered, µg/L	5	63.9–112	87.8	No ²
Arsenic, unfiltered recoverable, µg/L	5	43.4–128	85.9	No ³

¹The data-quality objective for acceptable bias is a maximum deviation of 25 percent from a theoretical 100-percent recovery (table 3).

²Exceedance of the data-quality objective resulted from one sample having a recovery of 65.5 percent. When data from this one spiked-sample set are removed from the 95-percent confidence interval calculation, filtered arsenic meets the data-quality objective limit (78.1–108 percent).

³Exceedance of the data-quality objective resulted from one sample having a recovery of 29.6 percent. When data from this one spiked-sample set are removed from the 95-percent confidence interval calculation, filtered arsenic meets the data-quality objective limit (75.2–125 percent).

Table 14. Analyses of field blanks for water samples.

[hh, hours; mm, minutes; $\mu\text{S}/\text{cm}$, microsiemens per centimeter at 25 degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; mg/L , milligram per liter; <, less than laboratory reporting level; --, no data; $\mu\text{g}/\text{L}$, microgram per liter]

Date	Time (hhmm)	pH, onsite (standard units)	Specific conductance, onsite ($\mu\text{S}/\text{cm}$)	Turbidity, unfiltered, lab (NTRU)	Calcium, filtered (mg/L)	Magnesium, filtered (mg/L)	Potassium, filtered (mg/L)	Sodium, filtered (mg/L)	Alkalinity, lab filtered, lab (mg/L)	Chloride, filtered (mg/L)
10/17/2016	1420	5.3	2	<2.0	<0.022	<0.011	<0.03	<0.06	<4.0	<0.02
10/13/2017	1200	5.6	2	<2.0	<0.022	<0.011	<0.06	<0.10	<4.0	<0.02
04/19/2017	1025	5.4	2	--	<0.022	<0.011	--	--	--	--
05/09/2017	0730	5.5	2	<2.0	<0.022	<0.011	<0.06	<0.10	<4.0	<0.02
05/23/2017	1350	5.5	2	--	<0.022	<0.011	--	--	--	--
06/14/2017	0940	5.4	2	--	<0.022	<0.011	--	--	--	--
07/10/2017	2000	5.5	2	--	<0.022	<0.011	--	--	--	--
08/15/2017	1145	5.6	2	<2.0	<0.022	<0.011	<0.10	<0.10	<4.0	<0.02

Date	Fluoride, filtered (mg/L)	Silica, filtered (mg/L)	Sulfate, filtered (mg/L)	Nitrate plus nitrite, filtered (mg/L)	Cadmium, filtered (ug/L)	Cadmium, unfiltered recoverable (ug/L)	Copper, filtered (ug/L)	Copper, unfiltered recoverable (ug/L)	Iron, filtered (ug/L)	Iron, unfiltered recoverable (ug/L)
10/17/2016	<0.01	<0.018	<0.02	--	<0.030	<0.03	0.22	<0.2	<4.0	<4.6
10/13/2017	<0.01	<0.018	<0.02	<0.01	<0.030	<0.03	<0.20	<0.2	<5.0	<4.6
04/19/2017	--	--	--	--	<0.030	<0.03	<0.20	<0.2	<5.0	<10.0
05/09/2017	<0.01	0.031	<0.02	--	<0.030	<0.03	<0.20	<0.2	<5.0	<10.0
05/23/2017	--	--	--	--	<0.030	<0.03	<0.20	<0.2	<10.0	<10.0
06/14/2017	--	--	--	--	<0.030	<0.03	0.21	<0.2	<10.0	<10.0
07/10/2017	--	--	--	--	<0.030	<0.03	0.26	<0.2	<10.0	<10.0
08/15/2017	<0.01	<0.018	<0.02	--	<0.030	<0.03	<0.20	0.2	<10.0	<10.0

Date	Lead, filtered (ug/L)	Lead, unfiltered recoverable (ug/L)	Manganese, filtered (ug/L)	Manganese, unfiltered recoverable (ug/L)	Zinc, filtered (ug/L)	Zinc, unfiltered recoverable (ug/L)	Arsenic, filtered (ug/L)	Arsenic, unfiltered recoverable (ug/L)	Organic carbon, filtered (mg/L)
10/17/2016	<0.020	<0.02	<0.40	<0.4	<2.0	<2	<0.05	<0.1	<0.23
10/13/2017	<0.020	<0.02	<0.40	<0.4	<2.0	<2	<0.05	<0.1	<0.23
04/19/2017	<0.020	<0.02	<0.40	<0.4	<2.0	<2	<0.05	<0.1	--
05/09/2017	<0.020	<0.02	<0.40	<0.4	<2.0	<2	<0.05	<0.1	<0.23
05/23/2017	<0.020	<0.02	<0.40	<0.4	<2.0	<2	<0.05	<0.1	--
06/14/2017	<0.020	<0.02	<0.40	<0.4	<2.0	<2	<0.05	<0.1	--
07/10/2017	<0.020	<0.02	<0.40	<0.4	<2.0	<2	<0.05	<0.1	--
08/15/2017	<0.020	<0.02	<0.40	<0.4	<2.0	<2	<0.05	<0.1	<0.23

¹ Annual office equipment blank collected before any equipment was used in the field.

Table 15. Bed-sediment data for the Clark Fork Basin, Montana, August 2017.

[Trace-element concentrations in bed sediment were determined for the fine-grained fraction (material less than 0.063 millimeter in diameter). Reported concentrations are the mean of all replicate aliquot analyses from each composite sample. µg/g, microgram per gram of dry sample weight; <, less than laboratory reporting level]

Site number (fig. 1)	Site name	Number of composite samples	Concentration (µg/g)									
			Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Zinc	
12323600	Silver Bow Creek at Opportunity	3	16.4	7.1	25.8	452	30,200	95.6	3,250	14.8	1,350	
12323750	Silver Bow Creek at Warm Springs	3	75.2	5.3	19.3	257	22,900	75.6	5,120	14.7	609	
12323770	Warm Springs Creek at Warm Springs	3	59.6	2.7	31.4	771	22,700	78.7	2,790	34.3	442	
12323800	Clark Fork near Galen	3	102	4.0	30.6	780	26,300	105	4,920	29.1	765	
461415112450801	Clark Fork below Lost Creek, near Galen	3	119	4.7	25.2	1,440	29,700	195	2,190	15.2	1,170	
461559112443301	Clark Fork at county bridge, near Racetrack	3	75.7	4.6	20.0	1,040	25,200	140	2,210	12.9	975	
461903112440701	Clark Fork at Dempspey Creek diversion, near Racetrack	3	59.2	3.8	13.5	718	18,800	104	1,580	9.0	875	
12324200	Clark Fork at Deer Lodge	3	78.2	4.3	32.6	1,090	27,600	150	1,240	13.2	981	
12324400	Clark Fork above Little Blackfoot River, near Garrison	3	59.1	3.6	30.1	940	24,300	139	1,820	13.0	964	
12324680	Clark Fork at Goldcreek	3	31.9	2.2	23.2	415	17,900	77.7	1,360	9.5	579	
12331800	Clark Fork near Drummond	3	41.4	5.1	23.1	442	20,400	82.0	1,440	13.0	1,100	
12334550	Clark Fork at Turah Bridge, near Bonner	3	26.1	2.0	24.0	284	20,800	58.4	1,220	13.1	628	
12340000	Blackfoot River near Bonner	3	5.5	<0.04	18.0	16.4	17,900	9.9	397	10.9	59.9	
12340500	Clark Fork above Missoula	3	16.4	1.2	21.2	162	19,000	38.4	602	12.0	417	

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

[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 0.6N (normal) hydrochloric acid used for reconstituting dried residue. $\mu\text{g/g}$, microgram per gram of dry sample weight; SRM, standard reference material (agricultural soils)]

Constituent	Number of analyses	Dilution ratio	Certified concentration ($\mu\text{g/g}$)	Mean SRM recovery (percent)	95-percent confidence interval for SRM recovery (percent)
SRM sample 2709a					
Arsenic	10	1:10	10.5	50.2	47.1–53.3
Cadmium	10	1:10	0.371	53.6	51.7–55.5
Chromium	10	1:10	130	67.6	66.1–69.0
Copper	10	1:10	33.9	76.4	74.8–78.0
Iron	10	1:10	33,600	87.4	86.6–88.3
Lead	10	1:10	17.3	45.0	43.9–46.1
Manganese	10	1:10	529	84.9	83.6–86.3
Nickel	10	1:10	85	87.7	87.2–88.1
Zinc	10	1:10	103	90.0	89.5–90.5
SRM sample 2711a					
Arsenic	10	1:10	107	89.7	86.8–92.5
Cadmium	10	1:10	54.1	97.7	96.6–99.0
Chromium	10	1:10	52.3	55.6	54.3–56.9
Copper	10	1:10	140	91.9	90.6–93.2
Iron	10	1:10	28,200	83.7	82.6–84.8
Lead	10	1:10	1,400	97.4	96.5–98.3
Manganese	10	1:10	675	79.3	77.7–80.9
Nickel	10	1:10	21.7	88.0	87.1–88.9
Zinc	10	1:10	414	94.6	93.6–95.6

Table 17. Analyses of procedural blanks for bed-sediment samples.

[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 0.6N (normal) hydrochloric acid used for reconstituting dried residue. µg/mL, microgram per milliliter; <, less than minimum reporting level for liquid-phase concentration, in micrograms per milliliter]

Site number (fig. 1)	Site name	Dilution ratio	Concentration (µg/mL)									
			Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Zinc	
12323600	Silver Bow Creek at Opportunity	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
12323750	Silver Bow Creek at Warm Springs	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
12323800	Clark Fork near Galen	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
12323770	Warm Springs Creek at Warm Springs	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
461415112450801	Clark Fork below Lost Creek, near Galen	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
461559112443301	Clark Fork at county bridge, near Racetrack	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
461903112440701	Clark Fork at Dempsey Creek diversion, near Racetrack	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
12324200	Clark Fork at Deer Lodge	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
12324400	Clark Fork above Little Blackfoot River, near Garrison	1:10	<0.002	<0.0001	<0.02	<0.008	<0.7	<0.005	<0.003	<0.009	<0.006	
12324680	Clark Fork at Goldcreek	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
12331800	Clark Fork near Drummond	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
12334550	Clark Fork at Turah Bridge, near Bonner	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
12340000	Blackfoot River near Bonner	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	
12340500	Clark Fork above Missoula	1:10	<0.002	<0.0001	<0.008	<0.008	<0.08	<0.005	<0.0007	<0.0008	<0.006	

Table 18. Biological data for the Clark Fork Basin, Montana, August 2017.

[Analyses are for the whole-body tissue of aquatic insects. Composite samples were 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. All tissues were analyzed undiluted (dilution ratio 1:1). µg/g, microgram per gram of dry sample weight]

Taxon	Number of composite samples	Concentration (µg/g)								
		Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Zinc
12323600—Silver Bow Creek at Opportunity										
<i>Hydropsyche cockerelli</i>	2	5.1	3.1	3.5	133	2,200	11.5	3,130	3.3	489
<i>Hydropsyche</i> species	1	3.5	1.0	<6.8	71.0	1,250	9.4	2,750	3.6	380
12323750—Silver Bow Creek at Warm Springs										
<i>Hydropsyche cockerelli</i>	2	8.5	0.4	0.9	30.7	703	2.6	1,040	1.4	152
<i>Hydropsyche occidentalis</i>	1	15.6	1.0	1.9	42.0	1,670	6.5	2,320	2.6	186
12323770—Warm Springs Creek at Warm Springs										
<i>Arctopsyche grandis</i>	2	8.2	2.7	<3.0	115	1,290	6.3	1,590	7.0	325
<i>Hesperoperla pacifica</i>	2	2.4	0.9	4.1	52.3	403	1.6	332	1.6	457
<i>Hydropsyche</i> species	1	13.1	1.3	3.5	155	2,260	11.3	2,030	8.8	214
12323800—Clark Fork near Galen										
<i>Hydropsyche cockerelli</i>	2	10.4	1.5	2.9	79.3	1,460	7.6	2,020	3.4	210
<i>Hydropsyche</i> species	1	7.2	1.2	0.6	55.9	1,090	6.4	1,920	3.9	208
461415112450801—Clark Fork below Lost Creek, near Galen										
<i>Hydropsyche cockerelli</i>	2	14.4	2.1	2.6	155	2,030	17.6	1,600	3.2	243
<i>Hydropsyche occidentalis</i>	1	13.6	1.6	<8.9	167	2,080	19.5	2,170	6.4	266
461559112443301--Clark Fork at county bridge, near Racetrack										
<i>Hydropsyche cockerelli</i>	2	11.5	1.3	3.0	137	1,730	11.1	1,590	2.8	233
<i>Hydropsyche occidentalis</i>	1	15.0	1.7	1.8	168	2,070	14.6	2,820	5.7	311
461903112440701—Clark Fork at Dempsey Creek diversion, near Racetrack										
<i>Arctopsyche grandis</i>	1	5.8	2.2	0.5	80.8	661	5.1	956	1.4	202
<i>Hydropsyche cockerelli</i>	2	9.3	1.6	2.9	118	1,720	9.9	997	1.6	193
<i>Hydropsyche</i> species	2	8.7	1.4	2.3	115	1,420	7.7	983	1.5	188
12324200—Clark Fork at Deer Lodge										
<i>Hydropsyche cockerelli</i>	2	11.9	2.8	4.1	181	2,060	16.2	1,350	2.1	252
<i>Hydropsyche occidentalis</i>	1	10.0	1.6	3.0	152	1,750	14.6	1,230	2.6	250
12324400—Clark Fork above Little Blackfoot River, near Garrison										
<i>Arctopsyche grandis</i>	2	3.6	1.0	<0.6	42.1	359	4.2	645	0.6	180
<i>Hydropsyche cockerelli</i>	2	6.4	1.3	1.3	111	1,030	10.8	1,060	1.5	208
<i>Hydropsyche occidentalis</i>	1	7.5	1.6	<1.5	120	1,190	12.6	1,340	1.9	240
12324680—Clark Fork at Goldcreek										
<i>Arctopsyche grandis</i>	2	7.9	1.0	1.2	61.0	807	4.5	966	1.2	163
<i>Hydropsyche cockerelli</i>	3	10.2	1.2	3.2	114	1,750	9.7	1,260	2.0	201
<i>Hydropsyche occidentalis</i>	1	8.9	1.0	3.5	81.0	1,200	8.0	1,230	2.0	181
12331800—Clark Fork near Drummond										
<i>Arctopsyche grandis</i>	1	3.6	1.3	0.1	37.5	390	3.3	687	0.7	177
<i>Claassenia sabulosa</i>	1	1.4	0.8	0.3	60.6	212	1.1	143	0.6	240
<i>Hydropsyche cockerelli</i>	1	7.6	1.2	1.6	84.6	1,690	8.2	1,070	2.0	203
<i>Hydropsyche occidentalis</i>	1	6.5	1.0	2.1	70.7	1,420	8.0	1,240	2.3	231
<i>Hydropsyche</i> species	2	7.8	1.2	3.1	92.6	2,190	10.4	1,380	2.4	239

Table 18. Biological data for the Clark Fork Basin, Montana, August 2017.—Continued

[Analyses are for the whole-body tissue of aquatic insects. Composite samples were 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. All tissues were analyzed undiluted (dilution ratio 1:1). $\mu\text{g/g}$, microgram per gram of dry sample weight]

Taxon	Number of composite samples	Concentration ($\mu\text{g/g}$)								
		Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Zinc
12334550—Clark Fork at Turah Bridge, near Bonner										
<i>Arctopsyche grandis</i>	2	4.1	1.8	0.9	34.7	770	3.8	659	1.2	228
<i>Claassenia sabulosa</i>	1	0.8	1.3	<0.6	42.3	106	0.5	96.7	0.4	228
<i>Hydropsyche cockerelli</i>	2	5.6	1.5	3.5	64.9	1,840	7.5	715	2.1	219
<i>Hydropsyche</i> species	1	4.4	1.1	2.6	50.5	1,430	5.9	980	1.7	231
12340000—Blackfoot River near Bonner										
<i>Arctopsyche grandis</i>	1	3.3	0.3	2.0	16.9	1,240	1.4	522	2.2	153
<i>Hydropsyche cockerelli</i>	1	3.8	0.2	5.4	16.2	2,400	2.6	572	2.6	148
<i>Hydropsyche</i> species	1	3.1	0.2	4.4	19.9	2,100	2.0	623	2.4	160
12340500—Clark Fork above Missoula										
<i>Arctopsyche grandis</i>	2	2.4	1.4	<1.1	19.5	501	1.8	784	0.8	191
<i>Claassenia sabulosa</i>	1	1.3	1.4	2.4	35.7	273	1.6	263	1.5	344
<i>Hydropsyche cockerelli</i>	2	4.5	1.1	3.7	42.9	1,770	5.5	1,010	2.3	216
<i>Hydropsyche</i> species	1	3.3	1.0	<3.4	45.4	1,140	4.6	1,180	2.8	223

Table 19. Recovery efficiency for analyses of certified reference material for biota samples.

