

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Analytical results for 32 water samples from a
hydrogeochemical survey of the Geneva Creek area, central Colorado

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Open-File Report 88-365

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.

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1988

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INTRODUCTION

A hydrogeochemical study was conducted in the Geneva Creek area in central Colorado. Thirty-two water samples were collected from the study area in September 1979. The purpose of the study was to examine the concentration of metals and anions in water to determine the hydrogeochemical characteristics associated with an iron bog area. The samples were analyzed for 15 metal ions, silica, and 4 anions along with pH and specific conductance. The study was funded by the USGS project for the development of hydrogeochemical techniques.

STUDY AREA

The study area is located in the Front Range of the Rocky Mountains, 45 mi southwest of Denver, Colorado (fig. 1). The main study area is 3 mi north to south and 2 mi east to west. The area is mountainous with many streams and elevation ranges from 8,500 to 13,000 ft. Access to Geneva Creek is by dirt road between Georgetown on I-70 and Grant on U.S. 285.

The study area is underlain by Pre-Cambrian Idaho Spring formation (chiefly biotite schist) and Silver Plume granite with Tertiary intrusives ranging in composition from quartz monzonite to alkalic syenite, diorite, monzonite, and sodic granite.

SAMPLE COLLECTION

Thirty-two water samples were collected from 21 streams, 4 springs, 4 mine adits, 2 drill holes, and 1 lake. At each site, a 60-ml sample was filtered through a 0.45-mm membrane filter into an acid-rinsed polyethylene bottle and then acidified with reagent grade concentrated nitric acid to a pH of less than 2. A 500-ml untreated sample was also collected in a clean polyethylene bottle.

ANALYTICAL METHODS

Water temperature and pH were measured at the sample site. All other analyses were completed at the U.S. Geological Survey laboratory in Denver, Colorado.

Calcium, magnesium, sodium, potassium, lithium, silica, zinc, copper, molybdenum, silver, arsenic, iron, manganese, aluminum, and vanadium were determined using the filtered-acidified sample. Alkalinity, sulfate, chloride, fluoride, uranium, and specific conductance were determined using the untreated sample. Alkalinity measures the total acid-neutralizable constituents in water and is generally due to the presence of carbonate and bicarbonate ions. A complete list of analytical methods used and a reference for each are listed in table 1.

RESULTS

Figure 2 is a map showing the location of each sample. Sample number 121 is a lake water; sample numbers 112, 114, 142, and 144 are springs. Sample numbers 110, 115, 116, and 149 are flowing waters from mine adits and sample numbers 109 and 145 are flowing waters from two drill holes. All other samples are from streams.

The analytical results of the 23 constituents that were determined for these samples are shown in table 2 along with the latitude and longitude for each sample location.

