Appendix 1—Summary Information Relating to Quality-Control, Water-Quality, and Continuous Streamflow Data

Summary information is presented relating to quality-control, water-quality, and continuous streamflow data. Results for quality-control equipment blank and replicate samples collected during water years 1993–2010 are summarized in table 1–1. Spike recoveries for laboratory-spiked deionized-water blank samples collected during water years 1993–2010 are presented in table 1–2. Spike recoveries for laboratory-spiked stream-water blank samples collected during water years 1993–2010 are presented in table 1–3. Statistical summaries of water-quality data collected during water years 2001–10 are presented in table 1–4. For reference, aquatic life standards (based on median hardness for water years 2001–10, Montana Department of Environmental Quality, 2012a) are presented in table 1–5. Statistical summaries of continuous streamflow data collected during water years 2001–10 are presented in table 1–6.

Evaluation of long-term spike-recovery data is of particular relevance to the long-term trend analysis. Spike-recoveries during water years 1993–2010 for laboratory-spiked deionized-water blank samples (table 1–2 and fig. 1–1) and laboratory-spiked stream-water samples (table 1–3 and fig. 1–2) indicate generally consistent recoveries over time, typically varying within plus or minus 10 percent of 100 percent recovery. However, before about water year 2000, spike recoveries for unfiltered-recoverable copper in spiked stream-water samples generally were near 100 percent (mean annual spike recovery for water years 1993–1999 of 99.1 percent), whereas after about water year 2000, spike recoveries were consistently less than 100 percent (mean annual spike recovery for water years 2000–2010 of 93.9 percent). Changes in spike recoveries in about water year 2000 probably were related to a change in about water year 2000 by the U.S. Geological Survey National Water Quality Laboratory from analysis of most metallic elements by graphite furnace atomic absorption spectrophotometry (Fishman, 1993) to inductively coupled plasma-mass spectrometry (Garbarino and Struzeski, 1998; Garbarino and others, 2006). Potential effects on trend results of differences in spike recoveries between pre-2000 and post-2000 data relate only to sites with long-term data that were analyzed by using the TSM.

The potential effects of temporal differences in spike recoveries on trend results were evaluated by using two approaches: (1) exploratory TSM analysis with inclusion of a step trend in the trend model, and (2) exploratory TSM analysis on constituent concentrations adjusted based on annual mean spike recoveries. For the exploratory step-trend approach, for each site and constituent combination a step trend for the period water years 1996–1999 was included in the TSM model in addition to including applicable trends for periods 1 through 3 (depending on available data for the given site and constituent combination). Inclusion of a step trend allowed evaluation of whether there was a distinct change in data structure between pre-2000 and post-2000 data that might have affected trend results. Results of the exploratory step-trend analysis indicated that for all site and constituent combinations, the step trend was nonsignificant, and inclusion of the step trend had minor effects on trend results with respect to magnitude, direction, and significance on constituent concentration trends. For the exploratory spike-recovery adjustment approach, before TSM analysis constituent concentrations for each year were adjusted by multiplying the concentrations divided by the annual mean spike recovery for laboratory-spiked stream-water samples. Results of the exploratory spike-recovery adjustment analysis were more variable than results for the exploratory step-trend approach but resulted in the same general conclusion that temporal differences in spike recoveries had minor effects on trend results.

Table 1–1. Summary information relating to quality-control samples (equipment blank and replicate samples) collected at sites in the upper Clark Fork Basin, Montana, based on data collected during water years 1993–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. LRL, laboratory reporting level; SRL, study reporting level; RSD, relative standard deviation; µS/cm, microsiemens per centimeter at 25 degrees Celsius; NA, not applicable; µg/L, micrograms per liter; mg/L, milligrams per liter]

Constituent or property, units of measurement	Summary information relating to field blank samples							Summary informaiton relating to field replicate samples	
	Number of field blank samples	Number of field blank samples with detected concentrations greater than the LRL at the time of analysis	Percent of field blank samples with detected concentrations greater than the LRL at the time of analysis	Maximum detected concentration for field blank samples	Median concentration in field blank samples with detected concentrations greater than the LRL at the time of analysis	SRL used in application of the time-series model	Percent of detections in blank samples at concentrations greater than the SRL used in the application of the time-series model	Number of field replicate pairs	*RSD*[1], percent
Specific conductance, µS/cm	NA	NA	NA	NA	NA	8	NA	121	0.1
Cadmium, filtered, µg/L	158	3	1.9	0.34	0.07	0.05	3.2	139	12.7
Cadmium, unfiltered-recoverable, µg/L	154	0	0	no detections	no detections	0.09	0	140	3.9
Copper, filtered, µg/L	157	8	5.1	3.6	0.52	1	1.3	141	12.4
Copper, unfiltered-recoverable, µg/L	154	6	3.9	3.0	1.0	1	1.9	140	8.7
Iron, filtered,µg/L	154	0	0	no detections	no detections	6	0	130	9.8
Iron unfiltered-recoverable, µg/L	150	4	2.7	36	7	20	2.0	138	5.5
Lead, filtered, µg/L	158	4	2.5	0.60	0.23	0.5	0.6	137	11.0
Lead, unfiltered-recoverable, µg/L	154	3	1.9	0.16	0.06	0.5	0	140	16.2
Manganese, filtered, µg/L	153	0	0	no detections	no detections	1	0	142	5.5
Manganese, unfiltered-recoverable, µg/L	150	2	1.3	0.30	0.15	1	0	140	5.6
Zinc, filtered, µg/L	156	23	14.7	6.20	0.90	5	0.6	141	8.6
Zinc, unfiltered-recoverable, µg/L	152	10	6.6	3.40	1.40	2	3.3	141	8.4
Arsenic, filtered, µg/L	158	0	0	no detections	no detections	1	0	142	6.1
Arsenic, unfiltered-recoverable, µg/L	154	0	0	no detections	no detections	1	0	141	7.5
Suspended sediment, mg/L	NA	NA	NA	NA	NA	1	NA	129	9.6

[1]The *RSD* is calculated according to the following equation (Taylor, 1987):

$$RSD = \frac{S}{\bar{x}} \text{ x } 100,$$

where

RSD is the relative standard deviation;

S is the standard deviation; and

$\bar{x}$ is the mean contentration for all replicates.

Table 1–2. Summary information relating to quality-control samples (laboratory-spiked deionized-water blank samples) collected at sites in the upper Clark Fork Basin, Montana, based on data collected during water years 1993–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. F, filtered; UFR, unfiltered-recoverable]

Water year	Mean spike recovery, percent (values in parentheses indicate 95-percent confidence intervals)													
	Cadmium, F	Cadmium, UFR	Copper, F	Copper, UFR	Iron, F	Iron, UFR	Lead, F	Lead, UFR	Manganese, F	Manganese, UFR	Zinc, F	Zinc, UFR	Arsenic, F	Arsenic, UFR
1993	93.4 (85.9, 101)	97 (93.5, 101)	99.5 (95.9, 103)	101.7 (94.4, 109)	94 (90.0, 98.0)	103.3 (92.4, 114)	105.8 (99.5, 112)	100.5 (95.2, 106)	96.9 (96.3, 97.5)	95.6 (82.2, 109)	106.5 (99.7, 113)	96.3 (94.1, 98.5)	94 (89.6, 98.4)	102.6 (95.8, 109)
1994	97.5 (89.1, 106)	98.8 (90.6, 107)	101.1 (98.4, 104)	99.7 (94.3, 105)	100 (93.0, 107)	94.6 (84.2, 105)	100.5 (98.5, 102)	99.1 (94.3, 104)	95.7 (90.8, 100)	101.5 (96.2, 107)	106.5 (95.8, 117)	102.6 (91.5, 114)	100.6 (95.6, 106)	109.3 (104, 114)
1995	100 (97.3, 103)	101.3 (97.5, 105)	102.7 (101, 105)	97.6 (92.3, 103)	102.2 (97.8, 107)	93.8 (87.9, 99.7)	1023 (97.7, 107)	100.8 (96.6, 105)	96.5 (92.0, 101)	98.5 (93.1, 104)	102.3 (97.1, 108)	101.5 (97.1, 106)	103.9 (99.1, 109)	106.8 (103, 110)
1996	95.3 (92.2, 98.4)	82.3 (79.7, 84.9)	99.2 (91.4, 107)	99.6 (93.5, 106)	89.8 (76.0, 104)	90.8 (70.9, 111)	100.5 (93.3, 108)	97.4 (80.2, 115)	89.2 (77.9, 100)	96.5 (91.6, 101)	96.1 (84.3, 108)	87.8 (82.8, 92.8)	89.7 (77.1, 102)	104.1 (101, 107)
1997	98.5 (92.1, 105)	85.7 (77.7, 93.7)	101.1 (86.2, 116)	106.4 (82.0, 131)	94.7 (78.5, 111)	96.1 (80.2, 112)	101 (93.4, 109)	101.1 (88.9, 113)	90.3 (82.7, 97.9)	99.3 (95.8, 103)	97.9 (78.1, 118)	92.7 (86.4, 99.0)	93.9 (87.8, 100)	106.1 (104, 108)
1998	104 (93.8, 114)	97.4 (87.0, 108)	100.4 (93.4, 107)	103.4 (98.8, 108)	101.8 (90.7, 113)	95.7 (89.9, 102)	100.2 (91.8, 109)	104.8 (88.8, 121)	102.8 (94.4, 111)	99 (92.1, 106)	95.2 (85.9, 104)	101.3 (86.9, 116)	91.5 (87.3, 95.7)	105.4 (99.2, 112)
1999	100.9 (92.6, 109)	103.4 (99.9, 107)	107.5 (99.5, 116)	105 (102, 108)	97.7 (94.3, 101)	96.5 (90.0, 103)	97.4 (87.9, 107)	96.2 (85.2, 107)	96 (91.8, 100)	95.9 (86.3, 106)	96.9 (92.9, 101)	93.3 (88.9, 97.7)	108.9 (95.4, 122)	102.9 (97.8, 108)
2000	103.8 (97.3, 110)	105 (96.0, 114)	104 (96.0, 112)	100.3 (92.4, 108)	97.4 (92.3, 102)	100.6 (89.2, 112)	98.3 (88.9, 108)	102.6 (97.3, 108)	100.8 (93.3, 108)	103.2 (96.8, 110)	107.8 (95.8, 120)	102.6 (90.0, 115)	101.6 (95.3, 108)	101.4 (95.1, 108)
2001	102.9 (98.9, 107)	107.9 (101, 115)	105.2 (98.6, 112)	96.8 (93.7, 99.9)	101.3 (95.5, 107)	98.3 (86.7, 110)	97.3 (91.9, 103)	96.4 (93.7, 99.1)	101.9 (79.0, 125)	103.7 (89.9, 118)	102 (87.9, 116)	99.1 (82.7, 116)	99.2 (92.3, 106)	97.7 (86.6, 109)
2002	101.1 (98.8, 103)	97.6 (96.3, 98.9)	99.4 (95.0, 104)	98.8 (96.7, 101)	95.1 (89.3, 101)	102.3 (93.0, 112)	98.5 (89.9, 107)	96.9 (90.5, 103)	98.5 (95.4, 102)	96.5 (88.8, 104)	103.9 (94.4, 113)	98.3 (91.8, 105)	105.1 (95.8, 114)	97.9 (93.0, 103)
2003	98.6 (92.6, 105)	97.5 (94.1, 101)	100.4 (93.0, 108)	97.6 (93.2, 102)	101.6 (96.4, 107)	93.1 (87.4, 8.8)	97.2 (92.3, 102)	96 (93.9, 98.1)	95.8 (90.7, 101)	96.6 (79.7, 114)	101.4 (89.8, 113)	99.1 (93.2, 105)	87.9 (71.3, 104)	96.6 (78.5, 115)
2004	97.4 (95.6, 99.2)	100 (98.6, 101)	98.9 (92.7, 105)	99.6 (95.4, 104)	101 (96.3, 106)	96.1 (88.8, 103)	96 (91.9, 100)	98.9 (97.3, 100)	99.1 (92.3, 106)	98.6 (90.6, 107)	102 (91.7, 112)	100 (96.3, 104)	101 (75, 127)	102 (93.6, 110)
2005	102 (97.3, 106)	97.5 (88.1, 107)	102 (97.4, 107)	97.6 (88.4, 107)	97.6 (90.5, 105)	100 (95.2, 105)	101 (95.5, 106)	104 (99.4, 108)	93.8 (82.2, 105)	102 (86.4, 117)	102 (88.3, 116)	96.1 (83.5, 109)	97.4 (95.5, 99.3)	101 (90.7, 111)

Table 1–2. Summary information relating to quality-control samples (laboratory-spiked deionized-water blank samples) collected at sites in the upper Clark Fork Basin, Montana, based on data collected during water years 1993–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. F, filtered; UFR, unfiltered-recoverable]

Water year	Mean spike recovery, percent (values in parentheses indicate 95-percent confidence intervals)													
	Cadmium, F	Cadmium, UFR	Copper, F	Copper, UFR	Iron, F	Iron, UFR	Lead, F	Lead, UFR	Manganese, F	Manganese, UFR	Zinc, F	Zinc, UFR	Arsenic, F	Arsenic, UFR
2006	100 (92.6, 107)	98.9 (94.1, 104)	102 (97.7, 107)	98.7 (93.8, 104)	106 (101, 112)	103 (95.4, 111)	99 (89.3, 109)	98 (91.2, 105)	97 (90.7, 103)	105 (95.3, 115)	105 (95.4, 115)	94.9 (90.1, 100)	95.2 (89.2, 101)	98.5 (94.7, 102)
2007	107 (103, 112)	103 (94.4, 111)	105 (99.2, 111)	98.4 (86.9, 110)	99.9 (92.1, 108)	104 (98.5, 110)	99.6 (93.9, 105)	103 (100, 106)	107 (99.9, 114)	107 (97.0, 116)	107 (102, 113)	103 (96.5, 110)	105 (96.6, 114)	102 (95.2, 109)
2008	102 (88.2, 116)	101 (91.9, 110)	105 (88, 121)	97.9 (87.2, 109)	103 (95.9, 110)	101 (96.5, 106)	101 (89, 112)	101 (98, 105)	102 (92.9, 111)	102 (92.5, 112)	99.8 (87.9, 112)	103 (96, 111)	103 (89.2, 117)	102 (93.9, 110)
2009	102 (97.4, 107)	97.2 (93.6, 101)	102 (92.0, 113)	96 (94.0, 97.0)	102 (91.4, 112)	104 (78.8, 130)	102 (96.0, 107)	98.4 (96.1, 101)	105 (103, 106)	99.7 (94.6, 105)	111 (104, 118)	93.3 (88.5, 98.1)	101 (92.3, 110)	97 (94.9, 99.1)
2010	106 (94.9, 117)	100 (88.4, 112)	97.2 (84.9, 109)	98.6 (84.0, 113)	108 (101, 115)	102 (95.8, 108)	102 (91.5, 113)	102 (91.0, 113)	103 (95.2, 111)	105 (97.2, 112)	113 (94.7, 132)	101 (89.6, 113)	105 (96.7, 113)	102 (89.7, 114)

Table 1–3. Summary information relating to quality-control samples (laboratory-spiked stream-water samples) collected at sites in the upper Clark Fork Basin, Montana, based on data collected during water years 1993–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. F, filtered; UFR, unfiltered-recoverable]

Water year	Mean spike recovery, percent (values in parentheses indicate 95-percent confidence intervals)													
	Cadmium, F	Cadmium, UFR	Copper, F	Copper, UFR	Iron, F	Iron, UFR	Lead, F	Lead, UFR	Manganese, F	Manganese, UFR	Zinc, F	Zinc, UFR	Arsenic, F	Arsenic, UFR
1993	97.1 (92.3, 102)	98.1 (95.2, 101)	97.4 (95.8, 99.0)	97.2 (92.3, 102)	94.6 (86.7, 103)	102.2 (94.4, 110)	104.7 (98.5, 111)	96 (93.0, 99.0)	95.7 (92.1, 99.3)	100.2 (96.4, 104)	105.7 (93.4, 118)	95.7 (92.2, 99.2)	95.2 (92.0, 98.3)	99.9 (96.5, 103)
1994	101.3 (97.5, 105)	97.9 (94.4, 101)	96.6 (93.3, 99.8)	98.4 (91.1, 106)	98.2 (94.8, 102)	99.3 (90.6, 108)	103 (101, 105)	99.3 (95.6, 103)	98.1 (95.4, 101)	100.4 (95.4, 105)	97.5 (92.4, 102)	106 (95.4, 117)	97.3 (90.4, 104)	106.9 (101, 113)
1995	101.3 (96.7, 106)	102.9 (98.0, 108)	99.8 (96.2, 103)	98 (92.7, 103)	99.5 (96.1, 103)	101.4 (96.2, 107)	102.9 (98.6, 107)	100 (96.7, 103)	97.4 (92.9, 102)	103.8 (99.0, 109)	104.7 (101, 108)	101.1 (99.1, 103)	103.8 (94.6, 113)	102.2 (97.1, 107)
1996	100.2 (91.5, 109)	88.4 (57.8, 119)	101.1 (91.9, 110)	100.3 (92.3, 108)	93.8 (73.3, 114)	101.5 (88.5, 114)	105.1 (90.4, 120)	105.6 (98.4, 113)	90.3 (79.1, 102)	99.5 (92.9, 106)	103.2 (90.2, 116)	99.3 (74.8, 124)	105.9 (94.4, 117)	102.8 (96.0, 110)
1997	98.1 (83.5, 113)	84.3 (75.0, 93.6)	97.3 (88.3, 106)	100.5 (71.9, 129)	99.3 (81.0, 118)	97.5 (78.2, 117)	100.8 (91.6, 110)	102.1 (99.1, 105)	93 (84.0, 102)	99.8 (94.5, 105)	97 (89.9, 104)	92.7 (74.4, 111)	93.3 (73.5, 113)	107.1 (99.9, 114)
1998	104.4 (97.3, 112)	99.5 (92.7, 106)	97.2 (90.6, 104)	99.1 (88.4, 110)	97.5 (82.8, 112)	101.8 (90.2, 113)	102.2 (94.3, 110)	105 (92.9, 117)	99.5 (85.8, 113)	101.5 (98.0, 105)	99.5 (89.1, 110)	98.8 (85.6, 112)	90.1 (85.5, 94.7)	104 (95.8, 112)
1999	102.6 (92.4, 113)	103 (100, 106)	102.7 (89.1, 116)	100.5 (97.5, 104)	97.2 (93.5, 101)	99.9 (90.6, 109)	100.2 (94.0, 106)	101.1 (93.7, 108)	99.8 (92.8, 107)	98.8 (89.3, 108)	98.6 (95.7, 102)	96.2 (91.1, 101)	105.2 (97.5, 113)	103.6 (96.4, 111)
2000	104.2 (100, 108)	98.1 (88.9, 107)	101.6 (97.3, 106)	94.6 (87.7, 102)	96.5 (88.0, 105)	98 (88.3, 108)	101.4 (97.3, 106)	105.3 (103, 108)	97.3 (83.3, 111)	101.7 (91.4, 112)	101.5 (90.9, 112)	97.8 (91.1, 104)	102.5 (97.5, 108)	98.9 (87.8, 110)
2001	103.2 (100, 106)	105.8 (95.9, 116)	106.8 (104, 110)	91.8 (87.7, 95.9)	95.8 (91.4, 100)	101.6 (92.1, 111)	99.7 (95.2, 104)	97.3 (95.3, 99.3)	100 (84.4, 116)	100.9 (90.3, 112)	100.8 (85.7, 116)	96.9 (75.9, 118)	102.8 (95.1, 110)	100.1 (96.7, 104)
2002	106 (97.5, 114)	102 (98.6, 101)	97.3 (91.2, 103)	96.9 (92.9, 101)	92.6 (83.3, 102)	107.1 (103, 111)	101.4 (91.9, 111)	98.9 (92.2, 106)	98.3 (92.5, 104)	94.3 (88.4, 100)	101.3 (92.6, 110)	95.8 (89.9, 102)	105.8 (97.1, 114)	99.9 (86.0, 114)
2003	100.5 (91.4, 110)	99 (94.4, 104)	95.8 (88.9, 103)	91.6 (89.7, 93.5)	106.4 (100, 113)	96.7 (91.6, 102)	96 (90.2, 102)	96.8 (93.7, 99.9)	93.9 (78.8, 109)	99.3 (86.2, 112)	98.4 (93.6, 103)	93 (87.5, 98.5)	94.6 (80.2, 109)	108.6 (100, 117)
2004	101 (94.2, 108)	101 (100, 103)	95.4 (93.8, 97)	93.8 (89.5, 98.1)	104 (99.5, 108)	111 (91.2, 130)	98.7 (93, 104)	100 (98.6, 102)	103 (89.8, 117)	96 (91.8, 100)	100 (95.3, 105)	94.4 (91, 97.8)	97.3 (86.9, 108)	112 (106, 118)
2005	97.8 (62.7, 133)	98.2 (88.5, 108)	93.6 (57.9, 129)	93 (84.8, 101)	102 (95.9, 108)	99.3 (95.6, 103)	102 (96.1, 109)	103 (99.7, 106)	88.3 (78.3, 98.3)	97.5 (87.3, 108)	94.3 (60.8, 128)	91.6 (80.8, 102)	103 (98.3, 107)	104 (101, 108)

Table 1–3. Summary information relating to quality-control samples (laboratory-spiked deionized-water blank samples) collected at sites in the upper Clark Fork Basin, Montana, based on data collected during water years 1993–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. F, filtered; UFR, unfiltered-recoverable]

Water year	Mean spike recovery, percent (values in parentheses indicate 95-percent confidence intervals)													
	Cadmium, F	Cadmium, UFR	Copper, F	Copper, UFR	Iron, F	Iron, UFR	Lead, F	Lead, UFR	Manganese, F	Manganese, UFR	Zinc, F	Zinc, UFR	Arsenic, F	Arsenic, UFR
2006	104 (99.0, 108)	99.6 (94.7, 104)	101 (96.7, 104)	94.8 (91.0, 98.6)	105 (102, 109)	102 (93.6, 110)	102 (94.2, 111)	100 (92.9, 106)	94.9 (88.2, 102)	106 (97.9, 113)	108 (93.3, 123)	91.2 (87.8, 94.6)	96.5 (89.0, 104)	99.1 (94.9, 103)
2007	108 (102, 114)	98 (92.2, 104)	100 (89.8, 110)	96.3 (91.8, 101)	107 (103, 111)	103 (94.7, 112)	109 (103, 115)	104 (102, 107)	106 (100, 113)	101 (96.1, 106)	104 (95.7, 113)	98 (89.2, 107)	106 (100, 113)	102 (98.2, 106)
2008	101 (91, 112)	97 (93.6, 100)	98.9 (92, 106)	92.8 (86.4, 99.1)	105 (94.1, 117)	99.4 (92, 107)	100 (91.3, 109)	103 (99.5, 106)	98.9 (90.3, 108)	98.4 (92.5, 104)	106 (88.1, 124)	95.7 (93.1, 98.2)	100 (90.2, 110)	101 (98.5, 104)
2009	106 (101, 112)	94.7 (89.5, 99.8)	96.2 (91.2, 101)	91.4 (87.8, 95.0)	107 (89.7, 124)	102 (86.9, 118)	100 (97.0, 103)	100 (98.8, 101)	97 (88.0, 106)	92.8 (81.7, 104)	114 (104, 124)	89.8 (80.4, 99.2)	106 (97.7, 114)	100 (89.6, 111)
2010	110 (87.6, 132)	98.2 (87.1, 109)	93.8 (83.6, 104)	96.5 (84.4, 108)	105 (91.7, 119)	111 (103, 118)	101 (87.7, 115)	104 (91.5, 116)	104 (93.3, 114)	98.7 (86.4, 111)	109 (101, 118)	94 (81.3, 107)	106 (96.0, 116)	102 (90.1, 113)

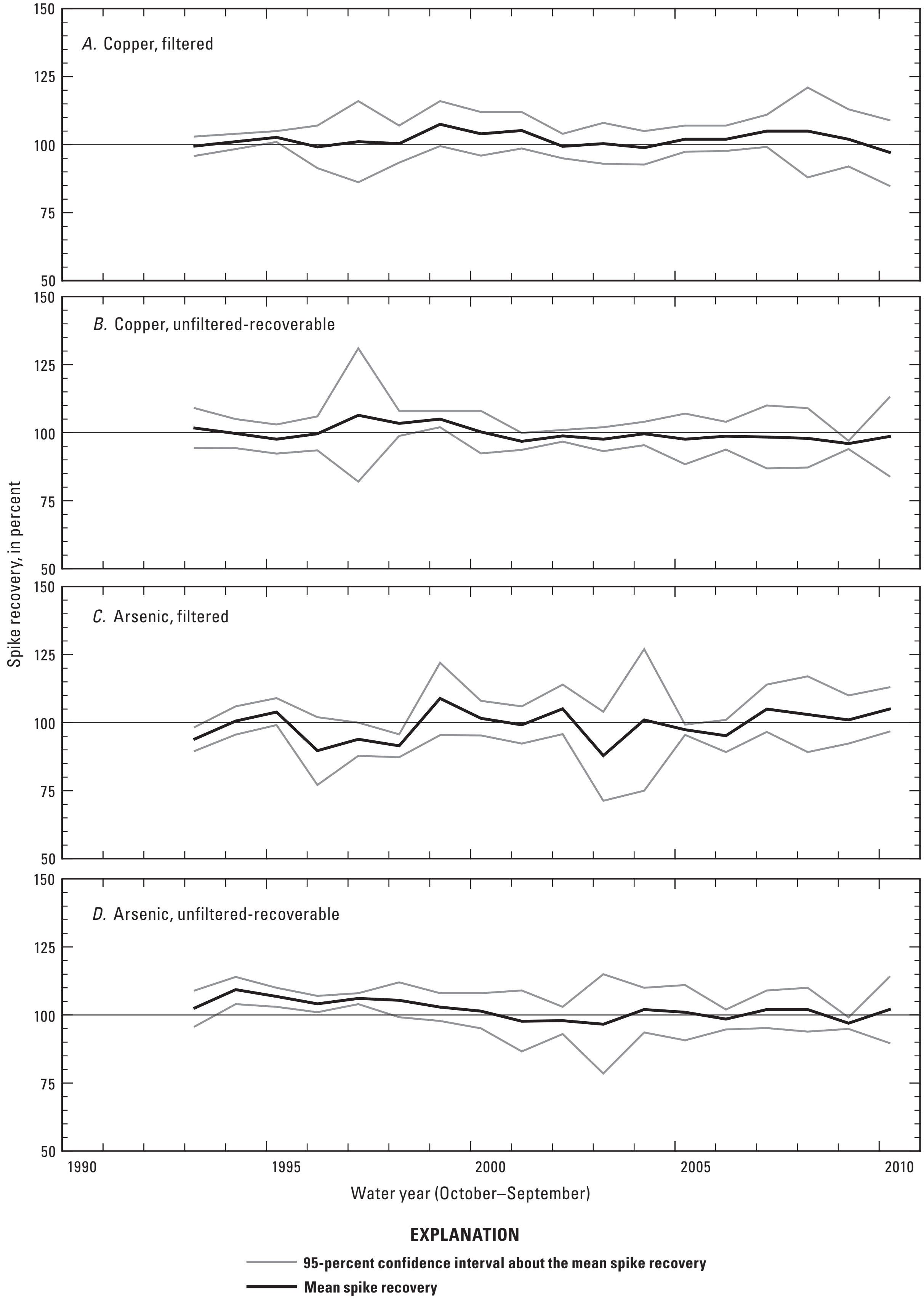

Figure 1–1. Spike recoveries for laboratory-spiked deionized-water blank samples, based on data collected during water years 1993–2010. *A*, Copper, filtered; *B*, Copper, unfiltered-recoverable; *C*, Arsenic, filtered; *D*, Arsenic, unfiltered-recoverable.

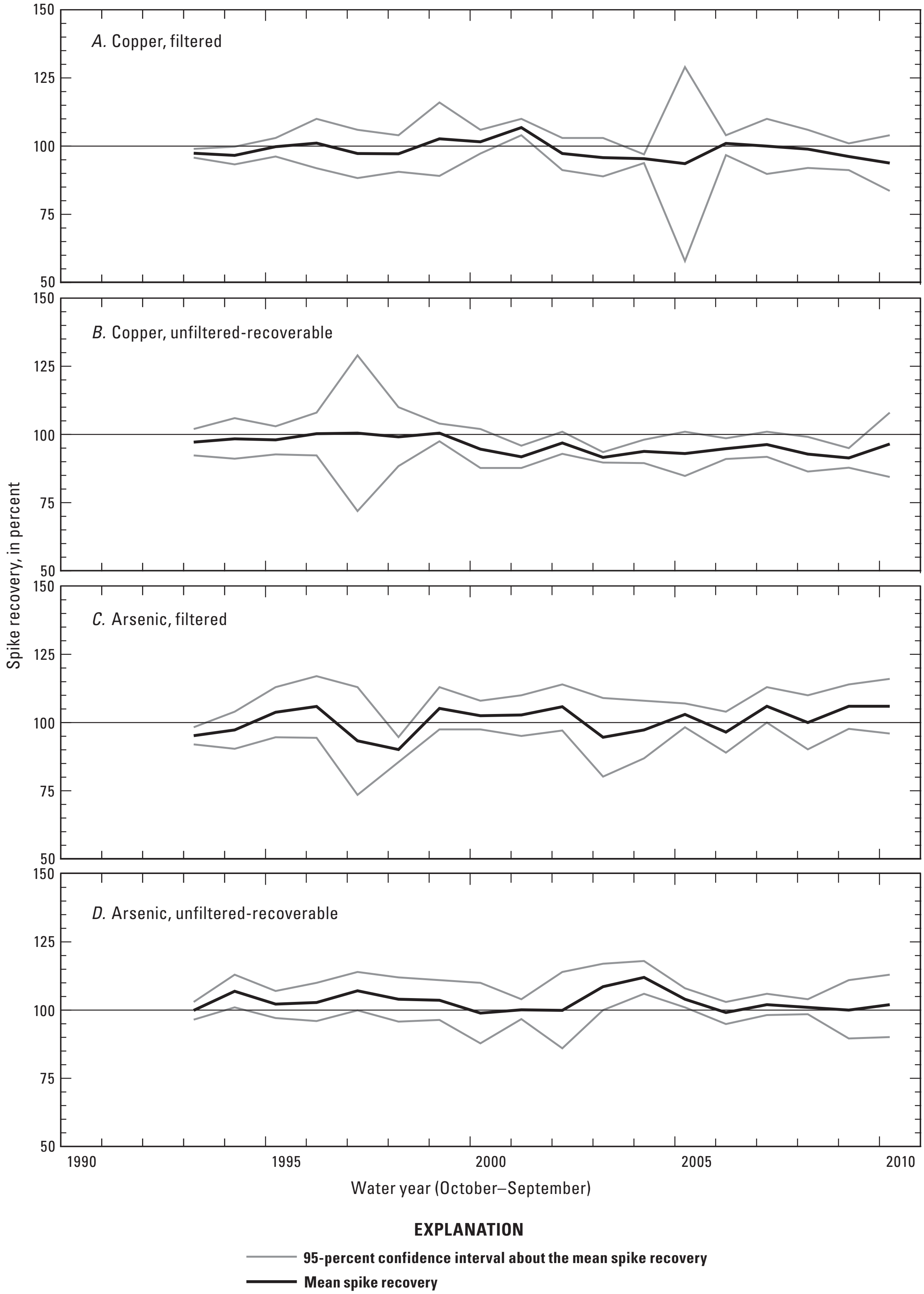

Figure 1–2. Spike recoveries for laboratory-spiked stream-water samples, based on data collected during water years 1993–2010. *A*, Copper, filtered; B, Copper, unfiltered-recoverable; *C*, Arsenic, filtered; *D*, Arsenic, unfiltered-recoverable.

