

**Table 1–1.** Summary information relating to quality-control samples (equipment blank and replicate samples) collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 1997–2013.

[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; RPD, relative percent difference;  $\mu\text{S}/\text{cm}$  at 25 °C, microsiemens per centimeter at 25 degrees Celsius; NA, not applicable; mg/L, micrograms per liter; mg/L, milligrams per liter]

Constituent or property, units of measurement	Summary information relating to field blank samples					Summary information 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	Median detected concentration for field blank samples	Maximum detected concentration for field blank samples	Number of field replicate pairs	10th percentile RPD <sup>1</sup>	Median RPD	90th percentile RPD <sup>1</sup>
Specific conductance, $\mu\text{S}/\text{cm}$ at 25 °C	NA	NA	NA	NA	NA	26	0.0	0.0	0.0
Cadmium, filtered, mg/L	30	0	0	no detections	no detections	34	-4.3	0.0	4.2
Cadmium, unfiltered-recoverable, mg/L	30	0	0	no detections	no detections	34	-3.3	-0.1	5.5
Copper, filtered, mg/L	30	8	27	0.242	0.526	34	-4.3	0.0	8.3
Copper, unfiltered-recoverable, mg/L	30	3	10	0.46	1.03	34	-11	-1.1	11
Lead, filtered, mg/L	30	1	3	0.048	0.048	34	-11	0.0	13
Lead, unfiltered-recoverable, mg/L	30	4	13	0.04	0.12	34	-3.7	0.2	10
Zinc, filtered, mg/L	30	13	43	0.43	2.40	34	-2.1	-0.2	3.2
Zinc, unfiltered-recoverable, mg/L	30	6	20	1.19	5.84	34	-2.7	-0.2	4.2
Arsenic, filtered, mg/L	30	1	3	0.03	0.03	34	-2.0	0.2	4.6
Arsenic, unfiltered-recoverable, mg/L	30	2	7	0.09	0.12	34	-8.2	2.1	15
Suspended sediment, mg/L	NA	NA	NA	NA	NA	21	-62	0.0	89

<sup>1</sup>Relative percent difference (RPD) for each primary and replicate sample pair is calculated by using the following equation:

$$RPD = 100 \times \frac{|X - Y|}{[(X + Y) / 2]}$$

where

- RPD* is the relative percent difference,
- X* is the value of the primary sample, and
- Y* is the value of the replicate sample.

**Table 1–2.** Summary information relating to water-quality constituents and properties in samples collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 2009–13.

[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; μS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; μg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Boulder River above Kleinsmith Gulch (site 1, fig. 1, table 1)									
5/2012–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	7(0)	9.5	ND <sup>3</sup>	23	97	ND <sup>3</sup>	237	NA
	pH, standard units	7(0)	7.4	ND <sup>3</sup>	7.6	7.8	ND <sup>3</sup>	8.4	NA
	Specific conductance, μS/cm at 25 °C	7(0)	56	ND <sup>3</sup>	141	114	ND <sup>3</sup>	157	NA
	Hardness, mg/L as CaCO <sub>3</sub>	7(0)	21.2	ND <sup>3</sup>	47.1	42.5	ND <sup>3</sup>	59.2	NA
	Calcium, filtered, mg/L	7(0)	6.37	ND <sup>3</sup>	14.1	12.8	ND <sup>3</sup>	17.9	NA
	Magnesium, filtered, mg/L	7(0)	1.29	ND <sup>3</sup>	2.91	2.57	ND <sup>3</sup>	3.53	NA
	Cadmium, filtered, μg/L	7 (6)	0.017	ND <sup>4</sup>	ND <sup>4</sup>	ND <sup>4</sup>	ND <sup>4</sup>	ND <sup>4</sup>	NA
	Cadmium, unfiltered-recoverable, μg/L	7 (3)	0.019	ND <sup>3</sup>	0.019	0.020	ND <sup>3</sup>	0.028	
	Copper, filtered, μg/L	7 (0)	0.90	ND <sup>3</sup>	1.90	1.74	ND <sup>3</sup>	2.30	106
	Copper, unfiltered-recoverable, μg/L	7 (0)	1.00	ND <sup>3</sup>	1.80	1.86	ND <sup>3</sup>	3.30	
	Lead, filtered, μg/L	7 (0)	0.032	ND <sup>3</sup>	0.084	0.095	ND <sup>3</sup>	0.170	56
	Lead, unfiltered-recoverable, μg/L	7 (0)	0.10	ND <sup>3</sup>	0.15	0.39	ND <sup>3</sup>	1.09	
	Zinc, filtered, μg/L	7 (2)	1.50	ND <sup>3</sup>	1.50	2.20	ND <sup>3</sup>	6.20	47
	Zinc, unfiltered-recoverable, μg/L	7 (3)	3.20	ND <sup>3</sup>	3.20	3.25	ND <sup>3</sup>	5.30	
	Arsenic, filtered, μg/L	7 (0)	2.50	ND <sup>3</sup>	3.00	3.17	ND <sup>3</sup>	4.00	86
	Arsenic, unfiltered-recoverable, μg/L	7 (0)	3.00	ND <sup>3</sup>	3.50	3.43	ND <sup>3</sup>	4.10	
	Suspended sediment, mg/L	7(0)	1	ND <sup>3</sup>	3	10	ND <sup>3</sup>	29	NA
	Suspended sediment, percent fines <sup>5</sup>	7(0)	35	ND <sup>3</sup>	88	76	ND <sup>3</sup>	98	NA
Bullion Mine adit (site 2, fig. 1, table 1)									
4/2009–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	14(0)	0.01	0.01	0.01	0.01	0.01	0.03	NA
	pH, standard units	18(0)	2.5	2.8	3.0	3.0	3.3	3.4	NA
	Specific conductance, μS/cm at 25 °C	18(0)	1,070	1,370	1,580	1,770	2,080	3,100	NA