[$\mu\text{g/g}$, microgram per gram of dry sample weight; CRM, certified reference material (lobster hepatopancreas)]

Constituent	Number of analyses	Certified concentration ($\mu\text{g/g}$)	Mean CRM recovery (percent)	95-percent confidence interval for CRM recovery (percent)
CRM sample TORT-3				
Arsenic	12	59.5	108	107–108
Cadmium	12	42.3	86.4	89.2–84.0
Chromium	12	1.95	86.6	84.0–89.2
Copper	12	497	91.9	91.4–92.4
Iron	12	179	92.4	92.1–92.8
Lead	12	0.225	185	182–187
Manganese	12	15.6	92.2	91.4–93.0
Nickel	12	5.3	80.4	79.9–80.9
Zinc	12	136	86.8	86.1–87.4

Table 20. Analyses of procedural blanks for biota samples.

[Procedural blanks were not diluted before analyses. µg/mL, microgram per milliliter; <, less than minimum reporting level for liquid-phase concentration, in micrograms per milliliter]

Site number (fig. 1)	Site name	Dilution ratio	Concentration (µg/mL)										
			Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Nickel	Zinc		
12323600	Silver Bow Creek at Opportunity	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
12323750	Silver Bow Creek at Warm Springs	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
12323770	Warm Springs Creek at Warm Springs	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
12323800	Clark Fork near Galen	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
461415112450801	Clark Fork below Lost Creek, near Galen	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
461559112443301	Clark Fork at county bridge, near Racetrack	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
461903112440701	Clark Fork at Dempsey Creek diversion, near Racetrack	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
12324200	Clark Fork at Deer Lodge	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
12324400	Clark Fork above Little Blackfoot River, near Garrison	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
12324680	Clark Fork at Goldcreek	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
12331800	Clark Fork near Drummond	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
12334550	Clark Fork at Turah Bridge, near Bonner	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
12340000	Blackfoot River near Bonner	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01
12340500	Clark Fork above Missoula	1:1	<0.002	<0.003	<0.03	<0.02	<0.03	<0.003	<0.01	<0.003	<0.01	<0.003	<0.01

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.

[ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323230—Blacktail Creek at Harrison Avenue, at Butte					
Period of record for water-quality data: March 1993–August 1995, December 1996–August 2003, December 2004–September 2017					
Streamflow, instantaneous (ft ³ /s)	187	156	1.9	16	9.7
pH, onsite (standard units)	187	8.4	7.3	7.7	7.7
Specific conductance, onsite (μ S/cm)	187	412	116	261	261
Temperature, water (°C)	187	18	1.0	7.9	8.0
Turbidity, unfiltered, lab (NTRU)	31	25	<2.0	14.5	3.5
Hardness, filtered (mg/L as CaCO ₃)	187	153	37.7	104	104
Calcium, filtered (mg/L)	187	42.9	10.6	29.6	29.7
Magnesium, filtered (mg/L)	187	11.1	2.71	7.21	7.16
Potassium, filtered (mg/L)	49	6.4	2	2.75	2.57
Sodium, filtered (mg/L)	49	18	6.4	10.6	10.2
Alkalinity, filtered, lab (mg/L)	21	124	54.5	85.5	78.4
Chloride, filtered (mg/L)	49	18	2.8	8.5	8
Fluoride, filtered (mg/L)	49	0.6	0.18	0.28	0.3
Silica, filtered (mg/L)	49	32	14	24.3	24.4
Sulfate, filtered (mg/L)	49	40.2	14.7	26.2	26
Nitrate plus nitrite, filtered (mg/L)	31	1.24	0.15	0.6	0.5
Cadmium, filtered (μ g/L)	185	0.5	<0.03	10.04	0.02
Cadmium, unfiltered recoverable (μ g/L)	187	0.12	<0.02	10.04	<1.00
Copper, filtered (μ g/L)	186	10	0.8	3.5	3
Copper, unfiltered recoverable (μ g/L)	187	52	0.91	6.22	4.9
Iron, filtered (μ g/L)	187	739	15.2	198	180
Iron, unfiltered recoverable (μ g/L)	187	4,220	123	660	592
Lead, filtered (μ g/L)	187	2.8	<0.03	10.18	0.08
Lead, unfiltered recoverable (μ g/L)	187	47	<1.00	11.51	0.64
Manganese, filtered (μ g/L)	187	144	14.2	43.6	38.6
Manganese, unfiltered recoverable (μ g/L)	187	240	23.5	60.4	52.7
Zinc, filtered (μ g/L)	185	11	<1.00	13.14	2.4
Zinc, unfiltered recoverable (μ g/L)	187	130	<3.00	17.42	4
Arsenic, filtered (μ g/L)	186	13	1	4	3
Arsenic, unfiltered recoverable (μ g/L)	187	18	1	5	5
Organic carbon, filtered (mg/L)	21	9.52	1.4	4.7	4.3
Sediment, suspended (percent finer than 0.062 mm)	187	97	50	83	85
Sediment, suspended concentration (mg/L)	187	139	1	11	7
Sediment, suspended discharge (ton/d)	187	59	0.01	0.88	0.17

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323250—Silver Bow Creek below Blacktail Creek, at Butte					
Period of record for water-quality data: March 1993–August 1995, December 1996–September 2017					
Streamflow, instantaneous (ft ³ /s)	195	202	13	31	26
pH, onsite (standard units)	195	8.2	7.2	7.6	7.6
Specific conductance, onsite (µS/cm)	195	691	209	456	457
Temperature, water (°C)	195	20	1.0	10	10
Turbidity, unfiltered, lab (NTRU)	31	18	<2.0	4.3	4
Hardness, filtered (mg/L as CaCO ₃)	195	217	66	147	149
Calcium, filtered (mg/L)	195	62.7	19	41.8	42
Magnesium, filtered (mg/L)	195	16.1	4.51	10.4	10.7
Potassium, filtered (mg/L)	49	35	3.64	7.50	5.7
Sodium, filtered (mg/L)	49	66	12	25	25
Alkalinity, filtered, lab (mg/L)	21	119	66.9	87.7	88.6
Chloride, filtered (mg/L)	48	88	6.7	23.8	21.2
Fluoride, filtered (mg/L)	48	0.8	0.26	0.41	0.4
Silica, filtered (mg/L)	48	28	17	22	22
Sulfate, filtered (mg/L)	48	96	35	71	74
Nitrate plus nitrite, filtered (mg/L)	31	4.4	0.34	1.04	0.96
Cadmium, filtered (µg/L)	195	6.2	0.03	0.74	0.13
Cadmium, unfiltered recoverable (µg/L)	195	6	0.06	1.00	0.23
Copper, filtered (µg/L)	195	303	2.6	25.5	10.5
Copper, unfiltered recoverable (µg/L)	195	550	6.4	58.8	20.9
Iron, filtered (µg/L)	195	392	9.6	103	83.7
Iron, unfiltered recoverable (µg/L)	195	7,400	85.4	743	538
Lead, filtered (µg/L)	195	2.4	<0.50	0.40	0.24
Lead, unfiltered recoverable (µg/L)	195	250	0.53	9.13	2.3
Manganese, filtered (µg/L)	195	1,700	20.7	255	113
Manganese, unfiltered recoverable (µg/L)	195	1,600	25.9	292	139
Zinc, filtered (µg/L)	195	2,200	2	241	50.4
Zinc, unfiltered recoverable (µg/L)	195	2,200	20.5	293	62
Arsenic, filtered (µg/L)	195	13.4	2.3	5.7	5.2
Arsenic, unfiltered recoverable (µg/L)	195	45	3	9.0	7.6
Organic carbon, filtered (mg/L)	21	9.97	4.93	7.16	7.21
Sediment, suspended (percent finer than 0.062 mm)	194	98	42	83	85
Sediment, suspended concentration (mg/L)	194	405	2	18	9
Sediment, suspended discharge (ton/d)	194	70	0.08	2.06	0.61

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; μS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; μg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323600—Silver Bow Creek at Opportunity					
Period of record for water-quality data: March 1993–August 1995, December 1996–September 2017					
Streamflow, instantaneous (ft ³ /s)	195	648	13	78	56
pH, onsite (standard units)	197	9.5	7.2	8.4	8.3
Specific conductance, onsite (μS/cm)	197	633	202	414	403
Temperature, water (°C)	197	24	–1.0	9.5	9.5
Turbidity, unfiltered, lab (NTRU)	31	12	2	5.8	5.2
Hardness, filtered (mg/L as CaCO ₃)	197	248	60.2	150	147
Calcium, filtered (mg/L)	197	75	18.5	44.4	44
Magnesium, filtered (mg/L)	197	15	3.42	9.44	9.06
Potassium, filtered (mg/L)	68	16	1.79	4.46	4.1
Sodium, filtered (mg/L)	68	34.5	5.06	18.8	17.6
Alkalinity, filtered, lab (mg/L)	39	122	71.6	93.8	92.9
Chloride, filtered (mg/L)	67	63.9	3.2	18.6	15
Fluoride, filtered (mg/L)	67	0.8	0.16	0.39	0.4
Silica, filtered (mg/L)	67	28	9.56	20.5	21
Sulfate, filtered (mg/L)	67	190	32	65	62
Cadmium, filtered (μg/L)	196	41	0.07	0.84	0.40
Cadmium, unfiltered recoverable (μg/L)	197	49	0.17	1.53	0.87
Copper, filtered (μg/L)	195	450	6.5	35.1	25.4
Copper, unfiltered recoverable (μg/L)	197	3,900	12.1	149	79.6
Iron, filtered (μg/L)	197	397	3	51.5	30.8
Iron, unfiltered recoverable (μg/L)	196	24,100	105	1,300	646
Lead, filtered (μg/L)	197	5.1	<0.50	0.60	0.30
Lead, unfiltered recoverable (μg/L)	197	650	0.53	27.8	12.4
Manganese, filtered (μg/L)	197	9,300	25.5	320	227
Manganese, unfiltered recoverable (μg/L)	197	10,000	55.3	425	314
Zinc, filtered (μg/L)	196	13,000	11.2	215	97
Zinc, unfiltered recoverable (μg/L)	197	15,000	27	381	204
Arsenic, filtered (μg/L)	197	34	1	10	9.3
Arsenic, unfiltered recoverable (μg/L)	197	235	5.3	20.6	15.1
Organic carbon, filtered (mg/L)	36	9.07	3.06	5.68	5.66
Sediment, suspended (percent finer than 0.062 mm)	198	95	37	79	84
Sediment, suspended concentration (mg/L)	198	801	3	43	18
Sediment, suspended discharge (ton/d)	195	781	0.18	18.6	2.5

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323670—Mill Creek near Anaconda					
Period of record for water-quality data: December 2004–September 2017					
Streamflow, instantaneous (ft ³ /s)	103	309	7.4	64	38
pH, onsite (standard units)	104	8.6	7.5	8.0	7.9
Specific conductance, onsite (µS/cm)	104	213	56	128	129
Temperature, water (°C)	104	17	0.0	8.6	9.0
Turbidity, unfiltered, lab, (NTRU)	97	21	<2.0	12.4	<2.0
Hardness, filtered (mg/L as CaCO ₃)	104	98	23.7	56.4	52.9
Calcium, filtered (mg/L)	104	26.7	7	15.7	14.9
Magnesium, filtered (mg/L)	104	8.01	1.45	4.18	3.88
Potassium, filtered (mg/L)	31	0.84	0.45	0.63	0.63
Sodium, filtered (mg/L)	31	6.04	2.14	3.82	3.64
Alkalinity, filtered, lab (mg/L)	31	85.1	30.8	54.4	52.5
Chloride, filtered (mg/L)	31	0.54	0.16	0.30	0.26
Fluoride, filtered (mg/L)	31	0.37	0.27	0.31	0.3
Silica, filtered (mg/L)	31	16	9.27	12.6	12.5
Sulfate, filtered (mg/L)	31	13.9	3.12	6.17	5.37
Cadmium, filtered (µg/L)	103	0.11	0.02	0.05	0.04
Cadmium, unfiltered recoverable (µg/L)	104	0.19	0.03	0.08	0.07
Copper, filtered (µg/L)	103	5.1	0.72	2.26	2.1
Copper, unfiltered recoverable (µg/L)	103	10.6	1.3	3.71	3.1
Iron, filtered (µg/L)	104	128	21.2	49.7	43.5
Iron, unfiltered recoverable (µg/L)	104	730	64.9	194	156
Lead, filtered (µg/L)	104	0.36	0.02	0.12	0.11
Lead, unfiltered recoverable (µg/L)	104	3.12	0.15	0.70	0.53
Manganese, filtered (µg/L)	104	12	3.09	5.96	5.85
Manganese, unfiltered recoverable (µg/L)	104	36.6	6.2	13.4	11.8
Zinc, filtered (µg/L)	104	4.3	<1.40	1.64	1.2
Zinc, unfiltered recoverable (µg/L)	104	9.2	<2.00	3.00	2.6
Arsenic, filtered (µg/L)	104	32.9	7.3	15.9	15.1
Arsenic, unfiltered recoverable (µg/L)	104	34.8	7.8	17.1	15.9
Organic carbon, filtered (mg/L)	31	5.1	1.26	2.43	2.35
Sediment, suspended (percent finer than 0.062 mm)	104	97	14	65	68
Sediment, suspended concentration (mg/L)	104	42	1	6	4
Sediment, suspended discharge (ton/d)	103	28	0.02	1.94	0.36