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
		Blacktail Creek (site 1, fig. 1, table 1)							
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	72	1.9	4.6	8.8	12	17	54	NA
	Specific conductance, µS/cm	72	161	226	265	267	316	364	NA
	pH, standard units	72	7.3	7.6	7.7	7.7	7.8	8.4	NA
	Hardness, filtered, mg/L as $CaCO_3$	72	65	87	106	105	122	146	NA
	Calcium, filtered, mg/L	72	19.2	25.0	30.5	30.1	35.0	41.8	NA
	Magnesium, filtered, mg/L	72	4.09	6.00	7.23	7.24	8.68	10.2	NA
	Cadmium, filtered, µg/L	70 (12)	0.02	0.03	0.04	0.04	0.05	0.10	[3]133
	Cadmium, unfiltered-recoverable, µg/L	72 (18)	0.02	0.02	0.03	0.04	0.05	0.11	
	Copper, filtered, µg/L	71 (1)	0.80	1.6	3.0	3.6	5.2	9.3	60
	Copper, unfiltered-recoverable, µg/L	72	1.7	3.4	5.0	5.8	7.6	17	
	Iron, filtered, µg/L	72	15	68	163	180	277	640	30
	Iron unfiltered-recoverable, µg/L	72	150	334	544	561	693	1,640	
	Lead, filtered, µg/L	72 (20)	0.04	0.06	0.11	0.17	0.21	2.8	19
	Lead, unfiltered-recoverable, µg/L	72 (9)	0.10	0.35	0.59	0.79	0.92	4.9	
	Manganese, filtered, µg/L	72	14	29	34	41	44	144	72
	Manganese, unfiltered-recoverable, µg/L	72	24	42	48	55	60	173	
	Zinc, filtered, µg/L	70 (2)	0.82	2.2	2.9	3.2	3.9	8.0	67
	Zinc, unfiltered-recoverable, µg/L	72	2.0	3.0	4.3	6.0	6.3	35	
	Arsenic, filtered, µg/L	71	1.1	2.2	3.1	3.9	5.1	8.7	74
	Arsenic, unfiltered-recoverable, µg/L	72 (1)	1.0	3.0	4.2	4.9	6.5	11	
	Suspended sediment, mg/L	72	1	4	7	8	10	31	NA
	Suspended sediment, percent fines[4]	72	54	77	82	81	87	96	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Silver Bow Creek at Butte (site 2, fig. 1, table 1)									
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	80	13	17	22	27	33	76	NA
	Specific conductance, µS/cm	80	238	402	484	468	546	614	NA
	pH, standard units	80	7.4	7.6	7.6	7.6	7.7	8.0	NA
	Hardness, filtered, mg/L as $CaCO_3$	80	79	126	154	149	170	217	NA
	Calcium, filtered, mg/L	80	23.4	36.7	43.9	42.5	48.1	62.7	NA
	Magnesium, filtered, mg/L	80	5.02	8.86	10.6	10.4	12.0	14.6	NA
	Cadmium, filtered, µg/L	80	0.05	0.10	0.13	0.33	0.24	2.0	58
	Cadmium, unfiltered-recoverable, µg/L	80	0.09	0.15	0.22	0.46	0.57	1.9	
	Copper, filtered, µg/L	80	3.20	8.3	11	11	13	24	53
	Copper, unfiltered-recoverable, µg/L	80	9.5	16	20	24	25	111	
	Iron, filtered, µg/L	80	10.0	28	51	85	143	268	12
	Iron unfiltered-recoverable, µg/L	80	85	278	414	480	571	2,970	
	Lead, filtered, µg/L	79 (8)	0.12	0.20	0.25	0.27	0.33	0.79	13
	Lead, unfiltered-recoverable, µg/L	80 (1)	0.64	1.4	2.0	2.8	2.8	31	
	Manganese, filtered, µg/L	80	21	71	109	150	177	505	84
	Manganese, unfiltered-recoverable, µg/L	80	26	98	129	180	200	555	
	Zinc, filtered, µg/L	80	16	34	47	100	104	478	80
	Zinc, unfiltered-recoverable, µg/L	80	29	44	59	120	173	473	
	Arsenic, filtered, µg/L	80	2.3	4.3	5.2	5.4	6.5	9.3	83
	Arsenic, unfiltered-recoverable, µg/L	80	3.0	5.0	6.3	7.0	8.9	19	
	Suspended sediment, mg/L	80	2	6	8	11	11	97	NA
	Suspended sediment, percent fines[4]	80	70	81	86	85	89	94	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]: Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
	Silver Bow Creek at Opportunity (site 3, fig. 1, table 1)								
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	80	13	29	44	65	88	222	NA
	Specific conductance, µS/cm	80	248	348	441	437	527	633	NA
	pH, standard units	80	7.8	8.2	8.4	8.4	8.8	9.5	NA
	Hardness, filtered, mg/L as $CaCO_3$	80	81	129	159	157	184	240	NA
	Calcium, filtered, mg/L	80	24.2	38.9	47.3	46.5	54.3	71.6	NA
	Magnesium, filtered, mg/L	80	4.96	7.30	9.89	9.87	12.0	15.0	NA
	Cadmium, filtered, µg/L	79	0.17	0.26	0.40	0.55	0.70	2.7	50
	Cadmium, unfiltered-recoverable, µg/L	80	0.38	0.67	0.80	1.2	1.3	5.2	
	Copper, filtered, µg/L	78	12	20	25	31	36	142	32
	Copper, unfiltered-recoverable, µg/L	80	31	61	79	120	110	860	
	Iron, filtered, µg/L	80 (1)	7.0	14	23	42	67	248	4
	Iron unfiltered-recoverable, µg/L	79	240	463	621	1,136	889	9,190	
	Lead, filtered, µg/L	80 (8)	0.20	0.29	0.44	0.54	0.60	3.2	3
	Lead, unfiltered-recoverable, µg/L	80	5.0	10	13	25	20	269	
	Manganese, filtered, µg/L	80	30	120	223	254	342	934	77
	Manganese, unfiltered-recoverable, µg/L	80	85	200	290	361	437	1,520	
	Zinc, filtered, µg/L	79	11	48	80	129	175	611	41
	Zinc, unfiltered-recoverable, µg/L	80	70	139	197	273	284	1,230	
	Arsenic, filtered, µg/L	80	6.4	9.5	11	12	13	22	69
	Arsenic, unfiltered-recoverable, µg/L	80	9.1	14	16	20	20	91	
	Suspended sediment, mg/L	80	5	13	18	33	30	286	NA
	Suspended sediment, percent fines[4]	80	45	78	84	81	86	92	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
		Mill Creek near Anaconda (site 4, fig. 1, table 1)							
12/2004–8/2010	Streamflow, instantaneous, ft^3/s	48	7.4	13	26	58	102	213	NA
	Specific conductance, µS/cm	48	56	87	133	132	177	213	NA
	pH, standard units	48	7.6	7.9	8.1	8.1	8.2	8.6	NA
	Hardness, filtered, mg/L as $CaCO_3$	48	24	36	60	57	79	98	NA
	Calcium, filtered, mg/L	48	7.00	10.5	16.9	15.8	21.7	25.9	NA
	Magnesium, filtered, mg/L	48	1.45	2.39	4.22	4.28	5.96	8.01	NA
	Cadmium, filtered, µg/L	47 (2)	0.02	0.03	0.04	0.04	0.05	0.11	57
	Cadmium, unfiltered-recoverable, µg/L	48	0.03	0.05	0.07	0.08	0.09	0.19	
	Copper, filtered, µg/L	48	0.72	1.3	2.1	2.3	3.1	5.1	61
	Copper, unfiltered-recoverable, µg/L	48 (1)	1.3	2.1	3.5	3.9	5.4	11	
	Iron, filtered, µg/L	48	21.0	30	41	47	63	125	25
	Iron unfiltered-recoverable, µg/L	48	78	123	163	192	203	619	
	Lead, filtered, µg/L	48 (3)	0.02	0.08	0.11	0.12	0.16	0.24	19
	Lead, unfiltered-recoverable, µg/L	48	0.15	0.42	0.59	0.76	0.88	3	
	Manganese, filtered, µg/L	48	3.2	4.2	5.9	5.9	6.9	12	46
	Manganese, unfiltered-recoverable, µg/L	48	7.4	11	13	14	15	37	
	Zinc, filtered, µg/L	48 (5)	0.73	1.1	1.4	1.5	1.9	4.0	53
	Zinc, unfiltered-recoverable, µg/L	48	1.0	1.8	2.6	3.0	3.9	9.2	
	Arsenic, filtered, µg/L	48	7.3	12	15	16	20	33	91
	Arsenic, unfiltered-recoverable, µg/L	48	8.6	13	17	18	23	35	
	Suspended sediment, mg/L	48	1	2	3	6	6	29	NA
	Suspended sediment, percent fines[4]	48	28	57	67	64	75	81	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Mill Creek at Opportunity (site 5, fig. 1, table 1)									
3/2003–8/2010	Streamflow, instantaneous, ft^3/s	64	0.43	3.6	9.7	35	48	261	NA
	Specific conductance, µS/cm	64	59	95	153	148	196	230	NA
	pH, standard units	64	7.7	7.9	8.0	8.0	8.1	8.2	NA
	Hardness, filtered, mg/L as $CaCO_3$	64	24	39	67	63	85	102	NA
	Calcium, filtered, mg/L	64	7.01	11.5	18.8	17.6	23.5	28.0	NA
	Magnesium, filtered, mg/L	64	1.56	2.64	4.67	4.56	6.30	7.83	NA
	Cadmium, filtered, µg/L	64	0.02	0.05	0.06	0.06	0.07	0.13	60
	Cadmium, unfiltered-recoverable, µg/L	64	0.04	0.07	0.10	0.15	0.13	0.85	
	Copper, filtered, µg/L	64	1.0	1.9	2.7	3.0	3.9	6.1	61
	Copper, unfiltered-recoverable, µg/L	64	1.5	2.8	4.4	6.8	7.2	39	
	Iron, filtered, µg/L	64	16	36	43	48	60	94	30
	Iron unfiltered-recoverable, µg/L	64	44	113	145	299	264	1,960	
	Lead, filtered, µg/L	64 (6)	0.02	0.09	0.13	0.14	0.17	0.32	29
	Lead, unfiltered-recoverable, µg/L	64	0.07	0.23	0.45	1.5	1.6	13	
	Manganese, filtered, µg/L	64	2.2	4.5	5.6	7.7	9.2	33	43
	Manganese, unfiltered-recoverable, µg/L	64	3.3	10	13	20	18	113	
	Zinc, filtered, µg/L	63 (1)	1.3	2.1	2.8	3.0	3.8	7.7	58
	Zinc, unfiltered-recoverable, µg/L	64	1.7	3.0	4.9	6.7	7.0	41	
	Arsenic, filtered, µg/L	64	9.0	16	21	22	28	55	84
	Arsenic, unfiltered-recoverable, µg/L	64	10	20	25	26	31	54	
	Suspended sediment, mg/L	64	1	1	2	12	10	107	NA
	Suspended sediment, percent fines[4]	64	26	57	74	69	82	90	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Willow Creek near Anaconda (site 6, fig. 1, table 1)									
12/2004–8/2010	Streamflow, instantaneous, ft^3/s	44	1.0	2.5	7.6	14	16	75	NA
	Specific conductance, µS/cm	44	66	88	108	102	114	145	NA
	pH, standard units	44	7.5	7.6	7.7	7.7	7.8	8.2	NA
	Hardness, filtered, mg/L as $CaCO_3$	44	22	32	38	37	41	52	NA
	Calcium, filtered, mg/L	44	7.56	10.8	13.0	12.4	13.8	16.5	NA
	Magnesium, filtered, mg/L	44	0.78	1.18	1.43	1.44	1.64	2.49	NA
	Cadmium, filtered, µg/L	42 (5)	0.02	0.02	0.03	0.03	0.04	0.05	60
	Cadmium, unfiltered-recoverable, µg/L	44 (3)	0.02	0.04	0.05	0.06	0.07	0.33	
	Copper, filtered, µg/L	44	0.90	1.3	1.9	2.0	2.4	4.2	61
	Copper, unfiltered-recoverable, µg/L	44 (1)	1.0	2.1	3.1	3.7	4.1	17	
	Iron, filtered, µg/L	44	28	51	65	80	85	277	30
	Iron unfiltered-recoverable, µg/L	44	86	134	216	342	405	2,380	
	Lead, filtered, µg/L	44	0.03	0.07	0.13	0.14	0.16	0.37	26
	Lead, unfiltered-recoverable, µg/L	44	0.10	0.24	0.49	0.87	0.94	8.0	
	Manganese, filtered, µg/L	44	6.0	11	13	14	18	35	57
	Manganese, unfiltered-recoverable, µg/L	44	14	19	23	26	28	100	
	Zinc, filtered, µg/L	44 (4)	0.65	1.2	1.6	1.7	2.0	3.3	76
	Zinc, unfiltered-recoverable, µg/L	44 (4)	1.0	1.5	2.1	3.1	3.9	18	
	Arsenic, filtered, µg/L	44	9.9	13	14	15	17	25	93
	Arsenic, unfiltered-recoverable, µg/L	44	10	14	15	16	18	27	
	Suspended sediment, mg/L	44	1	3	6	17	13	195	NA
	Suspended sediment, percent fines[4]	44	25	62	78	73	88	94	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
		Willow Creek at Opportunity (site 7, fig. 1, table 1)							
3/2003–8/2010	Streamflow, instantaneous, ft^3/s	64	4.5	6.2	9.1	17	20	70	NA
	Specific conductance, µS/cm	64	116	227	297	276	315	371	NA
	pH, standard units	64	7.7	8.0	8.1	8.1	8.3	9.0	NA
	Hardness, filtered, mg/L as $CaCO_3$	64	65	98	130	120	137	169	NA
	Calcium, filtered, mg/L	64	20.10	28.8	36.9	34.8	39.8	47.4	NA
	Magnesium, filtered, mg/L	64	3.52	6.27	8.56	7.98	9.40	12.30	NA
	Cadmium, filtered, µg/L	64 (5)	0.02	0.03	0.04	0.04	0.06	0.12	57
	Cadmium, unfiltered-recoverable, µg/L	64 (1)	0.02	0.05	0.07	0.10	0.14	0.52	
	Copper, filtered, µg/L	64	1.1	2.4	3.6	5.6	8.6	21	44
	Copper, unfiltered-recoverable, µg/L	64	2.8	4.6	8.1	12	16	49	
	Iron, filtered, µg/L	64	7.0	14	36	44	68	179	18
	Iron unfiltered-recoverable, µg/L	64	27	108	205	272	332	1,420	
	Lead, filtered, µg/L	64 (1)	0.04	0.10	0.19	0.22	0.30	0.58	12
	Lead, unfiltered-recoverable, µg/L	64	0.27	0.85	1.5	2.3	2.6	14	
	Manganese, filtered, µg/L	64	3.3	15	24	32	45	200	68
	Manganese, unfiltered-recoverable, µg/L	64	4.7	19	35	45	58	228	
	Zinc, filtered, µg/L	64 (3)	0.84	2.3	3.9	5.3	7.0	20	41
	Zinc, unfiltered-recoverable, µg/L	64	1.1	4.8	9.5	13	17	68	
	Arsenic, filtered, µg/L	64	11	17	32	42	63	164	96
	Arsenic, unfiltered-recoverable, µg/L	64	12	19	33	45	65	164	
	Suspended sediment, mg/L	64	1	3	5	11	15	84	NA
	Suspended sediment, percent fines[4]	64	55	80	88	85	92	96	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
		Silver Bow Creek at Warm Springs (site 8, fig. 1, table 1)							
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	80	21	41	65	112	146	481	NA
	Specific conductance, µS/cm	80	253	386	507	488	582	783	NA
	pH, standard units	80	8.1	8.5	8.8	8.8	9.0	9.6	NA
	Hardness, filtered, mg/L as $CaCO_3$	80	104	154	207	203	242	314	NA
	Calcium, filtered, mg/L	80	29.1	45.4	60.7	58.8	69.6	90.4	NA
	Magnesium, filtered, mg/L	80	6.04	10.5	13.7	13.5	16.5	21.4	NA
	Cadmium, filtered, µg/L	80 (14)	0.02	0.03	0.04	0.05	0.06	0.31	41
	Cadmium, unfiltered-recoverable, µg/L	80 (4)	0.03	0.07	0.10	0.12	0.14	0.56	
	Copper, filtered, µg/L	80	1.7	3.3	4.3	5.0	6.0	28	54
	Copper, unfiltered-recoverable, µg/L	80	2.4	5.7	8.0	11	12	97	
	Iron, filtered, µg/L	80 (7)	4.0	8.0	15	18	24	72	7
	Iron unfiltered-recoverable, µg/L	80	36	143	218	258	272	1,420	
	Lead, filtered, µg/L	80 (23)	0.03	0.05	0.08	0.10	0.13	0.57	7
	Lead, unfiltered-recoverable, µg/L	80 (7)	0.15	0.58	1.2	1.6	1.8	42	
	Manganese, filtered, µg/L	80	13	50	78	122	167	875	57
	Manganese, unfiltered-recoverable, µg/L	80	24	95	138	175	221	899	
	Zinc, filtered, µg/L	80 (2)	0.59	2.1	3.5	4.5	5.2	37	32
	Zinc, unfiltered-recoverable, µg/L	80	2.0	6.5	11	15	17	158	
	Arsenic, filtered, µg/L	80	6.8	15	26	24	32	47	90
	Arsenic, unfiltered-recoverable, µg/L	80	10.0	18	29	28	35	52	
	Suspended sediment, mg/L	80	1	3	5	7	7	47	NA
	Suspended sediment, percent fines[4]	80	47	79	84	82	88	97	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
		Warm Springs Creek near Anaconda (site 9, fig. 1, table 1)							
10/2005–8/2010	Streamflow, instantaneous, ft^3/s	30	41	61	84	137	170	573	NA
	Specific conductance, µS/cm	30	125	184	235	217	253	271	NA
	pH, standard units	30	8.0	8.4	8.5	8.5	8.6	8.8	NA
	Hardness, filtered, mg/L as $CaCO_3$	30	58	89	112	105	124	132	NA
	Calcium, filtered, mg/L	30	18.5	27.5	33.8	31.6	36.5	39.2	NA
	Magnesium, filtered, mg/L	30	2.96	4.90	6.90	6.36	7.85	8.57	NA
	Cadmium, filtered, µg/L	30 (9)	0.02	0.02	0.02	0.02	0.02	0.04	67
	Cadmium, unfiltered-recoverable, µg/L	30 (3)	0.01	0.02	0.03	0.04	0.04	0.14	
	Copper, filtered, µg/L	30 (2)	0.57	0.68	0.91	1.1	1.3	2.2	43
	Copper, unfiltered-recoverable, µg/L	30 (3)	1.1	1.5	2.1	3.2	3.3	28	
	Iron, filtered, µg/L	30 (3)	2.0	5.0	6.0	7.1	10	15	8
	Iron unfiltered-recoverable, µg/L	30	28	64	75	144	123	1,000	
	Lead, filtered, µg/L	30 (21)	0.02	0.01	0.02	0.03	0.03	0.11	8
	Lead, unfiltered-recoverable, µg/L	30	0.08	0.20	0.26	0.52	0.43	3.5	
	Manganese, filtered, µg/L	30 (1)	0.50	0.70	0.95	1.2	1.5	2.9	22
	Manganese, unfiltered-recoverable, µg/L	30	1.20	2.8	4.3	6.9	6.9	45	
	Zinc, filtered, µg/L	30 (14)	0.30	0.50	0.74	0.89	1.1	2.8	37
	Zinc, unfiltered-recoverable, µg/L	30 (4)	1.0	1.0	2.0	3.2	3.6	20	
	Arsenic, filtered, µg/L	30	1.8	2	2	2	2	4	84
	Arsenic, unfiltered-recoverable, µg/L	30	2	2	3	3	3	6	
	Suspended sediment, mg/L	30	1	3	4	9	6	65	NA
	Suspended sediment, percent fines[4]	30	32	61	66	64	70	83	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Warm Springs Creek at Warm Springs (site 10, fig. 1, table 1)									
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	63	14	37	48	83	102	389	NA
	Specific conductance, µS/cm	63	155	219	308	287	339	431	NA
	pH, standard units	63	7.8	8.1	8.2	8.3	8.4	8.7	NA
	Hardness, filtered, mg/L as $CaCO_3$	63	40	106	148	138	167	222	NA
	Calcium, filtered, mg/L	63	10.5	32.5	45.4	42.2	50.8	67.9	NA
	Magnesium, filtered, mg/L	63	3.29	5.84	8.49	7.93	9.48	12.8	NA
	Cadmium, filtered, µg/L	63 (14)	0.02	0.02	0.03	0.03	0.04	0.10	62
	Cadmium, unfiltered-recoverable, µg/L	63 (9)	0.03	0.04	0.05	0.08	0.08	0.41	
	Copper, filtered, µg/L	63 (1)	1.1	2.0	2.7	2.9	3.2	11	33
	Copper, unfiltered-recoverable, µg/L	63	3.9	6.4	8.1	18	14	147	
	Iron, filtered, µg/L	63 (4)	5.0	8.0	10	11	14	28	10
	Iron unfiltered-recoverable, µg/L	63	39	76	102	272	219	2,110	
	Lead, filtered, µg/L	63 (31)	0.03	0.03	0.04	0.05	0.06	0.32	7
	Lead, unfiltered-recoverable, µg/L	63 (10)	0.21	0.34	0.60	1.3	1.2	14	
	Manganese, filtered, µg/L	63	19	48	78	98	135	394	55
	Manganese, unfiltered-recoverable, µg/L	63	37	95	142	180	203	1,270	
	Zinc, filtered, µg/L	62 (7)	0.60	0.92	1.5	1.6	1.9	7.6	50
	Zinc, unfiltered-recoverable, µg/L	63	1.0	2.7	3.0	7.1	6.0	48	
	Arsenic, filtered, µg/L	63	3.0	3.9	4.5	5.0	5.7	12	82
	Arsenic, unfiltered-recoverable, µg/L	63	3.7	5.0	5.5	6.9	7.1	22	
	Suspended sediment, mg/L	63	1	3	6	15	12	127	NA
	Suspended sediment, percent fines[4]	63	43	65	68	68	73	81	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Clark Fork near Galen (site 11, fig. 1, table 1)									
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	80	33	79	127	203	258	905	NA
	Specific conductance, µS/cm	80	216	320	416	405	480	607	NA
	pH, standard units	80	8.1	8.4	8.6	8.6	8.8	9.2	NA
	Hardness, filtered, mg/L as $CaCO_3$	80	91	135	188	176	211	280	NA
	Calcium, filtered, mg/L	80	27.5	41.0	55.5	52.2	62.0	82.3	NA
	Magnesium, filtered, mg/L	80	5.11	8.30	11.8	11.2	13.8	18.1	NA
	Cadmium, filtered, µg/L	80 (13)	0.02	0.03	0.04	0.05	0.05	0.25	40
	Cadmium, unfiltered-recoverable, µg/L	80 (5)	0.04	0.07	0.10	0.12	0.15	0.64	
	Copper, filtered, µg/L	80	1.7	3.4	4.2	4.8	5.6	21	36
	Copper, unfiltered-recoverable, µg/L	80	4.1	8.4	12	19	17	94	
	Iron, filtered, µg/L	80 (5)	4.0	7.0	11	14	19	63	5
	Iron unfiltered-recoverable, µg/L	80	56	135	224	332	324	2,030	
	Lead, filtered, µg/L	80 (26)	0.04	0.04	0.06	0.08	0.10	1.0	5
	Lead, unfiltered-recoverable, µg/L	80 (8)	0.36	0.69	1.3	2.3	2.1	31	
	Manganese, filtered, µg/L	80	24	42	67	94	120	460	45
	Manganese, unfiltered-recoverable, µg/L	80	47	104	149	177	227	785	
	Zinc, filtered, µg/L	80 (3)	0.90	1.7	2.7	3.5	4.7	31	24
	Zinc, unfiltered-recoverable, µg/L	80	2.7	7.5	11	16	18	116	
	Arsenic, filtered, µg/L	80	5.7	10	16	16	20	30	92
	Arsenic, unfiltered-recoverable, µg/L	80	7.5	12	18	19	23	50	
	Suspended sediment, mg/L	80	1	4	7	13	12	97	NA
	Suspended sediment, percent fines[4]	80	40	70	76	75	80	96	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft³/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
		Lost Creek near Anaconda (site 12, fig. 1, table 1)							
12/2004–8/2010	Streamflow, instantaneous, ft³/s	47	0.37	4.3	8.0	10	13	54	NA
	Specific conductance, µS/cm	47	121	173	211	198	221	253	NA
	pH, standard units	47	7.4	8.2	8.2	8.2	8.3	8.6	NA
	Hardness, filtered, mg/L as $CaCO_3$	47	50	85	99	94	106	122	NA
	Calcium, filtered, mg/L	47	15.7	26.3	30.0	28.5	32.2	37.1	NA
	Magnesium, filtered, mg/L	47	2.71	4.54	5.78	5.50	6.45	7.2	NA
	Cadmium, filtered, µg/L	46 (5)	0.01	0.02	0.03	0.03	0.03	0.90	75
	Cadmium, unfiltered-recoverable, µg/L	47 (5)	0.01	0.03	0.04	0.12	0.07	147	
	Copper, filtered, µg/L	47	0.86	1.3	1.8	3.9	2.9	91	41
	Copper, unfiltered-recoverable, µg/L	47 (1)	1.7	2.8	4.4	16.3	8.3	29,100	
	Iron, filtered, µg/L	47 (4)	4.0	6.0	9.0	10	12	25	9
	Iron unfiltered-recoverable, µg/L	47	22	61	98	2,300	217	99,700	
	Lead, filtered, µg/L	47 (26)	0.02	0.02	0.03	0.04	0.05	0.18	7
	Lead, unfiltered-recoverable, µg/L	47	0.10	0.28	0.42	28	1.0	1,290	
	Manganese, filtered, µg/L	47 (1)	0.40	0.80	1.1	1.6	1.5	42	24
	Manganese, unfiltered-recoverable, µg/L	47	1.2	2.8	4.6	194	7.6	8,830	
	Zinc, filtered, µg/L	47 (14)	0.62	0.71	1.1	1.3	1.5	30	46
	Zinc, unfiltered-recoverable, µg/L	47 (2)	1.0	2.0	2.4	7.7	4.0	7,780	
	Arsenic, filtered, µg/L	47	1.8	2.7	3.4	7.8	5.8	156	92
	Arsenic, unfiltered-recoverable, µg/L	47	2.0	3.2	3.7	87	7.7	3,860	
	Suspended sediment, mg/L	47	1	3	5	1,270	15	58,900	NA
	Suspended sediment, percent fines[4]	47	22	49	61	58	67	97	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Lost Creek near Galen (site 13, fig. 1, table 1)									
3/2003–8/2010	Streamflow, instantaneous, ft^3/s	64	1.3	3.5	13	21	41	71	NA
	Specific conductance, µS/cm	64	540	611	631	648	672	934	NA
	pH, standard units	64	8.0	8.2	8.3	8.3	8.5	8.7	NA
	Hardness, filtered, mg/L as $CaCO_3$	64	203	281	298	301	316	451	NA
	Calcium, filtered, mg/L	64	48.5	78.5	85.2	84.7	92.2	122	NA
	Magnesium, filtered, mg/L	64	17.3	19.9	21.0	21.7	23.2	35.7	NA
	Cadmium, filtered, µg/L	63 (10)	0.01	0.02	0.02	0.03	0.03	0.05	50
	Cadmium, unfiltered-recoverable, µg/L	64 (5)	0.01	0.03	0.04	0.04	0.05	0.11	
	Copper, filtered, µg/L	64	0.99	1.6	2.4	2.4	2.9	7	53
	Copper, unfiltered-recoverable, µg/L	64	1.6	3.7	4.4	5.5	6.3	23	
	Iron, filtered, µg/L	64 (3)	4.0	7.0	10	13	16	61	13
	Iron unfiltered-recoverable, µg/L	64	14	47	77	99	128	293	
	Lead, filtered, µg/L	63 (35)	0.02	0.02	0.03	0.04	0.05	0.33	12
	Lead, unfiltered-recoverable, µg/L	64	0.04	0.14	0.24	0.35	0.44	1.3	
	Manganese, filtered, µg/L	64	1.9	6.9	14	15	20	54	75
	Manganese, unfiltered-recoverable, µg/L	64	2.2	9.6	18	20	29	57	
	Zinc, filtered, µg/L	63 (9)	0.40	0.87	1.3	1.5	1.8	3.8	63
	Zinc, unfiltered-recoverable, µg/L	64 (6)	1.0	1.3	2.0	2.8	3.9	9.0	
	Arsenic, filtered, µg/L	64	6.0	10	13	14	16	42	90
	Arsenic, unfiltered-recoverable, µg/L	64	6.0	11	14	15	16	43	
	Suspended sediment, mg/L	64	2	8	15	16	22	79	NA
	Suspended sediment, percent fines[4]	64	18	46	60	57	68	86	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft³/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Clark Fork at Deer Lodge (site 14, fig. 1, table 1)									
10/2000–8/2010	Streamflow, instantaneous, ft³/s	80	38	151	215	282	343	1,130	NA
	Specific conductance, µS/cm	80	245	360	489	452	524	605	NA
	pH, standard units	80	8.0	8.2	8.3	8.3	8.5	8.9	NA
	Hardness, filtered, mg/L as $CaCO_3$	80	102	152	210	196	230	282	NA
	Calcium, filtered, mg/L	80	31.8	45.3	62.3	58.1	67.5	82.0	NA
	Magnesium, filtered, mg/L	80	5.53	10.1	13.2	12.5	14.7	18.7	NA
	Cadmium, filtered, µg/L	79 (9)	0.02	0.04	0.06	0.06	0.07	0.12	40
	Cadmium, unfiltered-recoverable, µg/L	79 (1)	0.02	0.10	0.15	0.22	0.24	2.06	
	Copper, filtered, µg/L	80	3.2	5.6	7.1	7.9	9.5	19	27
	Copper, unfiltered-recoverable, µg/L	79	8.2	18	27	49	57	468	
	Iron, filtered, µg/L	80 (9)	3.0	6.0	8.0	12	17	44	2
	Iron unfiltered-recoverable, µg/L	80	27	218	393	711	823	6,960	
	Lead, filtered, µg/L	79 (19)	0.04	0.05	0.08	0.10	0.13	0.54	3
	Lead, unfiltered-recoverable, µg/L	80 (2)	0.33	1.8	3.0	6.7	7.0	62	
	Manganese, filtered, µg/L	80	4.0	24	34	38	49	98	30
	Manganese, unfiltered-recoverable, µg/L	80	12	76	112	143	164	1,010	
	Zinc, filtered, µg/L	80	0.90	4.5	5.9	6.5	8.1	19	23
	Zinc, unfiltered-recoverable, µg/L	78	4.0	16	26	40	44	359	
	Arsenic, filtered, µg/L	80	6.0	11	15	15	17	26	88
	Arsenic, unfiltered-recoverable, µg/L	79	4.8	13	17	20	24	78	
	Suspended sediment, mg/L	80	1	11	18	37	40	387	NA
	Suspended sediment, percent fines[4]	80	31	67	73	71	79	92	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Little Blackfoot River (site 15, fig. 1, table 1)									
11/2000–8/2004	Streamflow, instantaneous, ft^3/s	20	19.0	56.3	135	176	297	455	NA
	Specific conductance, µS/cm	20	174	211	259	255	287	347	NA
	pH, standard units	20	8.0	8.1	8.2	8.3	8.4	8.7	NA
	Hardness, filtered, mg/L as $CaCO_3$	20	79	94	116	117	136	172	NA
	Calcium, filtered, mg/L	20	22.9	27.6	34.0	34.1	39.9	49.3	NA
	Magnesium, filtered, mg/L	20	5.33	6.03	7.56	7.69	8.83	11.9	NA
	Cadmium, filtered, µg/L	20 (18)	0.02	ND	ND	ND	ND	0.04	ND
	Cadmium, unfiltered-recoverable, µg/L	20 (14)	0.02	0.01	0.02	0.02	0.03	0.10	
	Copper, filtered, µg/L	20 (3)	0.60	0.75	1.1	1.3	1.5	3.9	67
	Copper, unfiltered-recoverable, µg/L	20	0.80	1.2	1.7	1.9	2.4	4.2	
	Iron, filtered, µg/L	20 (3)	5.0	5.5	16	27	33	117	9
	Iron unfiltered-recoverable, µg/L	20	38	63	178	236	305	701	
	Lead, filtered, µg/L	19 (13)	0.05	0.03	0.04	0.05	0.06	0.13	16
	Lead, unfiltered-recoverable, µg/L	20 (8)	0.06	0.11	0.24	0.45	0.51	1.8	
	Manganese, filtered, µg/L	20	2.5	7.9	8.5	11	11	45	37
	Manganese, unfiltered-recoverable, µg/L	20	6.8	18	23	28	32	90	
	Zinc, filtered, µg/L	20 (4)	0.50	0.50	1.2	1.1	1.4	2.9	58
	Zinc, unfiltered-recoverable, µg/L	20 (5)	1.0	0.89	2.0	2.8	3.5	8.0	
	Arsenic, filtered, µg/L	20	3.9	4.6	5.1	5.2	5.8	6.5	85
	Arsenic, unfiltered-recoverable, µg/L	20	4.0	5.0	6.0	5.7	6.0	8.0	
	Suspended sediment, mg/L	20	2	3	8	13	14	47	NA
	Suspended sediment, percent fines[4]	20	54	73	83	80	85	95	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Clark Fork at Goldcreek (site 16, fig. 1, table 1)									
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	80	100	310	495	690	876	2,300	NA
	Specific conductance, µS/cm	80	206	304	384	370	435	498	NA
	pH, standard units	80	8.0	8.3	8.4	8.4	8.6	8.9	NA
	Hardness, filtered, mg/L as $CaCO_3$	80	90	132	169	163	196	220	NA
	Calcium, filtered, mg/L	80	27.0	39.4	50.3	48.2	57.9	65.3	NA
	Magnesium, filtered, mg/L	80	5.40	8.17	10.6	10.3	12.8	14.2	NA
	Cadmium, filtered, µg/L	80 (18)	0.02	0.03	0.04	0.04	0.05	0.14	31
	Cadmium, unfiltered-recoverable, µg/L	80 (3)	0.03	0.08	0.12	0.17	0.21	0.60	
	Copper, filtered, µg/L	80	2.1	4.1	4.9	5.6	6.6	14	24
	Copper, unfiltered-recoverable, µg/L	80	5.2	12	20	31	43	122	
	Iron, filtered, µg/L	80 (10)	3.0	5.1	11	18	25	71	3
	Iron unfiltered-recoverable, µg/L	80	27	198	371	640	870	3,020	
	Lead, filtered, µg/L	79 (30)	0.04	0.04	0.07	0.10	0.12	0.35	3
	Lead, unfiltered-recoverable, µg/L	80 (2)	0.14	1.3	2.4	4.8	5.8	20	
	Manganese, filtered, µg/L	80	4.0	11	15	17	21	57	20
	Manganese, unfiltered-recoverable, µg/L	80	11	56	76	99	117	348	
	Zinc, filtered, µg/L	80 (1)	0.70	2.2	3.1	4.0	5.2	11	15
	Zinc, unfiltered-recoverable, µg/L	80	2.0	12	20	30	42	122	
	Arsenic, filtered, µg/L	80	5.8	7.8	10	10	12	14	84
	Arsenic, unfiltered-recoverable, µg/L	80	7.0	10	12	13	15	26	
	Suspended sediment, mg/L	80	1	10	17	35	44	196	NA
	Suspended sediment, percent fines[4]	80	44	66	77	74	82	94	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
				Flint Creek (site 17, fig. 1, table 1)					
11/2000–8/2004	Streamflow, instantaneous, ft^3/s	23	5.4	29	76	84	113	331	NA
	Specific conductance, µS/cm	23	276	305	350	373	430	529	NA
	pH, standard units	23	8.1	8.3	8.4	8.4	8.5	8.8	NA
	Hardness, filtered, mg/L as $CaCO_3$	23	115	140	161	172	204	253	NA
	Calcium, filtered, mg/L	23	30.5	38.5	43.8	46.8	56.6	70.0	NA
	Magnesium, filtered, mg/L	23	9.51	10.9	12.5	13.3	15.4	19.0	NA
	Cadmium, filtered, µg/L	23 (20)	0.02	ND	ND	ND	ND	0.02	ND
	Cadmium, unfiltered-recoverable, µg/L	23 (9)	0.02	0.02	0.04	0.06	0.07	0.30	
	Copper, filtered, µg/L	23 (2)	0.70	1.0	1.2	1.4	1.4	4.4	52
	Copper, unfiltered-recoverable, µg/L	23	1.4	1.8	2.3	3.3	3.3	11	
	Iron, filtered, µg/L	23 (2)	5.0	8.0	15	23	21	113	6
	Iron unfiltered-recoverable, µg/L	23	56	127	245	374	432	2,050	
	Lead, filtered, µg/L	21 (6)	0.05	0.08	0.13	0.16	0.19	0.67	4
	Lead, unfiltered-recoverable, µg/L	23 (2)	0.65	1.5	3.1	5.3	5.6	34	
	Manganese, filtered, µg/L	23	22	38	51	56	59	139	50
	Manganese, unfiltered-recoverable, µg/L	23	53	78	101	143	142	595	
	Zinc, filtered, µg/L	23 (1)	1.1	1.2	1.6	2.0	1.9	8.7	16
	Zinc, unfiltered-recoverable, µg/L	23	2.0	5.0	10	15	15	87	
	Arsenic, filtered, µg/L	23	6.1	7.8	10	9.5	11	12	81
	Arsenic, unfiltered-recoverable, µg/L	23	7.0	11	12	13	14	35	
	Suspended sediment, mg/L	23	3	8	15	30	26	195	NA
	Suspended sediment, percent fines[4]	23	30	84	88	83	90	94	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Clark Fork near Drummond (site 18, fig. 1, table 1)									
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	80	157	464	709	964	1,158	3,350	NA
	Specific conductance, µS/cm	80	236	346	415	414	480	601	NA
	pH, standard units	80	7.9	8.2	8.3	8.3	8.4	8.7	NA
	Hardness, filtered, mg/L as $CaCO_3$	80	102	154	184	186	221	283	NA
	Calcium, filtered, mg/L	80	30.6	44.5	53.4	53.4	63.4	81.1	NA
	Magnesium, filtered, mg/L	80	6.07	10.1	12.6	12.8	15.3	20.9	NA
	Cadmium, filtered, µg/L	79 (14)	0.02	0.03	0.04	0.05	0.05	0.30	29
	Cadmium, unfiltered-recoverable, µg/L	80 (2)	0.02	0.08	0.14	0.22	0.27	1.3	
	Copper, filtered, µg/L	79	2.0	3.8	4.7	5.9	7.0	20	24
	Copper, unfiltered-recoverable, µg/L	80	4.6	10	20	37	43	215	
	Iron, filtered, µg/L	80 (18)	3.0	4.0	8.0	16	23	88	2
	Iron unfiltered-recoverable, µg/L	79	20	179	379	822	1,140	5,770	
	Lead, filtered, µg/L	79 (23)	0.04	0.04	0.09	0.14	0.17	0.66	3
	Lead, unfiltered-recoverable, µg/L	80 (2)	0.18	1.3	3.2	7.4	8.3	44	
	Manganese, filtered, µg/L	79	3.3	10	12	16	18	61	14
	Manganese, unfiltered-recoverable, µg/L	80	8.0	53	84	129	157	691	
	Zinc, filtered, µg/L	80 (1)	0.95	2.9	4.1	4.7	5.8	13	17
	Zinc, unfiltered-recoverable, µg/L	80	2.9	12	25	46	57	276	
	Arsenic, filtered, µg/L	80	3.2	8.4	10	10	12	18	77
	Arsenic, unfiltered-recoverable, µg/L	80	8.0	10	13	15	17	41	
	Suspended sediment, mg/L	80	2	11	23	52	63	315	NA
	Suspended sediment, percent fines[4]	80	50	66	74	74	81	91	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
				Rock Creek (site 19, fig. 1, table 1)					
11/2000–8/2004	Streamflow, instantaneous, ft^3/s	20	149	209	356	608	915	2,080	NA
	Specific conductance, µS/cm	20	68	88	129	118	145	160	NA
	pH, standard units	20	7.7	8.0	8.2	8.1	8.3	8.6	NA
	Hardness, filtered, mg/L as $CaCO_3$	20	28	38	57	53	67	74	NA
	Calcium, filtered, mg/L	20	7.23	9.90	14.5	13.7	17.2	19.0	NA
	Magnesium, filtered, mg/L	20	2.46	3.32	4.78	4.51	5.77	6.58	NA
	Cadmium, filtered, µg/L	20 (17)	0.02	ND	ND	ND	ND	0.04	ND
	Cadmium, unfiltered-recoverable, µg/L	20 (18)	0.02	ND	ND	ND	ND	0.06	
	Copper, filtered, µg/L	20 (6)	0.20	0.34	0.46	0.52	0.70	1.3	77
	Copper, unfiltered-recoverable, µg/L	20 (3)	0.30	0.45	0.60	0.80	1.2	1.8	
	Iron, filtered, µg/L	20 (1)	6.0	8.0	15	19	25	57	21
	Iron unfiltered-recoverable, µg/L	20	23	41	72	88	114	264	
	Lead, filtered, µg/L	20 (19)	0.05	ND	ND	ND	ND	0.05	ND
	Lead, unfiltered-recoverable, µg/L	20 (15)	0.03	0.02	0.04	0.05	0.06	0.14	
	Manganese, filtered, µg/L	20	0.60	1.0	1.6	1.5	1.8	2.9	31
	Manganese, unfiltered-recoverable, µg/L	20	1.5	3.5	5.2	5.6	7.2	13	
	Zinc, filtered, µg/L	20 (15)	0.40	0.15	0.25	0.32	0.41	1.6	91
	Zinc, unfiltered-recoverable, µg/L	20 (15)	1.0	0.11	0.27	0.66	0.80	3.0	
	Arsenic, filtered, µg/L	20	0.50	0.50	0.60	0.61	0.63	0.80	ND
	Arsenic, unfiltered-recoverable, µg/L	18 (15)	1.0	ND	ND	ND	ND	5.0	
	Suspended sediment, mg/L	20	1	3	4	5	6	17	NA
	Suspended sediment, percent fines[4]	20	57	73	76	75	80	84	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Clark Fork at Turah Bridge (site 20, fig. 1, table 1)									
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	80	331	744	1,200	1,940	2,550	7,560	NA
	Specific conductance, µS/cm	80	139	226	303	290	359	416	NA
	pH, standard units	80	7.9	8.1	8.3	8.3	8.5	8.8	NA
	Hardness, filtered, mg/L as $CaCO_3$	80	54	98	130	128	159	191	NA
	Calcium, filtered, mg/L	80	14.9	28.1	36.9	36.1	44.0	53.8	NA
	Magnesium, filtered, mg/L	80	3.97	6.82	9.19	9.29	11.9	13.7	NA
	Cadmium, filtered, µg/L	79 (29)	0.02	0.02	0.03	0.03	0.04	0.10	27
	Cadmium, unfiltered-recoverable, µg/L	80 (7)	0.03	0.05	0.10	0.14	0.16	1.0	
	Copper, filtered, µg/L	80	1.1	2.4	3.0	3.8	4.4	13	25
	Copper, unfiltered-recoverable, µg/L	80	2.7	5.8	12	21	25	117	
	Iron, filtered, µg/L	80 (16)	3.0	4.3	11.0	22	30	93	4
	Iron unfiltered-recoverable, µg/L	80	33	117	289	590	711	4,250	
	Lead, filtered, µg/L	80 (30)	0.03	0.04	0.07	0.10	0.13	0.37	3
	Lead, unfiltered-recoverable, µg/L	80 (6)	0.17	0.58	2.0	4.2	4.3	30	
	Manganese, filtered, µg/L	80	2.9	4.8	7.3	8.1	10	30	14
	Manganese, unfiltered-recoverable, µg/L	80	8.9	24	53	80	92	622	
	Zinc, filtered, µg/L	78	0.94	2.1	3.1	3.6	4.6	12	18
	Zinc, unfiltered-recoverable, µg/L	80	2.9	9.0	18	31	35	236	
	Arsenic, filtered, µg/L	80	3.1	4.9	5.6	5.9	6.7	10	80
	Arsenic, unfiltered-recoverable, µg/L	80	3.0	6.0	7.0	8.3	9.3	28	
	Suspended sediment, mg/L	80	2	7	17	39	43	302	NA
	Suspended sediment, percent fines[4]	80	54	69	77	76	83	90	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
				Blackfoot River (site 21, fig. 1, table 1)					
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	57	450	634	1,310	2,430	3,980	9,320	NA
	Specific conductance, µS/cm	57	140	174	205	215	260	282	NA
	pH, standard units	57	8.0	8.2	8.4	8.4	8.5	8.7	NA
	Hardness, filtered, mg/L as $CaCO_3$	56	68	86	108	107	130	146	NA
	Calcium, filtered, mg/L	56	18.6	22.5	27.9	27.3	32.0	37.7	NA
	Magnesium, filtered, mg/L	56	5.37	7.14	9.46	9.48	11.9	13.2	NA
	Cadmium, filtered, µg/L	55 (48)	0.01	ND	ND	ND	ND	0.02	ND
	Cadmium, unfiltered-recoverable, µg/L	57 (44)	0.01	<0.01	<0.01	0.01	0.01	0.10	
	Copper, filtered, µg/L	55 (10)	0.23	0.44	0.63	0.72	0.93	1.8	50
	Copper, unfiltered-recoverable, µg/L	57 (8)	0.30	0.72	1.3	1.8	2.2	8.5	
	Iron, filtered, µg/L	56 (13)	3.0	3.6	7.0	13	17	100	8
	Iron unfiltered-recoverable, µg/L	57	14	30	86	232	387	2,200	
	Lead, filtered, µg/L	55 (45)	0.02	ND	ND	ND	ND	0.03	ND
	Lead, unfiltered-recoverable, µg/L	57 (18)	0.04	0.05	0.12	0.33	0.31	3.6	
	Manganese, filtered, µg/L	56	0.50	1.2	1.7	2.0	2.5	5.2	20
	Manganese, unfiltered-recoverable, µg/L	57	2.0	5.0	8.6	19	28	150	
	Zinc, filtered, µg/L	55 (24)	0.30	0.36	0.57	0.70	0.88	2.8	57
	Zinc, unfiltered-recoverable, µg/L	57 (26)	1.0	0.49	1.0	2.0	2.7	12	
	Arsenic, filtered, µg/L	56	0.41	0.80	0.97	1.0	1.2	1.5	88
	Arsenic, unfiltered-recoverable, µg/L	54 (10)	0.93	1.0	1.1	1.2	1.3	2.6	
	Suspended sediment, mg/L	57	1	2	5	19	28	228	NA
	Suspended sediment, percent fines[4]	57	69	79	82	82	85	95	NA