**Table 1–2.** Summary information relating to water-quality constituents and properties in samples collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 2009–13.—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<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; µS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Bullion Mine adit (site 2, fig. 1, table 1)—Continued									
	Hardness, mg/L as CaCO <sub>3</sub>	18(0)	234	277	290	302	324	398	NA
	Calcium, filtered, mg/L	18(0)	57.6	68.1	72.0	73.7	80.1	92.6	NA
	Magnesium, filtered, mg/L	18(0)	21.9	25.9	27.0	28.5	29.8	40.5	NA
	Cadmium, filtered, µg/L	18 (0)	214	278	344	431	480	1,070	110
	Cadmium, unfiltered-recoverable, µg/L	18 (0)	193	266	314	402	404	1,100	
	Copper, filtered, µg/L	18 (0)	1,220	3,130	4,920	7,330	9,020	22,500	98
	Copper, unfiltered-recoverable, µg/L	18 (0)	1,330	3,450	5,020	7,340	9,460	23,100	
	Lead, filtered, µg/L	18 (0)	196	284	355	358	408	666	92
	Lead, unfiltered-recoverable, µg/L	18 (0)	266	362	384	412	446	664	
	Zinc, filtered, µg/L	18 (0)	22,100	28,300	35,200	48,400	53,100	141,000	111
	Zinc, unfiltered-recoverable, µg/L	18 (0)	20,800	29,300	31,800	45,400	46,800	132,000	
	Arsenic, filtered, µg/L	18 (0)	513	968	1,530	2,350	3,040	10,100	63
	Arsenic, unfiltered-recoverable, µg/L	18 (0)	904	1,420	2,420	2,870	3,390	9,700	
	Suspended sediment, mg/L	0(0)	--	--	--	--	--	--	NA
	Suspended sediment, percent fines <sup>5</sup>	0(0)	--	--	--	--	--	--	NA
Bullion Mine tributary at mouth (site 3, fig. 1, table 1)									
4/2009–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	20(0)	0.07	0.22	0.61	2.2	3.8	8.5	NA
	pH, standard units	20(0)	5.5	6.7	6.8	6.9	7.2	7.7	NA
	Specific conductance, µS/cm at 25 °C	20(0)	49	57	115	114	152	226	NA
	Hardness, mg/L as CaCO <sub>3</sub>	20(0)	17.6	21.0	39.4	41.8	57.4	80.9	NA
	Calcium, filtered, mg/L	20(0)	5.1	6.1	11.3	11.9	16.3	22.6	NA
	Magnesium, filtered, mg/L	20(0)	1.19	1.38	2.82	2.95	4.03	5.93	NA