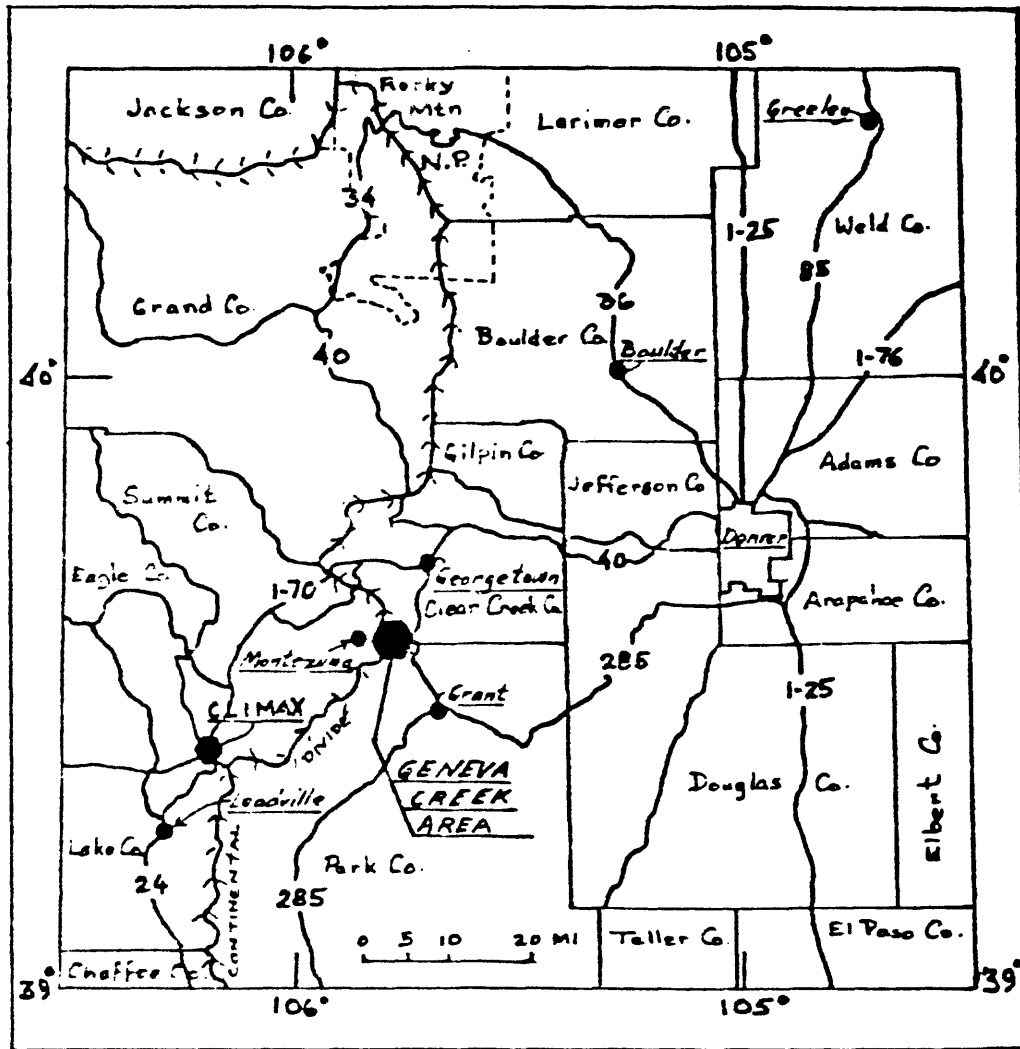


Figure 1. Index map of the Geneva Creek area, central Colorado.