Table 1–4. Summary information relating to water-quality constituents and properties in samples collected at sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft^3/s, cubic feet per second; NA, not applicable; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; µg/L, micrograms per liter; mg/L, milligrams per liter; ND, distributional parameter not determined because of excessive number of censored values; <, less than]

Period of water-quality sampling during water years 2001–10	Constituent or property, unadjusted (not flow adjusted) units of measurement	Statistical summaries of water-quality data[1]							Ratios of median filtered to median unfiltered-recoverable concentrations for trace elements, percent
		Number of samples (values in parentheses indicate number of censored values)	Minimum uncensored value[2]	25th percentile	Median	Mean	75th percentile	Maximum	
Clark Fork above Missoula (site 22, fig. 1, table 1)									
10/2000–8/2010	Streamflow, instantaneous, ft^3/s	80	772	1,320	3,300	4,280	6,510	15,400	NA
	Specific conductance, µS/cm	80	148	196	256	252	311	351	NA
	pH, standard units	80	7.9	8.2	8.3	8.3	8.4	8.8	NA
	Hardness, filtered, mg/L as $CaCO_3$	80	70	91	118	117	142	166	NA
	Calcium, filtered, mg/L	80	19.3	24.7	31.5	31.5	38.3	44.8	NA
	Magnesium, filtered, mg/L	80	5.34	7.08	9.08	9.22	11.6	13.4	NA
	Cadmium, filtered, µg/L	79 (40)	0.01	0.01	0.02	0.02	0.03	0.20	25
	Cadmium, unfiltered-recoverable, µg/L	80 (8)	0.02	0.05	0.08	0.14	0.15	1.9	
	Copper, filtered, mg/L	80	0.90	1.7	2.3	2.7	3.3	13	24
	Copper, unfiltered-recoverable, µg/L	80	2.5	6.0	10	23	20	386	
	Iron, filtered, µg/L	80 (9)	3.0	7.0	13.5	20	25	106	5
	Iron unfiltered-recoverable, µg/L	80	43	141	246	603	724	5,980	
	Lead, filtered, µg/L	78 (20)	0.04	0.05	0.07	0.10	0.12	0.34	4
	Lead, unfiltered-recoverable, µg/L	80 (7)	0.18	0.77	1.7	3.4	3.8	54	
	Manganese, filtered, µg/L	80	5.9	9.5	13	14	17	38	30
	Manganese, unfiltered-recoverable, µg/L	80	11.7	28	45	64	72	314	
	Zinc, filtered, µg/L	79 (2)	0.80	1.5	2.4	2.7	3.4	8.0	16
	Zinc, unfiltered-recoverable, µg/L	80	3.3	8.5	15	35	33	495	
	Arsenic, filtered, µg/L	80	1.6	3.0	3.6	3.7	4.4	9.0	84
	Arsenic, unfiltered-recoverable, µg/L	80	2.0	3.8	4.3	5.6	6.0	27	
	Suspended sediment, mg/L	80	2	9	15	52	56	950	NA
	Suspended sediment, percent fines[4]	80	14	69	83	77	90	99	NA

[1]Distributional parameters affected by censored observations (that is, concentrations reported as less than the laboratory reporting level) were estimated by using adjusted maximum likelihood estimation (Cohn, 1988).

[2]Minimum uncensored value refers to the smallest concentration reported as detected above any of the various laboratory reporting levels applicable for a given constituent.

[3]Ratio of median filtered to unfiltered-recoverable concentration greater than 100 percent affected by low median concentrations near minimum laboratory reporting levels (table 2) and small bias in filtered concentrations.

[4]Percent fines refers to the percentage of suspended sediment smaller than 0.062-millimeter diameter.

Table 1–5. Aquatic life standards (based on median hardness for water years 2001–10) for selected sites in the upper Clark Fork Basin, Montana.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. $CaCO_3$, calcium carbonate]

Site number (fig. 1, table 1)	Site name (fig. 1, table 1)	Median hardness for water years 2001–10, in milligrams per liter as $CaCO_3$	Aquatic life standards (Montana Department of Environmental Quality, 2012a), in micrograms per liter (adjusted for hardness)							
			Cadmium		Copper		Lead		Zinc	
			Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic
1	Blacktail Creek	106	2.26	0.283	14.8	9.81	87.9	3.43	126	126
2	Silver Bow Creek at Butte	154	3.31	0.373	21.0	13.5	141	5.51	173	173
3	Silver Bow Creek at Opportunity	159	3.42	0.382	21.7	13.9	147	5.74	177	177
4	Mill Creek near Anaconda	59.8	1.26	0.185	8.62	6.01	42.4	1.65	77.5	77.5
5	Mill Creek at Opportunity	67.0	1.42	0.201	9.60	6.63	49.0	1.91	85.3	85.3
6	Willow Creek near Anaconda	38.4	0.806	0.133	5.68	4.12	24.1	0.941	53.3	53.3
7	Willow Creek at Opportunity	130	2.79	0.329	17.9	11.7	114	4.44	150	150
8	Silver Bow Creek at Warm Springs	207	4.47	0.464	27.8	17.4	206	8.03	222	222
9	Warm Springs Creek near Anaconda	112	2.39	0.294	15.6	10.3	94.3	3.68	132	132
10	Warm Springs Creek at Warm Springs	148	3.18	0.362	20.3	13.0	134	5.24	167	167
11	Clark Fork near Galen	188	4.05	0.432	25.4	16.0	182	7.11	205	205
12	Lost Creek near Anaconda	98.8	2.11	0.268	13.8	9.23	80.4	3.13	119	119
13	Lost Creek near Galen	298	6.47	0.608	39.2	23.7	328	12.8	302	302
14	Clark Fork at Deer Lodge	210	4.54	0.469	28.2	17.6	210	8.18	225	225
15	Little Blackfoot River	116	2.48	0.302	16.1	10.6	98.6	3.84	136	136
16	Clark Fork at Goldcreek	169	3.64	0.399	23.0	14.6	159	6.21	187	187
17	Flint Creek near Drummond	161	3.46	0.385	21.9	14.0	150	5.83	179	179
18	Clark Fork near Drummond	184	3.96	0.425	24.9	15.7	177	6.91	201	201
19	Rock Creek	56.9	1.20	0.178	8.23	5.76	39.8	1.55	74.3	74.3
20	Clark Fork at Turah Bridge	130	2.79	0.329	17.9	11.7	114	4.44	150	150
21	Blackfoot River	108	2.31	0.287	15.1	9.96	90.0	3.51	128	128
22	Clark Fork above Missoula	118	2.52	0.306	16.4	10.7	101	3.93	138	138

Table 1–6. Summary information relating to continuous streamflow data for sites in the upper Clark Fork Basin, Montana , based on data collected during water years 2001–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site number (fig. 1, table 1)	Site name (fig. 1, table 1)	Drainage area, square miles	Water years summarized based on available data during water years 2001–10	Daily mean streamflow, cubic feet per second					
				Minimum	25th percentile	Median	Mean	75th percentile	Maximum
1	Blacktail Creek at Harrison Avenue, at Butte, Mont.	85	2001–10	4.4	7.2	8.9	13	13	131
2	Silver Bow Creek below Blacktail Creek, at Butte, Mont.	103	2001–10	11	15	17	21	22	156
3	Silver Bow Creek at Opportunity, Mont.	363	2001–10	11	24	30	44	45	454
4	Mill Creek near Anaconda, Mont.	34	2005–10	5.5	10	14	33	30	252
5	Mill Creek at Opportunity, Mont.	43	2004–10	0.20	1.7	4.3	15	10	195
6	Willow Creek near Anaconda, Mont.	14	2005–10	0.50	1.5	2.2	7.0	5.9	95
7	Willow Creek at Opportunity, Mont.	31	2004–10	2.5	5.1	6.6	10	9.2	114
8	Silver Bow Creek at Warm Springs, Mont.	473	2001–10	15	35	47	70	67	615
9	Warm Springs Creek near Anaconda, Mont.	157	2001–10	13	46	61	84	87	601
10	Warm Springs Creek at Warm Springs, Mont.	163	2001–10	5.0	30	40	58	59	387
11	Clark Fork near Galen, Mont.	651	2001–10	26	68	89	130	130	988
12	Lost Creek near Anaconda, Mont.	26	2005–10	0.00	3.1	4.7	6.5	7.1	56
13	Lost Creek near Galen, Mont.	61	2004–10	1.4	8.5	36	29	43	100
14	Clark Fork at Deer Lodge, Mont.	995	2001–10	27	147	187	216	236	1,470
15	Little Blackfoot River near Garrison, Mont.	407	2001–10	16	52	72	145	147	1,440
16	Clark Fork at Goldcreek, Mont.	1,704	2001–10	73	271	332	460	474	3,990
17	Flint Creek near Drummond, Mont.	490	2001–10	2.1	66	98	123	142	869
18	Clark Fork near Drummond, Mont.	2,501	2001–10	100	401	503	648	684	4,130
19	Rock Creek near Clinton, Mont.	885	2001–10	40	180	240	471	468	5,020
20	Clark Fork at Turah Bridge, near Bonner, Mont.	3,641	2001–10	177	654	816	1,200	1,160	7,900
21	Blackfoot River near Bonner, Mont.	2,290	2001–10	180	490	624	1,330	1,460	10,100
22	Clark Fork above Missoula, Mont.	5,999	2001–10	450	1,130	1,420	2,500	2,640	17,300

Appendix 2—Summary of the Time-Series Model (TSM) as Applied in this Study

The theory and parameter estimation for the model are described in detail in Vecchia (2005). In the time-series model, log-transformed concentration data were partitioned into several components according to equation 2:

$$\log(C) = M_C + ANN_C + SEAS_C + TREND + HFV_C \qquad (2)$$

where

- log is the base-10 logarithm;
- C is the concentration, in milligrams per liter;
- M_C is the long-term mean of the log-transformed concentration, as the base-10 logarithm of milligrams per liter;
- ANN_C is the annual concentration anomaly (dimensionless);
- $SEAS_C$ is the seasonal concentration anomaly (dimensionless);
- $TREND$ is the concentration trend (dimensionless); and
- HFV_C is the high-frequency variability of the concentration (dimensionless).

In equation 2, the annual concentration anomaly (ANN_C), seasonal concentration anomaly ($SEAS_C$), and high-frequency variability (HFV_C) terms represent natural variability in concentration for different time scales. ANN_C is an estimate of the interannual variability in concentration that can be attributed to long-term variability in streamflow. ANN_C is quantified by relating annual means (for the 365-day period immediately before a given sample) of log concentration and log streamflow to long-term means (for the entire period of record). Extended droughts and wet periods can change the chemical and suspended-material composition of streamflow by changing the degree of contact between surface runoff and soil particles, availability of particulate material in stream channels and near-stream areas, and changing the relative composition of runoff among groundwater, overland flow, and subsurface flow (Vecchia, 2005).

$SEAS_C$ is an estimate of the seasonal variability in concentration that can be attributed to seasonal variability in streamflow or to factors other than variability in streamflow. $SEAS_C$ is quantified by relating seasonal means (for the 90-day period immediately before a given sample was collected) of log concentration and log streamflow to annual means (for the 365-day period immediately before a given sample was collected). For example, the seasonal snow-accumulation and snowmelt cycle causes seasonal fluctuations in streamflow and water quality. Seasonal differences in the relative amount of streamflow that comes from natural sources compared to anthropogenic contributions (such as wastewater inputs) also might cause seasonal fluctuations in concentration that are more complicated than a simple relation between concentration and streamflow could produce.

HFV_C is an estimate of the variability in concentration for time scales that are smaller than the seasonal time scale (time scales of several days to several weeks). Thus, high-frequency variability is the variability that remains after the removal of seasonal and annual anomalies and trends. HFV_C is quantified by relating log concentration and log streamflow for the day of sampling to log concentration and log streamflow for each of the two 10-day periods immediately before a given sample. Short-term changes in meteorological conditions might cause high-frequency variability in concentration and streamflow. The high-frequency variability depends on a time-series model, called a periodic autoregressive moving average model, that accounts for the presence of serial correlation among concentrations (for example, the tendency for high or low values to persist for several days to several weeks before returning to normal levels; Vecchia, 2005).

TREND is an estimate of the long-term systematic changes in concentration during the study period that are unrelated to long-term variability in streamflow. For this report, a significant trend might indicate changes in the extent to which mining wastes affect chemical composition of surface water or changes in other activities, such as agricultural practices, that can change the amount of suspended sediment or trace elements that reach the stream. *TREND* consists of piecewise monotonic trends during specified trend-analysis periods. The overall significance of *TREND* (determined by using the generalized likelihood ratio principle; Vecchia, 2005, appendix 1) specifies whether there were any significant changes during any of the specified trend-analysis periods. For a given site and constituent combination, if *TREND* was determined to be nonsignificant, the trends for all of the specified trend-analysis periods were considered nonsignificant and *p*-values were not reported. Infrequently, overall significance of *TREND* could not be determined (and thus *TREND* was assumed to be nonsignificant), but the individual trend coefficient for a specified trend-analysis period was highly significant and of large magnitude. In those cases, with *TREND* included in the model, the numerical procedure for minimizing the likelihood function apparently converged to a local, rather than global, minimum and produced unrealistic results relative to the model without *TREND* included. However, trend directions and magnitudes for those infrequent cases generally were consistent with trends for other constituents that would be expected to behave in a similar manner, and with trends for upstream or downstream sites. Therefore, the TSM was presumed to provide reasonably accurate trend magnitudes for the specified trend-analysis period and overall trend patterns were not strongly affected. For a given site and constituent combination, if *TREND* was determined to be significant, the slope coefficient (γ; Vecchia, 2005, appendix 1) for the trend for each specified trend-analysis period was used to determine the significance and magnitude of the trend for the specified trend-analysis period. The null hypothesis in the test for trend significance in a given trend analysis period is that there is no trend (that is, $\gamma = 0$). If the two-tailed p-value for γ was less than the selected alpha level (0.01 in this report), the null hypothesis was rejected and the trend was determined to be significant. Determination of a nonsignificant trend (that is, a p-value greater than 0.01) does not imply that the null hypothesis is accepted (that is, that there is no trend). It indicates that within the statistical framework of the analysis, a significant trend was not detected. The magnitude of the trend for a specified trend-analysis period is expressed as the percent difference between the geometric mean concentration at the end of the period and the geometric mean concentration at the start of the period and is determined by the equation:

$$\%\Delta FAC = 100(10^{\gamma} - 1), \qquad (3)$$

where

- $\%\Delta FAC$ is the percent change in the geometric mean of the flow-adjusted concentration, and
- γ is the slope coefficient of the trend for the specified trend-analysis period in log-transformed units.

Log-transformed concentrations that have ANN_C and $SEAS_C$ removed are referred to in this report as flow-adjusted concentrations. Using equation 2, the flow-adjusted concentration is defined as:

$$FAC = \log(C) - ANN_C - SEAS_C = M_C + TREND + HFV_C \qquad (4)$$

where

- FAC is the flow-adjusted value, as the base-10 logarithm of the original units of measurement.

The FACs defined by equation 4 are analogous to FACs defined in previous publications as the residuals from a regression model that relates concentration to concurrent daily streamflow (Helsel and Hirsch, 2002); however, the TSM approach generally is more effective than a regression-based approach for removing streamflow-related variability (Vecchia, 2005). Time-series plots showing the FACs along with the fitted trend (M_C+$TREND$) illustrate long-term changes in geometric mean concentration that might indicate changes in effects of mining wastes on water-quality in the selected watersheds.

The key to making TSM a powerful trend analysis tool is that the entire time series of daily streamflow data are used in the model, not just streamflow for the days when concentration samples are available. The model uses a three-per-month, or approximately 10-day, sampling frequency. Each month is divided into three intervals—days 1 through 10, days 11 through 20, and day 21 through the end of the month. If a water-quality sample is available for a particular interval, it is paired with daily streamflow for the same day of the water-quality sample. If no water-quality sample is available, the concentration value for the interval is missing and streamflow for the middle of the interval (day 5, 15, or 25) is used. If more than one concentration sample is available for the interval, the value nearest to the midpoint of the interval is used. The log-transformed streamflow time series (consisting of three values per month) is divided into an annual anomaly, seasonal anomaly, and high-frequency variability according to the following equation,

$$\log(Q) = M_Q + ANN_Q + SEAS_Q + HFV_Q \qquad (5)$$

where

- Q is daily mean streamflow, in cubic feet per second;
- M_Q is the mean of the log-transformed streamflow for the entire trend analysis period, as the base-10 logarithm of cubic feet per second;
- ANN_Q is the annual streamflow anomaly, computed as the 1-year lagged moving average of $\log(Q)$-M_Q (dimensionless);
- $SEAS_Q$ is the seasonal streamflow anomaly, computed as the 3-month lagged moving average of $\log(Q)$-M_Q-ANN_Q (dimensionless); and
- HFV_Q is $\log(Q)$-M_Q-ANN_Q-$SEAS_Q$ is the high-frequency streamflow variability (dimensionless).

The water-quality time-series model (equation 2) is directly tied to the streamflow time-series model because the streamflow anomalies (ANN_Q and $SEAS_Q$ from equation 5) are used as predictor variables for concentration (equation 2). For example, ANN_C is assumed to equal a constant coefficient (estimated from the time-series model) times ANN_Q. The different scales of streamflow variability often affect concentration in different ways. The relation between HFV_C and HFV_Q can be particularly complicated, changing depending on the time-of-year and the degree of serial correlation in the concentration data and cross-correlation between concentration and streamflow.

The TSM residuals for each site and constituent combination were examined graphically to verify the model assumptions that the residuals had constant variance, were serially uncorrelated, and were approximately normally distributed. Because of the application of the TSM to the large number of site and constituent combinations, and practical considerations to keep the trend periods comparable among sites and constituents, some minor deviations of the residuals from model assumptions were tolerated. Such deviations included small changes in residual variance through time and short-term (about 1 to 2 years) unresolved trending in the residuals. In cases where unresolved residual trends were considered to be large enough to possibly affect the magnitudes and significance levels of reported fitted trends, more complicated trend models were tested and in nearly all cases the more complicated models did not change the general findings and conclusions of this report. Therefore, the reported TSM results were judged to provide acceptable fits representative of linearity through nearly all of the range in *FAC*s for a given site and constituent combination. Standard errors of estimates (SEEs) for the TSM analyses are presented in table 2–1. In this report, SEEs are expressed in percent and were converted from log units by using procedures described by Tasker (1978). For all trace elements, mean SEEs range from 20.9 to 64.5 percent. Mean SEEs for unfiltered-recoverable copper and arsenic concentrations are 47.0 and 28.8 percent, respectively. Mean SEE for suspended-sediment concentration (62.8) is substantially higher than for mean SEEs for trace elements. The SEEs indicate reasonably accurate definition of concentration and streamflow relations for the purpose of trend analysis. However, higher mean SEE for suspended sediment than mean SEEs for trace elements indicates lower confidence in results. For each site and constituent combination, the fit of the TSM can be assessed by examination of the fitted trends in relation to the *FAC*s that are shown in figures 4–1 through 4–3, 4–8 through 4–11, and 4–14 through 4–22. The distribution of the *FAC*s about the fitted trend lines shows the extent to which the residuals might exhibit nonconstant variance or unresolved trends.

Table 2–1. Statistical summaries of standard errors of estimates (SEEs) for the time-series model (TSM) analyses[1].

[NA, not applicable]

Constituent or property	Number of sites for which trend results are reported	SEE, percent		
		Minimum	Mean	Maximum
Specific conductance	15	6.1	10.5	15.5
Cadmium, filtered	2	54.0	64.5	74.9
Cadmium, unfiltered-recoverable	2	52.1	56.5	61.0
Copper, filtered	11	22.0	32.0	40.2
Copper, unfiltered-recoverable	13	33.9	47.0	63.4
Iron, filtered	7	29.9	44.4	54.0
Iron unfiltered-recoverable	15	30.1	48.5	65.5
Lead, filtered	0	NA	NA	NA
Lead, unfiltered-recoverable	6	51.9	58.8	65.9
Manganese, filtered	14	29.0	38.9	60.7
Manganese, unfiltered-recoverable	14	33.7	42.8	51.2
Zinc, filtered	2	56.4	62.0	67.6
Zinc, unfiltered-recoverable	11	42.4	52.1	77.1
Arsenic, filtered	13	12.8	20.9	28.2
Arsenic, unfiltered-recoverable	13	18.0	28.8	45.1
Suspended sediment	15	48.6	62.8	73.8

[1]The TSM was applied to the following 15 sites (fig. 1, table 1): Blacktail Creek (site 1), Silver Bow Creek at Butte (site 2), Silver Bow Creek at Opportunity (site 3), Silver Bow Creek at Warm Springs (site 8), Warm Springs Creek at Warm Springs (site 10), Clark Fork near Galen (site 11), Clark Fork at Deer Lodge (site 14), Little Blackfoot River (site 15), Clark Fork at Goldcreek (site 16), Flint Creek (site 17), Clark Fork near Drummond (site 18), Rock Creek (site 19), Clark Fork at Turah Bridge (site 20), Blackfoot River (site 21), and Clark Fork above Missoula (site 22). For some of the site and constituent combinations, trend results are not reported because greater than 6 percent of values were affected by recensoring at study reporting level, as discussed in the section of this report "Time-Series Model." The statistical summaries present the mean and ranges of SEE for the TSM analyses for each constituent or property for which trend results are reported.