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323700—Mill Creek at Opportunity					
Period of record for water-quality data: March 2003–September 2017					
Streamflow, instantaneous (ft ³ /s)	118	261	0.43	37	17
pH, onsite (standard units)	120	8.3	7.5	7.9	8
Specific conductance, onsite (µS/cm)	120	242	59	145	142
Temperature, water (°C)	120	20	-1.0	9.3	9.5
Turbidity, unfiltered, lab (NTRU)	38	9.1	<2.0	2.5	<2.0
Hardness, filtered (mg/L as CaCO ₃)	120	112	24	62.3	59.8
Calcium, filtered (mg/L)	120	31	7.01	17.5	16.9
Magnesium, filtered (mg/L)	120	8.44	1.56	4.51	4.34
Potassium, filtered (mg/L)	38	1.02	0.47	0.70	0.72
Sodium, filtered (mg/L)	38	8.15	2.29	4.41	4.13
Alkalinity, filtered, lab (mg/L)	38	88.2	31.9	57.0	55.6
Chloride, filtered (mg/L)	38	0.82	0.18	0.38	0.34
Fluoride, filtered (mg/L)	38	0.4	0.29	0.33	0.32
Silica, filtered (mg/L)	38	16.9	9.47	12.5	12.3
Sulfate, filtered (mg/L)	38	27.7	4.11	10.2	9.4
Cadmium, filtered (µg/L)	120	0.13	0.02	0.06	0.06
Cadmium, unfiltered recoverable (µg/L)	120	0.86	0.03	0.13	0.09
Copper, filtered (µg/L)	120	6.1	1	2.8	2.5
Copper, unfiltered recoverable (µg/L)	120	38.8	1.5	5.9	4.0
Iron, filtered (µg/L)	120	108	15.9	49.2	43.8
Iron, unfiltered recoverable (µg/L)	120	1,960	44.3	284	162
Lead, filtered (µg/L)	120	0.35	<0.04	0.14	0.13
Lead, unfiltered recoverable (µg/L)	120	12.7	0.07	1.28	0.53
Manganese, filtered (µg/L)	120	32.8	2.13	6.45	5.05
Manganese, unfiltered recoverable (µg/L)	120	113	2.9	17.5	12.1
Zinc, filtered (µg/L)	119	7.7	<1.40	2.61	2.4
Zinc, unfiltered recoverable (µg/L)	120	41	<2.00	5.85	4
Arsenic, filtered (µg/L)	120	55.1	9	20.8	18.9
Arsenic, unfiltered recoverable (µg/L)	120	53.5	10	23.4	21.8
Organic carbon, filtered (mg/L)	38	4.86	1.33	2.46	2.44
Sediment, suspended (percent finer than 0.062 mm)	120	91	26	69	71
Sediment, suspended concentration (mg/L)	120	107	1	11	4
Sediment, suspended discharge (ton/d)	118	55	<0.1	2.91	0.20

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323710—Willow Creek near Anaconda					
Period of record for water-quality data: December 2004–September 2017					
Streamflow, instantaneous (ft ³ /s)	94	114	1.0	15	9.2
pH, onsite (standard units)	97	8.2	7.5	7.7	7.7
Specific conductance, onsite (µS/cm)	97	151	65	102	105
Temperature, water (°C)	97	16.0	0.0	7.4	7.5
Turbidity, unfiltered, lab (NTRU)	90	39	<2.0	15.3	3.2
Hardness, filtered (mg/L as CaCO ₃)	97	56.3	21.5	37.5	38.5
Calcium, filtered (mg/L)	97	18.3	7.22	12.5	13
Magnesium, filtered (mg/L)	97	2.6	0.78	1.50	1.48
Potassium, filtered (mg/L)	31	1.13	0.7	0.91	0.91
Sodium, filtered (mg/L)	31	7.94	4.33	5.87	5.99
Alkalinity, filtered, lab (mg/L)	31	55.4	26.3	41.4	40
Chloride, filtered (mg/L)	31	0.85	0.27	0.46	0.37
Fluoride, filtered (mg/L)	31	0.08	0.06	0.07	0.07
Silica, filtered (mg/L)	31	26.9	20.9	24.6	24.8
Sulfate, filtered (mg/L)	31	15.7	4.75	7.21	6.29
Cadmium, filtered (µg/L)	95	0.05	<0.02	0.03	0.03
Cadmium, unfiltered recoverable (µg/L)	97	0.33	<0.03	0.05	0.05
Copper, filtered (µg/L)	97	5.5	0.82	2.3	2.2
Copper, unfiltered recoverable (µg/L)	97	16.8	1	3.6	3
Iron, filtered (µg/L)	97	277	28	94.9	84.2
Iron, unfiltered recoverable (µg/L)	97	2,380	85.7	353	235
Lead, filtered (µg/L)	97	0.39	0.03	0.18	0.17
Lead, unfiltered recoverable (µg/L)	97	7.96	0.1	0.82	0.53
Manganese, filtered (µg/L)	97	34.5	6.04	13.3	11.7
Manganese, unfiltered recoverable (µg/L)	97	99.9	12.8	24.7	21.4
Zinc, filtered (µg/L)	97	3.3	<1.40	1.64	1.2
Zinc, unfiltered recoverable (µg/L)	97	17.8	<2.00	3.04	2
Arsenic, filtered (µg/L)	97	25.7	7.7	16.0	15.2
Arsenic, unfiltered recoverable (µg/L)	97	27.9	9.8	17.1	15.6
Organic carbon, filtered (mg/L)	31	7.19	0.25	4.85	4.63
Sediment, suspended (percent finer than 0.062 mm)	97	97	25	78	85
Sediment, suspended concentration (mg/L)	97	195	1	13	4
Sediment, suspended discharge (ton/d)	94	50	<0.1	1.66	0.11

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323720—Willow Creek at Opportunity					
Period of record for water-quality data: March 2003–September 2017					
Streamflow, instantaneous (ft ³ /s)	120	116	4.5	17	10
pH, onsite (standard units)	120	9.0	7.6	8.1	8.0
Specific conductance, onsite (µS/cm)	120	380	116	259	275
Temperature, water (°C)	120	24.0	0.0	10.9	11.0
Turbidity, unfiltered, lab (NTRU)	38	11	<2.0	¹ 4.4	3.8
Hardness, filtered (mg/L as CaCO ₃)	120	173	50.4	113	118
Calcium, filtered (mg/L)	120	48.4	15.6	32.9	34.9
Magnesium, filtered (mg/L)	120	12.8	2.75	7.41	7.88
Potassium, filtered (mg/L)	38	2.73	0.94	1.46	1.39
Sodium, filtered (mg/L)	38	16.7	6.12	9.40	9.16
Alkalinity, filtered, lab (mg/L)	38	175	51.6	101	111
Chloride, filtered (mg/L)	38	3.28	0.79	1.75	1.65
Fluoride, filtered (mg/L)	38	0.66	0.12	0.35	0.38
Silica, filtered (mg/L)	38	30.8	18.4	23.5	23.5
Sulfate, filtered (mg/L)	38	36.5	9.21	18.4	18.4
Cadmium, filtered (µg/L)	120	0.12	<0.03	¹ 0.04	0.03
Cadmium, unfiltered recoverable (µg/L)	119	0.52	0.02	0.10	0.07
Copper, filtered (µg/L)	120	21.4	0.87	5.08	3.65
Copper, unfiltered recoverable (µg/L)	119	48.8	2.6	10.2	7.8
Iron, filtered (µg/L)	120	274	6.1	54.6	48.4
Iron, unfiltered recoverable (µg/L)	119	1,670	27.4	290	241
Lead, filtered (µg/L)	120	0.89	0.04	0.24	0.21
Lead, unfiltered recoverable (µg/L)	119	14.4	0.27	2.05	1.43
Manganese, filtered (µg/L)	120	200	3.3	32.1	25.7
Manganese, unfiltered recoverable (µg/L)	119	228	4.7	44.9	38
Zinc, filtered (µg/L)	120	19.8	<1.40	¹ 4.68	3.8
Zinc, unfiltered recoverable (µg/L)	119	68	1.2	11.2	9
Arsenic, filtered (µg/L)	120	164	9.3	37.5	25.7
Arsenic, unfiltered recoverable (µg/L)	120	164	11.4	39.8	27.4
Organic carbon, filtered (mg/L)	38	12.9	1.6	5.05	5.11
Sediment, suspended (percent finer than 0.062 mm)	120	99	54	87	90
Sediment, suspended concentration (mg/L)	120	87	1	10	6
Sediment, suspended discharge (ton/d)	120	11	0.01	0.81	0.18

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323750—Silver Bow Creek at Warm Springs					
Period of record for water-quality data: March 1993–September 2017					
Streamflow, instantaneous (ft ³ /s)	204	1,030	16	139	91
pH, onsite (standard units)	202	9.6	7.9	8.8	8.8
Specific conductance, onsite (µS/cm)	202	783	182	451	455
Temperature, water (°C)	203	25.0	0.0	10.3	10.0
Turbidity, unfiltered, lab (NTRU)	31	11	<2.0	3.7	3
Hardness, filtered (mg/L as CaCO ₃)	202	314	74.9	187	189
Calcium, filtered (mg/L)	202	90.4	22.5	54.2	54.1
Magnesium, filtered (mg/L)	202	21.4	4.52	12.4	12.2
Potassium, filtered (mg/L)	62	8.3	1.72	3.81	3.81
Sodium, filtered (mg/L)	62	23	8.2	16.1	16.8
Alkalinity, filtered, lab (mg/L)	34	113	69.2	91.3	94.0
Chloride, filtered (mg/L)	62	26.2	1.3	11.6	10.4
Fluoride, filtered (mg/L)	62	1.2	0.41	0.66	0.64
Silica, filtered (mg/L)	62	20	6.3	12.9	12.7
Sulfate, filtered (mg/L)	62	210	39.2	97.8	91.3
Cadmium, filtered (µg/L)	202	0.31	<0.03	0.06	0.03
Cadmium, unfiltered recoverable (µg/L)	202	0.57	<0.03	0.12	0.07
Copper, filtered (µg/L)	202	40	1.6	6.9	5
Copper, unfiltered recoverable (µg/L)	202	96.8	2.4	14.1	10
Iron, filtered (µg/L)	202	103	<5.00	21.9	18.4
Iron, unfiltered recoverable (µg/L)	202	3,000	35.8	306	237
Lead, filtered (µg/L)	202	1	<0.08	0.14	0.06
Lead, unfiltered recoverable (µg/L)	202	41.8	<1.00	2.14	1.24
Manganese, filtered (µg/L)	202	875	5.03	107	72.9
Manganese, unfiltered recoverable (µg/L)	202	899	24	163	127
Zinc, filtered (µg/L)	202	73	<1.00	6.25	3.5
Zinc, unfiltered recoverable (µg/L)	202	180	2	25.9	14.1
Arsenic, filtered (µg/L)	202	60	6.8	22.6	21.9
Arsenic, unfiltered recoverable (µg/L)	202	94	9.9	26	24.3
Organic carbon, filtered (mg/L)	31	9.29	2.88	4.93	4.86
Sediment, suspended (percent finer than 0.062 mm)	203	98	35	83	86
Sediment, suspended concentration (mg/L)	204	229	1	9	6
Sediment, suspended discharge (ton/d)	204	279	0.05	5.54	1.45

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Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; μS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; μg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323760—Warm Springs Creek near Anaconda					
Period of record for water-quality data: October 2005–September 2017					
Streamflow, instantaneous (ft ³ /s)	72	573	41	134	93
pH, onsite (standard units)	72	8.8	7.8	8.4	8.4
Specific conductance, onsite (μS/cm)	72	278	125	222	237
Temperature, water (°C)	72	16.0	0.5	8.0	8.0
Turbidity, unfiltered, lab (NTRU)	66	18	<2.00	¹ 1.94	<2.00
Hardness, filtered (mg/L as CaCO ₃)	72	145	58.5	109	115
Calcium, filtered (mg/L)	72	42.8	18.5	32.7	34.3
Magnesium, filtered (mg/L)	72	9.34	2.96	6.66	6.99
Potassium, filtered (mg/L)	23	1.37	0.8	1.11	1.17
Sodium, filtered (mg/L)	23	3.6	1.54	2.64	2.83
Alkalinity, filtered, lab (mg/L)	23	127	60.3	102	111
Chloride, filtered (mg/L)	23	1.53	0.49	1.01	1.06
Fluoride, filtered (mg/L)	23	0.42	0.29	0.37	0.38
Silica, filtered (mg/L)	23	11.7	8.25	10.1	9.94
Sulfate, filtered (mg/L)	23	16.9	7.98	12.8	13.5
Cadmium, filtered (μg/L)	72	0.05	<0.02	¹ 0.02	0.02
Cadmium, unfiltered recoverable (μg/L)	72	0.14	<0.02	¹ 0.03	0.03
Copper, filtered (μg/L)	71	6.4	<0.80	¹ 1.08	0.88
Copper, unfiltered recoverable (μg/L)	72	28	<0.80	¹ 3.11	2.1
Iron, filtered (μg/L)	72	37	<4.00	¹ 7.82	6.2
Iron, unfiltered recoverable (μg/L)	72	1,000	19.1	119	75.1
Lead, filtered (μg/L)	72	0.11	<0.02	¹ 0.02	<0.08
Lead, unfiltered recoverable (μg/L)	72	3.51	0.07	0.39	0.25
Manganese, filtered (μg/L)	72	4.2	0.13	1.30	1.1
Manganese, unfiltered recoverable (μg/L)	72	45.2	0.9	5.94	4.2
Zinc, filtered (μg/L)	72	5.6	<1.4	¹ 1.1	<2.0
Zinc, unfiltered recoverable (μg/L)	72	20.1	<2.0	¹ 3.6	2
Arsenic, filtered (μg/L)	72	3.9	1.3	2.2	2.1
Arsenic, unfiltered recoverable (μg/L)	72	5.6	1.5	2.6	2.4
Organic carbon, filtered (mg/L)	23	3.19	0.77	1.48	1.28
Sediment, suspended (percent finer than 0.062 mm)	72	84	32	66	67
Sediment, suspended concentration (mg/L)	72	65	1	7	4
Sediment, suspended discharge (ton/d)	72	68	0.13	3.92	0.92

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323770—Warm Springs Creek at Warm Springs					
Period of record for water-quality data: March 1993–September 2017					
Streamflow, instantaneous (ft ³ /s)	160	420	2.8	95	57
pH, onsite (standard units)	159	8.7	7.4	8.2	8.2
Specific conductance, onsite (µS/cm)	159	795	139	291	299
Temperature, water (°C)	160	20.0	0.0	8.2	8.0
Turbidity, unfiltered, lab (NTRU)	38	13	<2.0	12.7	<2.0
Hardness, filtered (mg/L as CaCO ₃)	159	415	39.8	142	146
Calcium, filtered (mg/L)	159	130	10.5	43.2	44.1
Magnesium, filtered (mg/L)	159	22	3.29	8.25	8.38
Potassium, filtered (mg/L)	57	4.7	0.83	1.45	1.35
Sodium, filtered (mg/L)	57	19.2	1.78	3.64	3.31
Alkalinity, filtered, lab (mg/L)	40	149	60.1	114	125
Chloride, filtered (mg/L)	57	3.6	0.5	1.3	1.2
Fluoride, filtered (mg/L)	57	0.6	0.3	0.4	0.4
Silica, filtered (mg/L)	57	13	8.4	10.4	10.1
Sulfate, filtered (mg/L)	57	270	15.3	44.4	35.4
Cadmium, filtered (µg/L)	158	0.1	<0.03	0.04	0.03
Cadmium, unfiltered recoverable (µg/L)	158	0.41	<0.03	0.08	0.04
Copper, filtered (µg/L)	158	16	1	3.12	2.65
Copper, unfiltered recoverable (µg/L)	158	147	2.3	17.7	8.6
Iron, filtered (µg/L)	159	36.8	<5.00	12.5	11.2
Iron, unfiltered recoverable (µg/L)	159	2,110	17.2	286	120
Lead, filtered (µg/L)	158	1.8	<0.02	0.06	<1.00
Lead, unfiltered recoverable (µg/L)	158	14	<1.00	1.73	0.61
Manganese, filtered (µg/L)	158	570	18.8	98.7	68.7
Manganese, unfiltered recoverable (µg/L)	158	1,400	37.1	173	128
Zinc, filtered (µg/L)	158	10	<1.00	1.95	1.1
Zinc, unfiltered recoverable (µg/L)	159	60	<2.00	8.32	3.1
Arsenic, filtered (µg/L)	158	14	2	5.01	4.5
Arsenic, unfiltered recoverable (µg/L)	158	27	3	7.06	5.9
Organic carbon, filtered (mg/L)	38	4.27	0.88	1.71	1.52
Sediment, suspended (percent finer than 0.062 mm)	160	95	43	71	71
Sediment, suspended concentration (mg/L)	160	127	1	16	7
Sediment, suspended discharge (ton/d)	160	87	0.03	7.57	0.99