**Table 1–2.** Summary information relating to water-quality constituents and properties in samples collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 2009–13.—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<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; µS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Bullion Mine tributary at mouth (site 3, fig. 1, table 1)—Continued									
	Cadmium, filtered, µg/L	20 (0)	2.07	3.50	13.9	12.5	17.0	38.6	93
	Cadmium, unfiltered-recoverable, µg/L	20 (0)	2.29	3.84	15.0	12.3	17.0	31.9	
	Copper, filtered, µg/L	20 (0)	16.1	35.6	52.8	87.2	79.2	416	43
	Copper, unfiltered-recoverable, µg/L	20 (0)	41.6	72.6	122	161	244	436	
	Lead, filtered, µg/L	20 (3)	0.101	0.248	0.696	0.838	1.11	3.47	14
	Lead, unfiltered-recoverable, µg/L	20 (0)	2.02	3.98	5.16	5.88	7.46	11.6	
	Zinc, filtered, µg/L	20 (0)	252	430	1,700	1,470	2,050	4,550	92
	Zinc, unfiltered-recoverable, µg/L	20 (0)	280	452	1,840	1,490	1,990	4,080	
	Arsenic, filtered, µg/L	20 (0)	0.8	1.5	3.5	4.8	5.3	17.9	18
	Arsenic, unfiltered-recoverable, µg/L	20 (0)	6.1	12.6	19.1	20.7	26.2	47.9	
	Suspended sediment, mg/L	19(0)	1	5	7	7	10	17	NA
	Suspended sediment, percent fines <sup>5</sup>	20(0)	13	49	88	72	97	99	NA
Jack Creek at mouth (site 4, fig. 1, table 1)									
4/2009–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	20(0)	1.0	1.8	5.2	15	25	52	NA
	pH, standard units	20(0)	7.0	7.3	7.4	7.4	7.5	8.0	NA
	Specific conductance, µS/cm at 25 °C	20(0)	42	49	78	73	90	101	NA
	Hardness, mg/L as CaCO <sub>3</sub>	20(0)	16.2	19.2	29.2	28.0	34.8	38.4	NA
	Calcium, filtered, mg/L	20(0)	4.66	5.53	8.35	7.97	9.90	10.9	NA
	Magnesium, filtered, mg/L	20(0)	1.11	1.34	2.04	1.97	2.46	2.73	NA
	Cadmium, filtered, µg/L	20 (0)	0.544	0.720	1.27	1.31	1.86	2.24	89
	Cadmium, unfiltered-recoverable, µg/L	20 (0)	0.543	0.878	1.43	1.52	2.01	3.98	

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[Water year is the 12-month period from October 1 through September 30 and is designated by the year in which it ends. ft<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; μS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; μg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Jack Creek at mouth (site 4, fig. 1, table 1)—Continued									
	Copper, filtered, μg/L	20 (0)	5.40	8.75	11.6	13.8	18.8	26.5	67
	Copper, unfiltered-recoverable, μg/L	20 (0)	7.90	12.3	17.4	24.6	26.6	137	
	Lead, filtered, μg/L	20 (0)	0.119	0.178	0.286	0.332	0.468	0.617	29
	Lead, unfiltered-recoverable, μg/L	20 (0)	0.31	0.60	0.99	2.78	2.48	20.1	
	Zinc, filtered, μg/L	20 (0)	73.6	104	169	181	262	318	85
	Zinc, unfiltered-recoverable, μg/L	20 (0)	74.5	106	198	191	271	359	
	Arsenic, filtered, μg/L	20 (0)	2.9	4.0	4.2	4.6	5.1	7.7	54
	Arsenic, unfiltered-recoverable, μg/L	20 (0)	4.8	5.7	7.9	10.2	10.6	46.8	
	Suspended sediment, mg/L	20(0)	1	1	1	10	11	57	NA
	Suspended sediment, percent fines <sup>5</sup>	20(0)	3	43	81	67	86	93	NA
Basin Creek at Basin (site 5, fig. 1, table 1)									
4/2009–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	20(0)	2.9	4.8	18	76	98	414	NA
	pH, standard units	20(0)	7.0	7.3	7.6	7.5	7.8	8.1	NA
	Specific conductance, μS/cm at 25 °C	20(0)	34	45	76	72	93	118	NA
	Hardness, mg/L as CaCO <sub>3</sub>	20(0)	12.4	16.3	29.1	28.0	37.1	46.3	NA
	Calcium, filtered, mg/L	20(0)	3.62	4.73	8.30	8.04	10.63	13.2	NA
	Magnesium, filtered, mg/L	20(0)	0.82	1.10	2.03	1.93	2.56	3.22	NA
	Cadmium, filtered, μg/L	20 (0)	0.158	0.209	0.245	0.252	0.284	0.419	81
	Cadmium, unfiltered-recoverable, μg/L	20 (0)	0.177	0.226	0.302	0.332	0.365	0.726	
	Copper, filtered, μg/L	20 (0)	3.00	4.05	5.50	5.49	6.20	9.30	72
	Copper, unfiltered-recoverable, μg/L	19 (0)	3.20	4.00	7.60	7.72	10.6	19.4	