Appendix 3—Summary of Multiple Linear Regression of Water-Quality Constituents on Time, Streamflow, and Season, as Applied in this Study

Multiple linear regression of water-quality constituents on time, streamflow, and season (MLR) was applied in this study following guidelines presented in Helsel and Hirsch (2002). The basic multiple linear regression model used is represented by the equation:

$$\log(C_t) = b_0 + b_1\,T_t + b_2\log Q_t + b_3\sin(2\pi T_t) + b_4\cos(2\pi T_t) + b_5\sin(4\pi T_t) + b_6\cos(4\pi T_t) + E_t \qquad (6)$$

where

- log denotes the base-10 logarithm;
- C_t is the value of the water-quality constituent or property, in indicated units of measurement, at time t;
- b_0 is the intercept;
- b_1 through b_6 are the estimated slope coefficients associated with the various explanatory variables;
- T_t is decimal time (day of year expressed in decimal form; for example, June 30, 2010, is expressed as 2010.5) at time t;
- Q_t is instantaneous streamflow at the time of sampling, in cubic feet per second;
- $\sin(2\pi T_t)$, $\cos(2\pi T_t)$, $\sin(4\pi T_t)$, and $\cos(4\pi T_t)$ are periodic functions that describe seasonal variability; and
- E_t is an approximately normally distributed random error.

The MLR used ordinary least squares if the concentration data contained no censored observations. If censored observations were present, the MLR used adjusted maximum-likelihood estimation (Cohn, 1988, 2005) with the same formulation of dependent and explanatory variables.

Use of MLR for trend analysis involves regression of constituent concentration [$\log(C_t)$, equation 6] on streamflow (Q_t, equation 6), which inherently provides for flow adjustment and quantifies concentration and streamflow relations. The residuals from the regression of concentration on streamflow represent flow-adjusted concentrations (*FAC*s; Helsel and Hirsch, 2002). Including periodic functions that describe seasonal variability [$\sin(2\pi T_t)$, $\cos(2\pi T_t)$, $\sin(4\pi T_t)$, and $\cos(4\pi T_t)$, equation 6] accounts for the effect of repetitive seasonal variability on concentration and streamflow relations. The residuals from the regression of concentration on streamflow and the periodic functions represent changes in concentration and streamflow relations through the trend-analysis period. Including decimal time (T_t, equation 6) in the model provides quantification of the change in concentration and streamflow relations through time and describes the temporal trend in *FAC*s for the specified trend-analysis period. The slope coefficient for decimal time (b_1, equation 6) is used to determine the significance and magnitude of the trend. The null hypothesis in the test for trend significance is that there is no trend (that is, $b_1 = 0$). If the two-tailed p-value for b_1 is less than the selected alpha level (0.01 in this report), the null hypothesis is rejected and the trend is determined to be significant. Determination of a nonsignificant trend (that is, a p-value greater than 0.01) does not imply that the null hypothesis is accepted (that is, that there is no trend). It indicates that within the statistical framework of the analysis, a significant trend was not detected. The magnitude of the trend is expressed as the percent difference between the geometric mean concentration at the end of the period and the geometric mean concentration at the start of the period and is determined by the equation:

$$\%\Delta FAC = 100(10^{(Nb_1)} - 1) \qquad (7)$$

where

- $\%\Delta FAC$ is the percent change in the geometric mean of the flow-adjusted concentration; and
- N is the number of years in the trend-analysis period.

Application of linear regression for flow-adjusted trend analysis assumes that the data are normally distributed and that relations between the response variable (a given water-quality constituent) and the combined explanatory variables (time, streamflow, and periodic functions that describe seasonal variability) can be represented appropriately by a linear fit. Further, the relation between the water-quality constituent and streamflow must be statistically significant to accurately determine significance level. Data for many water-quality constituents typically do not conform to a normal distribution because of positive skew (Helsel and Hirsch, 2002). To approximate normality, constituent concentrations and streamflow were transformed to logarithm (base 10) units.

In accounting for seasonal variability, 2π and 4π sine and cosine terms were included in the regression model for all site and constituent combinations. During exploratory analysis, different multiples of π were added to the model and evaluated for significant effect. The 2π and 4π terms frequently, but not always, were significant. Inclusion of the periodic functions when they were not significant in the regression model for some site and constituent combinations probably had small effect on the trend analysis results.

Effects of serial correlation on MLR results were evaluated for each site and constituent combination. Significant serial correlation was determined if Spearman’s correlation coefficient on the lag-one residuals produced a p-value less than 0.05 (Helsel and Hirsch, 2002). Significant serial correlation was infrequent, but for site and constituent combinations with significant serial correlation the significance level of the trend results was not reported. It is notable that the simple measure of serial correlation used in this report can be affected by many factors and also might not completely represent all serial correlation effects in a given MLR model. Serial correlation does not affect the unbiased estimate of the trend line, but can result in unrepresentatively deflated SEEs and *p*-values.

The regression model results for each site and constituent combination were evaluated by examining the SEEs, the significance of the concentration and streamflow relation, influence and leverage statistics, and homoscedasticity and normality of residuals. Statistical summaries of SEE for the regression models are presented in table 3–1. In this report, SEEs are expressed in percent and were converted from log units by using procedures described by Tasker (1978). For all trace elements, mean SEEs range from 29.7–58.6 percent. Mean SEEs for unfiltered-recoverable copper and arsenic concentrations are 41.2 and 29.7 percent, respectively. SEEs for trace-element MLR models are similar to SEEs for regressions of constituents on streamflow previously used to estimate trace-element loads in the Clark Fork Basin (Lambing, 1991; Hornberger and others, 1997; Lambing, 1998; Lambing and Sando, 2008, 2009; Sando and Lambing, 2011). Mean SEE for suspended-sediment concentration (70.9) is substantially higher than for mean SEEs for trace elements, but also generally is less than or similar to SEEs for regressions previously used to estimate suspended-sediment loads in the Clark Fork Basin (Lambing, 1991; Hornberger and others, 1997; Lambing, 1998; Lambing and Sando, 2008, 2009; Sando and Lambing, 2011). The SEEs indicate reasonably accurate definition of concentration and streamflow relations for the purpose of trend analysis. However, higher mean SEE for suspended sediment than mean SEEs for trace elements indicates lower confidence in results. For a given site and constituent combination, the significance level of the trend results was not reported if the concentration and streamflow relation was nonsignificant (*p*-value greater than 0.05). No data values were determined to have significant high influence for any of the MLR models. Because of the application of a consistent regression model to the large number of site and constituent combinations, and practical considerations to keep the trend periods comparable among sites and constituents, some minor deviations of the residuals from model assumptions was tolerated. However, the reported regression model results were judged to provide acceptable fits representative of linearity through nearly all of the range in *FAC*s for a given site and constituent combination. For each site and constituent combination, the fit of the regression model can be assessed by examination of the fitted trends in relation to the *FAC*s that are shown in figures 4–4 through 4–7, 4–9, and 4–12 through 4–13. For plotting purposes, the *FAC*s were determined by adding the residuals from the regression of concentration on streamflow to the geometric mean concentration based on data collected during water years 2001–2010. The distribution of the *FAC*s about the fitted trend lines shows the extent to which the regression model results were affected by factors such as residual heteroscedasticity and curvature.

Table 3–1. Statistical summaries of standard errors of estimates (SEEs) for multiple linear regression models of water-quality constituents on time, streamflow, and season (MLR)[1].

Constituent or property	SEE, percent		
	Minimum	Mean	Maximum
Specific conductance	4.7	9.4	17.5
Cadmium, filtered	21.4	34.9	43.9
Cadmium, unfiltered-recoverable	34.0	42.4	50.1
Copper, filtered	23.9	30.5	35.6
Copper, unfiltered-recoverable	27.1	41.2	57.3
Iron, filtered	36.3	50.2	63.9
Iron unfiltered-recoverable	34.0	43.1	64.9
Lead, filtered	43.8	48.2	57.6
Lead, unfiltered-recoverable	42.3	58.6	68.8
Manganese, filtered	19.5	43.1	63.6
Manganese, unfiltered-recoverable	35.4	51.8	69.1
Zinc, filtered	24.2	35.9	51.9
Zinc, unfiltered-recoverable	35.9	46.4	61.5
Arsenic, filtered	17.4	30.1	38.4
Arsenic, unfiltered-recoverable	20.3	29.7	36.3
Suspended sediment	48.1	70.9	81.6

[1]MLR was applied to the following seven sites (fig. 1, table 1): Mill Creek near Anaconda (site 4); Mill Creek at Opportunity (site 5); Willow Creek near Anaconda (site 6); Willow Creek at Opportunity (site 7); Warm Springs Creek near Anaconda (site 9); Lost Creek near Anaconda (site 12); and Lost Creek near Galen (site 13). The statistical summaries present the mean and ranges of SEE for the seven regression models for each constituent or property.

Table 4–1. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for water years 2006–2010 (period 3)	*p*-value for overall trend analysis[1]	$SEAS_c$	ANN_c	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Blacktail Creek (site 1, fig. 1, table 1)									
Specific conductance	131	7 (NR[3])	-1 (NR[3])	-2 (NR[3])	1.000	-0.32 (<0.001)	-0.17 (<0.001)	8.7	0
Cadmium, filtered	129	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	64
Cadmium, unfiltered-recoverable	131	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	79
Copper, filtered	130	-11 (NR[3])	-2 (NR[3])	-5 (NR[3])	0.038	1.43 (<0.001)	-0.13 (0.136)	40.2	5
Copper, unfiltered-recoverable	131	-17 (0.060)	0 (0.974)	-12 (0.327)	0.005	1.31 (<0.001)	-0.11 (0.416)	33.9	0
Iron, filtered	131	-38 (0.001)	56 (0.004)	27 (0.215)	<0.001	1.89 (<0.001)	1.61 (<0.001)	43.4	0
Iron unfiltered-recoverable	131	-22 (NR[3])	-14 (NR[3])	48 (NR[3])	0.030	1.17 (<0.001)	0.38 (0.007)	37.4	0
Lead, filtered	129	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	76
Lead, unfiltered-recoverable	131	NR[4]	NR[4]	NR[4]	NR4	NR[4]	NR[4]	NR[4]	36
Manganese, filtered	131	1 (NR[3])	-19 (NR[3])	31 (NR[3])	0.579	-0.40 (0.006)	-0.03 (0.705)	33.3	0
Manganese, unfiltered-recoverable	131	-16 (0.007)	-17 (0.010)	45 (<0.001)	0.001	-0.42 (0.004)	-0.20 (0.010)	34.1	0
Zinc, filtered	129	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	64
Zinc, unfiltered-recoverable	131	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	24
Arsenic, filtered	130	-27 (<0.001)	18 (0.003)	7 (0.371)	<0.001	0.88 (<0.001)	0.31 (<0.001)	22.0	0
Arsenic, unfiltered-recoverable	130	-26 (<0.001)	9 (0.246)	7 (0.499)	0.001	0.98 (<0.001)	0.51 (<0.001)	22.3	1
Suspended sediment	131	7 (0.648)	-21 (0.150)	-10 (0.599)	0.089	1.09 (<0.001)	0.20 (0.335)	61.8	0
Silver Bow Creek at Butte (site 2, fig. 1, table 1)									
Specific conductance	139	-5 (NR[3])	0 (NR[3])	-3 (NR[3])	0.010	-0.36 (<0.001)	-0.19 (<0.001)	9.7	0
Cadmium, filtered	138	-69 (<0.001)	-66 (<0.001)	-68 (<0.001)	<0.001	1.07 (0.043)	0.97 (0.009)	74.9	1
Cadmium, unfiltered-recoverable	137	-58 (<0.001)	-64 (<0.001)	-73 (<0.001)	<0.001	1.65 (<0.001)	0.47 (0.103)	61.0	1
Copper, filtered	139	-79 (<0.001)	6 (0.717)	-56 (<0.001)	<0.001	1.96 (<0.001)	0.96 (<0.001)	36.5	0
Copper, unfiltered-recoverable	139	-76 (<0.001)	-29 (<0.001)	-55 (<0.001)	<0.001	1.71 (<0.001)	0.89 (<0.001)	34.1	0
Iron, filtered	139	-68 (<0.001)	67 (<0.001)	73 (0.003)	<0.001	1.54 (<0.001)	0.74 (0.005)	46.2	0
Iron unfiltered-recoverable	139	-55 (<0.001)	-17 (0.080)	28 (0.072)	<0.001	2.07 (<0.001)	0.73 (<0.001)	47.6	0
Lead, filtered	134	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	79
Lead, unfiltered-recoverable	138	-66 (<0.001)	-50 (<0.001)	-9 (0.535)	<0.001	2.20 (<0.001)	0.73 (0.004)	65.5	1

Table 4–1. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for water years 2006–2010 (period 3)	*p*-value for overall trend analysis[1]	$SEAS_c$	ANN_c	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Silver Bow Creek at Butte (site 2, fig. 1, table 1)—Continued									
Manganese, filtered	139	-56 (<0.001)	-7 (0.234)	-75 (<0.001)	<0.001	1.32 (<0.001)	0.00 (0.988)	39.1	0
Manganese, unfiltered-recoverable	139	-49 (<0.001)	-35 (<0.001)	-54 (<0.001)	0.003	1.24 (<0.001)	0.07 (0.576)	42.3	0
Zinc, filtered	139	-69 (<0.001)	-73 (<0.001)	-59 (<0.001)	<0.001	1.16 (0.004)	0.42 (0.134)	56.4	0
Zinc, unfiltered-recoverable	139	-66 (<0.001)	-72 (<0.001)	-57 (<0.001)	<0.001	1.40 (<0.001)	0.13 (0.580)	49.7	0
Arsenic, filtered	139	4 (0.525)	-41 (<0.001)	7 (0.420)	<0.001	0.21 (0.150)	-0.28 (0.021)	19.9	0
Arsenic, unfiltered-recoverable	139	-26 (<0.001)	-44 (<0.001)	8 (0.381)	<0.001	0.73 (<0.001)	-0.19 (0.136)	25.9	0
Suspended sediment	138	-9 (0.530)	-46 (<0.001)	-2 (0.939)	<0.001	1.19 (0.001)	0.00 (0.990)	68.5	0
Silver Bow Creek at Opportunity (site 3, fig. 1, table 1)									
Specific conductance	141	9 (<0.001)	1 (0.187)	-7 (0.008)	<0.001	-0.31 (<0.001)	-0.25 (<0.001)	7.8	0
Cadmium, filtered	139	-25 (0.018)	-36 (<0.001)	-45 (<0.001)	<0.001	0.44 (0.017)	0.36 (0.016)	54.0	1
Cadmium, unfiltered-recoverable	138	-6 (0.581)	-28 (<0.001)	-60 (<0.001)	<0.001	0.51 (<0.001)	0.38 (0.001)	52.1	2
Copper, filtered	139	-11 (0.197)	-33 (<0.001)	-40 (<0.001)	<0.001	0.47 (<0.001)	0.22 (0.034)	34.6	0
Copper, unfiltered-recoverable	141	-8 (0.197)	-23 (<0.001)	-53 (<0.001)	<0.001	0.35 (<0.001)	0.40 (<0.001)	63.4	0
Iron, filtered	139	-4 (NR[3])	-8 (NR[3])	19 (NR[3])	0.267	0.88 (<0.001)	0.86 (<0.001)	54.0	2
Iron unfiltered-recoverable	140	-4 (NR[3])	6 (NR[3])	-22 (NR[3])	0.885	0.71 (<0.001)	0.73 (<0.001)	58.7	0
Lead, filtered	137	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	62
Lead, unfiltered-recoverable	141	35 (0.080)	2 (0.877)	-65 (<0.001)	<0.001	0.86 (<0.001)	0.81 (<0.001)	65.9	0
Manganese, filtered	141	-20 (<0.001)	-36 (<0.001)	-49 (<0.001)	<0.001	0.01 (0.916)	-0.19 (0.051)	55.2	0
Manganese, unfiltered-recoverable	141	-10 (0.276)	-36 (<0.001)	-45 (<0.001)	<0.001	0.14 (0.303)	0.00 (0.977)	48.4	0
Zinc, filtered	140	-25 (0.038)	-39 (<0.001)	-60 (<0.001)	<0.001	0.32 (0.139)	0.17 (0.357)	67.6	0
Zinc, unfiltered-recoverable	141	-13 (0.250)	-42 (<0.001)	-52 (<0.001)	<0.001	0.46 (0.006)	0.23 (0.110)	54.3	0
Arsenic, filtered	141	19 (0.005)	14 (0.005)	-40 (<0.001)	<0.001	-0.17 (0.016)	-0.16 (0.014)	28.2	0
Arsenic, unfiltered-recoverable	141	7 (0.121)	6 (0.036)	-51 (<0.001)	<0.001	0.02 (0.730)	0.15 (0.008)	45.1	0
Suspended sediment	122	-26 (NR[3])	20 (NR[3])	-10 (NR[3])	0.671	0.62 (0.004)	0.76 (0.001)	54.3	0

Table 4–1. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for water years 2006–2010 (period 3)	*p*-value for overall trend analysis[1]	$SEAS_C$	ANN_C	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Silver Bow Creek at Warm Springs (site 8, fig. 1, table 1)									
Specific conductance	146	0 (0.918)	-4 (0.063)	5 (0.114)	0.002	-0.24 (<0.001)	-0.28 (<0.001)	10.4	0
Cadmium, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	68
Cadmium, unfiltered-recoverable	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	63
Copper, filtered	146	-54 (<0.001)	-12 (0.201)	-5 (0.683)	<0.001	0.31 (0.020)	0.24 (0.034)	31.9	0
Copper, unfiltered-recoverable	146	-51 (<0.001)	-9 (0.328)	-13 (0.234)	<0.001	0.49 (<0.001)	0.27 (0.014)	38.1	0
Iron, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	16
Iron unfiltered-recoverable	146	-27 (0.009)	-10 (0.336)	-18 (0.147)	<0.001	0.46 (0.002)	0.03 (0.780)	39.7	0
Lead, filtered	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	98
Lead, unfiltered-recoverable	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	20
Manganese, filtered	146	-8 (NR[3])	10 (NR[3])	-38 (NR[3])	1.000	0.38 (0.099)	0.10 (0.647)	60.7	0
Manganese, unfiltered-recoverable	146	-16 (NR[3])	2 (NR[3])	-35 (NR[3])	0.039	-0.01 (0.955)	-0.17 (0.322)	43.0	0
Zinc, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	58
Zinc, unfiltered-recoverable	139	-64 (<0.001)	-47 (<0.001)	1 (0.963)	<0.001	0.42 (0.008)	0.17 (0.180)	43.5	5
Arsenic, filtered	146	11 (NR[3])	0 (NR[3])	4 (NR[3])	0.562	0.26 (0.001)	0.00 (0.996)	25.9	0
Arsenic, unfiltered-recoverable	146	12 (NR[3])	-3 (NR[3])	7 (NR[3])	0.630	0.28 (<0.001)	0.01 (0.930)	26.3	0
Suspended sediment	148	9 (0.679)	-30 (0.026)	-55 (<0.001)	<0.001	0.29 (0.147)	0.16 (0.403)	64.7	0
Warm Springs Creek at Warm Springs (site 10, fig. 1, table 1)									
Specific conductance	108	-12 (<0.001)	0 (0.853)	-7 (0.040)	<0.001	-0.26 (<0.001)	-0.17 (<0.001)	15.5	0
Cadmium, filtered	108	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	94
Cadmium, unfiltered-recoverable	108	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	88
Copper, filtered	107	-2 (0.837)	-6 (0.451)	-34 (<0.001)	<0.001	-0.15 (0.029)	-0.03 (0.576)	32.3	1
Copper, unfiltered-recoverable	108	-26 (<0.001)	5 (0.589)	27 (0.070)	<0.001	0.08 (0.336)	0.15 (<0.001)	60.9	0
Iron, filtered	108	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	11
Iron unfiltered-recoverable	108	-32 (NR[3])	11 (NR[3])	58 (NR[3])	0.044	0.34 (<0.001)	0.30 (0.010)	60.8	0
Lead, filtered	108	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	99
Lead, unfiltered-recoverable	108	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	47

Table 4–1. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for water years 2006–2010 (period 3)	*p*-value for overall trend analysis[1]	$SEAS_c$	ANN_c	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Warm Springs Creek at Warm Springs (site 10, fig. 1, table 1)—Continued									
Manganese, filtered	108	-40 (<0.001)	21 (0.150)	-52 (<0.001)	<0.001	-0.30 (0.047)	-0.23 (0.010)	44.8	0
Manganese, unfiltered-recoverable	108	-37 (NR[3])	24 (NR[3])	-34 (NR[3])	0.081	-0.33 (0.010)	-0.29 (0.001)	46.9	0
Zinc, filtered	108	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	91
Zinc, unfiltered-recoverable	108	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	23
Arsenic, filtered	108	13 (<0.001)	-1 (0.685)	-24 (<0.001)	<0.001	-0.13 (<0.001)	-0.24 (<0.001)	24.4	0
Arsenic, unfiltered-recoverable	108	-10 (NR[3])	5 (NR[3])	-12 (NR[3])	0.353	-0.09 (0.171)	-0.17 (<0.001)	35.8	0
Suspended sediment	109	-46 (0.004)	-33 (0.051)	144 (<0.001)	<0.001	-0.19 (0.226)	0.26 (0.072)	68.3	0
Clark Fork near Galen (site 11, fig. 1, table 1)									
Specific conductance	147	-2 (NR[3])	-2 (NR[3])	-2 (NR[3])	0.016	-0.23 (<0.001)	-0.27 (<0.001)	11.8	0
Cadmium, filtered	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR4	79
Cadmium, unfiltered-recoverable	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR4	65
Copper, filtered	147	-49 (<0.001)	-6 (0.409)	-12 (0.194)	<0.001	-0.17 (0.015)	-0.19 (0.026)	27.1	0
Copper, unfiltered-recoverable	147	-38 (<0.001)	9 (0.409)	-10 (0.437)	<0.001	0.12 (0.211)	0.13 (0.226)	46.5	0
Iron, filtered	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	15
Iron unfiltered-recoverable	147	-36 (<0.001)	17 (0.194)	0 (0.986)	0.023	0.45 (<0.001)	0.32 (0.003)	44.9	0
Lead, filtered	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	95
Lead, unfiltered-recoverable	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	17
Manganese, filtered	147	-16 (0.114)	20 (0.114)	-42 (<0.001)	<0.001	-0.07 (0.575)	-0.09 (0.391)	34.3	0
Manganese, unfiltered-recoverable	147	-23 (0.007)	7 (0.491)	-29 (0.011)	<0.001	0.09 (0.468)	-0.24 (0.008)	33.7	0
Zinc, filtered	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	51
Zinc, unfiltered-recoverable	140	-59 (<0.001)	-32 (<0.001)	9 (0.576)	<0.001	0.32 (0.029)	0.23 (0.043)	42.4	6
Arsenic, filtered	147	-4 (0.667)	9 (0.276)	-17 (0.078)	1.000	-0.13 (0.091)	0.17 (0.032)	25.6	0
Arsenic, unfiltered-recoverable	147	-10 (0.187)	14 (0.009)	-25 (<0.001)	<0.001	-0.07 (0.180)	0.10 (0.174)	26.4	0
Suspended sediment	148	-3 (0.859)	-18 (0.208)	1 (0.966)	1.000	0.53 (0.002)	0.55 (<0.001)	57.5	0

Table 4–1. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for water years 2006–2010 (period 3)	*p*-value for overall trend analysis[1]	$SEAS_c$	ANN_c	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Clark Fork at Deer Lodge (site 14, fig. 1, table 1)									
Specific conductance	146	-2 (0.355)	-1 (0.394)	-7 (0.002)	<0.001	-0.04 (0.001)	-0.20 (<0.001)	11.2	0
Cadmium, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	66
Cadmium, unfiltered-recoverable	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	51
Copper, filtered	146	-18 (0.002)	3 (0.691)	-17 (0.030)	0.002	0.18 (<0.001)	0.16 (0.023)	22.0	0
Copper, unfiltered-recoverable	145	-14 (NR[3])	-2 (NR[3])	2 (NR[3])	0.753	0.23 (0.034)	0.28 (0.030)	45.0	0
Iron, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	25
Iron unfiltered-recoverable	146	-25 (NR[3])	9 (NR[3])	18 (NR[3])	0.059	0.30 (0.042)	0.43 (0.002)	51.8	0
Lead, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	91
Lead, unfiltered-recoverable	143	-3 (NR[3])	-11 (NR[3])	33 (NR[3])	0.666	0.26 (0.101)	0.35 (0.039)	59.5	6
Manganese, filtered	146	-15 (NR[3])	45 (NR[3])	-31 (NR[3])	0.013	-0.08 (0.464)	-0.08 (0.443)	42.8	1
Manganese, unfiltered-recoverable	146	-29 (NR[3])	13 (NR[3])	-7 (NR[3])	0.090	-0.16 (0.258)	-0.09 (0.465)	46.9	0
Zinc, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	25
Zinc, unfiltered-recoverable	142	-36 (<0.001)	-8 (0.490)	-5 (0.775)	<0.001	0.27 (0.054)	0.25 (0.049)	46.6	1
Arsenic, filtered	146	-2 (0.575)	19 (<0.001)	-14 (0.001)	0.004	0.17 (<0.001)	0.21 (<0.001)	14.7	0
Arsenic, unfiltered-recoverable	146	-3 (NR[3])	5 (NR[3])	-7 (NR[3])	0.554	0.24 (<0.001)	0.24 (<0.001)	26.5	0
Suspended sediment	147	-15 (0.144)	-11 (0.380)	3 (0.870)	<0.001	-0.11 (0.565)	0.31 (0.033)	64.4	0
Little Blackfoot River (site 15, fig. 1, table 1)									
Specific conductance	65	3 (NR[3])	1 (NR[3])	NR[5]	0.357	-0.10 (<0.001)	-0.06 (<0.001)	10.7	0
Cadmium, filtered	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	98
Cadmium, unfiltered-recoverable	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	94
Copper, filtered	63	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	27
Copper, unfiltered-recoverable	65	-15 (NR[3])	11 (NR[3])	NR[5]	0.705	-0.29 (0.144)	-0.09 (0.643)	47.4	10
Iron, filtered	60	18 (NR[3])	-49 (NR[3])	NR[5]	0.019	0.30 (<0.001)	0.50 (<0.001)	51.9	19
Iron unfiltered-recoverable	65	-48 (<0.001)	33 (0.027)	NR[5]	<0.001	0.36 (<0.001)	-0.33 (0.019)	51.4	0
Lead, filtered	65	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	89
Lead, unfiltered-recoverable	65	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	61

Table 4–1. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for water years 2006–2010 (period 3)	*p*-value for overall trend analysis[1]	$SEAS_c$	ANN_c	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Little Blackfoot River (site 15, fig. 1, table 1)—Continued									
Manganese, filtered	65	-12 (NR[3])	-13 (NR[3])	NR[5]	1.000	-0.55 (<0.001)	-0.10 (0.406)	35.4	0
Manganese, unfiltered-recoverable	62	-39 (0.003)	32 (0.201)	NR[5]	0.002	0.03 (0.860)	-0.30 (0.136)	44.5	6
Zinc, filtered	65	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	88
Zinc, unfiltered-recoverable	65	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	56
Arsenic, filtered	65	-4 (NR[3])	12 (NR3)	NR[5]	0.077	0.00 (0.976)	0.03 (0.501)	12.8	0
Arsenic, unfiltered-recoverable	65	-23 (<0.001)	-5 (0.051)	NR5	<0.001	0.15 (<0.001)	-0.21 (<0.001)	18.0	0
Suspended sediment	66	-26 (NR3)	-25 (NR3)	NR[5]	0.146	0.03 (0.865)	0.24 (0.267)	67.9	0
Clark Fork at Goldcreek (site 16, fig. 1, table 1)									
Specific conductance	146	0 (NR[3])	-2 (NR[3])	-5 (NR[3])	0.197	-0.09 (<0.001)	-0.14 (<0.001)	10.0	0
Cadmium, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	85
Cadmium, unfiltered-recoverable	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	57
Copper, filtered	145	-21 (NR[3])	12 (NR[3])	-6 (NR[3])	0.019	0.01 (0.856)	0.35 (<0.001)	23.8	0
Copper, unfiltered-recoverable	145	-14 (0.168)	-18 (0.047)	3 (0.796)	0.005	0.37 (<0.001)	0.62 (<0.001)	43.1	0
Iron, filtered	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	27
Iron unfiltered-recoverable	146	-16 (0.121)	-28 (0.005)	45 (0.028)	<0.001	0.49 (0.001)	0.68 (<0.001)	49.3	0
Lead, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	99
Lead, unfiltered-recoverable	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	11
Manganese, filtered	146	-6 (NR[3])	-8 (NR[3])	3 (NR[3])	0.341	0.05 (0.648)	-0.02 (0.833)	32.3	0
Manganese, unfiltered-recoverable	146	-18 (0.017)	-20 (0.016)	22 (0.139)	<0.001	0.06 (0.631)	0.13 (0.208)	38.8	0
Zinc, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	62
Zinc, unfiltered-recoverable	144	-33 (<0.001)	-34 (<0.001)	36 (0.046)	<0.001	0.34 (0.010)	0.46 (<0.001)	42.7	1
Arsenic, filtered	146	-9 (NR[3])	10 (NR[3])	-2 (NR[3])	0.811	-0.06 (0.089)	0.15 (0.001)	15.7	0
Arsenic, unfiltered-recoverable	146	-13 (0.003)	6 (0.056)	5 (0.162)	0.003	0.06 (0.066)	0.23 (<0.001)	23.1	0
Suspended sediment	147	18 (0.263)	-53 (<0.001)	69 (0.011)	<0.001	0.48 (0.006)	0.50 (0.003)	58.9	0

Table 4–1. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for water years 2006–2010 (period 3)	*p*-value for overall trend analysis[1]	$SEAS_c$	ANN_c	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Flint Creek (site 17, fig. 1, table 1)									
Specific conductance	89	7 (NR[3])	10 (NR[3])	NR[5]	0.024	-0.12 (<0.001)	-0.12 (<0.001)	15.2	0
Cadmium, filtered	85	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	98
Cadmium, unfiltered-recoverable	85	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	91
Copper, filtered	88	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	20
Copper, unfiltered-recoverable	89	-21 (NR[3])	-16 (NR[3])	NR[5]	0.055	0.32 (<0.001)	0.23 (0.011)	37.9	1
Iron, filtered	84	-2 (NR[3])	0 (NR[3])	NR[5]	1.000	0.37 (<0.001)	0.35 (<0.001)	47.8	6
Iron unfiltered-recoverable	89	-41 (NR[3])	38 (NR[3])	NR[5]	1.000	0.65 (<0.001)	0.36 (<0.001)	37.0	0
Lead, filtered	85	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	73
Lead, unfiltered-recoverable	84	-31 (0.002)	-9 (0.481)	NR[5]	<0.001	0.88 (<0.001)	0.52 (<0.001)	52.6	8
Manganese, filtered	89	-4 (NR[3])	32 (NR[3])	NR[5]	0.072	0.00 (0.974)	-0.45 (<0.001)	33.0	0
Manganese, unfiltered-recoverable	89	-23 (0.003)	0 (0.977)	NR[5]	0.003	0.09 (0.095)	-0.14 (0.002)	39.6	0
Zinc, filtered	85	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	70
Zinc, unfiltered-recoverable	81	-33 (0.017)	-38 (0.047)	NR[5]	<0.001	0.60 (<0.001)	0.30 (0.016)	44.7	9
Arsenic, filtered	89	-7 (NR[3])	-4 (NR[3])	NR[5]	0.106	-0.08 (0.009)	-0.15 (<0.001)	20.1	0
Arsenic, unfiltered-recoverable	89	-19 (0.005)	-3 (0.687)	NR[5]	0.040	0.12 (0.017)	-0.05 (0.327)	29.6	0
Suspended sediment	90	-9 (NR[3])	-43 (NR[3])	NR[5]	1.000	0.62 (<0.001)	0.43 (0.002)	59.7	0
Clark Fork near Drummond (site 18, fig. 1, table 1)									
Specific conductance	146	-3 (0.103)	-3 (0.026)	-3 (0.084)	0.009	-0.19 (<0.001)	-0.22 (<0.001)	9.5	0
Cadmium, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	79
Cadmium, unfiltered-recoverable	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	55
Copper, filtered	143	2 (0.547)	15 (<0.001)	-23 (<0.001)	0.002	0.15 (0.029)	0.68 (<0.001)	36.2	0
Copper, unfiltered-recoverable	144	-23 (0.014)	-15 (0.107)	5 (0.755)	<0.001	0.68 (<0.001)	0.47 (<0.001)	52.9	0
Iron, filtered	143	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	36
Iron unfiltered-recoverable	145	-61 (<0.001)	7 (0.194)	44 (0.013)	<0.001	0.95 (<0.001)	0.33 (<0.001)	65.5	0
Lead, filtered	146	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	95
Lead, unfiltered-recoverable	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	12