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323800—Clark Fork near Galen					
Period of record for water-quality data: July 1988–September 2017					
Streamflow, instantaneous (ft ³ /s)	244	1,380	14	223	148
pH, onsite (standard units)	232	9.2	7.5	8.5	8.6
Specific conductance, onsite (µS/cm)	233	720	182	403	407
Temperature, water (°C)	244	23.5	0.0	9.8	10.0
Hardness, filtered (mg/L as CaCO ₃)	231	365	76.4	175	178
Calcium, filtered (mg/L)	231	110	23.2	51.9	52.5
Magnesium, filtered (mg/L)	231	22	4.44	11.2	11.4
Potassium, filtered (mg/L)	32	5.9	2	3.5	3.3
Sodium, filtered (mg/L)	32	19	3.6	12.0	12.5
Alkalinity, filtered, lab (mg/L)	3	117	84.4	96.3	87.4
Chloride, filtered (mg/L)	32	11	2	6.47	6.22
Fluoride, filtered (mg/L)	32	1.1	0.4	0.62	0.6
Silica, filtered (mg/L)	32	17	8.1	11.7	11.8
Sulfate, filtered (mg/L)	32	220	34	97	99
Cadmium, filtered (µg/L)	231	1	<0.03	¹ 0.06	0.03
Cadmium, unfiltered recoverable (µg/L)	231	3	<0.100	¹ 0.17	0.07
Copper, filtered (µg/L)	231	50	1.4	7.0	5.1
Copper, unfiltered recoverable (µg/L)	230	240	4.1	24.7	14.4
Iron, filtered (µg/L)	231	110	<3.00	¹ 17.0	13.3
Iron, unfiltered recoverable (µg/L)	231	9,200	56.2	441	265
Lead, filtered (µg/L)	231	3	<0.08	¹ 0.14	0.04
Lead, unfiltered recoverable (µg/L)	231	31	<1.00	¹ 3.10	1.75
Manganese, filtered (µg/L)	231	460	10.1	94.2	67.1
Manganese, unfiltered recoverable (µg/L)	231	1,400	25.8	197	150
Zinc, filtered (µg/L)	231	110	<1.00	¹ 7.58	3.4
Zinc, unfiltered recoverable (µg/L)	231	360	2.7	32.1	19
Arsenic, filtered (µg/L)	231	53	4	15.0	14
Arsenic, unfiltered recoverable (µg/L)	231	78	3	18.8	16.8
Sediment, suspended (percent finer than 0.062 mm)	244	97	32	76	77
Sediment, suspended concentration (mg/L)	245	338	1	17	8
Sediment, suspended discharge (ton/d)	244	459	0.12	19.0	2.9

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level¹; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323840—Lost Creek near Anaconda					
Period of record for water-quality data: December 2004–September 2017					
Streamflow, instantaneous (ft ³ /s)	103	73	0.37	12	8.5
pH, onsite (standard units)	103	8.6	7.4	8.1	8.1
Specific conductance, onsite (µS/cm)	103	253	121	200	212
Temperature, water (°C)	103	17.0	0.0	7.5	7.5
Turbidity, unfiltered, lab (NTRU)	103	24,200	<2.00	¹ 237	<2.00
Hardness, filtered (mg/L as CaCO ₃)	103	122	50.4	96.2	102
Calcium, filtered (mg/L)	103	37.1	15.7	29.1	30.8
Magnesium, filtered (mg/L)	103	7.47	2.71	5.68	6.01
Potassium, filtered (mg/L)	38	1.51	0.88	1.24	1.27
Sodium, filtered (mg/L)	38	3.68	1.87	2.87	2.87
Alkalinity, filtered, lab (mg/L)	38	118	59.5	96.2	102
Chloride, filtered (mg/L)	38	2.13	0.51	0.76	0.72
Fluoride, filtered (mg/L)	38	0.5	0.28	0.39	0.4
Silica, filtered (mg/L)	38	13	9.65	11.4	11.3
Sulfate, filtered (mg/L)	38	13.8	5.77	8.60	8.01
Cadmium, filtered (µg/L)	101	0.90	<0.02	¹ 0.04	0.02
Cadmium, unfiltered recoverable (µg/L)	102	147	<0.02	¹ 1.49	0.04
Copper, filtered (µg/L)	102	90.5	0.8	2.82	1.7
Copper, unfiltered recoverable (µg/L)	102	29,100	1.3	292	4.55
Iron, filtered (µg/L)	102	78.6	3.6	11.4	9.85
Iron, unfiltered recoverable (µg/L)	103	99,700	9.4	1,165	115
Lead, filtered (µg/L)	102	0.23	<0.02	¹ 0.04	0.02
Lead, unfiltered recoverable (µg/L)	103	1,290	0.04	13.4	0.48
Manganese, filtered (µg/L)	102	42.4	0.2	1.84	1.38
Manganese, unfiltered recoverable (µg/L)	103	8,830	1	93.0	5.2
Zinc, filtered (µg/L)	101	30	<1.40	¹ 1.55	<2.00
Zinc, unfiltered recoverable (µg/L)	101	7,780	<2.00	¹ 80.5	2.2
Arsenic, filtered (µg/L)	102	156	1.8	5.79	3.6
Arsenic, unfiltered recoverable (µg/L)	102	3,860	2	42.7	4.25
Organic carbon, filtered (mg/L)	38	7.1	0.87	1.94	1.66
Sediment, suspended (percent finer than 0.062 mm)	103	97	22	59	62
Sediment, suspended concentration (mg/L)	103	58,900	1	584	6
Sediment, suspended discharge (ton/d)	103	1,320	<0.01	13.6	0.11

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Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; μS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; μg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12323850—Lost Creek near Galen					
Period of record for water-quality data: March 2003–September 2017					
Streamflow, instantaneous (ft ³ /s)	118	71	1.3	25	18
pH, onsite (standard units)	120	8.7	7.9	8.3	8.3
Specific conductance, onsite (μS/cm)	120	934	537	637	627
Temperature, water (°C)	120	26.5	0.0	10.2	10.0
Turbidity, unfiltered, lab (NTRU)	31	13	<2.00	12.25	<2.00
Hardness, filtered (mg/L as CaCO ₃)	120	451	203	304	302
Calcium, filtered (mg/L)	120	122	48.5	86.1	86.7
Magnesium, filtered (mg/L)	120	35.7	17.3	21.5	20.9
Potassium, filtered (mg/L)	31	3.81	1.89	2.62	2.43
Sodium, filtered (mg/L)	31	33.3	10.1	16.7	12.9
Alkalinity, filtered, lab (mg/L)	31	232	166	192	188
Chloride, filtered (mg/L)	31	5.90	3.90	4.80	4.79
Fluoride, filtered (mg/L)	31	0.90	0.43	0.56	0.50
Silica, filtered (mg/L)	31	23.9	11.7	17.0	16.6
Sulfate, filtered (mg/L)	31	200	84.1	136	135
Cadmium, filtered (μg/L)	118	0.05	<0.02	0.03	0.02
Cadmium, unfiltered recoverable (μg/L)	120	0.19	<0.02	0.04	0.04
Copper, filtered (μg/L)	120	6.7	0.8	2.1	1.8
Copper, unfiltered recoverable (μg/L)	120	22.5	1.5	5.2	4.2
Iron, filtered (μg/L)	120	84.5	4.0	15.2	12.1
Iron, unfiltered recoverable (μg/L)	120	760	14.0	114	86.2
Lead, filtered (μg/L)	119	0.33	<0.02	0.06	0.03
Lead, unfiltered recoverable (μg/L)	120	2.55	0.04	0.42	0.31
Manganese, filtered (μg/L)	120	54	1.91	16.0	15.3
Manganese, unfiltered recoverable (μg/L)	120	74.3	2.2	21.4	20.6
Zinc, filtered (μg/L)	119	3.8	<1.00	1.46	0.84
Zinc, unfiltered recoverable (μg/L)	120	13	<2.00	3.01	2
Arsenic, filtered (μg/L)	120	41.8	6	13.8	12.5
Arsenic, unfiltered recoverable (μg/L)	120	43	6	14.7	13.0
Organic carbon, filtered (mg/L)	31	7.18	1.28	2.38	2.07
Sediment, suspended (percent finer than 0.062 mm)	120	94	18	62	65
Sediment, suspended concentration (mg/L)	120	79	2	16	15
Sediment, suspended discharge (ton/d)	118	5.2	0.01	1.05	0.76

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12324200—Clark Fork at Deer Lodge					
Period of record for water-quality data: March 1985–September 2017					
Streamflow, instantaneous (ft ³ /s)	297	2,000	23	307	230
pH, onsite (standard units)	245	8.9	7.4	8.3	8.3
Specific conductance, onsite (µS/cm)	280	642	228	462	486
Temperature, water (°C)	296	23.0	0.0	10.2	10.5
Hardness, filtered (mg/L as CaCO ₃)	237	282	94.9	196	206
Calcium, filtered (mg/L)	237	82	28.2	58.0	60.4
Magnesium, filtered (mg/L)	237	18.7	5.53	12.5	13.2
Potassium, filtered (mg/L)	31	6.3	2.4	3.6	3.6
Sodium, filtered (mg/L)	31	25	8.6	14.9	14
Alkalinity, filtered, lab (mg/L)	3	142	105	119	109
Chloride, filtered (mg/L)	31	12	1.2	7.00	7.1
Fluoride, filtered (mg/L)	31	0.7	0.1	0.6	0.6
Silica, filtered (mg/L)	31	34	11	17	16
Sulfate, filtered (mg/L)	31	140	44	96	98
Cadmium, filtered (µg/L)	246	2	<0.10	¹ 0.08	0.04
Cadmium, unfiltered recoverable (µg/L)	246	5	<0.10	¹ 0.4	0.1
Copper, filtered (µg/L)	247	120	3.2	10.3	7.8
Copper, unfiltered recoverable (µg/L)	245	1,500	8.2	74.3	34
Iron, filtered (µg/L)	247	190	<3.00	¹ 16.0	10
Iron, unfiltered recoverable (µg/L)	247	29,000	27.2	1,324	494
Lead, filtered (µg/L)	247	6	<0.04	¹ 0.28	0.04
Lead, unfiltered recoverable (µg/L)	247	200	0.23	9.82	4.08
Manganese, filtered (µg/L)	247	400	1	39.3	31
Manganese, unfiltered recoverable (µg/L)	247	4,600	6.8	207	120
Zinc, filtered (µg/L)	247	230	<2.00	¹ 10.5	7
Zinc, unfiltered recoverable (µg/L)	245	1,700	3	75.2	35.8
Arsenic, filtered (µg/L)	247	39	6	14.4	13.4
Arsenic, unfiltered recoverable (µg/L)	246	215	4.8	23.0	17.1
Sediment, suspended (percent finer than 0.062 mm)	288	99	31	72	74
Sediment, suspended concentration (mg/L)	297	2,250	1	63	21
Sediment, suspended discharge (ton/d)	297	8,690	0.18	132	12

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12324400—Clark Fork above Little Blackfoot River, near Garrison					
Period of record for water-quality data: March 2009–September 2017					
Streamflow, instantaneous (ft ³ /s)	70	2,310	66	429	306
pH, onsite (standard units)	70	8.9	7.9	8.4	8.4
Specific conductance, onsite (μ S/cm)	70	530	249	417	443
Temperature, water (°C)	70	22.0	1.0	12.1	12.8
Hardness, filtered (mg/L as CaCO ₃)	70	236	104	184	196
Calcium, filtered (mg/L)	70	69.4	31.8	53.6	56.8
Magnesium, filtered (mg/L)	70	15.8	5.93	12.1	13.2
Cadmium, filtered (μ g/L)	70	0.23	0.02	0.07	0.07
Cadmium, unfiltered recoverable (μ g/L)	70	3.25	0.03	0.28	0.18
Copper, filtered (μ g/L)	70	40.6	2.8	9.63	8
Copper, unfiltered recoverable (μ g/L)	70	869	9.7	66.0	34.6
Iron, filtered (μ g/L)	69	105	4.5	18.6	14.5
Iron, unfiltered recoverable (μ g/L)	70	17,300	21.5	1,043	541
Lead, filtered (μ g/L)	70	0.96	0.04	0.17	0.13
Lead, unfiltered recoverable (μ g/L)	70	132	0.15	8.71	4.08
Manganese, filtered (μ g/L)	70	164	2.68	29.2	24.1
Manganese, unfiltered recoverable (μ g/L)	70	1,060	6.4	127	101
Zinc, filtered (μ g/L)	70	37.1	<2.00	15.70	4.9
Zinc, unfiltered recoverable (μ g/L)	70	800	2	54.7	28.9
Arsenic, filtered (μ g/L)	70	36.7	7.8	15.3	15.3
Arsenic, unfiltered recoverable (μ g/L)	70	138	10.5	22.5	18.2
Sediment, suspended (percent finer than 0.062 mm)	70	92	42	74	76
Sediment, suspended concentration (mg/L)	70	836	1	50	22
Sediment, suspended discharge (ton/d)	70	3,700	0.31	122	22

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12324680—Clark Fork at Goldcreek					
Period of record for water-quality data: March 1993–September 2017					
Streamflow, instantaneous (ft ³ /s)	203	4,450	87	763	513
pH, onsite (standard units)	202	9.1	7.9	8.4	8.3
Specific conductance, onsite (µS/cm)	202	510	206	365	375
Temperature, water (°C)	203	23.0	0.0	10.4	10.5
Hardness, filtered (mg/L as CaCO ₃)	202	232	86	161	168
Calcium, filtered (mg/L)	202	68	25.9	47.5	49.4
Magnesium, filtered (mg/L)	202	15	5.15	10.3	10.6
Potassium, filtered (mg/L)	28	6.9	2	3.11	3
Sodium, filtered (mg/L)	28	19	6.9	11.5	12
Chloride, filtered (mg/L)	28	7.2	2.5	4.73	4.4
Fluoride, filtered (mg/L)	28	0.6	0.1	0.43	0.4
Silica, filtered (mg/L)	28	25.0	14.0	18.3	18.0
Sulfate, filtered (mg/L)	28	88.0	31.0	59.5	55.5
Cadmium, filtered (µg/L)	202	0.2	<0.02	¹ 0.04	0.03
Cadmium, unfiltered recoverable (µg/L)	202	2	<0.10	¹ 0.17	0.08
Copper, filtered (µg/L)	201	36	2.1	6.58	5.3
Copper, unfiltered recoverable (µg/L)	201	440	5.2	38.4	21.4
Iron, filtered (µg/L)	201	106	<3.00	¹ 20.4	14
Iron, unfiltered recoverable (µg/L)	202	12,000	27.3	829	411
Lead, filtered (µg/L)	199	0.73	<0.04	¹ 0.12	0.04
Lead, unfiltered recoverable (µg/L)	201	73	0.14	5.32	2.76
Manganese, filtered (µg/L)	202	57.3	3.98	18.5	16.4
Manganese, unfiltered recoverable (µg/L)	202	1,100	9.3	112	80.3
Zinc, filtered (µg/L)	202	26	<1.00	¹ 5.06	3.4
Zinc, unfiltered recoverable (µg/L)	202	510	2	40.2	26.3
Arsenic, filtered (µg/L)	202	22.5	5.6	10.1	9.85
Arsenic, unfiltered recoverable (µg/L)	202	75	7	14.5	12
Sediment, suspended (percent finer than 0.062 mm)	203	94	43	76	78
Sediment, suspended concentration (mg/L)	203	752	1	45	19
Sediment, suspended discharge (ton/d)	203	7,960	0.55	197	27