**Table 1–2.** Summary information relating to water-quality constituents and properties in samples collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 2009–13.—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<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; µS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Basin Creek at Basin (site 5, fig. 1, table 1)—Continued									
	Lead, filtered, µg/L	20 (0)	0.085	0.165	0.274	0.336	0.520	0.689	42
	Lead, unfiltered-recoverable, µg/L	20 (0)	0.31	0.45	0.65	2.50	3.63	12.8	
	Zinc, filtered, µg/L	20 (0)	24.8	32.1	41.9	43.2	53.1	68.4	86
	Zinc, unfiltered-recoverable, µg/L	20 (0)	26.1	35.2	48.9	48.6	56.3	87.2	
	Arsenic, filtered, µg/L	20 (0)	3.2	4.0	4.7	4.7	5.6	6.1	74
	Arsenic, unfiltered-recoverable, µg/L	20 (0)	3.6	5.3	6.3	7.9	8.1	27.9	
	Suspended sediment, mg/L	20(0)	1	1	2	17	13	128	NA
	Suspended sediment, percent fines <sup>5</sup>	20(0)	16	38	77	62	83	91	NA
Crystal Mine adit (site 6, fig. 1, table 1)									
4/2009–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	18(0)	0.02	0.04	0.05	0.06	0.07	0.20	NA
	pH, standard units	18(0)	2.1	3.8	4.7	4.5	5.4	5.7	NA
	Specific conductance, µS/cm at 25 °C	17(0)	478	610	695	695	788	961	NA
	Hardness, mg/L as CaCO <sub>3</sub>	18(0)	144	168	203	192	211	218	NA
	Calcium, filtered, mg/L	18(0)	39.1	45.4	53.9	52.0	57.5	59.8	NA
	Magnesium, filtered, mg/L	18(0)	11.4	14.0	15.7	15.1	16.4	16.9	NA
	Cadmium, filtered, µg/L	18 (0)	331	431	536	512	555	718	103
	Cadmium, unfiltered-recoverable, µg/L	18 (0)	342	416	521	498	574	638	
	Copper, filtered, µg/L	18 (0)	2,610	4,140	7,165	6,931	8,230	15,000	97
	Copper, unfiltered-recoverable, µg/L	18 (0)	3,160	4,320	7,370	7,068	8,810	15,600	
	Lead, filtered, µg/L	18 (0)	8.11	14.8	63.5	82	134	266	78
	Lead, unfiltered-recoverable, µg/L	18 (0)	24.6	27.7	81.3	121	206	297	

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Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Crystal Mine adit (site 6, fig. 1, table 1)—Continued									
	Zinc, filtered, μg/L	18 (0)	24,500	36,700	44,000	41,994	47,200	57,200	106
	Zinc, unfiltered-recoverable, μg/L	18 (0)	26,700	31,800	41,500	38,578	44,100	50,600	
	Arsenic, filtered, μg/L	18 (0)	18.4	77.0	121	157	206	715	32
	Arsenic, unfiltered-recoverable, μg/L	18 (0)	86	150	372	704	1,160	2,450	
	Suspended sediment, mg/L	0(0)	--	--	--	--	--	--	NA
	Suspended sediment, percent fines <sup>5</sup>	0(0)	--	--	--	--	--	--	NA
Cataract Creek above Uncle Sam Gulch (site 7, fig. 1, table 1)									
3/20110–8/2010	Streamflow, instantaneous, ft <sup>3</sup> /s	12(0)	1.6	2.8	5.9	35	34	220	NA
	pH, standard units	11(0)	7.0	7.4	7.6	7.5	7.8	7.9	NA
	Specific conductance, μS/cm at 25 °C	12(0)	40	54	101	88	115	124	NA
	Hardness, mg/L as CaCO <sub>3</sub>	12(0)	16.7	22.9	43.6	38.7	51.7	54.3	NA
	Calcium, filtered, mg/L	12(0)	5.06	6.98	13.45	11.88	16.00	16.8	NA
	Magnesium, filtered, mg/L	12(0)	0.99	1.33	2.44	2.19	2.89	3.05	NA
	Cadmium, filtered, μg/L	12 (0)	0.118	0.137	0.147	0.171	0.211	0.287	86
	Cadmium, unfiltered-recoverable, μg/L	12 (0)	0.121	0.133	0.171	0.188	0.220	0.373	
	Copper, filtered, μg/L	12 (0)	2.40	3.05	3.55	4.13	5.60	6.90	91
	Copper, unfiltered-recoverable, μg/L	12 (0)	2.60	3.00	3.90	4.74	5.80	10.0	
	Lead, filtered, μg/L	12 (0)	0.080	0.100	0.142	0.208	0.272	0.540	31
	Lead, unfiltered-recoverable, μg/L	12 (0)	0.14	0.22	0.46	1.30	0.70	9.41	
	Zinc, filtered, μg/L	12 (0)	25.0	31.3	37.2	40.9	51.1	62.2	96
	Zinc, unfiltered-recoverable, μg/L	12 (0)	26.1	31.4	38.8	41.6	52.2	62.2	