Table 4–1. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for water years 2006–2010 (period 3)	*p*-value for overall trend analysis[1]	$SEAS_c$	ANN_c	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Clark Fork near Drummond (site 18, fig. 1, table 1)—Continued									
Manganese, filtered	145	-8 (NR[3])	1 (NR[3])	-3 (NR[3])	0.736	0.38 (<0.001)	0.15 (0.162)	34.6	0
Manganese, unfiltered-recoverable	146	-35 (<0.001)	1 (0.901)	17 (0.353)	0.005	0.54 (<0.001)	0.32 (0.038)	46.6	0
Zinc, filtered	145	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	58
Zinc, unfiltered-recoverable	143	-55 (<0.001)	-16 (<0.001)	10 (0.448)	<0.001	0.78 (<0.001)	0.30 (<0.001)	56.2	2
Arsenic, filtered	146	-8 (NR[3])	8 (NR[3])	-10 (NR[3])	0.030	0.11 (<0.001)	0.06 (0.153)	15.8	0
Arsenic, unfiltered-recoverable	146	-15 (NR[3])	1 (NR[3])	1 (NR[3])	0.163	0.21 (<0.001)	0.10 (0.121)	24.7	0
Suspended sediment	147	-39 (<0.001)	-11 (0.084)	8 (0.686)	<0.001	0.40 (0.009)	0.52 (<0.001)	65.0	0
Rock Creek (site 19, fig. 1, table 1)									
Specific conductance	65	2 (NR[3])	-8 (NR[3])	NR[5]	1.000	-0.27 (<0.001)	-0.23 (<0.001)	9.7	0
Cadmium, filtered	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	98
Cadmium, unfiltered-recoverable	63	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	95
Copper, filtered	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	65
Copper, unfiltered-recoverable	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	40
Iron, filtered	64	-15 (NR[3])	-29 (NR[3])	NR[5]	0.013	0.77 (0.001)	0.69 (<0.001)	29.9	4
Iron unfiltered-recoverable	64	-26 (<0.001)	-27 (0.044)	NR[5]	<0.001	1.20 (<0.001)	0.60 (<0.001)	30.1	0
Lead, filtered	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	89
Lead, unfiltered-recoverable	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	69
Manganese, filtered	63	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	28
Manganese, unfiltered-recoverable	63	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	30
Zinc, filtered	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	90
Zinc, unfiltered-recoverable	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	77
Arsenic, filtered	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	92
Arsenic, unfiltered-recoverable	64	NR[4]	NR[4]	NR[5]	NR[4]	NR[4]	NR[4]	NR[4]	68
Suspended sediment	66	52 (<0.001)	-56 (<0.001)	NR[5]	<0.001	3.04 (<0.001)	0.86 (<0.001)	54.5	0

Table 4–1. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for water years 2006–2010 (period 3)	*p*-value for overall trend analysis[1]	$SEAS_C$	ANN_C	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Clark Fork at Turah Bridge (site 20, fig. 1, table 1)									
Specific conductance	193	-5 (NR[3])	-1 (NR[3])	0 (NR[3])	0.016	-0.12 (<0.001)	-0.20 (<0.001)	12.8	0
Cadmium, filtered	170	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	95
Cadmium, unfiltered-recoverable	170	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	68
Copper, filtered	169	-20 (NR3)	8 (NR3)	-12 (NR3)	0.012	0.57 (<0.001)	0.51 (<0.001)	30.0	0
Copper, unfiltered-recoverable	168	-6 (NR3)	-16 (NR3)	27 (NR3)	0.110	0.65 (<0.001)	0.58 (<0.001)	47.2	0
Iron, filtered	150	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	31
Iron unfiltered-recoverable	170	-28 (<0.001)	-15 (0.222)	58 (0.082)	<0.001	0.84 (<0.001)	0.44 (<0.001)	57.1	0
Lead, filtered	170	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	92
Lead, unfiltered-recoverable	170	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	18
Manganese, filtered	170	1 (NR[3])	-10 (NR[3])	18 (NR[3])	1.000	0.41 (<0.001)	0.27 (<0.001)	29.0	1
Manganese, unfiltered-recoverable	170	-20 (0.131)	-16 (0.147)	45 (0.025)	<0.001	0.67 (<0.001)	0.19 (0.035)	51.2	0
Zinc, filtered	170	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	56
Zinc, unfiltered-recoverable	161	-33 (0.317)	-39 (0.001)	82 (0.007)	<0.001	0.49 (0.001)	-0.10 (0.483)	56.3	5
Arsenic, filtered	170	-4 (NR[3])	7 (NR[3])	2 (NR[3])	0.022	0.23 (<0.001)	0.28 (<0.001)	19.7	0
Arsenic, unfiltered-recoverable	170	-7 (NR[3])	-6 (NR[3])	21(NR[3])	0.173	0.35 (<0.001)	0.21 (<0.001)	31.2	0
Suspended sediment	209	-7 (0.895)	-32 (0.197)	60 (0.531)	0.002	0.65 (<0.001)	0.18 (<0.001)	58.1	0
Blackfoot River (site 21, fig. 1, table 1)									
Specific conductance	102	0 (0.796)	-4 (<0.001)	6 (<0.001)	<0.001	-0.14 (<0.001)	-0.05 (0.009)	6.1	0
Cadmium, filtered	101	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	99
Cadmium, unfiltered-recoverable	100	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	93
Copper, filtered	102	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	55
Copper, unfiltered-recoverable	102	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	25
Iron, filtered	102	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	32
Iron unfiltered-recoverable	102	-37 (<0.001)	29 (0.032)	-28 (0.021)	<0.001	1.13 (<0.001)	0.95 (<0.001)	43.6	2
Lead, filtered	101	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	93
Lead, unfiltered-recoverable	102	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	62

Table 4–1. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for water years 2006–2010 (period 3)	*p*-value for overall trend analysis[1]	$SEAS_c$	ANN_c	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Blackfoot River (site 21, fig. 1, table 1)—Continued									
Manganese, filtered	99	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	13
Manganese, unfiltered-recoverable	100	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	12
Zinc, filtered	101	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	88
Zinc, unfiltered-recoverable	102	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	65
Arsenic, filtered	101	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	51
Arsenic, unfiltered-recoverable	101	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	31
Suspended sediment	103	-12 (NR[3])	4 (NR[3])	-24 (NR[3])	0.403	1.21 (<0.001)	1.31 (<0.001)	48.6	0

[1]Determination of and distinction between *p*-value for individual trend period and *p*-value for overall trend analysis are discussed in "Supplement 2: Summary of the Time-Series Model (TSM) as Applied in this Study."

[2]Procedures for determining and applying the study reporting level used in the application of the time-series model are discussed in the section of this report "Time-Series Model."

[3]Results not reported because of nonsignificant overall trend analysis (*p*-value greater than 0.01).

[4]Results not reported because greater than 6 percent of values were affected by recensoring at study reporting level, as discussed in the section of this report "Time-Series Model."

[5]Results not reported because of no or insufficient data for application of the TSM during indicated trend-analysis period.

Table 4–2. Flow-adjusted trend results determined by using the time-series model (TSM) for selected water-quality constituents and properties for Clark Fork above Missoula (site 22, fig. 1, table 1), water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate *p*-values for associated percent change or coefficient. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; $SEAS_C$, seasonal concentration anomaly coefficient; ANN_C, annual concentration anomaly coefficient; SEE, standard error of estimate in percent; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 1996–2000 (period 1)	Total percent change for water years 2001–05 (period 2)	Total percent change for October 1, 2005–March 27, 2008 (period 3A)	Total percent change for March 28, 2008–September 30, 2010 (period 3B)	*p*-value for overall trend analysis[1]	$SEAS_c$	ANN_c	SEE	Percent of values affected by recensoring at study reporting level used in the application of the time-series model[2]
Clark Fork above Missoula (site 22, fig. 1, table 1)										
Specific conductance	186	0 (NR[3])	-2 (NR[3])	0 (NR[3])	5 (NR[3])	0.031	-0.18 (<0.001)	-0.19 (<0.001)	8.5	0
Cadmium, filtered	166	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	96
Cadmium, unfiltered-recoverable	167	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	77
Copper, filtered	166	-21 (NR[3])	21 (NR[3])	7 (NR[3])	11 (NR[3])	0.027	0.53 (<0.001)	0.37 (0.007)	37.6	1
Copper, unfiltered-recoverable	165	-18 (0.026)	52 (<0.001)	104 (<0.001)	-59 (0.002)	<0.001	0.55 (<0.001)	0.62 (<0.001)	60.1	0
Iron, filtered	167	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	20
Iron unfiltered-recoverable	167	-30 (<0.001)	61 (<0.001)	79 (<0.001)	-58 (0.001)	<0.001	0.77 (<0.001)	0.76 (<0.001)	52.5	0
Lead, filtered	160	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	95
Lead, unfiltered-recoverable	162	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	25
Manganese, filtered	167	-8 (0.312)	1 (0.938)	2 (0.854)	-44 (0.001)	<0.001	-0.17 (0.303)	0.01 (0.930)	39.1	0
Manganese, unfiltered-recoverable	167	-20 (0.023)	17 (0.242)	71 (<0.001)	-45 (0.005)	<0.001	0.13 (0.461)	0.17 (0.267)	41.4	0
Zinc, filtered	166	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	77
Zinc, unfiltered-recoverable	150	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	NR[4]	10
Arsenic, filtered	167	-2 (0.636)	12 (0.078)	7 (0.365)	12 (0.276)	0.005	0.19 (0.015)	-0.02 (0.765)	26.8	0
Arsenic, unfiltered-recoverable	167	-6 (0.410)	14 (0.184)	24 (0.070)	-2 (0.921)	0.008	0.49 (<0.001)	0.08 (0.540)	39.7	0
Suspended sediment	209	-15 (0.211)	32 (0.150)	147 (<0.001)	-60 (0.004)	<0.001	1.28 (<0.001)	0.72 (<0.001)	70.4	0

[1]Determination of and distinction between *p*-value for individual trend period and *p*-value for overall trend analysis are discussed in "Supplement 2: Summary of the Time-Series Model (TSM) as Applied in this Study."

[2]Procedures for determining and applying the study reporting level used in the application of the time-series model are discussed in the section of this report "Time-Series Model."

[3]Results not reported because of nonsignificant overall trend analysis (*p*-value greater than 0.01).

[4]Results not reported because greater than 6 percent of values were affected by recensoring at study reporting level, as discussed in the section of this report "Time-Series Model."

Table 4–3. Flow-adjusted trend results determined by using multiple linear regression on time, streamflow, and season (MLR) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 2006–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate 95-percent confidence intervals. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; SEE, standard error of estimate; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 2006–2010 (period 5)	Percent censored values	*p*-value for streamflow coefficient	SEE	*p*-value for regression
Mill Creek near Anaconda (site 4, fig. 1, table 1)						
Specific conductance	48	7 (0.031)	0	<0.001	7.0	<0.001
Cadmium, filtered	47	0 (NR[1])	4	0.989	41.7	0.081
Cadmium, unfiltered-recoverable	48	-11 (0.433)	0	0.024	35.6	<0.001
Copper, filtered	48	-15 (0.253)	0	<0.001	33.8	<0.001
Copper, unfiltered-recoverable	48	-21 (0.091)	2	0.003	32.6	<0.001
Iron, filtered	48	-33 (NR[1])	0	0.507	34.9	<0.001
Iron unfiltered-recoverable	48	-25 (0.055)	0	0.022	36.3	<0.001
Lead, filtered	48	-36 (NR[1])	6	0.280	57.6	<0.001
Lead, unfiltered-recoverable	48	-29 (0.046)	0	0.010	19.5	<0.001
Manganese, filtered	48	-4 (NR[1])	0	0.210	19.5	<0.001
Manganese, unfiltered-recoverable	48	-15 (NR[1])	0	0.260	35.4	<0.001
Zinc, filtered	48	16 (0.258)	10	<0.001	29.6	<0.001
Zinc, unfiltered-recoverable	48	0 (0.982)	0	<0.001	35.9	<0.001
Arsenic, filtered	48	-9 (NR[1])	0	0.758	38.4	0.002
Arsenic, unfiltered-recoverable	48	-13 (NR[1])	0	0.960	34.7	<0.001
Suspended sediment	48	-20 (0.252)	0	<0.001	48.1	<0.001
Mill Creek at Opportunity (site 5, fig. 1, table 1)						
Specific conductance	64	11 (0.010)	0	<0.001	10.4	<0.001
Cadmium, filtered	64	-21 (NR[1])	0	0.343	27.5	<0.001
Cadmium, unfiltered-recoverable	64	-33 (0.007)	0	<0.001	41.1	<0.001
Copper, filtered	64	-36 (<0.001)	0	<0.001	26.2	<0.001
Copper, unfiltered-recoverable	64	-35 (0.003)	0	<0.001	38.0	<0.001
Iron, filtered	64	-27 (NR[1])	0	0.733	34.0	<0.001
Iron unfiltered-recoverable	64	-26 (0.116)	0	<0.001	54.0	<0.001
Lead, filtered	64	-40 (0.003)	9	<0.001	47.0	<0.001
Lead, unfiltered-recoverable	64	-23 (0.214)	0	<0.001	47.9	<0.001
Manganese, filtered	64	-32 (0.027)	0	<0.001	47.9	<0.001
Manganese, unfiltered-recoverable	64	-23 (NR[1])	0	0.222	69.1	<0.001
Zinc, filtered	63	-42 (NR[1])	2	0.534	24.2	<0.001
Zinc, unfiltered-recoverable	64	-33 (0.013)	0	<0.001	45.4	<0.001
Arsenic, filtered	64	-33 (NR[1])	0	0.071	33.0	<0.001
Arsenic, unfiltered-recoverable	64	-34 (<0.001)	0	0.009	30.7	<0.001
Suspended sediment	64	-15 (0.504)	0	<0.001	72.4	<0.001

Table 4–3. Flow-adjusted trend results determined by using multiple linear regression on time, streamflow, and season (MLR) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 2006–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate 95-percent confidence intervals. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; SEE, standard error of estimate; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 2006–2010 (period 5)	Percent censored values	*p*-value for streamflow coefficient	SEE	*p*-value for regression
Willow Creek near Anaconda (site 6, fig. 1, table 1)						
Specific conductance	44	24 (<0.001)	0	<0.001	8.5	<0.001
Cadmium, filtered	42	-14 (0.314)	12	0.040	33.1	0.005
Cadmium, unfiltered-recoverable	44	-33 (0.054)	7	0.001	47.9	<0.001
Copper, filtered	44	-23 (0.016)	0	<0.001	23.9	<0.001
Copper, unfiltered-recoverable	44	-32 (0.064)	2	0.009	48.3	<0.001
Iron, filtered	44	-16 (0.388)	0	0.017	47.0	<0.001
Iron unfiltered-recoverable	44	-29 (0.096)	0	<0.001	49.0	<0.001
Lead, filtered	44	-38 (0.014)	0	<0.001	44.2	<0.001
Lead, unfiltered-recoverable	44	-44 (0.022)	0	<0.001	30.2	<0.001
Manganese, filtered	44	-24 (NR[1])	0	0.086	30.2	<0.001
Manganese, unfiltered-recoverable	44	-26 (NR[1])	0	0.114	39.8	0.006
Zinc, filtered	44	-26 (0.055)	9	0.003	34.6	<0.001
Zinc, unfiltered-recoverable	44	-18 (0.317)	9	<0.001	44.7	<0.001
Arsenic, filtered	44	-16 (0.038)	0	0.042	18.3	<0.001
Arsenic, unfiltered-recoverable	44	-18 (0.026)	0	0.020	20.3	<0.001
Suspended sediment	44	-54 (0.015)	0	<0.001	80.8	<0.001
Willow Creek at Opportunity (site 7, fig. 1, table 1)						
Specific conductance	64	-13 (0.027)	0	0.020	17.5	<0.001
Cadmium, filtered	64	-25 (0.064)	8	<0.001	43.9	<0.001
Cadmium, unfiltered-recoverable	64	7 (0.611)	2	<0.001	39.7	<0.001
Copper, filtered	64	-26 (0.008)	0	<0.001	31.8	<0.001
Copper, unfiltered-recoverable	64	-15 (0.199)	0	<0.001	35.4	<0.001
Iron, filtered	64	54 (0.008)	0	<0.001	46.6	<0.001
Iron unfiltered-recoverable	64	61 (0.004)	0	<0.001	47.3	<0.001
Lead, filtered	64	32 (0.066)	2	<0.001	43.8	<0.001
Lead, unfiltered-recoverable	64	19 (0.358)	0	<0.001	57.4	<0.001
Manganese, filtered	64	41 (NR[1])	0	0.886	57.4	<0.001
Manganese, unfiltered-recoverable	64	70 (NR[1])	0	0.239	54.1	<0.001
Zinc, filtered	64	-21 (0.142)	5	<0.001	47.3	<0.001
Zinc, unfiltered-recoverable	64	6 (0.734)	0	<0.001	50.0	<0.001
Arsenic, filtered	64	-23 (0.041)	0	<0.001	37.1	<0.001
Arsenic, unfiltered-recoverable	64	-19 (0.090)	0	<0.001	36.3	<0.001
Suspended sediment	64	10 (0.657)	0	<0.001	66.4	<0.001

Table 4–3. Flow-adjusted trend results determined by using multiple linear regression on time, streamflow, and season (MLR) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 2006–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate 95-percent confidence intervals. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; SEE, standard error of estimate; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 2006–2010 (period 5)	Percent censored values	*p*-value for streamflow coefficient	SEE	*p*-value for regression
Warm Springs Creek near Anaconda (site 9, fig. 1, table 1)						
Specific conductance	30	16 (<0.001)	0	<0.001	4.7	<0.001
Cadmium, filtered	30	24 (NR[1])	30	0.224	21.4	<0.001
Cadmium, unfiltered-recoverable	30	1 (NR[1])	10	0.246	50.1	<0.001
Copper, filtered	30	-15 (NR[1])	7	0.060	32.1	<0.001
Copper, unfiltered-recoverable	30	24 (NR[1])	10	0.193	57.3	<0.001
Iron, filtered	30	-38 (NR[1])	10	0.768	39.1	<0.001
Iron unfiltered-recoverable	30	-1 (0.969)	0	0.038	57.2	<0.001
Lead, filtered	30	NR[2]	70	NR[2]	NR[2]	NR[2]
Lead, unfiltered-recoverable	30	4 (0.923)	0	0.016	67.6	<0.001
Manganese, filtered	30	91 (NR[1])	3	0.326	38.8	<0.001
Manganese, unfiltered-recoverable	30	18 (0.592)	0	0.029	53.2	<0.001
Zinc, filtered	30	NR[2]	47	NR[2]	NR[2]	NR[2]
Zinc, unfiltered-recoverable	30	22 (0.564)	13	0.005	61.5	<0.001
Arsenic, filtered	30	-9 (NR[1])	0	0.130	17.4	0.010
Arsenic, unfiltered-recoverable	30	18 (NR[1])	0	0.058	20.3	<0.001
Suspended sediment	30	-24 (0.498)	0	<0.001	72.3	<0.001
Lost Creek near Anaconda (site 12, fig. 1, table 1)						
Specific conductance	47	-4 (0.315)	0	<0.001	8.7	<0.001
Cadmium, filtered	46	-44 (NR[1])	11	0.504	41.9	<0.001
Cadmium, unfiltered-recoverable	47	-50 (NR[1])	11	0.526	48.4	<0.001
Copper, filtered	47	-46 (NR[1])	0	0.879	30.2	<0.001
Copper, unfiltered-recoverable	47	-42 (NR[1])	2	0.160	49.9	<0.001
Iron, filtered	47	25 (0.193)	9	0.034	35.3	<0.001
Iron unfiltered-recoverable	47	-20 (0.426)	0	0.002	63.9	<0.001
Lead, filtered	47	NR[2]	57	NR[2]	NR[2]	NR[2]
Lead, unfiltered-recoverable	47	-28 (0.286)	0	0.022	44.3	<0.001
Manganese, filtered	47	-16 (NR[1])	2	0.429	44.3	<0.001
Manganese, unfiltered-recoverable	47	-3 (NR[1])	0	0.067	52.6	<0.001
Zinc, filtered	47	-32 (NR[1])	30	0.245	28.1	<0.001
Zinc, unfiltered-recoverable	47	-43 (NR[1])	4	0.081	47.4	<0.001
Arsenic, filtered	47	-51 (NR[1])	0	0.161	32.3	<0.001
Arsenic, unfiltered-recoverable	47	-44 (NR[1])	0	0.375	31.3	<0.001
Suspended sediment	47	-56 (0.013)	0	<0.001	74.8	<0.001

Table 4–3. Flow-adjusted trend results determined by using multiple linear regression on time, streamflow, and season (MLR) for selected water-quality constituents and properties for selected sampling sites in the upper Clark Fork Basin, Montana, water years 2006–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. Values in parentheses indicate 95-percent confidence intervals. Gray shading indicates statistical significance at *p*-value less than 0.01. *p*-value, statistical probability level; SEE, standard error of estimate; NR, not reported; <, less than]

Constituent or property	Number of samples	Total percent change for water years 2006–2010 (period 5)	Percent censored values	*p*-value for streamflow coefficient	SEE	*p*-value for regression
Lost Creek near Galen (site 13, fig. 1, table 1)						
Specific conductance	62	4 (NR[1])	0	0.230	7.4	<0.001
Cadmium, filtered	61	8 (NR[1])	16	0.375	35.3	0.026
Cadmium, unfiltered-recoverable	62	-51 (<0.001)	8	0.026	34.3	<0.001
Copper, filtered	61	-52 (NR[1])	0	0.360	27.6	<0.001
Copper, unfiltered-recoverable	62	-49 (<0.001)	0	0.003	23.8	<0.001
Iron, filtered	62	129 (NR[1])	5	0.110	58.1	<0.001
Iron unfiltered-recoverable	62	31 (NR[1])	0	0.378	44.1	<0.001
Lead, filtered	61	4 (NR1)	57	0.760	81.2	0.011
Lead, unfiltered-recoverable	62	-10 (0.601)	0	0.002	61.7	<0.001
Manganese, filtered	62	141 (NR[1])	0	0.075	61.7	<0.001
Manganese, unfiltered-recoverable	62	140 (NR[1])	0	0.317	57.1	<0.001
Zinc, filtered	61	13 (NR[1])	15	0.911	50.5	<0.001
Zinc, unfiltered-recoverable	62	-24 (0.055)	10	0.004	37.6	<0.001
Arsenic, filtered	62	-3 (0.774)	0	0.030	32.6	<0.001
Arsenic, unfiltered-recoverable	62	6 (0.616)	0	0.038	32.8	<0.001
Suspended sediment	62	16 (0.588)	0	0.526	81.3	<0.001

[1]Results not reported because of nonsignificant relation between streamflow and consituent concentration as indicated by *p*-value greater than 0.05.

[2]Results not reported because greater than 45 percent of values were censored (that is, concentrations reported as less than the laboratory reporting level).

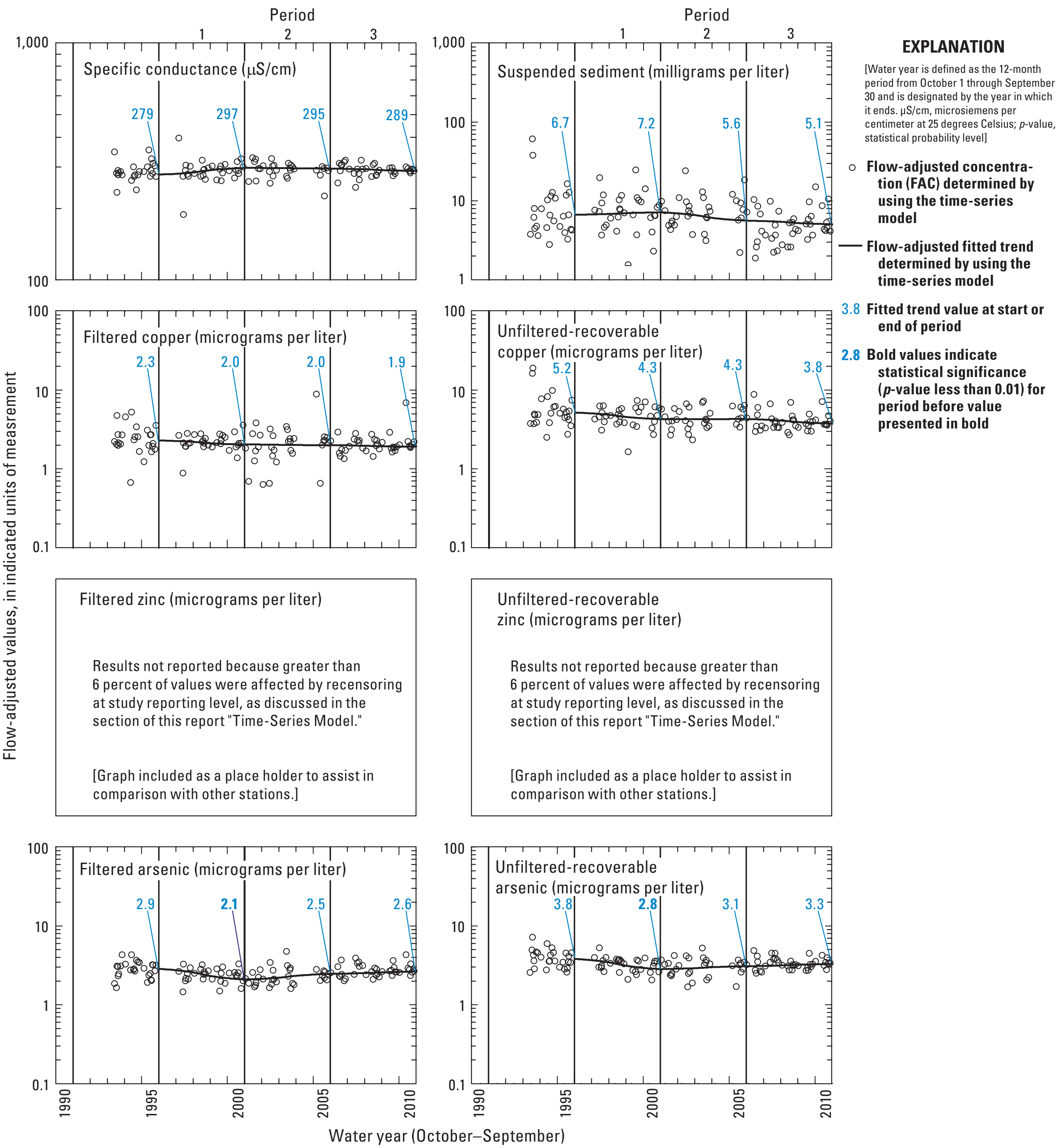

Figure 4–1. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Blacktail Creek (site 1, fig. 1, table 1), water years 1996–2010.

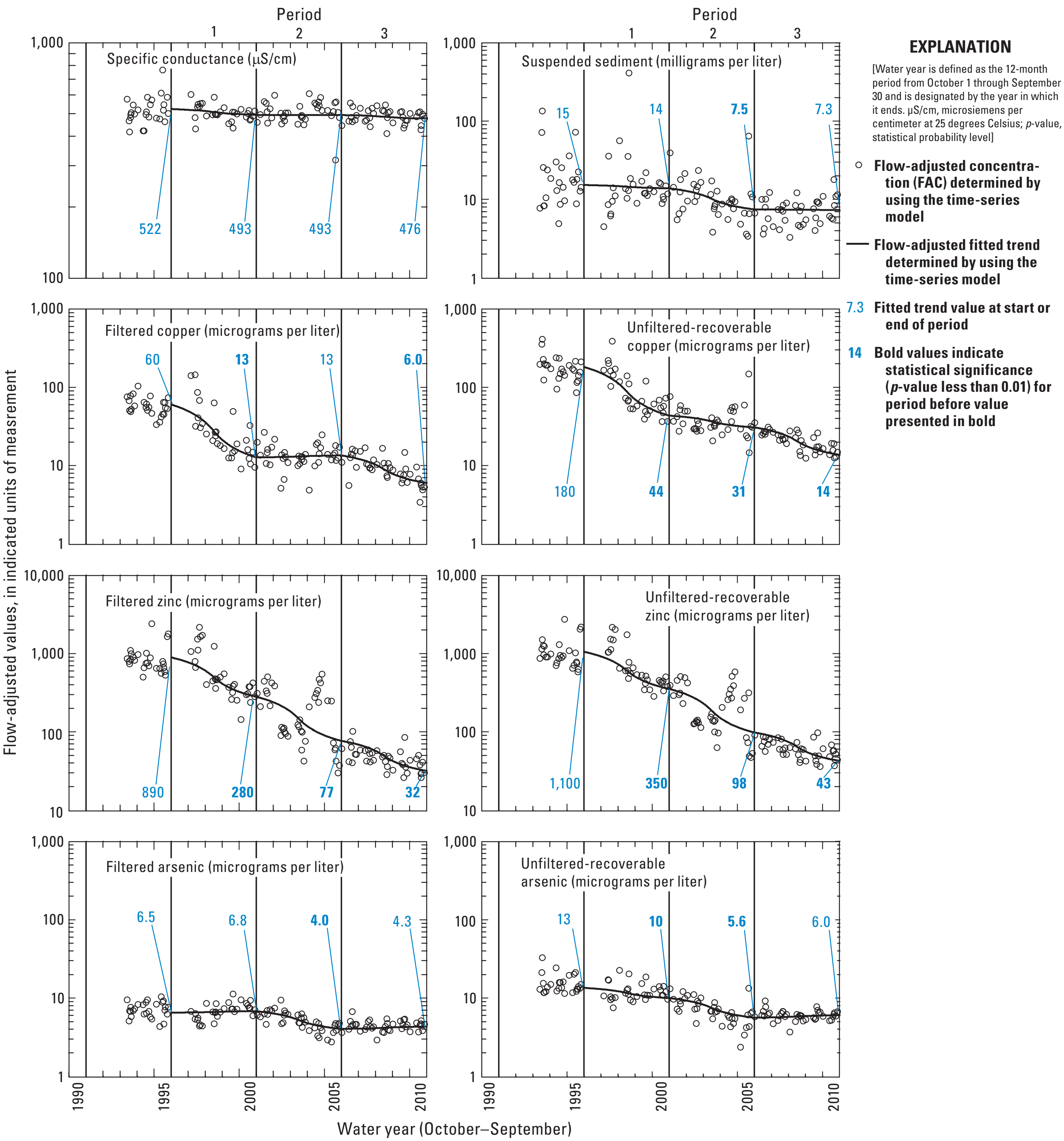

Figure 4–2. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Silver Bow Creek at Butte (site 2, fig. 1, table 1), water years 1996–2010.