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12331800—Clark Fork near Drummond					
Period of record for water-quality data: March 1993–September 2017					
Streamflow, instantaneous (ft ³ /s)	203	5,540	149	1,045	768
pH, onsite (standard units)	202	8.7	7.8	8.3	8.2
Specific conductance, onsite (µS/cm)	202	630	189	406	417
Temperature, water (°C)	203	22.5	0.5	11.0	11.0
Hardness, filtered (mg/L as CaCO ₃)	202	298	73.9	183	189
Calcium, filtered (mg/L)	202	83	21	52.5	54.3
Magnesium, filtered (mg/L)	202	22	5.2	12.6	13.0
Potassium, filtered (mg/L)	28	10	2.1	3.67	3.4
Sodium, filtered (mg/L)	28	20	5.6	11.5	12
Chloride, filtered (mg/L)	28	7.8	2.7	4.83	4.65
Fluoride, filtered (mg/L)	28	0.5	0.2	0.39	0.4
Silica, filtered (mg/L)	28	24	10	18.7	18.5
Sulfate, filtered (mg/L)	28	130	25	64.8	64.5
Cadmium, filtered (µg/L)	201	0.30	<0.03	¹ 0.05	0.03
Cadmium, unfiltered recoverable (µg/L)	202	2.2	<0.03	¹ 0.22	0.09
Copper, filtered (µg/L)	199	21	1	6.22	4.9
Copper, unfiltered recoverable (µg/L)	200	360	4.6	40.5	22
Iron, filtered (µg/L)	202	177	<3.00	¹ 19.5	10.3
Iron, unfiltered recoverable (µg/L)	201	14,000	19.7	979	461
Lead, filtered (µg/L)	198	1.54	<0.04	¹ 0.17	0.05
Lead, unfiltered recoverable (µg/L)	198	78.2	0.17	7.24	3.45
Manganese, filtered (µg/L)	201	77	3.3	16.6	14.2
Manganese, unfiltered recoverable (µg/L)	202	1,240	8.04	138	89.3
Zinc, filtered (µg/L)	202	21	<1.40	¹ 5.53	4.2
Zinc, unfiltered recoverable (µg/L)	202	575	2.9	55.3	30
Arsenic, filtered (µg/L)	202	26.5	3.2	10.5	10
Arsenic, unfiltered recoverable (µg/L)	202	79.1	7.7	15.7	13
Sediment, suspended (percent finer than 0.062 mm)	203	93	38	74	75
Sediment, suspended concentration (mg/L)	203	759	2	60	25
Sediment, suspended discharge (ton/d)	203	11,300	1.7	332	47

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; μ g/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12334550—Clark Fork at Turah Bridge, near Bonner					
Period of record for water-quality data: March 1985–September 2017					
Streamflow, instantaneous (ft ³ /s)	300	10,600	296	1,971	1,215
pH, onsite (standard units)	246	8.8	7.4	8.2	8.2
Specific conductance, onsite (μ S/cm)	275	483	139	295	305
Temperature, water (°C)	299	22.0	0.0	9.6	10.0
Hardness, filtered (mg/L as CaCO ₃)	236	205	53.6	129	130
Calcium, filtered (mg/L)	236	59	14.9	36.4	36.9
Magnesium, filtered (mg/L)	236	14	3.95	9.32	9.33
Potassium, filtered (mg/L)	32	5.7	1.51	2.45	2.45
Sodium, filtered (mg/L)	32	12	3.34	7.95	8.45
Alkalinity, filtered, lab (mg/L)	4	155	52.5	108	111
Chloride, filtered (mg/L)	32	5.6	1.5	3.13	2.95
Fluoride, filtered (mg/L)	32	0.4	0.17	0.29	0.3
Silica, filtered (mg/L)	32	19	12	14.9	15
Sulfate, filtered (mg/L)	32	68	12.6	41.8	41
Nitrate plus nitrite, filtered (mg/L)	8	0.069	<0.013	¹ 0.027	0.012
Phosphorus, unfiltered (mg/L)	10	0.24	0.014	0.080	0.068
Total nitrogen, unfiltered (mg/L)	2	0.49	0.38	--	--
Cadmium, filtered (μ g/L)	244	0.1	<0.02	¹ 0.03	<1.00
Cadmium, unfiltered recoverable (μ g/L)	245	4	<0.01	¹ 0.22	0.04
Copper, filtered (μ g/L)	244	25	1.1	4.52	3.4
Copper, unfiltered recoverable (μ g/L)	243	500	2.7	30.7	14
Iron, filtered (μ g/L)	245	359	<3.00	¹ 25.4	14.5
Iron, unfiltered recoverable (μ g/L)	245	19,000	32.6	925	356
Lead, filtered (μ g/L)	241	7	<0.02	¹ 0.25	<5.00
Lead, unfiltered recoverable (μ g/L)	241	100	<1.00	¹ 6.12	2.3
Manganese, filtered (μ g/L)	245	48.6	1	8.44	7
Manganese, unfiltered recoverable (μ g/L)	245	2,000	8.8	109	57.3
Zinc, filtered (μ g/L)	243	39	<2.00	¹ 5.36	3.7
Zinc, unfiltered recoverable (μ g/L)	245	1,100	2.9	51.6	22
Arsenic, filtered (μ g/L)	245	17	2.7	5.95	5.5
Arsenic, unfiltered recoverable (μ g/L)	245	110	3	9.26	7
Sediment, suspended (percent finer than 0.062 mm)	289	98	27	74	76
Sediment, suspended concentration (mg/L)	300	1,370	2	53	18
Sediment, suspended discharge (ton/d)	300	34,700	3	619	60

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Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; μS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level; mg/L, milligram per liter; CaCO₃, calcium carbonate; μg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12340000—Blackfoot River near Bonner					
Period of record for water-quality data: March 1985–September 2017					
Streamflow, instantaneous (ft ³ /s)	220	13,400	344	2,769	1,375
pH, onsite (standard units)	180	8.7	7.5	8.3	8.3
Specific conductance, onsite (μS/cm)	197	294	131	209	204
Temperature, water (°C)	220	22.5	0.0	9.8	10.0
Turbidity, unfiltered, lab (NTRU)	7	30	<2.00	¹ 7.2	2
Hardness, filtered (mg/L as CaCO ₃)	172	146	55.1	104	98.6
Calcium, filtered (mg/L)	172	37.7	14	26.6	25.5
Magnesium, filtered (mg/L)	172	13.2	4.9	9.20	8.66
Potassium, filtered (mg/L)	26	2.8	0.48	0.87	0.8
Sodium, filtered (mg/L)	26	3.41	1.17	2.46	2.5
Alkalinity, filtered, lab (mg/L)	9	148	71.5	117	131
Chloride, filtered (mg/L)	26	1.6	0.23	0.64	0.58
Fluoride, filtered (mg/L)	26	0.1	<0.10	¹ 0.10	<0.10
Silica, filtered (mg/L)	26	12	6.8	8.64	8.11
Sulfate, filtered (mg/L)	26	6.6	1.1	4.58	4.8
Nitrate plus nitrite, filtered (mg/L)	30	0.04	<0.005	¹ 0.010	0.005
Phosphorus, unfiltered (mg/L)	31	0.167	0.003	0.027	0.015
Total nitrogen, unfiltered (mg/L)	14	0.33	0.08	0.15	0.14
Cadmium, filtered (μg/L)	178	1	<0.02	¹ 0.02	<0.10
Cadmium, unfiltered recoverable (μg/L)	180	2	<0.01	¹ 0.08	<0.10
Copper, filtered (μg/L)	175	7	<0.80	¹ 1.20	0.7
Copper, unfiltered recoverable (μg/L)	176	34	<0.70	¹ 3.92	1.6
Iron, filtered (μg/L)	179	104	<3.00	¹ 17.5	10.2
Iron, unfiltered recoverable (μg/L)	180	3,600	13.9	378	163
Lead, filtered (μg/L)	173	8	<0.02	¹ 0.25	<0.50
Lead, unfiltered recoverable (μg/L)	174	25	<0.04	¹ 1.82	0.09
Manganese, filtered (μg/L)	179	11	<1.000	¹ 2.40	2
Manganese, unfiltered recoverable (μg/L)	180	180	<10.0	¹ 26.2	13.6
Zinc, filtered (μg/L)	178	15	<0.60	¹ 1.77	<3.00
Zinc, unfiltered recoverable (μg/L)	180	60	<1.00	¹ 4.46	<10.0
Arsenic, filtered (μg/L)	179	2	<1.00	¹ 0.97	0.96
Arsenic, unfiltered recoverable (μg/L)	180	4	<1.00	¹ 1.25	1
Sediment, suspended (percent finer than 0.062 mm)	218	98	42	80.5	82
Sediment, suspended concentration (mg/L)	220	271	1	27.0	8
Sediment, suspended discharge (ton/d)	220	7,670	1.1	485	31

Table 21. Statistical summary of long-term water-quality data for the Clark Fork Basin, Montana, March 1985 through September 2017.—Continued

[ft³/s, cubic foot per second; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; lab, laboratory; NTRU, nephelometric turbidity ratio unit; <, less than laboratory reporting level¹; mg/L, milligram per liter; CaCO₃, calcium carbonate; µg/L, microgram per liter; mm, millimeter; ton/d, ton per day; --, no data]

Property or constituent and reporting unit	Number of samples	Maximum	Minimum	Mean	Median
12340500—Clark Fork above Missoula					
Period of record for water-quality data: July 1986–September 2017					
Streamflow, instantaneous (ft ³ /s)	265	22,900	720	4,656	2,550
pH, onsite (standard units)	223	8.8	7.9	8.3	8.3
Specific conductance, onsite (µS/cm)	243	399	142	249	255
Temperature, water (°C)	263	22.0	0.0	9.8	10.0
Turbidity, unfiltered, lab (NTRU)	40	100	<2.00	¹ 13.3	4.9
Hardness, filtered (mg/L as CaCO ₃)	223	168	60.5	116	117
Calcium, filtered (mg/L)	223	46	14	31.2	31.2
Magnesium, filtered (mg/L)	223	13.4	5.28	9.16	9.1
Potassium, filtered (mg/L)	28	4.5	0.9	1.72	1.5
Sodium, filtered (mg/L)	28	7.8	2.4	5.29	5.35
Chloride, filtered (mg/L)	28	4.2	0.9	1.93	1.8
Fluoride, filtered (mg/L)	28	0.3	<0.10	¹ 0.19	0.2
Silica, filtered (mg/L)	28	16	9.4	11.8	11
Sulfate, filtered (mg/L)	28	43	9.3	23.3	23
Phosphorus, unfiltered (mg/L)	2	0.102	0.066	--	--
Total nitrogen, unfiltered (mg/L)	2	0.47	0.32	--	--
Cadmium, filtered (µg/L)	222	0.2	<0.02	¹ 0.03	<0.10
Cadmium, unfiltered recoverable (µg/L)	223	5	<0.01	¹ 0.13	0.02
Copper, filtered (µg/L)	222	12.6	0.7	2.65	2
Copper, unfiltered recoverable (µg/L)	221	400	1.9	17.7	8
Iron, filtered (µg/L)	223	200	<3.00	¹ 22.1	14.9
Iron, unfiltered recoverable (µg/L)	223	13,000	40.9	593	250
Lead, filtered (µg/L)	216	1.2	<0.02	¹ 0.12	0.02
Lead, unfiltered recoverable (µg/L)	218	78	<1.00	¹ 3.11	1.27
Manganese, filtered (µg/L)	223	230	3.48	14.3	12.3
Manganese, unfiltered recoverable (µg/L)	223	1,100	8.8	60.9	39.8
Zinc, filtered (µg/L)	222	16	<1.00	¹ 3.18	2.1
Zinc, unfiltered recoverable (µg/L)	223	1,100	<3.00	¹ 29.8	12
Arsenic, filtered (µg/L)	223	9	1	3.39	3.1
Arsenic, unfiltered recoverable (µg/L)	223	69	1	5.18	4
Sediment, suspended (percent finer than 0.062 mm)	261	99	14	82	86
Sediment, suspended concentration (mg/L)	266	950	2	41	13
Sediment, suspended discharge (ton/d)	265	21,900	5.8	1,059	97

¹Value for the mean is estimated 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 long-term bed-sediment data for the Clark Fork Basin, Montana, August 1986 through August 2017.