**Table 1–2.** Summary information relating to water-quality constituents and properties in samples collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 2009–13.—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<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; μS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; μg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Cataract Creek above Uncle Sam Gulch (site 7, fig. 1, table 1)—Continued									
	Arsenic, filtered, μg/L	12 (0)	1.8	2.3	2.5	2.5	2.7	3.7	91
	Arsenic, unfiltered-recoverable, μg/L	12 (0)	1.9	2.5	2.8	3.1	3.4	6.7	
	Suspended sediment, mg/L	12(0)	1	1	1	7	4	58	NA
	Suspended sediment, percent fines <sup>5</sup>	12(0)	13	71	80	74	85	99	NA
Cataract Creek at Basin (site 8, fig. 1, table 1)									
4/2009–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	20(0)	2.8	6.1	15	48	72	228	NA
	pH, standard units	20(0)	7.3	7.4	7.7	7.7	7.9	8.1	NA
	Specific conductance, μS/cm at 25 °C	19(0)	44	54	108	99	133	175	NA
	Hardness, mg/L as CaCO <sub>3</sub>	20(0)	18.4	21.7	45.5	43.4	61.1	74.2	NA
	Calcium, filtered, mg/L	20(0)	5.56	6.52	14.0	13.2	18.7	22.5	NA
	Magnesium, filtered, mg/L	20(0)	1.11	1.31	2.64	2.56	3.49	4.37	NA
	Cadmium, filtered, μg/L	20 (0)	0.499	0.660	1.02	0.961	1.23	1.37	98
	Cadmium, unfiltered-recoverable, μg/L	20 (0)	0.611	0.938	1.04	1.08	1.26	1.93	
	Copper, filtered, μg/L	20 (0)	4.00	6.05	9.50	10.1	13.1	23.2	90
	Copper, unfiltered-recoverable, μg/L	20 (0)	4.80	7.75	10.6	14.5	20.8	35.7	
	Lead, filtered, μg/L	20 (0)	0.125	0.174	0.281	0.371	0.542	0.828	20
	Lead, unfiltered-recoverable, μg/L	20 (0)	0.42	0.87	1.38	3.71	6.49	13.6	
	Zinc, filtered, μg/L	20 (0)	65.6	81.4	101	108	123	182	98
	Zinc, unfiltered-recoverable, μg/L	20 (0)	73.5	88.9	103	112	130	192	
	Arsenic, filtered, μg/L	20 (0)	2.9	3.4	3.9	4.4	5.1	8.2	64
	Arsenic, unfiltered-recoverable, μg/L	20 (0)	4.1	4.8	6.1	7.7	11.4	16.9	
	Suspended sediment, mg/L	20(0)	1	1	2	9	10	50	NA
	Suspended sediment, percent fines <sup>5</sup>	20(0)	22	44	69	64	83	92	NA