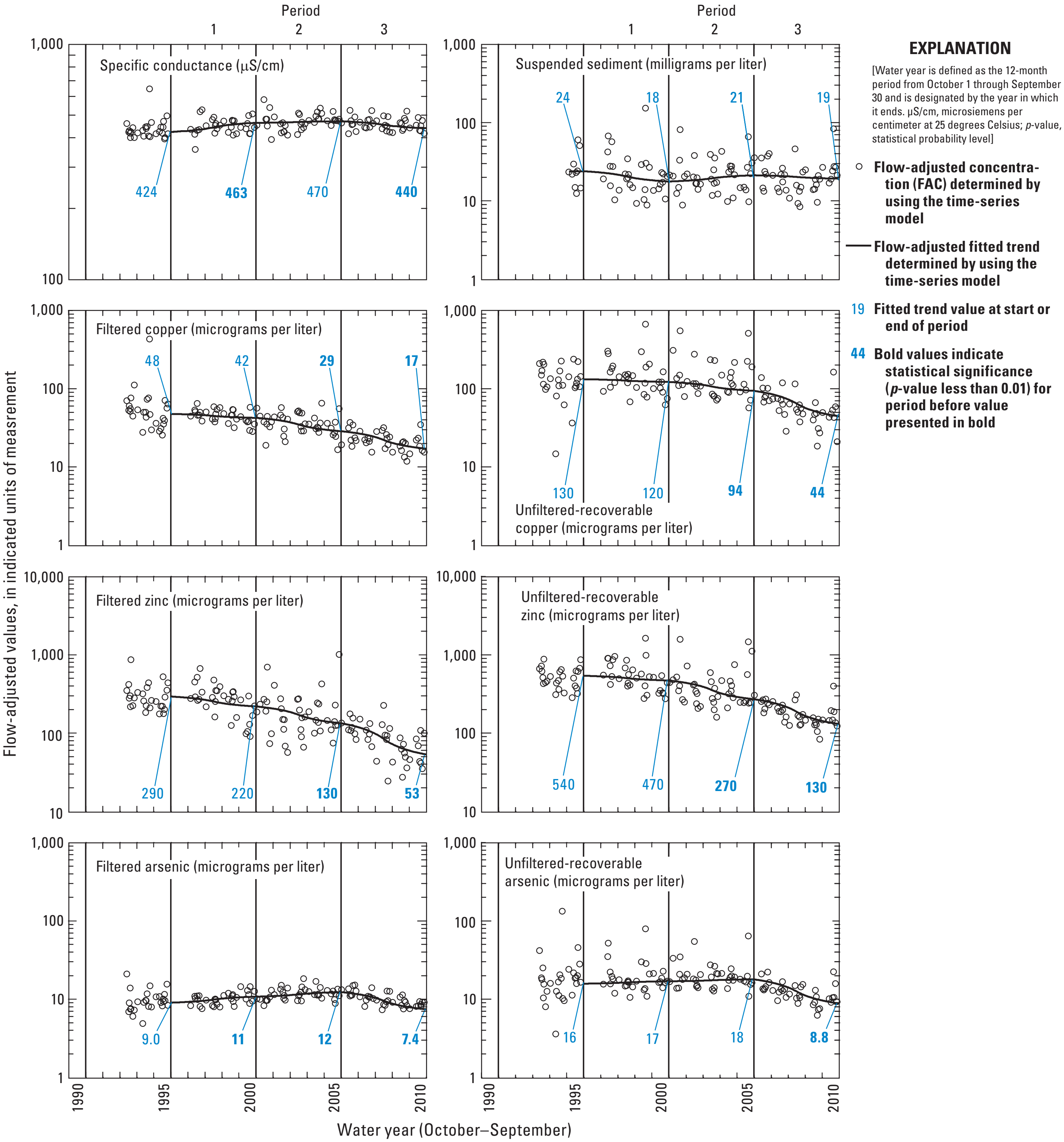

Figure 4–3. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Silver Bow Creek at Opportunity (site 3, fig. 1, table 1), water years 1996–2010.

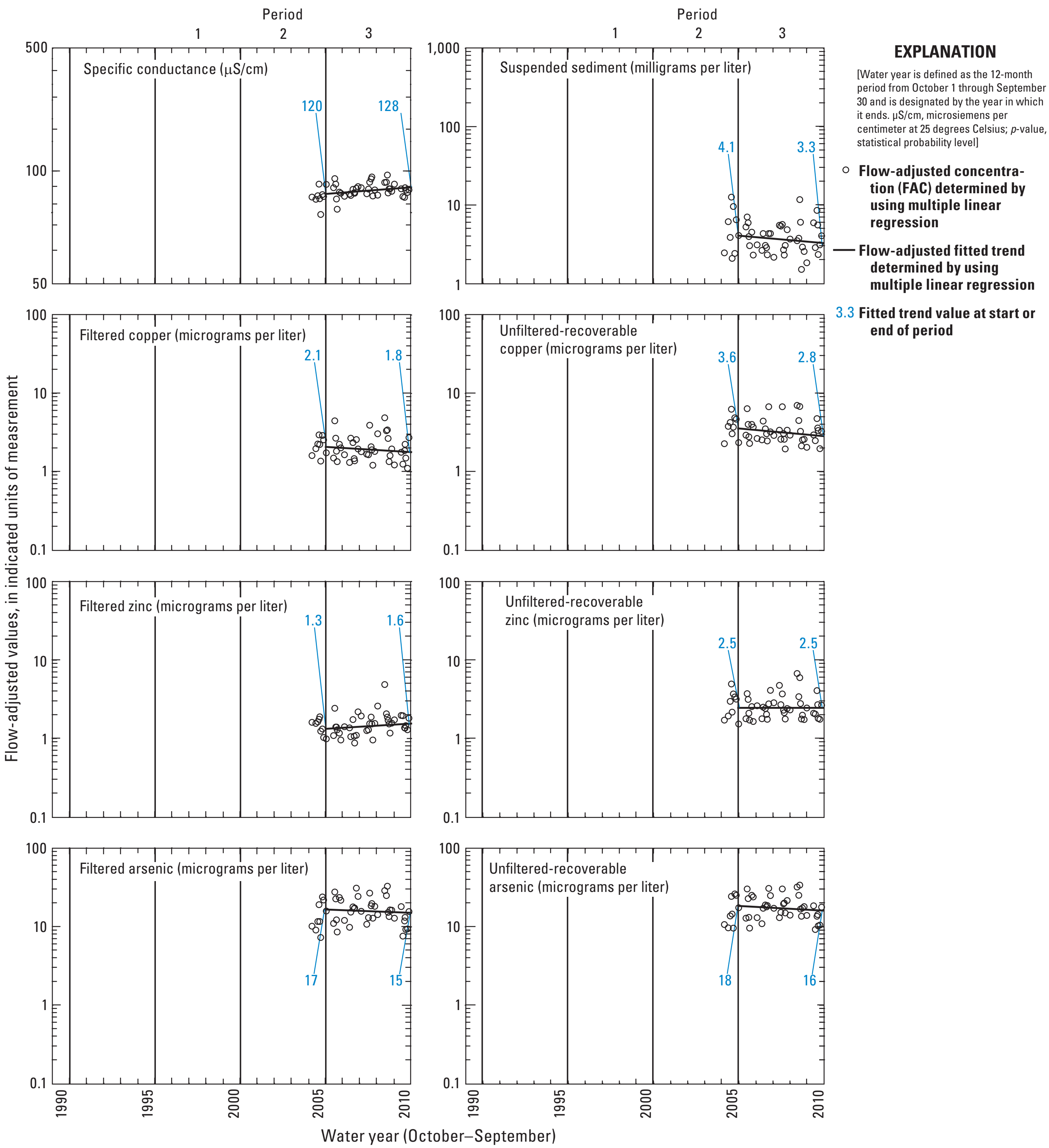

Figure 4–4. Flow-adjusted fitted trends determined by using multiple linear regression on time, discharge, and season (MLR) for selected water-quality constituents and properties for Mill Creek near Anaconda (site 4, fig. 1, table 1), water years 2006–2010.

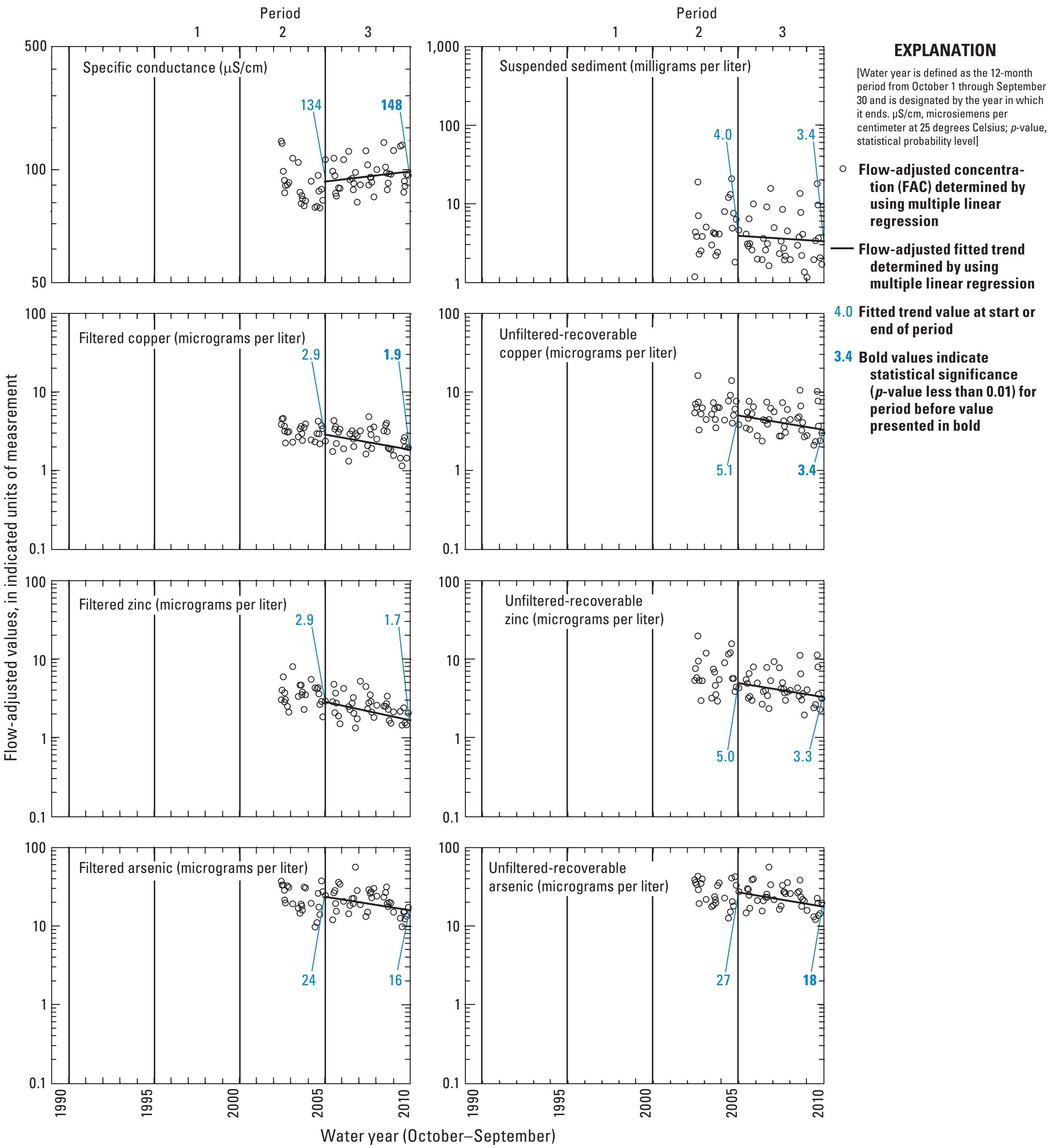

Figure 4–5. Flow-adjusted fitted trends determined by using multiple linear regression on time, discharge, and season (MLR) for selected water-quality constituents and properties for Mill Creek at Opportunity (site 5, fig. 1, table 1), water years 2006–10.

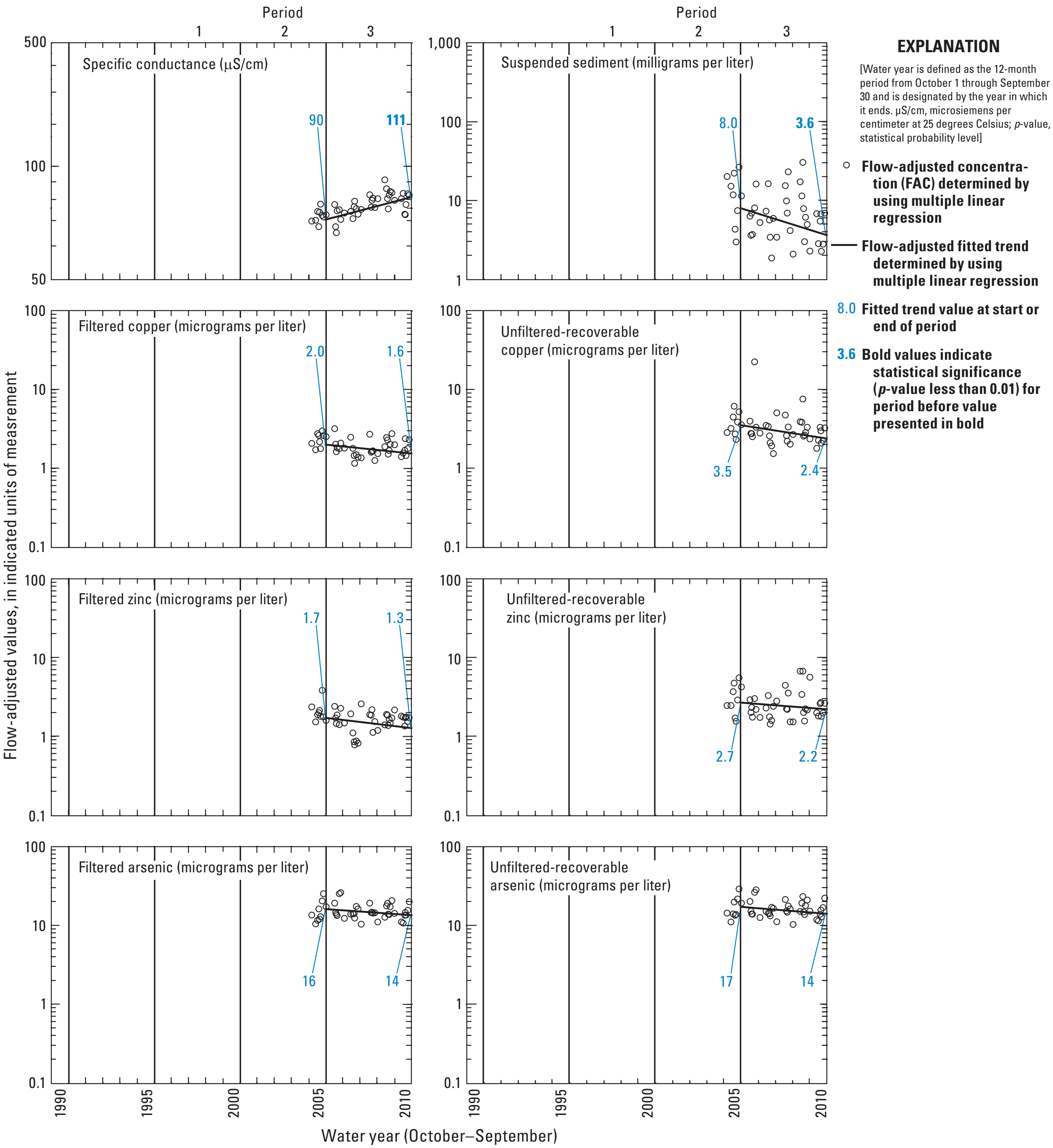

Figure 4–6. Flow-adjusted fitted trends determined by using multiple linear regression on time, discharge, and season (MLR) for selected water-quality constituents and properties for Willow Creek near Anaconda (site 6, fig. 1, table 1), water years 2006–10.

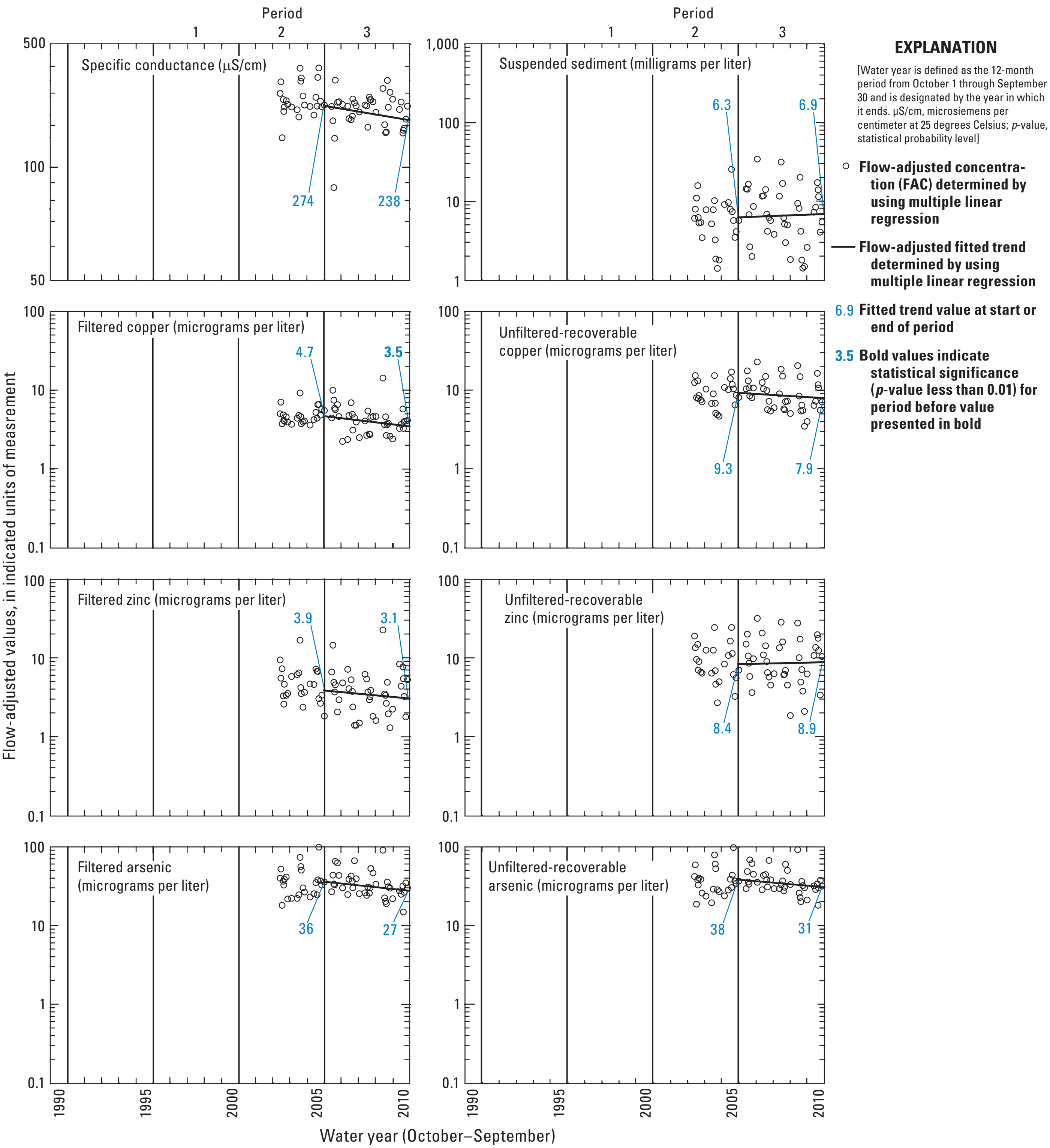

Figure 4–7. Flow-adjusted fitted trends determined by using multiple linear regression on time, discharge, and season (MLR) for selected water-quality constituents and properties for Mill Creek at Opportunity (site 7, fig. 1, table 1), water years 2006–10.

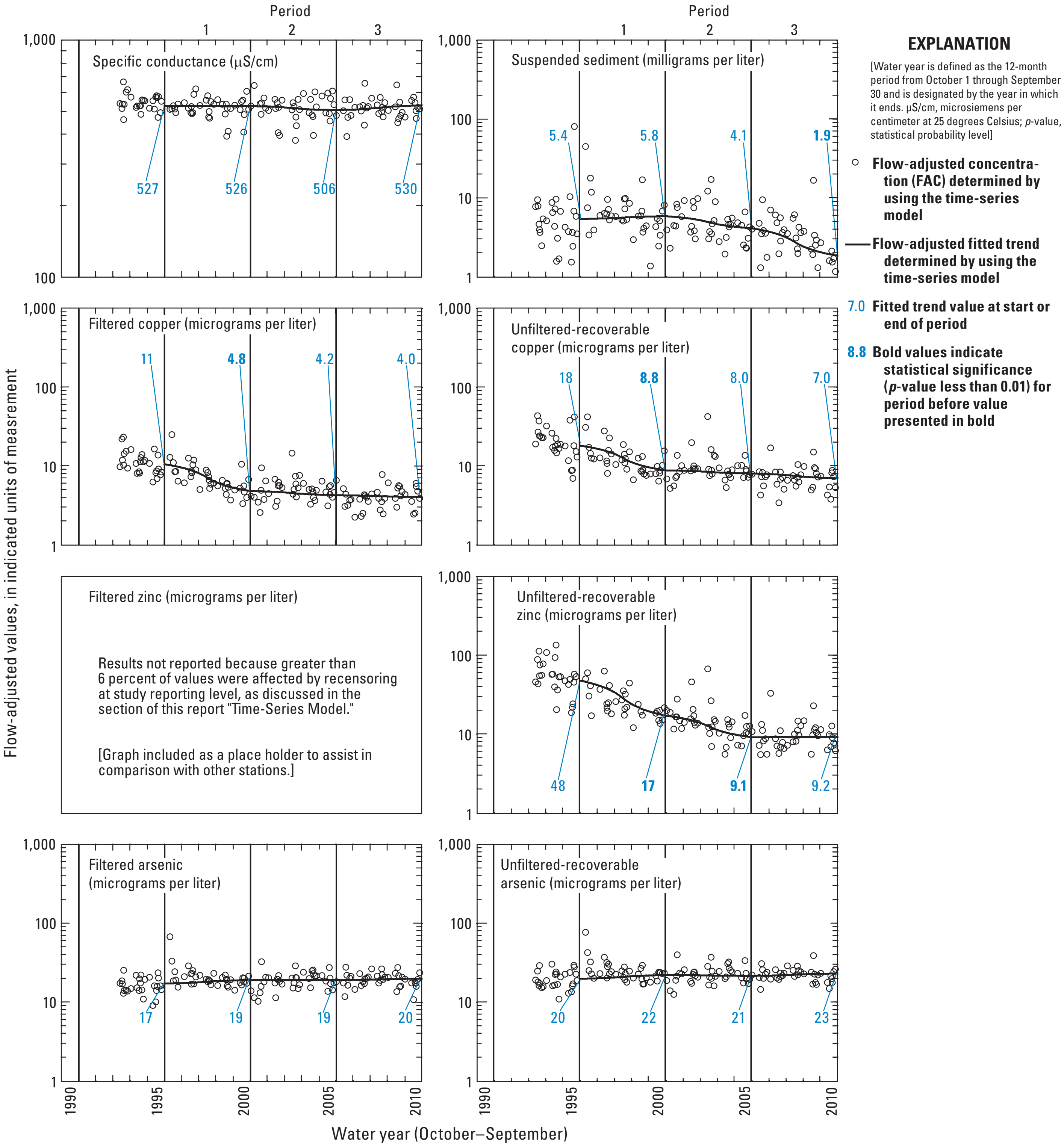

Figure 4–8. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Silver Bow Creek at Warm Springs (site 8, fig. 1, table 1), water years 1996–2010.

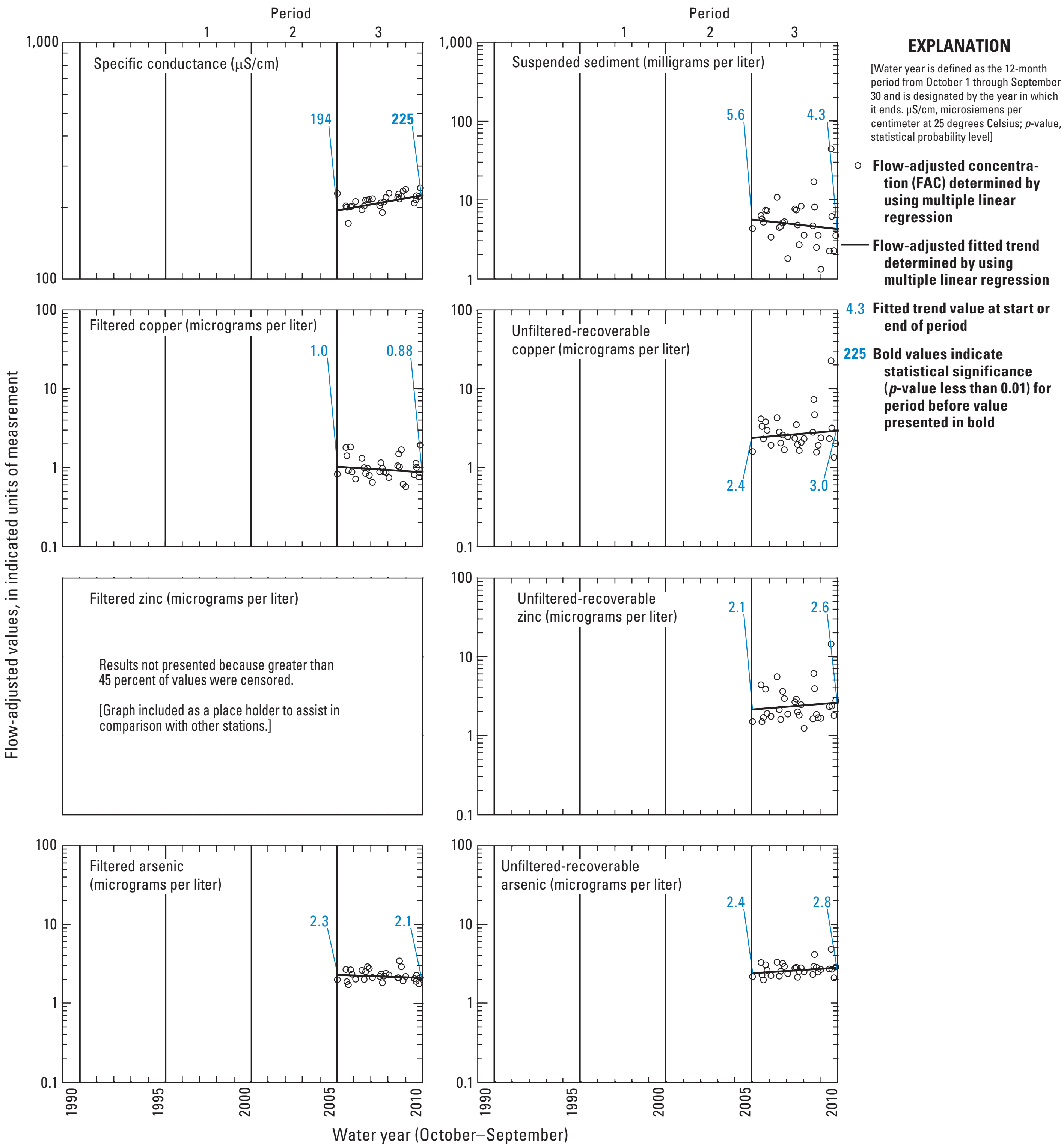

Figure 4–9. Flow-adjusted fitted trends determined by using multiple linear regression on time, discharge, and season (MLR) for selected water-quality constituents and properties for Warm Springs Creek near Anaconda (site 9, fig. 1, table 1), water years 2006–10.

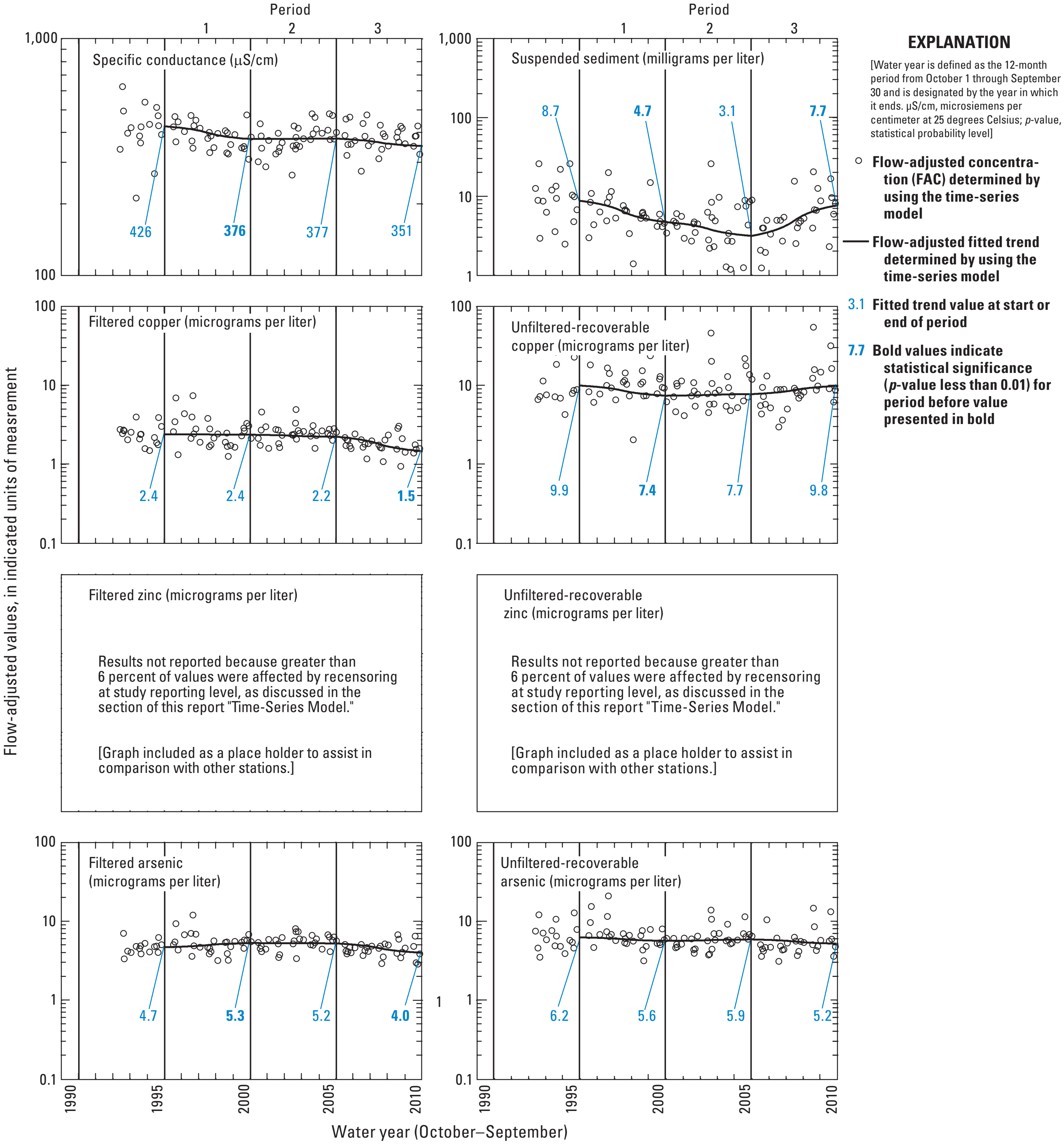

Figure 4–10. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Warm Springs Creek at Warm Springs (site 10, fig. 1, table 1), water years 1996–10.

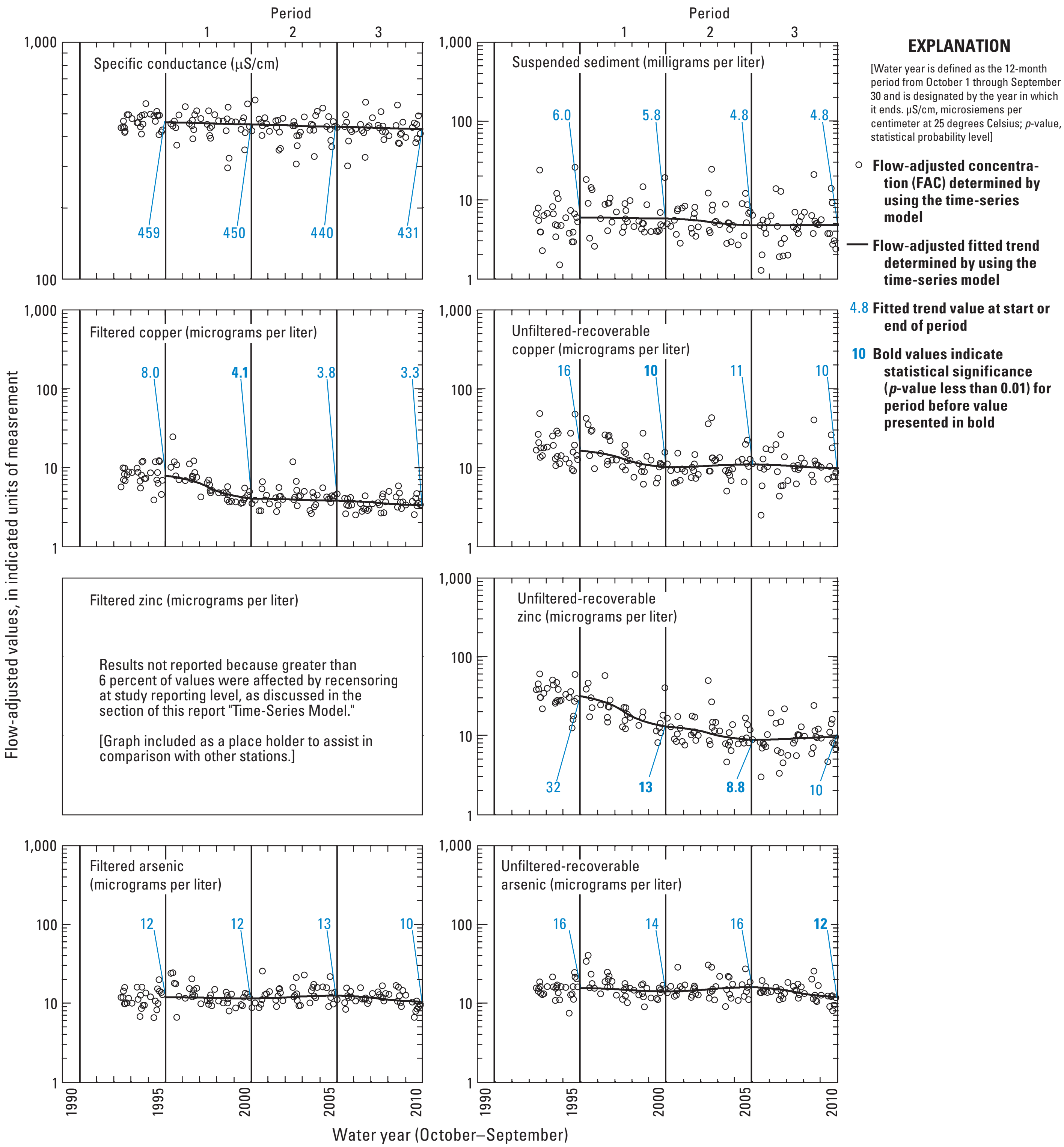

Figure 4–11. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Clark Fork near Galen (site 11, fig. 1, table 1), water years 1996–2010.