[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. Arsenic was not analyzed until 2003; therefore, the number of samples is smaller than that for the other trace elements. Analysis of samples for silver was discontinued in 2004; therefore, the number of samples is smaller than that for other trace elements. <, less than the minimum reporting level; --, indicates insufficient data (less than three samples) to compute statistic]

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12323600—Silver Bow Creek at Opportunity					
Period of record for bed-sediment data: 1992–2017					
Arsenic	15	186	16.4	84.5	58.7
Cadmium	26	43.9	5.9	24.2	25.8
Chromium	24	50.7	16.8	29.0	25.9
Copper	26	9,020	446	3,230	3,480
Iron	26	45,300	28,200	34,400	33,000
Lead	26	1,030	93.0	501	492
Manganese	26	9,220	1,160	3,270	2,840
Nickel	25	21.4	12.0	14.9	14.8
Silver	12	20.0	8.3	15.5	15.8
Zinc	26	13,400	1,350	5,770	6,140
12323750—Silver Bow Creek at Warm Springs					
Period of record for bed-sediment data: 1992–2017					
Arsenic	15	177	66.5	109	98
Cadmium	26	12.2	4.2	6.8	6.2
Chromium	24	46.8	<15.7	123.5	122.4
Copper	26	769	169	332	290
Iron	26	32,500	15,400	23,800	23,400
Lead	26	121	49.5	73.5	73.1
Manganese	26	17,700	1,470	7,220	7,210
Nickel	25	20.0	9.2	14.9	14.7
Silver	12	4.4	0.3	11.9	11.8
Zinc	26	2,220	554	863	681
12323770—Warm Springs Creek at Warm Springs					
Period of record for bed-sediment data: 1995, 1997, 1999, 2002, 2005, 2008, 2011, 2014, 2017					
Arsenic	5	66.1	34.0	55.3	59.6
Cadmium	9	5.8	1.2	3.1	2.8
Chromium	9	39.3	24.1	31.1	31.4
Copper	9	1,060	496	831	848
Iron	9	26,600	16,800	21,600	22,000
Lead	9	85.6	42.3	75.6	79.3
Manganese	9	12,100	555	6,190	6,030
Nickel	9	34.3	14.5	21.2	19.6
Silver	4	5.1	3.1	3.8	3.5
Zinc	9	453	237	386	396

Table 22. Statistical summary of long-term bed-sediment data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[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. Arsenic was not analyzed until 2003; therefore, the number of samples is smaller than that for the other trace elements. Analysis of samples for silver was discontinued in 2004; therefore, the number of samples is smaller than that for other trace elements. <, less than the minimum reporting level; --, indicates insufficient data (less than three samples) to compute statistic]

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12323800—Clark Fork near Galen					
Period of record for bed-sediment data: 1987, 1991–2017					
Arsenic	15	156	73.5	108	102
Cadmium	28	20.1	3.8	7.5	6.2
Chromium	24	44.6	18.1	28.6	26.7
Copper	28	2,300	780	1,160	1,110
Iron	28	39,800	22,600	27,700	26,900
Lead	28	235	91.9	128	122
Manganese	28	17,300	1,530	8,290	6,350
Nickel	25	29.1	13.9	19.1	19.0
Silver	14	7.3	<3.2	4.4	4.5
Zinc	28	3,560	721	1,300	1,090
461415112450801—Clark Fork below Lost Creek, near Galen					
Period of record for bed-sediment data: 1996–2017					
Arsenic	15	204	90.4	123	111
Cadmium	22	10.5	4.7	6.5	6.0
Chromium	21	42.4	16.4	28.3	27.1
Copper	22	2,050	1,150	1,490	1,450
Iron	22	32,800	24,400	28,900	29,200
Lead	22	218	123	164	164
Manganese	22	9,820	1,430	5,110	4,940
Nickel	22	19.9	11.7	15.8	16.2
Silver	8	7.8	4.2	6.5	6.7
Zinc	22	1,680	930	1,240	1,190
461559112443301—Clark Fork at county bridge, near Racetrack					
Period of record for bed-sediment data: 1996–2017					
Arsenic	15	132	56.4	90.6	89.7
Cadmium	22	8.7	3.6	6.1	5.9
Chromium	21	45.2	13.9	27.2	24.9
Copper	22	1,810	818	1,240	1,250
Iron	22	31,700	21,200	27,000	27,400
Lead	22	186	103	140	138
Manganese	22	6,310	1,600	3,170	2,990
Nickel	22	18.4	10.3	14.0	14.3
Silver	8	6.1	<3.3	5.0	5.4
Zinc	22	1,550	816	1,130	1,120

Table 22. Statistical summary of long-term bed-sediment data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[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. Arsenic was not analyzed until 2003; therefore, the number of samples is smaller than that for the other trace elements. Analysis of samples for silver was discontinued in 2004; therefore, the number of samples is smaller than that for other trace elements. <, less than the minimum reporting level; --, indicates insufficient data (less than three samples) to compute statistic]

Constituent	Number of samples	Maximum	Minimum	Mean	Median
461903112440701—Clark Fork at Dempsey Creek diversion, near Racetrack Period of record for bed-sediment data: 1996–2017					
Arsenic	15	109	57.8	80.0	79.3
Cadmium	22	10.3	3.8	5.9	5.2
Chromium	21	39.2	13.0	25.5	24.0
Copper	22	1,580	718	1,080	1,060
Iron	22	33,700	18,800	26,500	25,700
Lead	22	155	91.9	128	131
Manganese	22	8,370	1,200	3,540	3,070
Nickel	22	16.9	8.7	12.5	12.3
Silver	8	6.2	2.7	4.9	5.0
Zinc	22	1,570	875	1,090	1,070
12324200—Clark Fork at Deer Lodge Period of record for bed-sediment data: 1986–7, 1990–2017					
Arsenic	15	102	49.1	74.3	72.2
Cadmium	30	10.0	3.5	5.7	5.0
Chromium	24	50.7	17.0	31.0	28.3
Copper	30	4,180	683	1,220	1,070
Iron	30	35,300	20,500	27,100	26,300
Lead	30	242	103	141	140
Manganese	30	6,020	1,070	2,540	2,360
Nickel	25	21.1	11.5	14.6	13.6
Silver	16	7.9	2.4	4.7	4.5
Zinc	30	1,730	844	1,140	1,050
12324400—Clark Fork above Little Blackfoot River, near Garrison Period of record for bed-sediment data: 2009–17					
Arsenic	9	90.7	49.4	67.9	59.1
Cadmium	9	5.5	3.6	4.5	4.3
Chromium	9	52.8	15.0	33.1	30.1
Copper	9	1,290	666	1,010	940
Iron	9	32,400	16,800	24,900	24,300
Lead	9	145	92.1	122	132
Manganese	9	3,560	1,150	2,450	2,660
Nickel	9	17.2	9.2	13.1	13.0
Silver	0	--	--	--	--
Zinc	9	1,240	780	1,010	977

Table 22. Statistical summary of long-term bed-sediment data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[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. Arsenic was not analyzed until 2003; therefore, the number of samples is smaller than that for the other trace elements. Analysis of samples for silver was discontinued in 2004; therefore, the number of samples is smaller than that for other trace elements. <, less than the minimum reporting level; --, indicates insufficient data (less than three samples) to compute statistic]

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12324680—Clark Fork at Goldcreek					
Period of record for bed-sediment data: 1992–2017					
Arsenic	15	62.1	23.4	39.9	35.9
Cadmium	26	8.1	2.0	4.2	3.8
Chromium	24	55.3	9.9	31.0	28.8
Copper	26	1,080	281	643	664
Iron	26	32,100	11,500	22,700	23,200
Lead	26	152	45.4	90.6	92.2
Manganese	26	2,730	977	1,820	1,810
Nickel	25	18.6	7.6	13.3	13.3
Silver	12	4.8	2.3	3.2	3.2
Zinc	26	1,320	427	856	842
12331800—Clark Fork near Drummond					
Period of record for bed-sediment data: 1986–7, 1991–2017					
Arsenic	15	66.2	17.2	37.1	32.8
Cadmium	29	7.7	1.7	4.1	4.1
Chromium	24	41.9	9.2	26.5	26.1
Copper	29	747	183	459	443
Iron	29	44,000	14,800	24,200	20,400
Lead	29	135	26.8	83.0	82.0
Manganese	29	4,820	832	1,990	1,810
Nickel	25	16.8	4.8	12.6	13.0
Silver	15	4.7	<3.2	3.0	2.9
Zinc	29	1,230	380	900	947
12334550—Clark Fork at Turah Bridge, near Bonner					
Period of record for bed-sediment data: 1986, 1991–2017					
Arsenic	15	43.1	17.3	26.0	24.8
Cadmium	28	7.3	1.2	3.1	3.1
Chromium	24	42.5	13.6	25.8	25.4
Copper	28	635	211	334	320
Iron	28	25,900	12,600	19,000	17,300
Lead	28	115	37.4	63.9	60.4
Manganese	28	2,340	383	1,200	1,180
Nickel	25	19.1	6.9	12.2	11.5
Silver	14	3.9	<1.9	2.1	1.9
Zinc	28	1,160	448	747	742

Table 22. Statistical summary of long-term bed-sediment data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[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. Arsenic was not analyzed until 2003; therefore, the number of samples is smaller than that for the other trace elements. Analysis of samples for silver was discontinued in 2004; therefore, the number of samples is smaller than that for other trace elements. <, less than the minimum reporting level; --, indicates insufficient data (less than three samples) to compute statistic]

Constituent	Number of samples	Maximum	Minimum	Mean	Median
12340000—Blackfoot River near Bonner					
Period of record for bed-sediment data: 1986–7, 1991, 1993–6, 1998–2001, 2003, 2006–17					
Arsenic	13	6.2	<0.2	¹ 3.9	¹ 4.3
Cadmium	24	2.0	<0.04	¹ 0.4	¹ 0.2
Chromium	20	35.2	13.3	21.3	21.8
Copper	24	27.0	11.3	19.8	20.7
Iron	24	23,000	12,400	17,500	18,000
Lead	24	20.5	<13.0	¹ 12.4	¹ 11.1
Manganese	24	746	298	515	538
Nickel	21	14.3	6.0	11.1	11.1
Silver	12	<1.9	<0.3	¹ 0.5	¹ 0.3
Zinc	24	81.5	35.2	59.7	59.8
12340500—Clark Fork above Missoula					
Period of record for bed-sediment data: 1997–2017					
Arsenic	15	53.9	12.4	26.4	23.3
Cadmium	21	5.8	1.0	2.6	2.6
Chromium	20	40.7	12.8	25.1	26.0
Copper	21	551	125	306	281
Iron	21	27,000	13,800	19,900	19,500
Lead	21	78.2	24.7	48.8	47.3
Manganese	21	2,250	477	1,020	914
Nickel	21	15.8	7.6	12.2	12.0
Silver	7	2.9	0.8	¹ 2.0	¹ 2.1
Zinc	21	1,090	343	635	590

¹Value determined by substituting one-half of the minimum reporting level for censored (<) values when both uncensored and censored values were used to determine the mean and median.

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12323600—Silver Bow Creek at Opportunity Period of record for biological data: 1992, 1994–5, 1997–2017					
<i>Brachycentrus</i> spp.					
Arsenic	0	--	--	--	--
Cadmium	5	12.5	5.8	10.1	11.6
Chromium	5	5.9	0.7	2.1	0.9
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	<0.1	1.3	1.6
Zinc	5	995	629	803	815
<i>Hydropsyche cockerelli</i>					
Arsenic	30	33.3	4.3	10.4	7.3
Cadmium	36	9.7	2.4	4.8	4.5
Chromium	36	25.5	1.0	4.1	3.9
Copper	36	1,090	78.6	290	271
Iron	36	6,160	689	2,680	2,440
Lead	36	74.3	11.2	29.3	20.9
Manganese	36	4,000	180	1,400	1,190
Nickel	36	4.3	0.7	2.8	3.1
Zinc	36	1,590	432	756	739
<i>Hydropsyche</i> spp.					
Arsenic	15	23.1	3.5	10.8	9.8
Cadmium	20	11.0	1.0	5.2	4.8
Chromium	20	9.7	0.6	3.2	3.0
Copper	20	930	71.0	410	342
Iron	20	3,630	1,050	2,210	2,170
Lead	20	237	9.4	43.7	36.0
Manganese	20	2,750	612	1,130	1,050
Nickel	20	4.1	0.7	2.2	2.4
Zinc	20	1,290	380	850	855

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12323600—Silver Bow Creek at Opportunity—Continued Period of record for biological data: 1992, 1994–5, 1997–2017					
<i>Hydropsyche tana</i>					
Arsenic	0	--	--	--	--
Cadmium	6	9.2	4.8	6.8	6.9
Chromium	6	11.5	0.9	4.5	1.8
Copper	6	456	10.5	236	298
Iron	6	1,520	875	1,100	1,050
Lead	6	21.0	15.6	18.6	18.3
Manganese	6	969	307	634	675
Nickel	6	1.8	0.7	1.4	1.6
Zinc	6	1,070	760	961	1,020
12323750—Silver Bow Creek at Warm Springs Period of record for biological data: 1992–2017					
<i>Claassenia sabulosa</i>					
Arsenic	2	5.0	1.8	3.4	--
Cadmium	2	1.1	0.5	0.8	--
Chromium	2	2.8	0.6	1.7	--
Copper	2	66.4	47.6	57.0	--
Iron	2	300	151	226	--
Lead	2	1.5	0.6	1.0	--
Manganese	2	922	98	510	--
Nickel	2	0.6	0.5	0.6	--
Zinc	2	400	340	370	--
<i>Hydropsyche cockerelli</i>					
Arsenic	27	23.6	7.9	12.1	11.7
Cadmium	53	2.1	0.2	0.6	0.5
Chromium	53	4.3	0.1	1.2	1.0
Copper	53	97.0	16.7	35.7	31.1
Iron	53	1,660	351	830	793
Lead	53	6.0	0.3	3.2	2.9
Manganese	53	3,890	491	1,230	1,020
Nickel	53	1.8	0.3	1.0	0.9
Zinc	53	276	115	174	168

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12323750—Silver Bow Creek at Warm Springs—Continued Period of record for biological data: 1992–2017					
<i>Hydropsyche occidentalis</i>					
Arsenic	11	31.0	10.5	18.6	15.6
Cadmium	26	1.6	0.2	0.7	0.4
Chromium	26	6.8	0.3	2.0	1.0
Copper	26	48.9	11.0	34.0	33.0
Iron	26	2,960	372	1,280	1,020
Lead	26	8.2	<1.7	4.1	3.8
Manganese	26	6,940	996	2,400	2,040
Nickel	26	3.2	0.7	1.6	1.5
Zinc	26	220	140	182	184
<i>Hydropsyche</i> spp.					
Arsenic	1	--	--	14.0	--
Cadmium	5	2.3	0.4	1.0	0.6
Chromium	5	2.5	0.5	1.4	1.3
Copper	5	47.6	34.9	39.9	40.4
Iron	5	1,100	561	763	767
Lead	5	5.1	1.9	4.0	4.5
Manganese	5	1,190	443	817	804
Nickel	5	1.9	<0.4	1.0	0.8
Zinc	5	284	141	188	162
12323770—Warm Springs Creek at Warm Springs Period of record for biological data: 1995, 1997, 1999, 2002, 2005, 2008, 2011, 2014, 2017					
<i>Arctopsyche grandis</i>					
Arsenic	7	9.8	7.6	8.7	8.4
Cadmium	11	3.6	0.4	2.5	2.6
Chromium	11	5.0	0.8	2.7	2.8
Copper	11	133	53.2	104	102
Iron	11	1,490	684	1,080	1,050
Lead	11	8.7	3.0	6.0	6.3
Manganese	11	3,560	738	2,120	1,800
Nickel	11	7.5	1.1	3.7	2.8
Zinc	11	331	181	228	200

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12323770—Warm Springs Creek at Warm Springs—Continued					
Period of record for biological data: 1995, 1997, 1999, 2002, 2005, 2008, 2011, 2014, 2017					
<i>Hesperoperla</i> spp.					
Arsenic	4	2.9	1.2	2.2	2.4
Cadmium	4	2.6	0.5	1.3	1.1
Chromium	4	7.6	0.5	2.8	1.4
Copper	4	64.9	44.2	56.4	58.2
Iron	4	456	375	409	403
Lead	4	1.9	1.4	1.6	1.6
Manganese	4	356	202	284	289
Nickel	4	2.1	0.6	1.2	1.1
Zinc	4	573	394	479	474
<i>Hydropsyche occidentalis</i>					
Arsenic	4	13.6	9.8	12.4	13.0
Cadmium	6	1.4	0.7	1.1	1.2
Chromium	6	8.6	0.3	3.7	3.2
Copper	6	183	116	151	150
Iron	6	2,360	1,520	1,870	1,840
Lead	6	12.6	6.7	8.2	7.4
Manganese	6	3,190	1,440	2,580	2,680
Nickel	6	4.5	2.0	3.1	3.2
Zinc	6	204	148	169	168
<i>Hydropsyche</i> spp.					
Arsenic	1	--	--	13.1	--
Cadmium	3	1.3	0.6	1.0	1.1
Chromium	3	3.5	1.4	2.2	1.6
Copper	3	155	94.8	115	95.9
Iron	3	2,260	1,150	1,540	1,220
Lead	3	11.3	5.2	7.5	5.9
Manganese	3	3,390	956	2,120	2,030
Nickel	3	8.8	1.8	4.2	2.0
Zinc	3	214	125	156	129