**Table 1–2.** Summary information relating to water-quality constituents and properties in samples collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 2009–13.—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<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; μS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; μg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
High Ore Creek near Basin (site 9, fig. 1, table 1)									
3/2011–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	12(0)	0.36	0.75	1.6	3.5	2.2	24	NA
	pH, standard units	12(0)	7.6	7.9	8.1	8.1	8.2	8.4	NA
	Specific conductance, μS/cm at 25 °C	12(0)	126	190	277	244	288	306	NA
	Hardness, mg/L as CaCO <sub>3</sub>	12(0)	52.4	87.2	133	115	142	154	NA
	Calcium, filtered, mg/L	12(0)	14.7	24.3	36.6	31.6	38.6	42.3	NA
	Magnesium, filtered, mg/L	12(0)	3.78	6.47	10.1	8.82	11.1	11.7	NA
	Cadmium, filtered, μg/L	12 (0)	0.684	1.02	1.57	1.51	1.93	2.35	80
	Cadmium, unfiltered-recoverable, μg/L	12 (0)	1.270	1.56	1.96	2.47	2.48	8.50	
	Copper, filtered, μg/L	12 (1)	1.50	1.91	2.15	2.48	2.65	6.00	61
	Copper, unfiltered-recoverable, μg/L	12 (0)	2.50	3.10	3.50	11.7	4.85	91.1	
	Lead, filtered, μg/L	12 (0)	0.146	0.232	0.299	0.552	0.491	2.96	4
	Lead, unfiltered-recoverable, μg/L	12 (0)	1.84	3.02	6.77	45.2	11.1	438	
	Zinc, filtered, μg/L	12 (0)	228	271	427	458	612	844	92
	Zinc, unfiltered-recoverable, μg/L	12 (0)	313	382	462	612	773	1,510	
	Arsenic, filtered, μg/L	12 (0)	15.3	16.3	23.8	23.4	29.7	32.2	79
	Arsenic, unfiltered-recoverable, μg/L	12 (0)	20.2	23.5	30.0	65.7	32.0	458	
	Suspended sediment, mg/L	12(0)	1	3	8	37	12	255	NA
	Suspended sediment, percent fines <sup>5</sup>	12(0)	25	70	78	73	83	94	NA
Boulder River below Little Galena Gulch (site 10, fig. 1, table 1)									
4/2009–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	20(0)	18	40	101	414	505	2,880	NA
	pH, standard units	20(0)	7.3	7.9	8.0	8.0	8.3	8.6	NA
	Specific conductance, μS/cm at 25 °C	20(0)	49	69	124	114	158	170	NA

**Table 1–2.** Summary information relating to water-quality constituents and properties in samples collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 2009–13.—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<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; µS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Boulder River below Little Galena Gulch (site 10, fig. 1, table 1)—Continued									
	Hardness, mg/L as CaCO <sub>3</sub>	20(0)	19.3	25.1	46.1	44.2	62.3	70.7	NA
	Calcium, filtered, mg/L	20(0)	5.76	7.42	13.8	13.1	18.5	20.8	NA
	Magnesium, filtered, mg/L	20(0)	1.20	1.60	2.88	2.80	3.90	4.55	NA
	Cadmium, filtered, µg/L	20 (0)	0.135	0.174	0.226	0.226	0.251	0.382	80
	Cadmium, unfiltered-recoverable, µg/L	20 (0)	0.183	0.240	0.281	0.658	0.348	7.43	86
	Copper, filtered, µg/L	20 (0)	4.20	5.30	5.95	6.64	6.65	19.4	86
	Copper, unfiltered-recoverable, µg/L	20 (0)	5.20	6.20	6.95	22.9	9.45	304	86
	Lead, filtered, µg/L	20 (0)	0.074	0.136	0.171	0.360	0.333	1.860	19
	Lead, unfiltered-recoverable, µg/L	20 (0)	0.32	0.55	0.89	15.9	3.20	280	19
	Zinc, filtered, µg/L	20 (0)	15.5	28.6	31.2	37.1	41.6	69.7	75
	Zinc, unfiltered-recoverable, µg/L	20 (0)	24.7	35.9	41.6	79.2	62.9	716	75
	Arsenic, filtered, µg/L	20 (0)	3.3	4.0	4.8	5.3	6.4	9.50	75
	Arsenic, unfiltered-recoverable, µg/L	20 (0)	3.8	5.7	6.4	18.7	7.6	245	75
	Suspended sediment, mg/L	20(0)	1	2	3	65	17	969	NA
	Suspended sediment, percent fines <sup>5</sup>	20(0)	30	50	76	69	87	90	NA
Tenmile Creek above City Diversion (site 11, fig. 1, table 1)									
4/2009–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	16(0)	0.86	3.0	6.6	27	35	123	NA
	pH, standard units	17(0)	6.6	7.0	7.2	7.2	7.5	7.8	NA
	Specific conductance, µS/cm at 25 °C	18(0)	29	34	55	52	62	107	NA
	Hardness, mg/L as CaCO <sub>3</sub>	18(0)	10.7	12.3	20.2	19.1	21.9	42.6	NA
	Calcium, filtered, mg/L	18(0)	3.20	3.64	5.92	5.61	6.38	12.6	NA
	Magnesium, filtered, mg/L	18(0)	0.672	0.776	1.32	1.24	1.46	2.73	NA