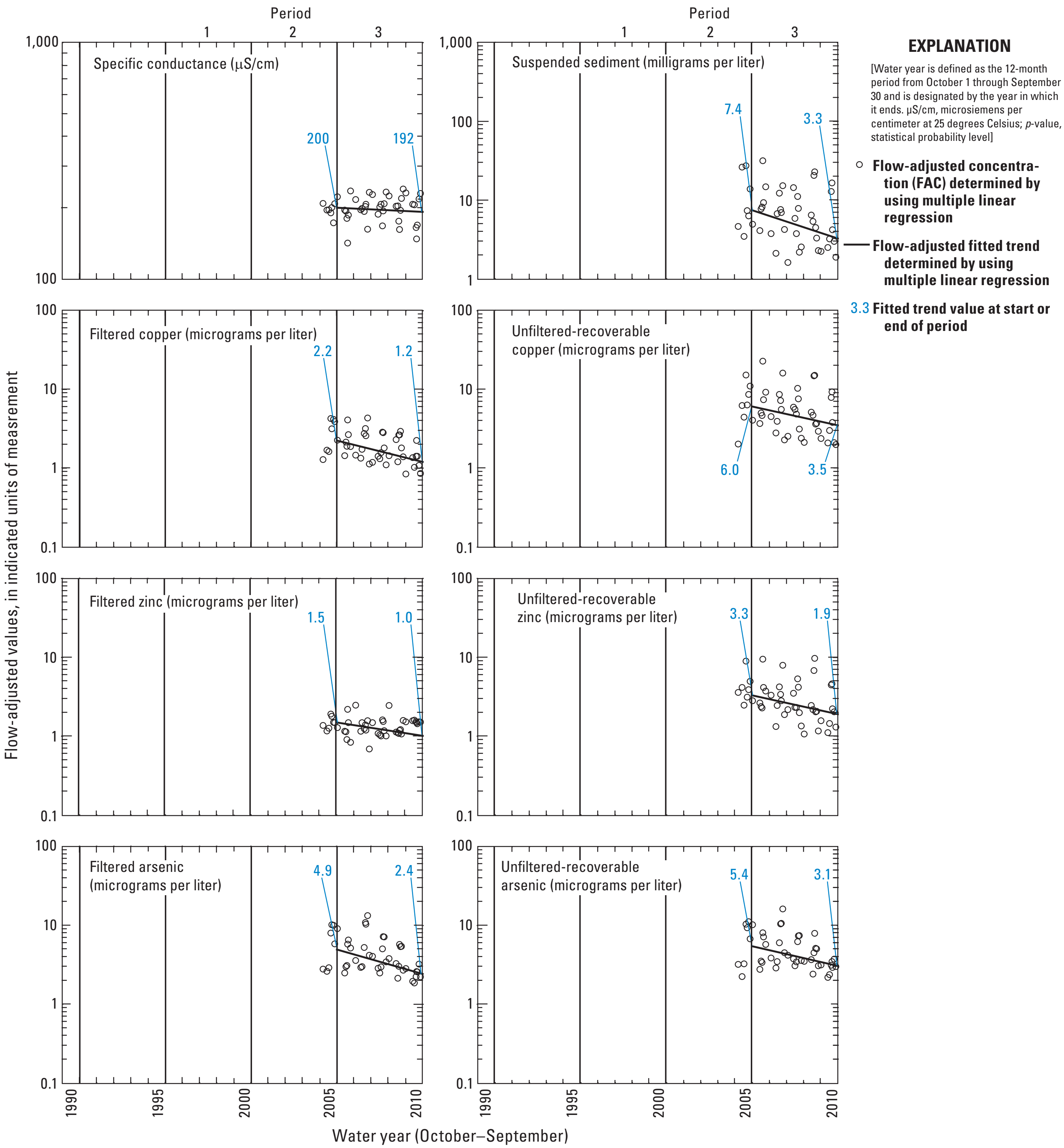

Figure 4–12. Flow-adjusted fitted trends determined by using multiple linear regression on time, discharge, and season (MLR) for selected water-quality constituents and properties for Lost Creek near Anaconda (site 12, fig. 1, table 1), water years 2006–10.

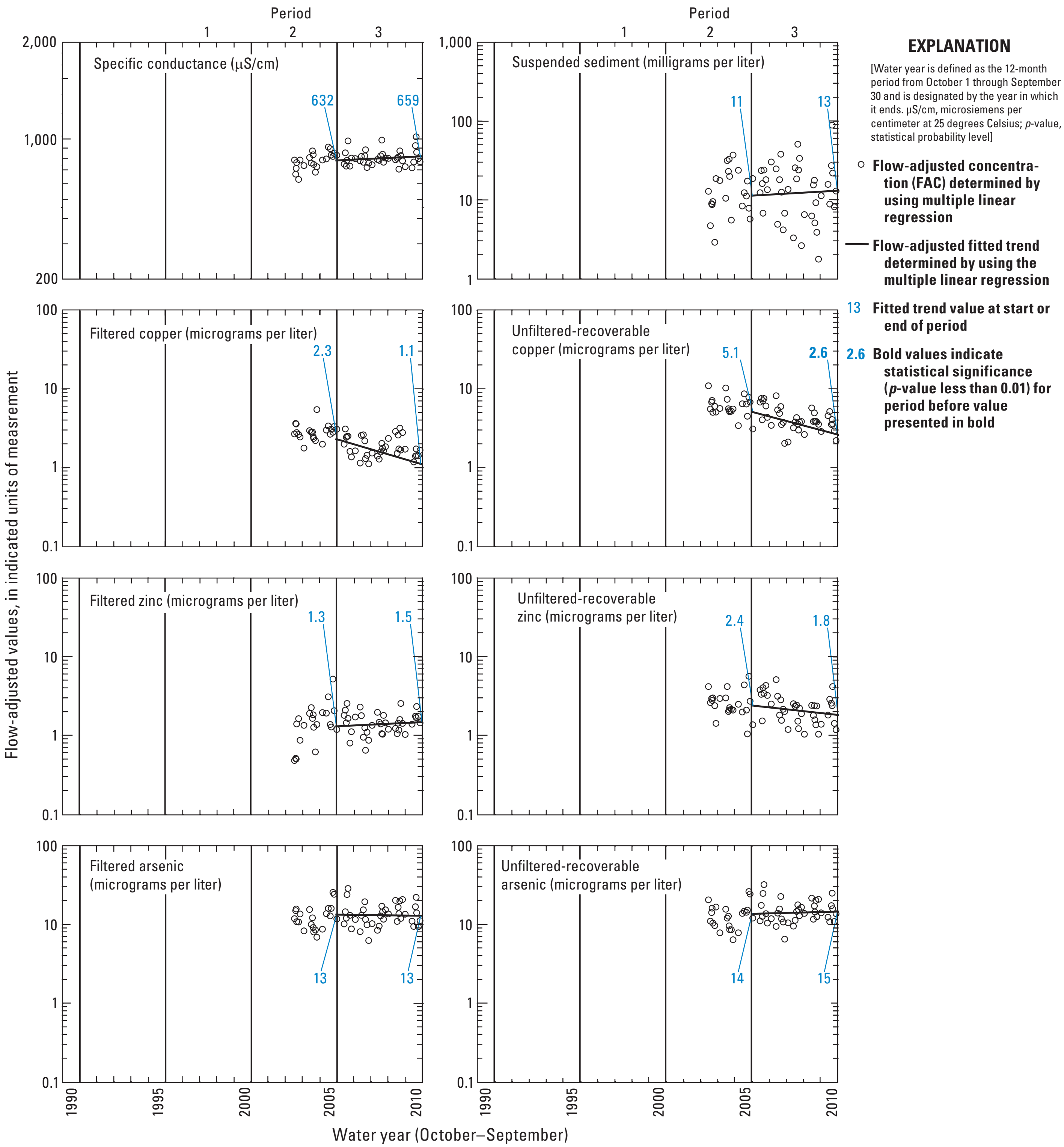

Figure 4–13. Flow-adjusted fitted trends determined by using multiple linear regression on time, discharge, and season (MLR) for selected water-quality constituents and properties for Lost Creek near Galen (site 13, fig. 1, table 1), water years 2006–10.

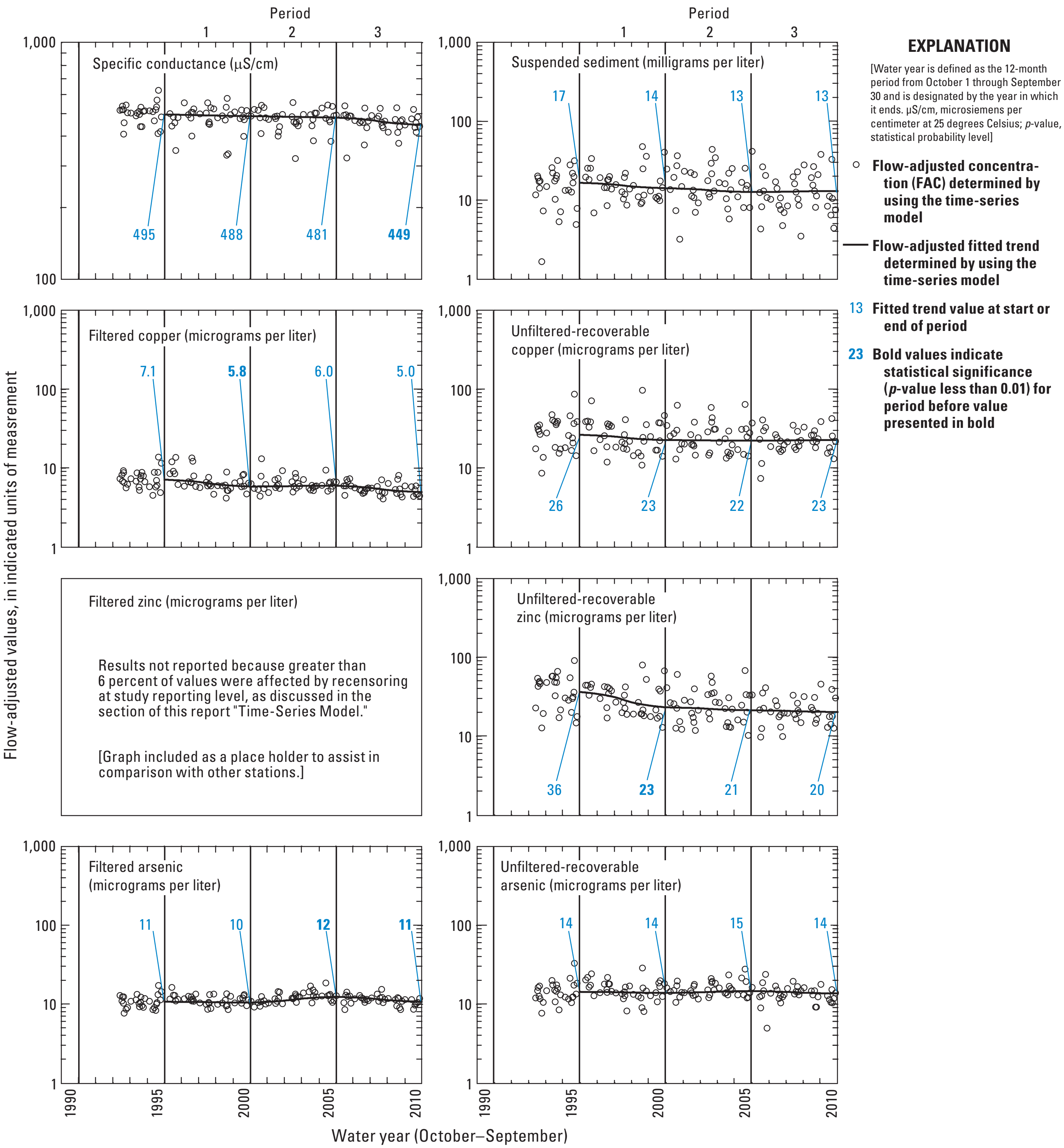

Figure 4–14. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Clark Fork at Deer Lodge (site 14, fig. 1, table 1), water years 1996–2010.

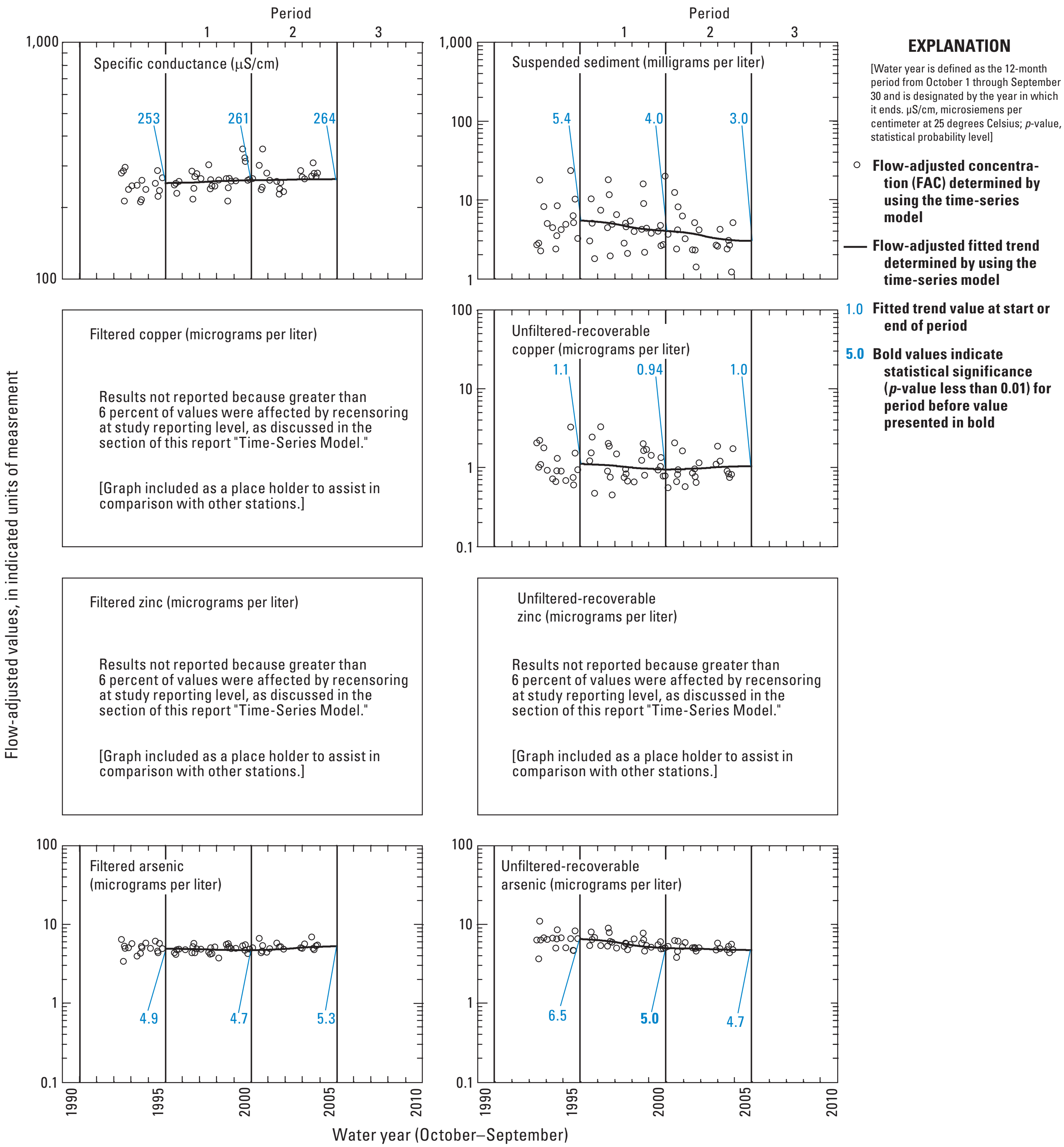

Figure 4–15. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Little Blackfoot River (site 15, fig. 1, table 1), water years 1996–2005.

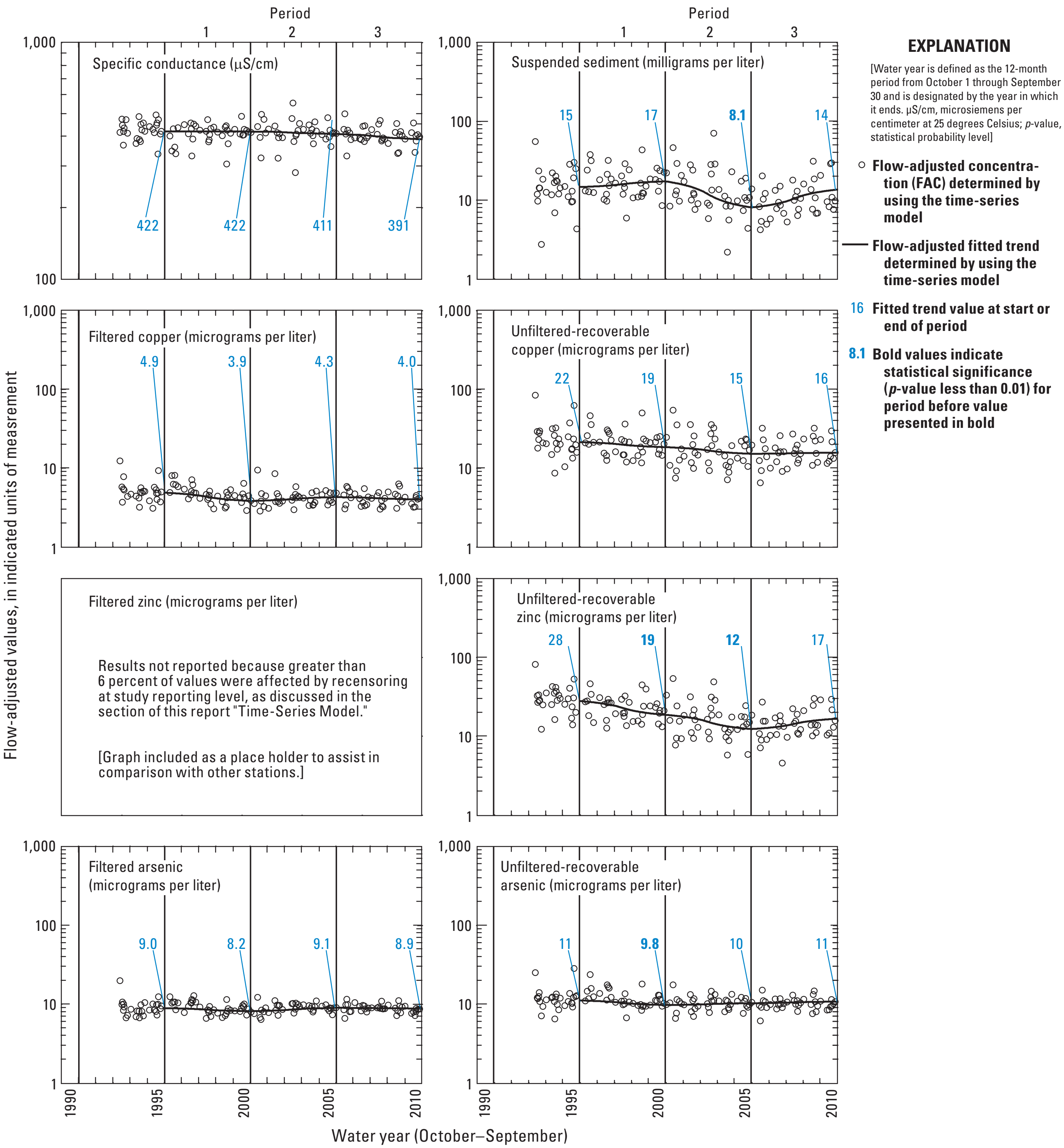

Figure 4–16. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Clark Fork at Goldcreek (site 16, fig. 1, table 1), water years 1996–2010.

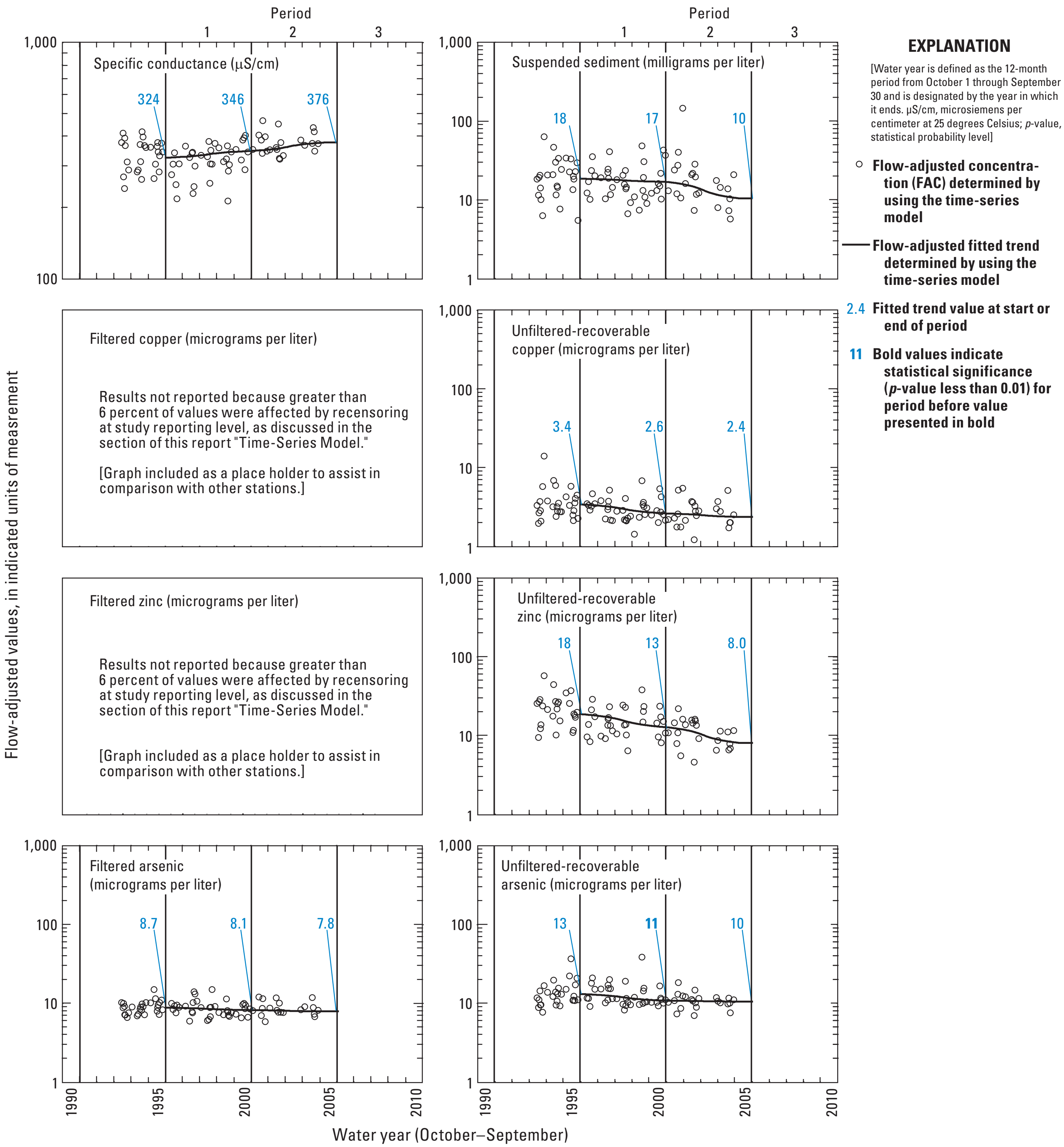

Figure 4–17. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Flint Creek (site 17, fig. 1, table 1), water years 1996–2005.

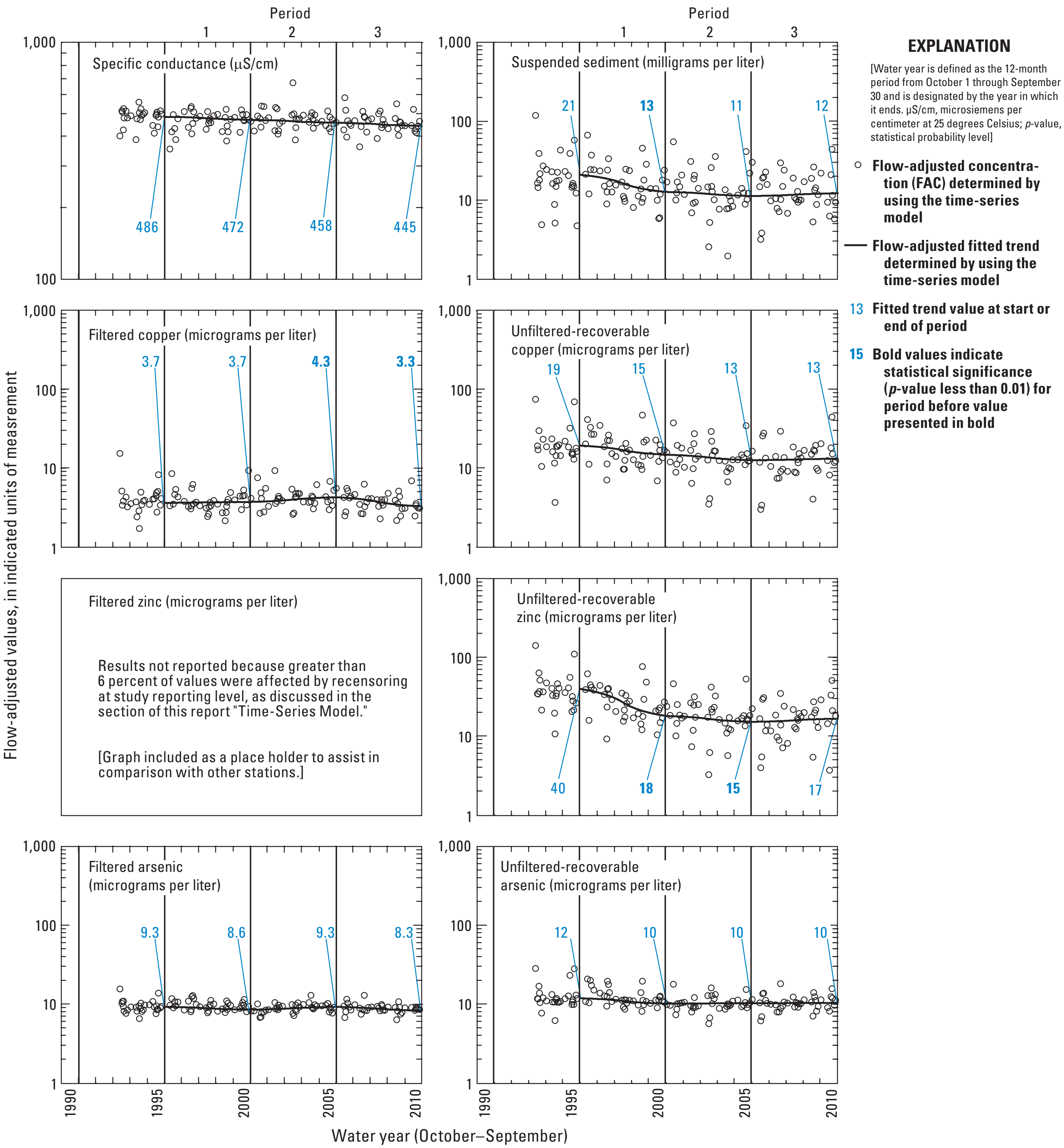

Figure 4–18. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Clark Fork near Drummond (site 18, fig. 1, table 1), water years 1996–2010.

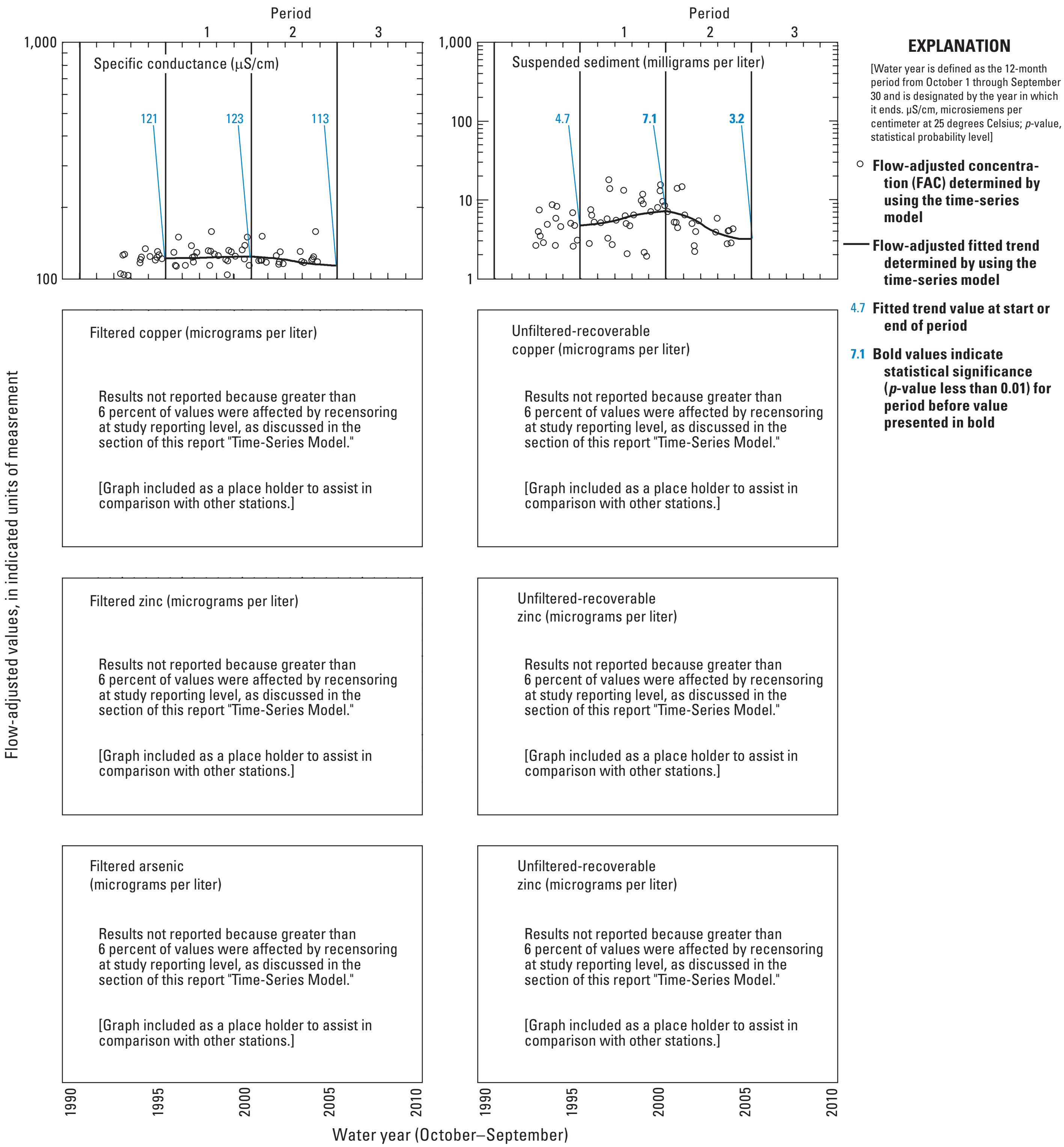

Figure 4–19. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Rock Creek (site19, fig. 1, table 1), water years 1996–2005.