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12323800—Clark Fork near Galen					
Period of record for biological data: 1987, 1991–2017					
<i>Claassenia sabulosa</i>					
Arsenic	1	--	--	2.0	--
Cadmium	1	--	--	0.2	--
Chromium	1	--	--	1.5	--
Copper	1	--	--	54.7	--
Iron	1	--	--	242	--
Lead	1	--	--	1.0	--
Manganese	1	--	--	323	--
Nickel	1	--	--	0.5	--
Zinc	1	--	--	237	--
<i>Hydropsyche cockerelli</i>					
Arsenic	21	20.5	10.0	14.9	14.1
Cadmium	46	2.7	0.7	1.6	1.5
Chromium	46	9.6	0.7	2.4	2.3
Copper	46	181	48.7	108	111
Iron	46	2,660	816	1,600	1,510
Lead	46	17.1	1.2	9.1	8.8
Manganese	46	3,620	1,070	2,260	2,220
Nickel	46	6.5	0.9	2.2	1.9
Zinc	46	536	136	229	220
<i>Hydropsyche morosa</i> group					
Arsenic	0	--	--	--	--
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

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12323800—Clark Fork near Galen—Continued Period of record for biological data: 1987, 1991–2017					
<i>Hydropsyche occidentalis</i>					
Arsenic	23	17.7	9.1	14.3	14.6
Cadmium	55	1.6	0.6	1.1	1.2
Chromium	55	6.6	0.4	2.2	2.0
Copper	55	151	49.2	95.1	93.1
Iron	55	2,590	642	1,520	1,450
Lead	55	13.5	1.6	8.3	8.4
Manganese	55	6,170	653	2,490	2,230
Nickel	55	3.8	0.8	1.9	1.8
Zinc	55	286	168	209	203
<i>Hydropsyche tana</i>					
Arsenic	0	--	--	--	--
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	--
<i>Hydropsyche</i> spp.					
Arsenic	6	15.7	5.5	10.5	10.7
Cadmium	10	3.5	0.7	1.8	1.3
Chromium	6	2.4	0.6	1.6	1.6
Copper	10	154	55.3	105	105
Iron	10	2,110	914	1,320	1,260
Lead	10	13.5	3.8	8.7	9.2
Manganese	6	4,760	668	2,330	1,720
Nickel	6	3.9	0.9	2.0	1.6
Zinc	10	329	132	236	223

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
461415112450801—Clark Fork below Lost Creek, near Galen Period of record for biological data: 1996–2017					
<i>Claassenia sabulosa</i>					
Arsenic	1	--	--	1.5	--
Cadmium	2	0.4	0.3	0.4	--
Chromium	2	1.9	0.4	1.2	--
Copper	2	70.1	67.1	68.6	--
Iron	2	209	189	199	--
Lead	2	1.2	0.7	1.0	--
Manganese	2	238	90.4	164	--
Nickel	2	0.2	<0.2	0.2	--
Zinc	2	245	208	226	--
<i>Hydropsyche cockerelli</i>					
Arsenic	24	27.8	8.8	16.4	16.1
Cadmium	35	3.7	1.1	1.9	1.8
Chromium	35	5.5	0.8	2.4	2.5
Copper	35	338	48.8	155	144
Iron	35	4,080	691	1,860	1,900
Lead	35	28.6	3.0	14.0	14.3
Manganese	35	3,160	1,230	1,810	1,670
Nickel	35	4.5	0.9	1.9	1.9
Zinc	35	339	151	244	248
<i>Hydropsyche occidentalis</i>					
Arsenic	13	20.9	12.7	16.1	15.6
Cadmium	27	2.1	0.5	1.4	1.5
Chromium	27	6.5	1.2	2.7	2.1
Copper	27	219	52.1	125	121
Iron	27	2,830	963	1,690	1,620
Lead	27	20.4	6.6	11.9	11.5
Manganese	27	4,150	1,220	2,510	2,190
Nickel	27	6.4	0.5	1.9	1.5
Zinc	27	330	174	252	252

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
461415112450801—Clark Fork below Lost Creek, near Galen—Continued Period of record for biological data: 1996–2017					
<i>Hydropsyche</i> spp.					
Arsenic	5	14.5	7.0	11.1	12.0
Cadmium	9	1.8	1.0	1.4	1.3
Chromium	9	3.0	0.9	1.6	1.3
Copper	9	153	45.1	101	103
Iron	9	2,040	533	1,260	1,200
Lead	9	20.5	4.1	10.2	8.7
Manganese	9	2,800	775	1,440	1,230
Nickel	9	4.4	0.9	1.9	1.4
Zinc	9	276	143	192	179
<i>Rhyacophila</i> spp.					
Arsenic	2	5.2	3.5	4.4	--
Cadmium	2	4.3	3.9	4.1	--
Chromium	2	1.1	1.0	1.0	--
Copper	2	93.1	73.7	83.4	--
Iron	2	346	324	335	--
Lead	2	5.9	4.8	5.4	--
Manganese	2	320	192	256	--
Nickel	2	0.3	0.3	0.3	--
Zinc	2	411	301	356	--
461559112443301—Clark Fork at county bridge, near Racetrack Period of record for biological data: 1996–2017					
<i>Arctopsyche grandis</i>					
Arsenic	3	13.0	5.2	9.2	9.3
Cadmium	3	3.5	1.2	2.3	2.4
Chromium	3	4.5	1.9	3.2	3.3
Copper	3	101	81.0	90.9	90.9
Iron	3	1,410	803	1,030	889
Lead	3	13.2	9.1	10.5	9.1
Manganese	3	3,140	1,430	2,350	2,480
Nickel	3	6.4	1.4	3.2	1.9
Zinc	3	572	243	358	260

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
461559112443301—Clark Fork at county bridge, near Racetrack—Continued Period of record for biological data: 1996–2017					
<i>Claassenia sabulosa</i>					
Arsenic	0	--	--	--	--
Cadmium	1	--	--	0.4	--
Chromium	1	--	--	0.3	--
Copper	1	--	--	40.3	--
Iron	1	--	--	113	--
Lead	1	--	--	0.8	--
Manganese	1	--	--	172	--
Nickel	1	--	--	0.2	--
Zinc	1	--	--	213	--
<i>Hydropsyche cockerelli</i>					
Arsenic	21	20.2	11.0	14.1	13.6
Cadmium	32	2.8	0.8	1.7	1.5
Chromium	32	3.0	0.6	2.0	2.3
Copper	32	197	50.0	110	108
Iron	32	3,330	657	1,450	1,260
Lead	32	18.7	3.7	9.9	9.7
Manganese	32	2,360	646	1,670	1,780
Nickel	32	2.0	0.7	1.7	1.5
Zinc	32	302	139	211	198
<i>Hydropsyche occidentalis</i>					
Arsenic	18	16.8	9.2	13.1	12.9
Cadmium	31	2.3	0.7	1.4	1.4
Chromium	31	3.7	1.1	2.1	2.0
Copper	31	168	59.5	116	121
Iron	31	3,690	1,030	1,660	1,580
Lead	31	15.7	4.3	11.0	10.7
Manganese	31	3,770	660	2,030	2,020
Nickel	31	5.7	1.1	1.7	1.4
Zinc	31	361	181	236	230

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
461559112443301—Clark Fork at county bridge, near Racetrack—Continued Period of record for biological data: 1996–2017					
<i>Hydropsyche</i> spp.					
Arsenic	6	12.8	5.7	9.6	9.8
Cadmium	8	2.4	1.0	1.6	1.5
Chromium	8	3.9	0.7	1.6	1.0
Copper	8	144	68.1	97	84.0
Iron	8	1,880	787	1,220	1,170
Lead	8	15.0	5.7	8.8	7.1
Manganese	8	2,370	886	1,320	1,150
Nickel	8	2.0	0.7	1.3	1.2
Zinc	8	229	151	193	194
461903112440701—Clark Fork at Dempsey Creek diversion, near Racetrack Period of record for biological data: 1996–2017					
<i>Arctopsyche grandis</i>					
Arsenic	12	17.5	4.4	7.2	5.9
Cadmium	13	7.1	0.9	2.6	2.2
Chromium	13	12.9	0.5	12.1	10.9
Copper	13	196	30.8	70.1	52.6
Iron	13	2,800	333	735	505
Lead	13	17.6	2.1	16.7	15.1
Manganese	13	2,060	510	1,060	956
Nickel	13	2.5	0.5	1.1	1.0
Zinc	13	489	86.8	241	216
<i>Claassenia sabulosa</i>					
Arsenic	8	3.8	1.2	2.2	2.0
Cadmium	8	2.4	0.4	1.0	0.8
Chromium	8	1.7	0.2	0.7	0.5
Copper	8	87.2	47.5	62.4	58.8
Iron	8	485	94	215	180
Lead	8	3.4	0.4	1.3	1.0
Manganese	8	1,260	98	329	208
Nickel	8	1.0	0.2	0.4	0.3
Zinc	8	394	168	279	266

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
461903112440701—Clark Fork at Dempsey Creek diversion, near Racetrack—Continued Period of record for biological data: 1996–2017					
<i>Hydropsyche cockerelli</i>					
Arsenic	21	18.8	8.0	12.0	10.2
Cadmium	30	2.1	0.7	1.5	1.5
Chromium	30	4.6	0.5	1.9	1.7
Copper	30	247	60.7	110	94.3
Iron	30	3,010	552	1,330	1,130
Lead	30	21.9	3.5	9.1	8.5
Manganese	30	2,650	487	1,380	1,230
Nickel	30	2.5	0.5	1.3	1.4
Zinc	30	285	162	217	217
<i>Hydropsyche occidentalis</i>					
Arsenic	22	24.0	7.2	14.0	13.9
Cadmium	39	2.4	0.7	1.3	1.3
Chromium	39	6.2	0.3	2.1	1.9
Copper	39	345	57.1	124	106
Iron	39	3,390	630	1,690	1,520
Lead	39	21.8	4.4	12.1	11.4
Manganese	39	4,460	826	2,230	2,150
Nickel	39	2.4	1.0	1.6	1.5
Zinc	39	386	189	259	241
<i>Hydropsyche</i> spp.					
Arsenic	4	9.1	6.5	7.6	7.4
Cadmium	6	1.7	0.9	1.3	1.4
Chromium	6	2.3	0.8	1.7	1.8
Copper	6	140	65.5	101	108
Iron	6	1,610	875	1,220	1,200
Lead	6	13.2	7.1	9.0	8.0
Manganese	6	1,150	638	877	848
Nickel	6	1.6	0.6	1.2	1.5
Zinc	6	212	162	185	186

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12324200—Clark Fork at Deer Lodge Period of record for biological data: 1986–7, 1990–2017					
<i>Arctopsyche grandis</i>					
Arsenic	7	13.3	5.8	8.8	8.3
Cadmium	9	4.7	2.6	3.5	3.4
Chromium	9	4.7	1.0	2.3	2.0
Copper	9	183	34.9	96.8	88.6
Iron	9	2,320	537	1,180	1,090
Lead	9	17.4	3.8	10.7	11.2
Manganese	9	1,620	380	1,150	1,320
Nickel	9	1.9	<1.3	1.4	1.3
Zinc	9	370	140	268	269
<i>Hydropsyche cockerelli</i>					
Arsenic	21	17.1	5.8	9.8	9.8
Cadmium	44	4.9	0.6	1.9	1.9
Chromium	44	4.5	0.4	2.0	2.0
Copper	44	241	54.7	110	103
Iron	44	3,340	490	1,320	1,160
Lead	44	24.9	3.8	10.9	10.2
Manganese	41	1,580	396	1,050	1,030
Nickel	44	3.3	0.3	1.4	1.3
Zinc	44	391	132	207	198
<i>Hydropsyche occidentalis</i>					
Arsenic	25	21.1	6.6	11.1	9.7
Cadmium	62	3.4	0.6	1.5	1.3
Chromium	62	3.7	0.6	2.0	1.9
Copper	62	222	49.4	123	121
Iron	62	3,240	557	1,510	1,490
Lead	62	20.1	3.5	11.8	11.8
Manganese	62	2,840	649	1,600	1,640
Nickel	62	12.9	1.0	1.7	1.5
Zinc	62	346	166	246	239

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12324200—Clark Fork at Deer Lodge—Continued Period of record for biological data: 1986–7, 1990–2017					
<i>Hydropsyche</i> spp.					
Arsenic	1	--	--	6.0	--
Cadmium	4	2.6	1.6	2.2	2.3
Chromium	1	--	--	0.8	--
Copper	4	222	91	166	176
Iron	4	2,220	1,070	1,770	1,900
Lead	4	16.7	9.0	14.4	15.9
Manganese	1	--	--	837	--
Nickel	1	--	--	0.9	--
Zinc	4	298	196	242	237
12324400—Clark Fork above Little Blackfoot River, near Garrison Period of record for biological data: 2009–17					
<i>Arctopsyche grandis</i>					
Arsenic	17	16.6	3.2	5.8	4.3
Cadmium	17	4.9	0.9	2.5	2.0
Chromium	17	4.6	0.6	1.5	1.3
Copper	17	209	35.4	74.2	54.6
Iron	17	2,580	257	711	453
Lead	17	18.0	2.8	6.5	4.7
Manganese	17	1,940	578	1,000	940
Nickel	17	2.2	0.5	1.0	0.8
Zinc	17	378	179	247	238
<i>Claassenia sabulosa</i>					
Arsenic	4	2.9	2.0	2.3	2.2
Cadmium	4	1.3	0.3	0.8	0.7
Chromium	4	0.6	0.3	0.5	0.6
Copper	4	73.1	58.3	67.7	69.7
Iron	4	284	173	254	279
Lead	4	2.3	1.7	2.0	2.1
Manganese	4	226	149	194	202
Nickel	4	0.8	0.6	0.7	0.7
Zinc	4	297	231	265	266

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12324400—Clark Fork above Little Blackfoot River, near Garrison—Continued Period of record for biological data: 2009–17					
<i>Hydropsyche cockerelli</i>					
Arsenic	7	11.1	6.1	8.2	7.8
Cadmium	7	4.0	0.9	1.9	1.4
Chromium	7	3.4	1.1	2.0	1.9
Copper	7	158	81.5	112	108
Iron	7	2,150	746	1,170	1,050
Lead	7	18.8	8.5	11.7	10.8
Manganese	7	1,880	984	1,280	1,130
Nickel	7	1.8	1.4	1.6	1.5
Zinc	7	284	205	226	213
<i>Hydropsyche occidentalis</i>					
Arsenic	13	14.7	6.4	9.5	8.4
Cadmium	13	2.5	1.0	1.8	1.7
Chromium	13	3.6	0.7	2.1	2.0
Copper	13	182	78.1	123	120
Iron	13	2,390	908	1,450	1,240
Lead	13	17.9	8.8	12.6	11.5
Manganese	13	2,100	975	1,460	1,340
Nickel	13	1.9	1.0	1.5	1.6
Zinc	13	299	223	251	248
<i>Hydropsyche</i> spp.					
Arsenic	1	--	--	13.6	--
Cadmium	1	--	--	1.7	--
Chromium	1	--	--	4.3	--
Copper	1	--	--	187	--
Iron	1	--	--	2,570	--
Lead	1	--	--	18.5	--
Manganese	1	--	--	919	--
Nickel	1	--	--	1.8	--
Zinc	1	--	--	296	--