**Table 1–2.** Summary information relating to water-quality constituents and properties in samples collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 2009–13.—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<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; µS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Tenmile Creek above City Diversion (site 11, fig. 1, table 1)—Continued									
	Cadmium, filtered, µg/L	18 (0)	0.255	0.356	0.682	0.760	1.03	2.18	90
	Cadmium, unfiltered-recoverable, µg/L	18 (0)	0.282	0.476	0.754	0.833	1.10	2.00	
	Copper, filtered, µg/L	18 (0)	2.00	2.40	3.25	3.36	4.10	9.10	89
	Copper, unfiltered-recoverable, µg/L	18 (0)	2.30	2.80	3.65	4.13	4.80	40.0	
	Lead, filtered, µg/L	18 (0)	0.329	0.753	0.800	0.913	0.994	3.97	46
	Lead, unfiltered-recoverable, µg/L	18 (0)	0.91	1.61	1.75	3.75	3.85	18.8	
	Zinc, filtered, µg/L	18 (0)	49.0	63.8	179	180	243	542	107
	Zinc, unfiltered-recoverable, µg/L	18 (0)	46.4	70.1	167	177	219	530	
	Arsenic, filtered, µg/L	18 (0)	2.2	3.5	4.4	4.7	5.8	9.6	70
	Arsenic, unfiltered-recoverable, µg/L	18 (0)	2.8	5.3	6.3	6.8	7.9	12.6	
	Suspended sediment, mg/L	18(0)	1	2	3	21	7	195	NA
	Suspended sediment, percent fines <sup>5</sup>	18(0)	22	41	72	65	90	96	NA
Minnehaha Creek near Rimini (site 12, fig. 1, table 1)									
4/2009–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	18(0)	0.38	1.1	2.8	14	10	72	NA
	pH, standard units	17(0)	6.7	7.2	7.3	7.3	7.5	7.8	NA
	Specific conductance, µS/cm at 25 °C	18(0)	36	46	62	58	65	83	NA
	Hardness, mg/L as CaCO <sub>3</sub>	18(0)	11.5	15.1	21.2	19.4	23.0	29.1	NA
	Calcium, filtered, mg/L	18(0)	3.27	4.40	6.06	5.59	6.57	8.24	NA
	Magnesium, filtered, mg/L	18(0)	0.799	0.998	1.43	1.33	1.57	2.06	NA
	Cadmium, filtered, µg/L	18 (0)	0.479	0.732	0.824	0.819	0.927	1.06	89
	Cadmium, unfiltered-recoverable, µg/L	18 (0)	0.774	0.824	0.927	0.997	1.12	1.55	

**Table 1–2.** Summary information relating to water-quality constituents and properties in samples collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 2009–13.—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<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; µS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Minnehaha Creek near Rimini (site 12, fig. 1, table 1)—Continued									
	Copper, filtered, µg/L	18 (0)	3.10	3.80	5.70	5.88	7.20	11.9	79
	Copper, unfiltered-recoverable, µg/L	18 (0)	2.80	5.70	7.25	8.90	9.6	27.4	
	Lead, filtered, µg/L	18 (0)	0.097	0.120	0.252	0.702	0.686	4.77	24
	Lead, unfiltered-recoverable, µg/L	18 (0)	0.23	0.46	1.04	4.35	2.39	44.9	
	Zinc, filtered, µg/L	18 (0)	79.0	130	145	146	162	193	98
	Zinc, unfiltered-recoverable, µg/L	18 (0)	115	130	148	151	172	196	
	Arsenic, filtered, µg/L	18 (0)	1.7	2.4	2.6	2.8	3.0	5.2	84
	Arsenic, unfiltered-recoverable, µg/L	18 (0)	1.9	2.7	3.1	4.7	3.3	26.4	
	Suspended sediment, mg/L	18(0)	1	2	4	14	10	98	NA
	Suspended sediment, percent fines <sup>5</sup>	18(0)	15	42	57	57	80	91	NA
Tenmile Creek near Rimini (site 13, fig. 1, table 1)									
4/2009–8/2013	Streamflow, instantaneous, ft <sup>3</sup> /s	17(0)	1.0	4.0	14	93	76	536	NA
	pH, standard units	17(0)	6.9	7.1	7.3	7.3	7.5	7.6	NA
	Specific conductance, µS/cm at 25 °C	18(0)	38	44	88	88	122	159	NA
	Hardness, mg/L as CaCO <sub>3</sub>	18(0)	14.5	15.9	30.9	33.3	47.0	60.9	NA
	Calcium, filtered, mg/L	18(0)	4.25	4.62	8.74	9.48	13.3	17.4	NA
	Magnesium, filtered, mg/L	18(0)	0.940	1.06	2.19	2.33	3.34	4.26	NA
	Cadmium, filtered, µg/L	18 (0)	0.459	0.572	1.23	1.38	1.49	4.30	93
	Cadmium, unfiltered-recoverable, µg/L	18 (0)	0.466	1.16	1.32	1.60	1.81	5.05	
	Copper, filtered, µg/L	18 (0)	2.00	3.70	4.80	5.87	8.20	13.2	79
	Copper, unfiltered-recoverable, µg/L	18 (0)	2.00	4.50	6.05	10.2	12.2	35.7	