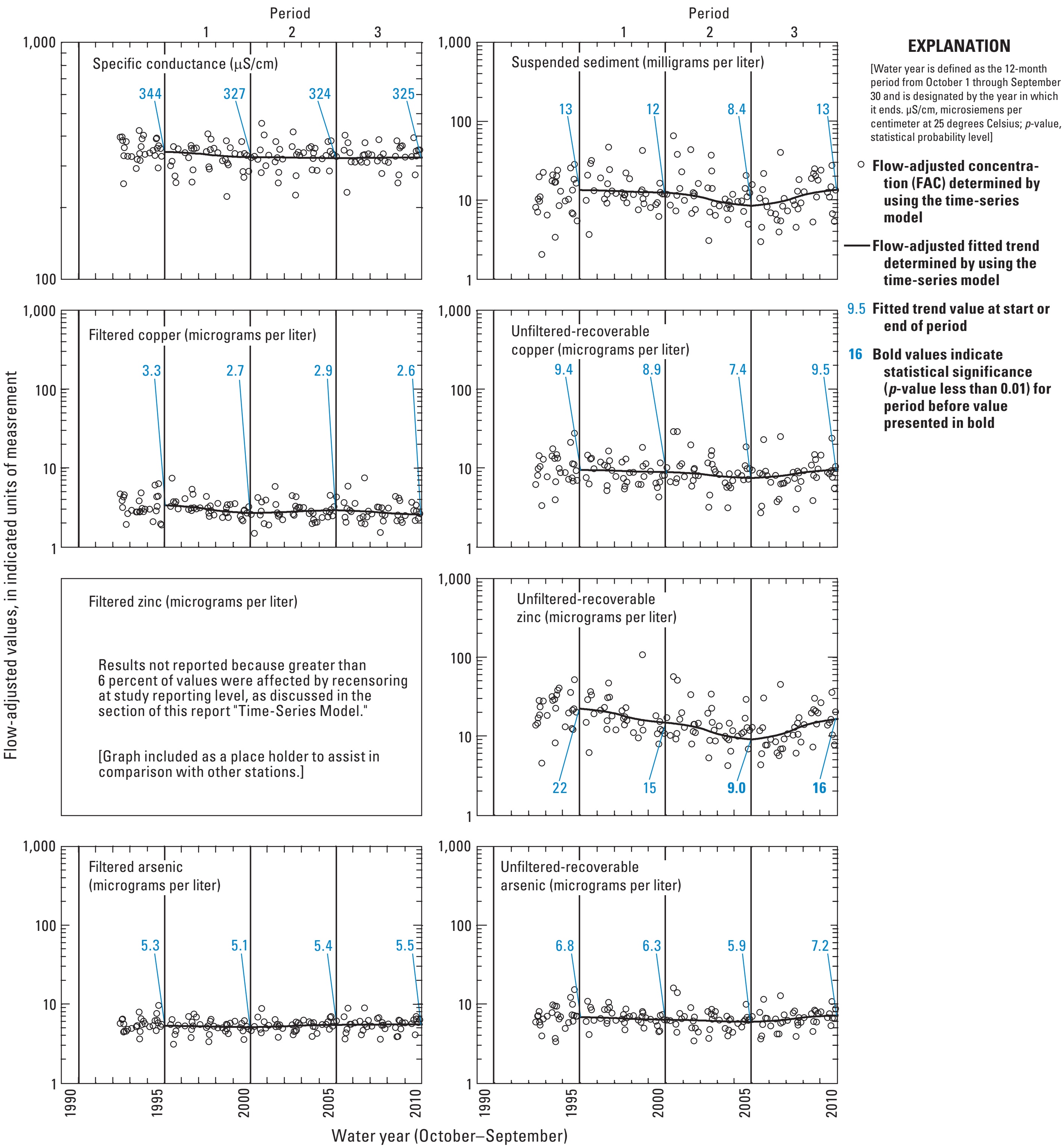

Figure 4–20. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Clark For at Turah Bridge (site 20, fig. 1, table 1), water years 1996–2010.

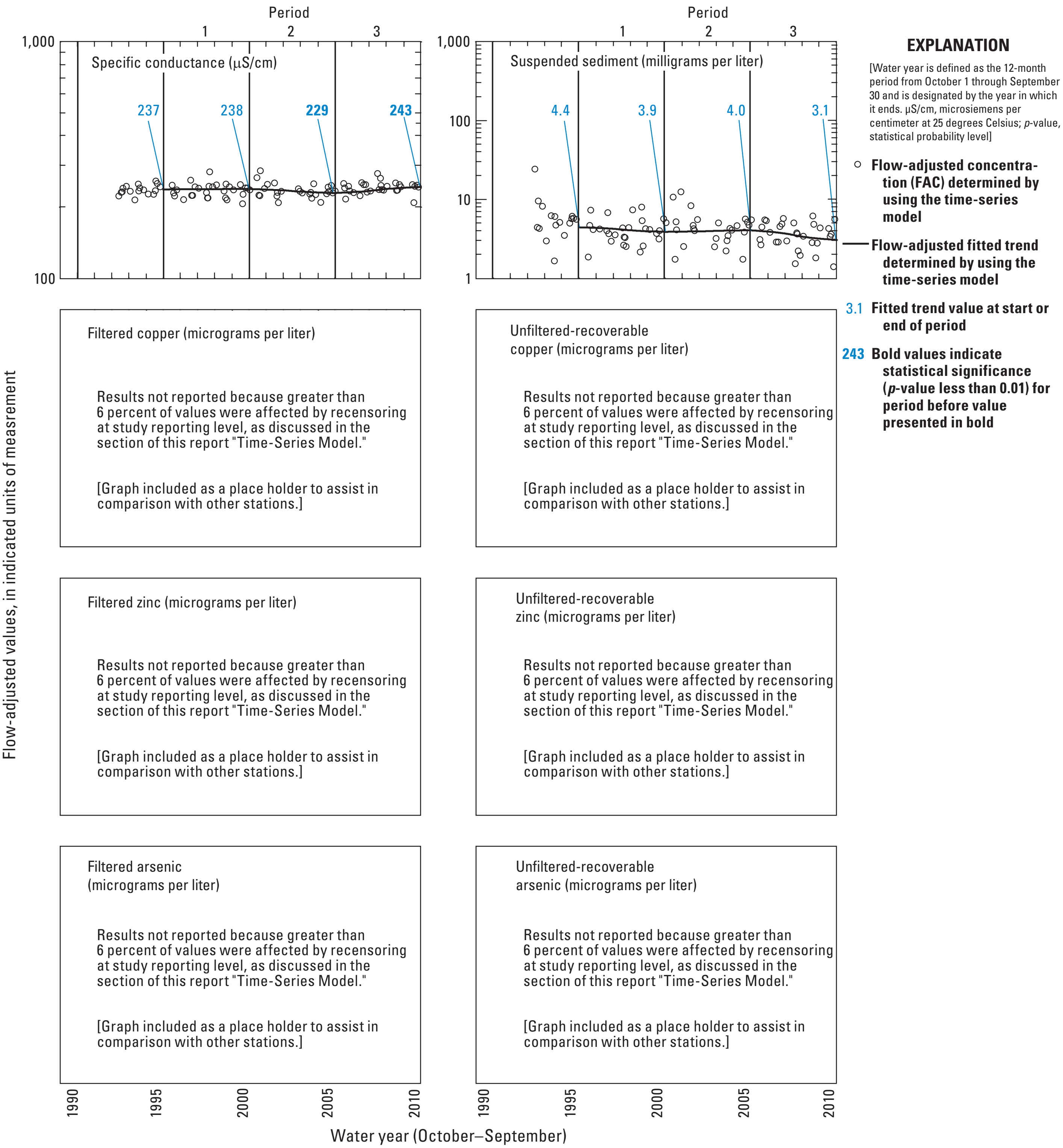

Figure 4–21. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Blackfoot River (site 21, fig. 1, table 1) water years 1996–2010.

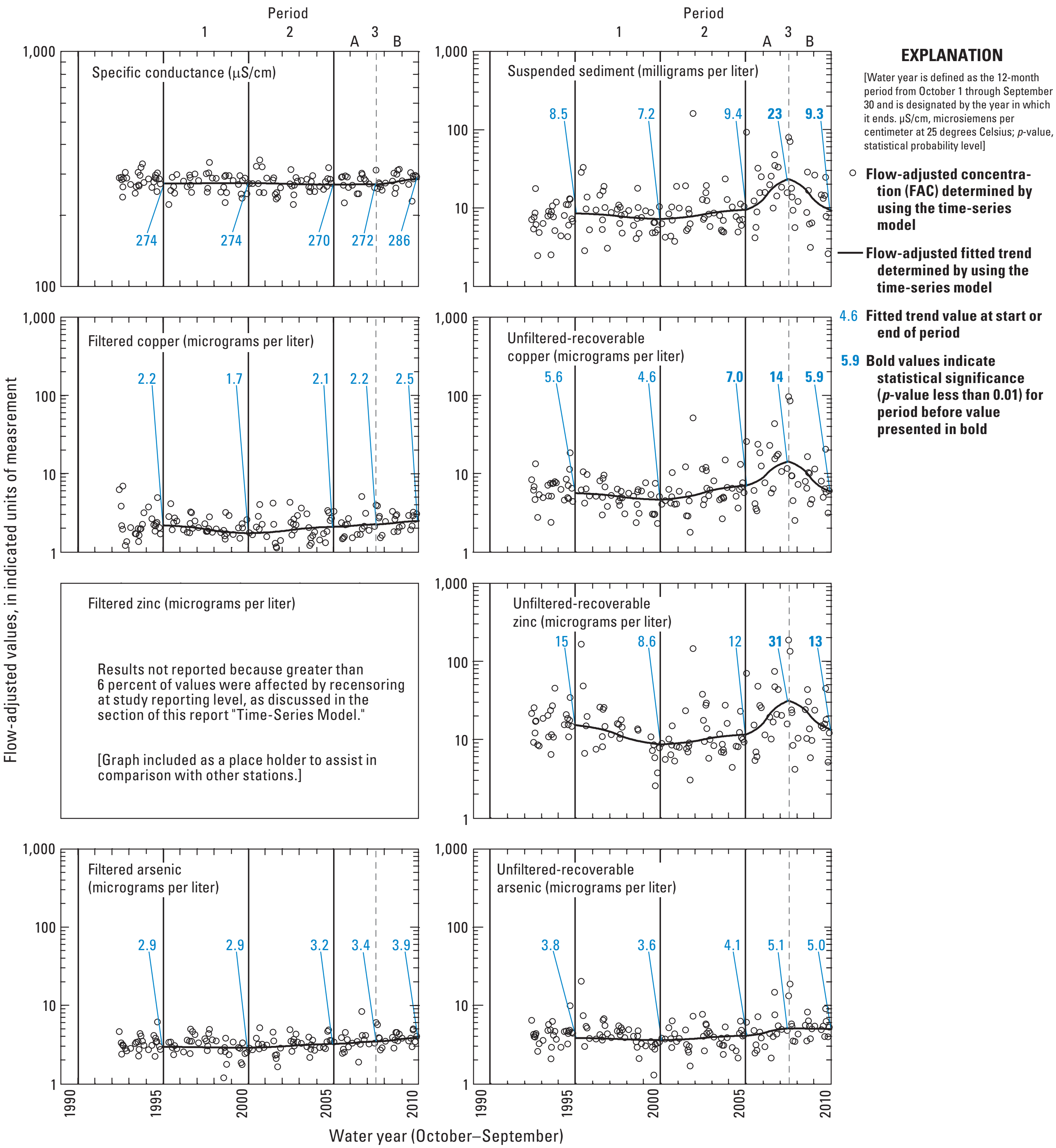

Figure 4–22. Flow-adjusted fitted trends determined by using the time-series model (TSM) for selected water-quality constituents and properties for Clark Fork above Missoula (site 22, fig. 1, table 1), water years 1996–2010.

Table 5–1. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 1, extending from Blacktail Creek (site 1, fig. 1, table 1) to Silver Bow Creek at Butte (site 2, fig. 1, table 1) for selected periods, water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site name and number or summation category	Estimated normalized load[1] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 1996–2000 (period 1)			
Inflow Blacktail Creek (site 1)	0.13	0.093	200
Outflow Silver Bow Creek at Butte (site 2)	5.0	0.59	740
Total within-reach change in load—outflow (site 2) minus inflow (site 1) (positive values indicate net mobilization from within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	4.9	0.50	540
Water years 2001–05 (period 2)			
Inflow Blacktail Creek (site 1)	0.12	0.083	180
Outflow Silver Bow Creek at Butte (site 2)	1.9	0.39	530
Total within-reach change in load—outflow (site 2) minus inflow (site 1) (positive values indicate net mobilization from within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	1.7	0.30	350
Water years 2006–10 (period 3)			
Inflow Blacktail Creek (site 1)	0.11	0.090	150
Outflow Silver Bow Creek at Butte (site 2)	1.1	0.30	380
Total within-reach change in load—outflow (site 2) minus inflow (site 1) (positive values indicate net mobilization from within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	1.0	0.21	220

[1]The estimated normalized load was computed by multiplying the mean annual fitted trend concentration (determined by using the time-series model) for the indicated period times the geometric mean streamflow for water years 1996–2010 and a units conversion factor according to equation 1 in the section of this report "Estimation of Normalized Constituent Loads." Loads are reported to two significant figures; however, before final rounding, calculations used three significant figures when necessary. As a result, some of the load values have minor rounding artifacts.

Table 5–2. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 2, extending from Silver Bow Creek at Butte (site 2, fig. 1, table 1) to Silver Bow Creek at Opportunity (site 3, fig. 1, table 1) for selected periods, water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site name and number or summation category	Estimated normalized load[1] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 1996–2000 (period 1)			
Inflow Silver Bow Creek at Butte (site 2)	5.0	0.59	740
Outflow Silver Bow Creek at Opportunity (site 3)	12	1.6	2,000
Total within-reach change in load—outflow (site 3) minus inflow (site 2) (positive values indicate net mobilization from within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	7.3	1.0	1,300
Water years 2001–05 (period 2)			
Inflow Silver Bow Creek at Butte (site 2)	1.9	0.39	530
Outflow Silver Bow Creek at Opportunity (site 3)	10	1.7	1,900
Total within-reach change in load—outflow (site 3) minus inflow (site 2) (positive values indicate net mobilization from within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	8.6	1.3	1,400
Water years 2006–10 (period 3)			
Inflow Silver Bow Creek at Butte (site 2)	1.1	0.29	380
Outflow Silver Bow Creek at Opportunity (site 3)	6.5	1.3	2,000
Total within-reach change in load—outflow (site 3) minus inflow (site 2) (positive values indicate net mobilization from within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	5.4	1.0	1,600

[1]The estimated normalized load was computed by multiplying the mean annual fitted trend concentration (determined by using the time-series model) for the indicated period times the geometric mean streamflow for water years 1996–2010 and a units conversion factor according to equation 1 in the section of this report "Estimation of Normalized Constituent Loads." Loads are reported to two significant figures; however, before final rounding, calculations used three significant figures when necessary. As a result, some of the load values have minor rounding artifacts.

Table 5–3. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 3[1], extending from Silver Bow Creek at Opportunity (site 3, fig. 1, table 1) to Silver Bow Creek at Warm Springs (site 8, fig. 1, table 1) for selected periods, water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site name and number or summation category	Estimated normalized load[2] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 1996–2000 (period 1)			
Inflow Silver Bow Creek at Opportunity (site 3)	12	1.6	2,000
Outflow Silver Bow Creek at Warm Springs (site 8)	2.0	3.1	850
Total within-reach change in load—outflow (site 8) minus inflow (site 3) (negative values indicate net accumulation in Warm Springs Ponds; positive values indicate net mobilization from within-reach sources including groundwater inflow, the Mill-Willow bypass, the outflow from Warm Springs Ponds, and the main-stem channel and floodplain downstream from Warm Springs Ponds)	-10	1.6	-1,200
Water years 2001–05 (period 2)			
Inflow Silver Bow Creek at Opportunity (site 3)	10	1.7	1,900
Outflow Silver Bow Creek at Warm Springs (site 8)	1.3	3.3	740
Total within-reach change in load—outflow (site 8) minus inflow (site 3) (negative values indicate net accumulation in Warm Springs Ponds; positive values indicate net mobilization from within-reach sources including groundwater inflow, the Mill-Willow bypass, the outflow from Warm Springs Ponds, and the main-stem channel and floodplain downstream from Warm Springs Ponds)	-9.2	1.6	-1,200
Water years 2006–10 (period 3)			
Inflow Silver Bow Creek at Opportunity (site 3)	6.5	1.3	2,000
Outflow Silver Bow Creek at Warm Springs (site 8)	1.1	3.4	430
Total within-reach change in load—outflow (site 8) minus inflow (site 3) (negative values indicate net accumulation in Warm Springs Ponds; positive values indicate net mobilization from within-reach sources including groundwater inflow, the Mill-Willow bypass, the outflow from Warm Springs Ponds, and the main-stem channel and floodplain downstream from Warm Springs Ponds)	-5.4	2.1	-1,600

[1]Data for Mill Creek at Opportunity (site 5) and Willow Creek at Opportunity (site 7) were not included as monitored tributary inflows because of factors that complicate directly combining the TSM results and multiple linear regression on time, streamflow, and season (MLR) results within a single analysis. The inability to distinguish the relative magnitudes of the within-reach contributions from the Mill-Willow bypass and Warm Springs Ponds to the reach outflow required simplifying assumptions. As a result, when net accumulation in the reach 3 channel is indicated for unfiltered-recoverable copper and suspended sediment, it is presumed that all of the reach inflow at site 3 is stored in Warm Springs Ponds.

[2]The estimated normalized load was computed by multiplying the mean annual fitted trend concentration (determined by using the time-series model) for the indicated period times the geometric mean streamflow for water years 1996–2010 and a units conversion factor according to equation 1 in the section of this report "Estimation of Normalized Constituent Loads." Loads are reported to two significant figures; however, before final rounding, calculations used three significant figures when necessary. As a result, some of the load values have minor rounding artifacts.

Table 5–4. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 4, extending from Silver Bow Creek at Warm Springs (site 8, fig. 1, table 1) to Clark Fork near Galen (site 11, fig. 1, table 1) for selected periods, water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site name and number or summation category	Estimated normalized load[1] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 1996–2000 (period 1)			
Inflow Silver Bow Creek at Warm Springs (site 8)	2.0	3.1	850
Monitored tributary inflow within reach Warm Springs Creek at Warm Springs (site 10)	1.0	0.70	780
Combined inflow (sum of sites 8 and 10)	3.0	3.9	1,600
Outflow Clark Fork near Galen (site 11)	3.6	4.1	1,600
Total within-reach change in load—outflow (site 11) minus inflow (site 8) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	1.7	1.0	790
Within-reach change in load after accounting for the monitored tributary—outflow (site 11) minus combined inflow (sum of sites 8 and 10) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries and the main-stem channel and floodplain; negative values indicate net accumulation in reach channel)	0.67	0.29	19
Water years 2001–05 (period 2)			
Inflow Silver Bow Creek at Warm Springs (site 8)	1.3	3.3	740
Monitored tributary inflow within reach Warm Springs Creek at Warm Springs (site 10)	0.89	0.68	460
Combined inflow (sum of sites 8 and 10)	2.2	4.0	1,200
Outflow Clark Fork near Galen (site 11)	2.9	4.2	1,500
Total within-reach change in load—outflow (site 11) minus inflow (site 8) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	1.7	0.91	720
Within-reach change in load after accounting for the monitored tributary—outflow (site 11) minus combined inflow (sum of sites 8 and 10) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries and the main-stem channel and floodplain)	0.78	0.23	260
Water years 2006–10 (period 3)			
Inflow Silver Bow Creek at Warm Springs (site 8)	1.1	3.4	430
Monitored tributary inflow within reach Warm Springs Creek at Warm Springs (site 10)	1.0	0.66	610
Combined inflow (sum of sites 8 and 10)	2.1	4.0	1,040
Outflow Clark Fork near Galen (site 11)	2.9	3.9	1,300

Table 5–4. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 4, extending from Silver Bow Creek at Warm Springs (site 8, fig. 1, table 1) to Clark Fork near Galen (site 11, fig. 1, table 1) for selected periods, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site name and number or summation category	Estimated normalized load[1] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 2006–10 (period 3)—Continued			
Total within-reach change in load—outflow (site 11) minus inflow (site 8) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	1.8	0.53	900
Within-reach change in load after accounting for the monitored tributary—outflow (site 11) minus combined inflow (sum of sites 8 and 10) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries and the main-stem channel and floodplain; negative values indicate net accumulation in reach channel)	0.74	-0.12	290

[1]The estimated normalized load was computed by multiplying the mean annual fitted trend concentration (determined by using the time-series model) for the indicated period times the geometric mean streamflow for water years 1996–2010 and a units conversion factor according to equation 1 in the section of this report "Estimation of Normalized Constituent Loads." Loads are reported to two significant figures; however, before final rounding, calculations used three significant figures when necessary. As a result, some of the load values have minor rounding artifacts.

Table 5–5. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 5[1], extending from Clark Fork near Galen (site 11, fig. 1, table 1) to Clark Fork at Deer Lodge (site 14, fig. 1, table 1) for selected periods, water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site name and number or summation category	Estimated normalized load[2] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 1996–2000 (period 1)			
Inflow Clark Fork near Galen (site 11)	3.6	4.1	1,600
Outflow Clark Fork at Deer Lodge (site 14)	12	6.9	7,500
Total within-reach change in load—outflow (site 14) minus inflow (site 11) (positive values indicate net mobilization from within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	8.4	2.8	5,900
Water years 2001–05 (period 2)			
Inflow Clark Fork near Galen (site 11)	2.9	4.2	1,500
Outflow Clark Fork at Deer Lodge (site 14)	11	7.0	6,600
Total within-reach change in load—outflow (site 14) minus inflow (site 11) (positive values indicate net mobilization from within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	8.1	2.8	5,100
Water years 2006–10 (period 3)			
Inflow Clark Fork near Galen (site 11)	2.9	3.9	1,300
Outflow Clark Fork at Deer Lodge (site 14)	11	7.0	6,300
Total within-reach change in load—outflow (site 14) minus inflow (site 11) (positive values indicate net mobilization from within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	8.1	3.1	5,000

[1]Data for Lost Creek near Galen (site 13) were not included as monitored tributary inflows because of factors that complicate directly combining the TSM results and multiple linear regression on time, streamflow, and season (MLR) results within a single analysis.

[2]The estimated normalized load was computed by multiplying the mean annual fitted trend concentration (determined by using the time-series model) for the indicated period times the geometric mean streamflow for water years 1996–2010 and a units conversion factor according to equation 1 in the section of this report "Estimation of Normalized Constituent Loads." Loads are reported to two significant figures; however, before final rounding, calculations used three significant figures when necessary. As a result, some of the load values have minor rounding artifacts.

Table 5–6. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 6, extending from Clark Fork at Deer Lodge (site 14, fig. 1, table 1) to Clark Fork at Goldcreek (site 16, fig. 1, table 1) for selected periods, water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site name and number or summation category	Estimated normalized load[1] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 1996–2000 (period 1)			
Inflow Clark Fork at Deer Lodge (site 14)	12	6.9	7,500
Monitored tributary inflow within reach Little Blackfoot River (site 15)	0.24	1.3	1,100
Combined inflow (sum of sites 14 and 15)	12	8.3	8,600
Outflow Clark Fork at Goldcreek (site 16)	19	10	16,000
Total within-reach change in load—outflow (site 16) minus inflow (site 14) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	7.3	3.2	8,000
Within-reach change in load after accounting for the monitored tributary—outflow (site 16) minus combined inflow (sum of sites 14 and 15) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries, and the mainstem channel and floodplain)	7.1	1.9	6,900
Water years 2001–05 (period 2)			
Inflow Clark Fork at Deer Lodge (site 14)	11	7.0	6,600
Monitored tributary inflow within reach Little Blackfoot River (site 15)	0.23	1.1	800
Combined inflow (sum of sites 14 and 15)	11	8.1	7,400
Outflow Clark Fork at Goldcreek (site 16)	16	9.7	12,000
Total within-reach change in load—outflow (site 16) minus inflow (site 14) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	5.3	2.7	5,300
Within-reach change in load after accounting for the monitored tributary—outflow (site 16) minus combined inflow (sum of sites 14 and 15) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries, and the mainstem channel and floodplain)	5.1	1.6	4,500
Water years 2006–10 (period 3[2])			
Inflow Clark Fork at Deer Lodge (site 14)	11	7.0	6,300
Outflow Clark Fork at Goldcreek (site 16)	15	10	10,000
Total within-reach change in load—outflow (site 16) minus inflow (site 14) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	4.0	3.3	4,000

[1]The estimated normalized load was computed by multiplying the mean annual fitted trend concentration (determined by using the time-series model) for the indicated period times the geometric mean streamflow for water years 1996–2010 and a units conversion factor according to equation 1 in the section of this report "Estimation of Normalized Constituent Loads." Loads are reported to two significant figures; however, before final rounding, calculations used three significant figures when necessary. As a result, some of the load values have minor rounding artifacts.

[2]No data available for site 15 for water years 2006–10 (period 3); thus loads from site 15 are not accounted for and contribute to the within-reach change in load for period 3. Further, for period 3, loads from site 15 are included in net mobilization from within-reach sources.

Table 5–7. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 7, extending from Clark Fork at Goldcreek (site 16, fig. 1, table 1) to Clark Fork near Drummond (site 18, fig. 1, table 1) for selected periods, water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site name and number or summation category	Estimated normalized load[1] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 1996–2000 (period 1)			
Inflow Clark Fork at Goldcreek (site 16)	19	10	16,000
Monitored tributary inflow within reach Flint Creek (site 17)	0.69	2.7	4,100
Combined inflow (sum of sites 16 and 17)	20	13	20,000
Outflow Clark Fork near Drummond (site 18)	24	16	24,000
Total within-reach change in load—outflow (site 18) minus inflow (site 16) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	4.8	5.5	8,000
Within-reach change in load after accounting for the monitored tributary—outflow (site 18) minus combined inflow (sum of sites 16 and 17) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries and the main-stem channel and floodplain)	4.1	2.8	3,900
Water years 2001–05 (period 2)			
Inflow Clark Fork at Goldcreek (site 16)	16	9.7	12,000
Monitored tributary inflow within reach Flint Creek (site 17)	0.57	2.4	3,000
Combined inflow (sum of sites 16 and 17)	17	12	15,000
Outflow Clark Fork near Drummond (site 18)	19	15	17,000
Total within-reach change in load—outflow (site 18) minus inflow (site 16) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	3.1	4.8	5,100
Within-reach change in load after accounting for the monitored tributary—outflow (site 18) minus combined inflow (sum of sites 16 and 17) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries and the main-stem channel and floodplain)	2.5	2.3	2,100
Water years 2006–10 (period 3[2])			
Inflow Clark Fork at Goldcreek (site 16)	15	10	10,000
Outflow Clark Fork near Drummond (site 18)	18	15	17,000
Total within-reach change in load—outflow (site 18) minus inflow (site 16) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	3.3	4.5	6,300

[1]The estimated normalized load was computed by multiplying the mean annual fitted trend concentration (determined by using the time-series model) for the indicated period times the geometric mean streamflow for water years 1996–2010 and a units conversion factor according to equation 1 in the section of this report "Estimation of Normalized Constituent Loads." Loads are reported to two significant figures; however, before final rounding, calculations used three significant figures when necessary. As a result, some of the load values have minor rounding artifacts.

[2]No data available for site 17 for water years 2006–10 (period 3); thus loads from site 17 are not accounted for and contribute to the total within-reach change in load for period 3. Further, for period 3, loads from site 17 are included in net mobilization from within-reach sources.

Table 5–8. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 8, extending from Clark Fork near Drummond (site 18, fig. 1, table 1) to Clark Fork at Turah Bridge (site 20, fig. 1, table 1) for selected periods, water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site name and number or summation category	Estimated normalized load[1] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 1996–2000 (period 1)			
InflowClark Fork near Drummond (site 18)	24	16	24,000
Monitored tributary inflow within reach[2] Rock Creek (site 19)	ND	ND	4,900
Combined inflow (sum of sites 18 and 19)	ND	ND	28,000
Outflow Clark Fork at Turah Bridge (site 20)	23	17	32,000
Total within-reach change in load—outflow (site 20) minus inflow (site 18) (negative values indicate net accumulation in reach channel; positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	-1.0	0.89	8,900
Within-reach change in load after accounting for the monitored tributary—outflow (site 20) minus combined inflow (sum of sites 18 and 19) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	ND	ND	4,000
Water years 2001–05 (period 2)			
Inflow Clark Fork near Drummond (site 18)	19	15	17,000
Monitored tributary inflow within reach[2] Rock Creek (site 19)	ND	ND	3,900
Combined inflow (sum of sites 18 and 19)	ND	ND	21,000
Outflow Clark Fork at Turah Bridge (site 20)	21	15	26,000
Total within-reach change in load—outflow (site 20) minus inflow (site 18) (negative values indicate net accumulation in reach channel; positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	1.1	0.92	9,000
Within-reach change in load after accounting for the monitored tributary—outflow (site 20) minus combined inflow (sum of sites 18 and 19) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	ND	ND	5,100
Water years 2006–10 (period 3[2])			
Inflow Clark Fork near Drummond (site 18)	18	15	17,000
Outflow Clark Fork at Turah Bridge (site 20)	21	16	27,000
Total within-reach change in load—outflow (site 20) minus inflow (site 18) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	3.0	1.8	10,000

[1]The estimated normalized load was computed by multiplying the mean annual fitted trend concentration (determined by using the time-series model) for the indicated period times the geometric mean streamflow for water years 1996–2010 and a units conversion factor according to equation 1 in the section of this report "Estimation of Normalized Constituent Loads." Loads are reported to two significant figures; however, before final rounding, calculations used three significant figures when necessary. As a result, some of the load values have minor rounding artifacts.

[2]Load results for Rock Creek near Clinton (site 19) for copper and arsenic not reported because greater than 6 percent of data values were affected by recensoring at study reporting level, as discussed in the section of this report "Time-Series Model." No suspended-sediment data available for site 19 for period 3; thus loads from site 19 of copper and arsenic for all periods and suspended sediment for period 3 are not accounted for and contribute to the within-reach change in load.

Table 5–9. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 9, extending from Clark Fork at Turah Bridge (site 20, fig. 1, table 1) to Clark Fork above Missoula (site 22, fig. 1, table 1) for selected periods, water years 1996–2010.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ND, not determined because of greater than 6 percent of values affected by recensoring at study reporting level, as discussed in the section of this report "Time-Series Model."]

Site name and number or summation category	Estimated normalized load[1] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 1996–2000 (period 1)			
Inflow Clark Fork at Turah Bridge (site 20)	23	17	32,000
Monitored tributary inflow within reach[2] Blackfoot River (site 21)	ND	ND	9,900
Combined inflow (sum of sites 20 and 21)	ND	ND	42,000
Outflow Clark Fork above Missoula (site 22)	25	18	39,000
Total within-reach change in load—outflow (site 22) minus inflow (site 20) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	2.4	1.9	6,500
Within-reach change in load after accounting for the monitored tributary—outflow (site 22) minus combined inflow (sum of sites 20 and 21) (negative values indicate net accumulation in reach channel)	ND	ND	-3,300
Water years 2001–05 (period 2)			
Inflow Clark Fork at Turah Bridge (site 20)	21	15	26,000
Monitored tributary inflow within reach[2] Blackfoot River (site 21)	ND	ND	9,400
Combined inflow (sum of sites 20 and 21)	21	15	35,000
OutflowClark Fork above Missoula (site 22)"	29	19	41,000
Total within-reach change in load—outflow (site 22) minus inflow (site 20) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	8.0	3.6	15,000
Within-reach change in load after accounting for the monitored tributary—outflow (site 22) minus combined inflow (sum of sites 20 and 21) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	ND	ND	5,600
Water years 2006–10 (period 3)			
Inflow Clark Fork at Turah Bridge (site 20)	21	16	27,000
Monitored tributary inflow within reach[2] Blackfoot River (site 21)	ND	ND	8,400
Combined inflow (sum of sites 20 and 21	21	16	36,000
Outflow Clark Fork above Missoula (site 22)	50	24	77,000

Table 5–9. Transport-analysis balance calculations for sites analyzed by using the time series model (TSM) in reach 9, extending from Clark Fork at Turah Bridge (site 20, fig. 1, table 1) to Clark Fork above Missoula (site 22, fig. 1, table 1) for selected periods, water years 1996–2010.—Continued

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends]

Site name and number or summation category	Estimated normalized load[1] (kilograms per day)		
	Unfiltered-recoverable copper	Unfiltered-recoverable arsenic	Suspended sediment
Water years 2006–10 (period 3)—Continued			
Total within-reach change in load—outflow (site 22) minus inflow (site 20) (positive values indicate net mobilization from all within-reach sources including groundwater inflow, the monitored tributary, unmonitored tributaries, and the main-stem channel and floodplain)	28	7.4	50,000
Within-reach change in load after accounting for the monitored tributary—outflow (site 22) minus combined inflow (sum of sites 20 and 21) (positive values indicate net mobilization from other within-reach sources including groundwater inflow, unmonitored tributaries, and the main-stem channel and floodplain)	ND	ND	42,000

[1]The estimated normalized load was computed by multiplying the mean annual fitted trend concentration (determined by using the time-series model) for the indicated period times the geometric mean streamflow for water years 1996–2010 and a units conversion factor according to equation 1 in the section of this report "Estimation of Normalized Constituent Loads." Loads are reported to two significant figures; however, before final rounding, calculations used three significant figures when necessary. As a result, some of the load values have minor rounding artifacts.

[2]Loads results for Blackfoot River near Bonner (site 21) for copper and arsenic not reported because greater than 6 percent of data values were affected by recensoring at study reporting level, as discussed in the section of this report "Time-Series Model." Thus loads from site 21 of copper and arsenic for all periods are not accounted for and contribute to the within-reach change in load.