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12324680—Clark Fork at Goldcreek					
Period of record for biological data: 1992–2017					
<i>Arctopsyche grandis</i>					
Arsenic	48	17.0	1.8	5.0	4.1
Cadmium	77	6.6	0.6	2.0	1.8
Chromium	77	5.3	0.1	1.3	1.1
Copper	77	232	19.9	50.3	39
Iron	77	3,070	195	729	516
Lead	77	16.9	1.0	4.0	3.4
Manganese	77	1,580	436	887	871
Nickel	77	3.1	0.2	0.8	0.7
Zinc	77	326	146	204	189
<i>Claassenia sabulosa</i>					
Arsenic	34	2.9	0.4	1.4	1.4
Cadmium	54	3.5	0.1	1.0	0.7
Chromium	54	1.6	0.2	0.7	0.6
Copper	54	84.9	29.7	58.9	58.2
Iron	54	640	63.0	203	171
Lead	54	2.8	0.4	1.0	0.9
Manganese	54	325	50.6	164	155
Nickel	54	1.0	0.1	0.4	0.3
Zinc	54	364	166	267	261
<i>Hydropsyche cockerelli</i>					
Arsenic	22	11.1	4.1	6.6	6.0
Cadmium	41	4.2	0.5	1.4	1.3
Chromium	41	4.7	0.5	2.5	2.0
Copper	41	188	17.1	76.1	61.4
Iron	41	3,250	522	1,180	1,010
Lead	41	17.6	2.4	6.9	5.5
Manganese	41	1,710	538	1,030	1,000
Nickel	41	3.5	0.3	1.3	1.2
Zinc	41	359	106	193	188

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12324680—Clark Fork at Goldcreek—Continued					
Period of record for biological data: 1992–2017					
<i>Hydropsyche morosa</i> group					
Arsenic	0	--	--	--	--
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	0.9	1.2	1.2
Zinc	4	190	137	167	170
<i>Hydropsyche occidentalis</i>					
Arsenic	18	11.5	4.4	6.9	6.5
Cadmium	33	2.3	0.4	1.3	1.3
Chromium	33	3.9	0.4	1.9	1.7
Copper	33	169	26.4	73.1	64.8
Iron	33	2,720	466	1,230	1,120
Lead	33	15.7	2.9	7.5	6.0
Manganese	33	2,900	530	1,300	1,180
Nickel	33	2.5	0.8	1.3	1.1
Zinc	33	328	97.0	206	203
<i>Hydropsyche</i> spp.					
Arsenic	2	5.9	5.7	5.8	--
Cadmium	2	1.8	1.7	1.8	--
Chromium	2	1.6	1.6	1.6	--
Copper	2	83.5	73.6	78.6	--
Iron	2	1,150	1,110	1,130	--
Lead	2	9.2	8.0	8.6	--
Manganese	2	1,180	1,130	1,160	--
Nickel	2	0.8	0.8	0.8	--
Zinc	2	210	196	203	--

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12331800—Clark Fork near Drummond Period of record for biological data: 1986, 1991–2017					
<i>Arctopsyche grandis</i>					
Arsenic	38	9.9	1.8	4.0	3.7
Cadmium	70	3.8	0.4	1.4	1.2
Chromium	70	4.2	0.1	1.1	1.0
Copper	70	103	16.9	34.9	28.2
Iron	70	2,400	193	611	486
Lead	70	12.4	1.6	4.7	3.9
Manganese	70	2,010	456	859	764
Nickel	70	2.6	0.1	0.7	0.6
Zinc	70	314	137	201	192
<i>Claassenia sabulosa</i>					
Arsenic	32	1.9	0.6	1.3	1.3
Cadmium	68	2.8	0.1	1.0	0.8
Chromium	68	3.3	0.1	0.6	0.5
Copper	68	165	18.0	63.7	60.3
Iron	68	449	45.4	178	148
Lead	68	2.9	0.2	1.0	0.9
Manganese	68	748	33.1	182	149
Nickel	68	1.1	0.1	0.3	0.3
Zinc	68	567	103	279	269
<i>Hydropsyche cockerelli</i>					
Arsenic	21	7.6	3.9	5.6	5.3
Cadmium	50	4.5	0.3	1.2	0.9
Chromium	50	3.5	0.4	1.6	1.6
Copper	50	156	30.0	58.4	51.7
Iron	50	2,500	506	1,160	940
Lead	50	15.0	4.7	8.1	7.4
Manganese	50	1,840	549	1,040	975
Nickel	50	2.0	0.5	1.2	1.1
Zinc	50	322	134	197	194

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12331800—Clark Fork near Drummond—Continued Period of record for biological data: 1986, 1991–2017					
<i>Hydropsyche morosa</i> group					
Arsenic	0	--	--	--	--
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	1,370	1,570	1,600
Lead	6	10.8	7.0	8.9	9.0
Manganese	6	1,940	1,260	1,610	1,610
Nickel	6	1.7	1.3	1.5	1.5
Zinc	6	250	227	239	240
<i>Hydropsyche occidentalis</i>					
Arsenic	22	9.2	4.3	5.8	5.8
Cadmium	38	2.9	0.4	1.1	1.0
Chromium	38	8.1	0.4	2.3	2.1
Copper	38	118	13.3	59.3	56.6
Iron	38	2,400	424	1,260	1,230
Lead	38	17.1	2.9	8.7	8.9
Manganese	38	2,920	477	1,480	1,260
Nickel	38	6.0	0.5	1.5	1.2
Zinc	38	344	153	226	222
<i>Hydropsyche</i> spp.					
Arsenic	2	7.9	7.8	7.8	--
Cadmium	3	2.6	1.2	1.7	1.3
Chromium	2	3.5	2.7	3.1	3.1
Copper	3	94.4	85.0	90.1	90.9
Iron	3	2,220	913	1,800	2,150
Lead	3	10.8	9.1	9.9	9.9
Manganese	2	1,390	1,370	1,380	1,380
Nickel	2	2.4	2.4	2.4	2.4
Zinc	3	260	238	246	239

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12334550—Clark Fork at Turah Bridge, near Bonner Period of record for biological data: 1986, 1991–2017					
<i>Arctopsyche grandis</i>					
Arsenic	39	7.2	2.8	4.4	4.3
Cadmium	81	2.7	0.3	1.2	1.0
Chromium	81	4.1	0.2	1.5	1.4
Copper	81	125	15.9	36.7	31.7
Iron	81	2,870	321	893	788
Lead	81	13.2	1.6	4.3	3.7
Manganese	81	1,050	324	656	662
Nickel	81	2.7	0.4	1.1	0.9
Zinc	81	282	111	204	204
<i>Claassenia sabulosa</i>					
Arsenic	27	3.1	0.2	1.1	1.0
Cadmium	53	2.5	0.05	1.1	0.8
Chromium	53	2.0	0.2	0.7	0.6
Copper	53	97.8	37.5	59.8	55.0
Iron	53	378	58.6	133	114
Lead	53	1.6	0.2	0.6	0.6
Manganese	53	229	37.2	102	90.6
Nickel	53	0.6	0.04	0.2	0.2
Zinc	53	429	144	239	243
<i>Hydropsyche cockerelli</i>					
Arsenic	30	9.8	3.7	4.9	4.8
Cadmium	58	2.2	0.3	0.9	0.7
Chromium	58	14.2	0.1	2.2	1.7
Copper	58	126	26.4	49.0	44.1
Iron	58	3,180	566	1,240	1,120
Lead	58	19.7	2.2	5.7	5.2
Manganese	58	957	426	656	666
Nickel	58	2.7	0.6	1.3	1.3
Zinc	58	332	119	192	195

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12334550—Clark Fork at Turah Bridge, near Bonner—Continued Period of record for biological data: 1986, 1991–2017					
<i>Hydropsyche morosa</i> group					
Arsenic	0	--	--	--	--
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	15.2	--
Manganese	2	1,320	537	928	--
Nickel	2	1.7	1.3	1.5	--
Zinc	2	231	171	201	--
<i>Hydropsyche occidentalis</i>					
Arsenic	24	7.3	2.9	4.7	4.3
Cadmium	44	1.8	0.3	0.9	0.9
Chromium	44	5.0	0.6	2.0	1.8
Copper	44	102	20.1	48.2	44.8
Iron	44	2,590	472	1,280	1,150
Lead	44	14.2	2.8	6.4	5.6
Manganese	44	1,600	454	845	807
Nickel	44	3.2	0.6	1.3	1.2
Zinc	44	416	126	214	220
<i>Hydropsyche</i> spp.					
Arsenic	1	--	--	4.4	--
Cadmium	2	1.3	1.1	1.2	--
Chromium	2	2.6	2.4	2.5	--
Copper	2	84.1	50.5	67.3	--
Iron	2	1,800	1,430	1,610	--
Lead	2	7.8	5.9	16.8	--
Manganese	2	980	537	759	--
Nickel	2	1.7	1.3	1.5	--
Zinc	2	231	171	201	--

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12340000—Blackfoot River near Bonner					
Period of record for biological data: 1986–7, 1991, 1993, 1996, 1998, 2000, 2003, 2006–17					
<i>Arctopsyche grandis</i>					
Arsenic	17	4.6	1.6	2.7	2.6
Cadmium	27	0.5	0.1	0.3	0.2
Chromium	22	6.9	0.5	2.0	1.5
Copper	27	19.3	9.9	13.7	12.8
Iron	27	1,880	108	763	765
Lead	27	2.3	0.5	1.1	0.9
Manganese	22	633	286	446	422
Nickel	22	3.7	0.7	1.4	1.2
Zinc	27	170	106	144	147
<i>Claassenia sabulosa</i>					
Arsenic	13	3.0	0.1	1.0	0.7
Cadmium	24	0.2	0.1	0.1	0.2
Chromium	19	5.2	0.3	1.0	0.7
Copper	24	88.5	19.0	43.3	44.0
Iron	24	317	46.2	144	137
Lead	24	0.8	0.1	0.3	0.2
Manganese	19	133	26.3	79.3	73.4
Nickel	19	1.1	0.1	0.3	0.3
Zinc	24	399	117	229	207
<i>Hydropsyche cockerelli</i>					
Arsenic	12	4.2	2.1	3.2	3.1
Cadmium	12	0.6	<0.1	0.3	0.3
Chromium	12	5.7	1.6	3.4	3.5
Copper	12	17.5	5.6	14.7	15.2
Iron	12	2,400	1,120	1,720	1,600
Lead	12	2.6	1.5	2.0	1.9
Manganese	12	814	409	556	542
Nickel	12	4.5	1.4	2.0	1.8
Zinc	12	165	132	148	148

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12340000—Blackfoot River near Bonner—Continued					
Period of record for biological data: 1986–7, 1991, 1993, 1996, 1998, 2000, 2003, 2006–17					
<i>Hydropsyche occidentalis</i>					
Arsenic	16	3.8	1.2	2.2	2.1
Cadmium	28	0.5	0.1	0.2	0.2
Chromium	28	5.8	0.8	2.2	1.9
Copper	28	20.9	12.0	15.9	15.8
Iron	28	2,090	927	1,470	1,480
Lead	28	2.0	0.8	1.5	1.6
Manganese	28	798	412	520	461
Nickel	28	4.9	0.9	1.6	1.4
Zinc	28	202	116	145	145
<i>Hydropsyche</i> spp.					
Arsenic	2	4.0	3.1	3.5	--
Cadmium	3	0.6	0.2	0.3	0.2
Chromium	3	4.4	1.6	2.9	2.8
Copper	3	19.9	13.9	17.4	18.3
Iron	3	2,100	1,140	1,480	1,180
Lead	3	2.9	1.8	2.2	2.0
Manganese	3	693	525	613	623
Nickel	3	2.8	2.4	2.7	2.7
Zinc	3	211	132	167	160
12340500—Clark Fork above Missoula					
Period of record for biological data: 1997–2017					
<i>Arctopsyche grandis</i>					
Arsenic	39	7.2	1.2	3.6	3.5
Cadmium	58	2.3	0.1	1.0	0.8
Chromium	58	4.2	0.3	1.6	1.4
Copper	58	81.2	13.7	36.1	29.1
Iron	58	2,340	302	944	824
Lead	58	8.9	1.1	3.8	3.2
Manganese	58	1,400	476	898	868
Nickel	58	2.1	0.3	1.1	1.1
Zinc	58	272	133	199	197

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12340500—Clark Fork above Missoula—Continued Period of record for biological data: 1997–2017					
<i>Claassenia sabulosa</i>					
Arsenic	27	1.9	0.1	1.1	1.1
Cadmium	36	2.0	0.2	0.8	0.6
Chromium	36	2.9	0.1	0.9	0.7
Copper	36	81.1	25.8	50.4	48.6
Iron	36	424	82.0	220	227
Lead	36	3.1	0.2	0.9	0.8
Manganese	36	683	57.8	184	139
Nickel	36	1.5	0.2	1.0	1.0
Zinc	36	384	191	280	272
<i>Hydropsyche cockerelli</i>					
Arsenic	29	9.3	2.4	5.5	5.2
Cadmium	38	2.0	0.1	0.9	0.8
Chromium	38	6.0	1.0	2.8	2.4
Copper	38	99.7	24.4	56.4	47.8
Iron	38	3,590	830	1,850	1,810
Lead	38	12.1	2.5	6.7	5.9
Manganese	38	1,910	764	1,150	1,150
Nickel	38	2.5	0.9	1.8	1.7
Zinc	38	266	156	217	219
<i>Hydropsyche</i> spp.					
Arsenic	1	--	--	3.3	--
Cadmium	1	--	--	1.0	--
Chromium	1	--	--	<3.4	--
Copper	1	--	--	45.4	--
Iron	1	--	--	1,140	--
Lead	1	--	--	4.6	--
Manganese	1	--	--	1,180	--
Nickel	1	--	--	2.8	--
Zinc	1	--	--	223	--

Table 23. Statistical summary of long-term biological data for the Clark Fork Basin, Montana, August 1986 through August 2017.—Continued

[Reported 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 a single sample are arbitrarily listed in the “Mean” column. Because *Hydropsyche* insects were not sorted to the species level during 1986–9, *Hydropsyche* species statistics for stations sampled during those years are based on the results of all *Hydropsyche* species combined. At some sites, statistics of the *Hydropsyche morosa* group are based on the combined results of two or more species. Insects collected during 1986–98 were depurated before analysis; depuration was discontinued in 1999. Arsenic was not analyzed until 2003; therefore, the number of samples may be small or zero for some taxa. spp., one or more similar species; --, indicates either too few samples (less than three) or insufficient data to compute statistic, or element not analyzed; <, less than minimum reporting level]

Constituent	Number of composite samples	Maximum	Minimum	Mean	Median
12340500—Clark Fork above Missoula—Continued Period of record for biological data: 1997–2017					
<i>Hydropsyche occidentalis</i>					
Arsenic	14	7.4	2.2	5.0	5.1
Cadmium	20	1.5	0.4	0.8	0.7
Chromium	20	5.5	0.7	2.9	3.0
Copper	20	80.7	25.3	51.6	57.3
Iron	20	2,540	690	1,820	1,990
Lead	20	11.4	2.1	6.5	6.3
Manganese	20	2,470	717	1,510	1,560
Nickel	20	2.4	0.7	1.8	1.7
Zinc	20	278	183	230	230

¹Values determined by substituting one-half of the minimum reporting level for censored (<) values when both uncensored and censored values were used in determining the mean and median.

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