**Table 1–2.** Summary information relating to water-quality constituents and properties in samples collected at sites in the Boulder River and Tenmile Creek watersheds, Montana, based on data collected during water years 2009–13.—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<sup>3</sup>/s, cubic feet per second; ND, not determined; NA, not applicable; µS/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; CaCO<sub>3</sub>, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data]

Period of water-quality sampling during water years 2009–13	Constituent or property, units of measurement	Statistical summaries of water-quality data <sup>1</sup>							Ratio 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 <sup>2</sup>	25th percentile	Median	Mean	75th percentile	Maximum	
Tenmile Creek near Rimini (site 13, fig. 1, table 1)—Continued									
	Lead, filtered, µg/L	18 (0)	0.104	0.527	0.805	0.816	0.949	2.23	39
	Lead, unfiltered-recoverable, µg/L	18 (0)	0.33	1.15	2.04	9.95	5.16	80.5	
	Zinc, filtered, µg/L	18 (0)	92.5	100	239	258	280	785	102
	Zinc, unfiltered-recoverable, µg/L	18 (0)	92.4	167	234	267	311	699	
	Arsenic, filtered, µg/L	18 (0)	5.4	7.5	13.9	17.3	25.3	62.6	61
	Arsenic, unfiltered-recoverable, µg/L	18 (0)	6.2	16.6	22.6	32.4	27.5	133	
	Suspended sediment, mg/L	17(0)	1	1	3	22	4	194	NA
	Suspended sediment, percent fines <sup>5</sup>	17(0)	33	63	87	78	94	96	NA

<sup>1</sup>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).

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

<sup>3</sup>Not determined because of insufficient number of samples to statistically define distributional parameter.

<sup>4</sup>Not determined because an excessive number of values were censored (that is, concentrations reported as less than the laboratory reporting level).

<sup>5</sup>Percent fines refers to the percentage of suspended sediment smaller than 0.062-millimeter diameter.

**Table 1–3.** Aquatic life standards (based on median hardness for water years 2009–13) for sites in the Boulder River and Tenmile Creek watersheds, 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<sub>3</sub>, calcium carbonate]

Site number (table 1, fig. 1)	Site name (table 1, fig. 1)	Median hardness for water years 2009–13, in milligrams per liter as CaCO <sub>3</sub>	Aquatic life standards (Montana Department of Environmental Quality, 2012a)							
			Cadmium		Copper		Lead		Zinc	
			Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic
1	Boulder River above Kleinsmith Gulch	47.1	0.99	0.15	6.9	4.9	31	1.2	63	63
2	Bullion Mine adit	290	6.3	0.59	38	23	320	12	290	290
3	Bullion Mine tributary at mouth	39.3	0.83	0.14	5.8	4.2	25	0.97	54	54
4	Jack Creek at mouth	29.2	0.61	0.11	4.4	3.3	17	0.66	42	42
5	Basin Creek at Basin	29.0	0.61	0.11	4.4	3.2	17	0.66	42	42
6	Crystal Mine adit	202	4.4	0.46	27	17	200	7.8	220	220
7	Cataract Creek above Uncle Sam Gulch	43.6	0.92	0.15	6.4	4.6	28	1.1	59	59
8	Cataract Creek at Basin	45.5	0.96	0.15	6.7	4.8	30	1.2	61	61
9	High Ore Creek near Basin	133	2.9	0.33	18	12	120	4.6	150	150
10	Boulder River below Little Galena Gulch	46.1	0.97	0.15	6.7	4.8	30	1.2	62	62
11	Tenmile Creek above City Diversion	20.2	0.42	0.083	3.1	2.4	11	0.42	31	31
12	Minnehaha Creek near Rimini	21.2	0.44	0.086	3.2	2.5	11	0.44	32	32
13	Tenmile Creek near Rimini	30.9	0.65	0.11	4.6	3.4	18	0.71	44	44