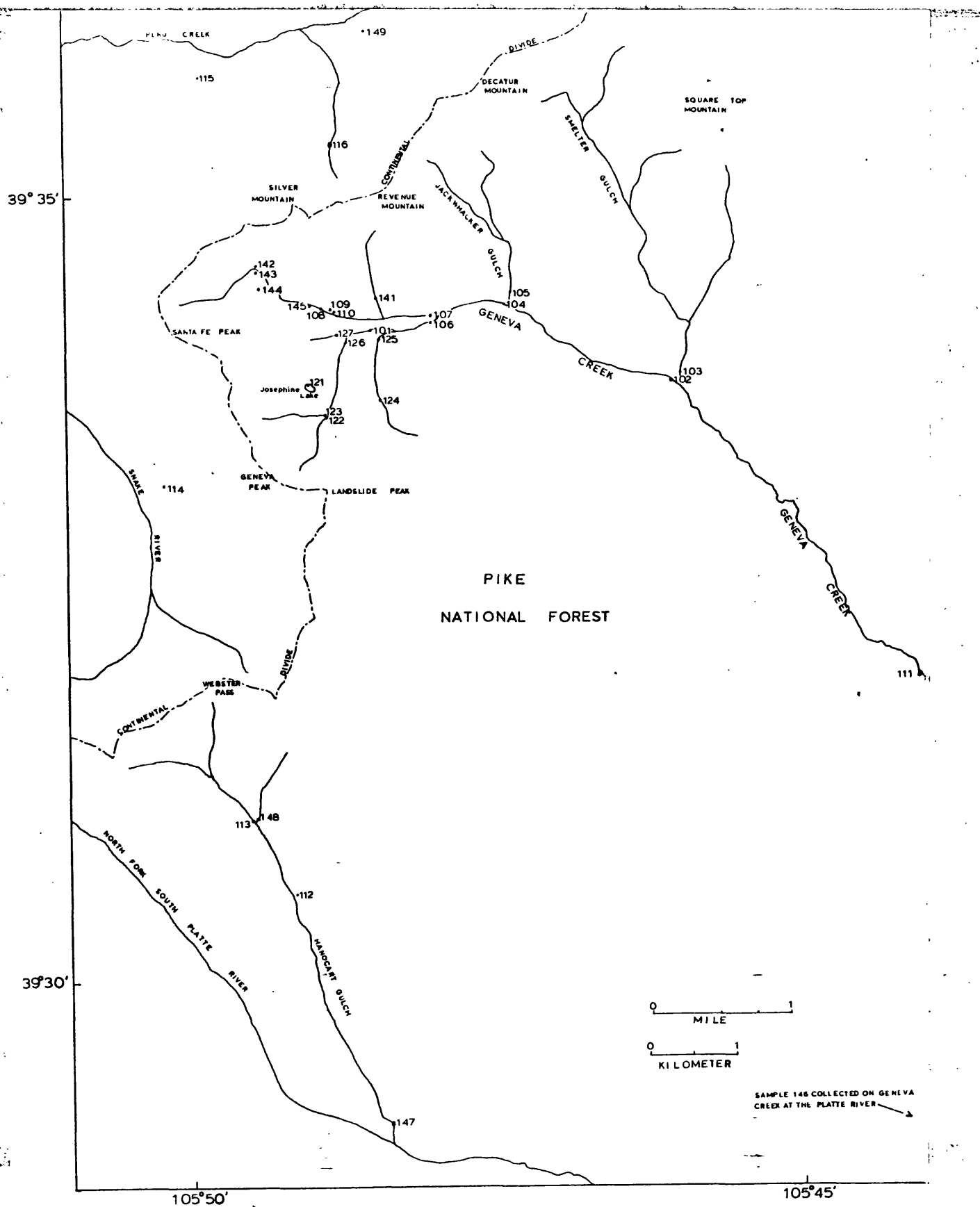


Figure 2. Sample locality map of the Geneva Creek area, central Colorado.

REFERENCES CITED

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- Skougstad, M.W., Fishman, M.J., Friedmann, L.C., Erdmann, D.E., and Duncan, S.S., 1979, Methods for determination of inorganic substances in water and fluvial sediments: Techniques of Water Resources Investigations of the U.S. Geological Survey, chapter A1, 26 p.

TABLE 1.--Analytical methods used for water analyses, Geneva Creek area, Colorado

Constituents	Method	Reference
Alkalinity	Gran's plot potentiometric titration	Orion Research, Inc. (1978).
Sulfate, chloride, and fluoride	Ion chromatography	Fishman and Pyen (1979).
Uranium	Laser-excited fluorescence	Scintrex Corp. (1979).
Specific conductance	Conductivity bridge	Skougstad et al. (1979), p. 545.
Calcium, magnesium, sodium, potassium, silica, lithium, aluminum, iron, manganese, and zinc	Flame atomic-absorption spectrophotometry	Perkin-Elmer Corp. (1976).
Arsenic, silver, vanadium, copper, and molybdenum	Flameless atomic-absorption spectrophotometry	Perkin-Elmer Corp. (1977).

TABLE 2.--ANALYTICAL RESULTS FOR 32 WATER SAMPLES FROM THE GENEVA CREEK AREA, COLORADO
[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	LATITUDE	LONGITUDE	CA (mg/L)	MG (mg/L)	NA (mg/L)	K (mg/L)	LI (mg/L)	SI02 (mg/
101	39 34 8	105 48 34	9.1	6.6	1.96	2.24	.006	32.0
102	39 33 48	105 46 7	12.4	4.4	1.85	1.15	.002	16.0
103	39 33 52	105 46 3	9.0	3.3	1.17	.87	<.002	5.7
104	39 34 17	105 47 29	13.2	4.9	2.03	1.32	<.002	20.0
105	39 34 22	105 47 26	9.1	2.3	1.22	.56	<.002	4.2
106	39 34 11	105 48 5	6.8	3.2	1.56	1.17	.002	15.0
107	39 34 13	105 48 5	17.8	6.4	2.20	1.58	.006	23.0
108	39 34 17	105 48 58	5.6	3.4	1.25	.76	.003	13.0
109	39 34 17	105 48 53	13.8	10.1	2.07	3.15	.008	38.0
110	39 34 16	105 48 52	13.6	10.0	2.06	3.15	.009	38.0
111	39 31 55	105 44 4	10.5	3.7	1.67	1.05	.003	13.0
112	39 30 33	105 49 12	17.1	13.5	5.96	2.35	.011	56.0
113	39 31 17	105 49 54	6.3	5.3	2.98	.99	.004	26.0
114	39 33 10	105 50 16	5.3	5.2	3.38	.98	.004	27.0
115	39 35 44	105 49 57	33.4	12.4	4.90	2.13	.002	46.0
116	39 35 18	105 48 52	19.6	6.6	3.57	1.17	.004	21.0
121	39 33 47	105 49 4	2.4	.8	.96	.50	<.002	4.2
122	39 33 35	105 48 55	3.2	.9	.80	.50	<.002	8.6
123	39 33 36	105 48 55	2.0	.6	.68	.37	<.002	8.8
124	39 33 42	105 48 30	5.8	1.6	1.13	.95	<.002	6.7
125	39 34 4	105 48 30	6.1	1.7	1.14	1.00	<.002	5.9
126	39 34 3	105 48 46	3.5	1.0	.95	.52	.002	8.4
127	39 34 6	105 48 51	5.1	3.7	1.39	1.40	.002	23.0
141	39 34 20	105 48 32	3.4	1.6	1.36	.77	.002	14.0
142	39 34 33	105 49 29	6.1	7.3	2.19	1.09	.006	21.0
143	39 34 30	105 49 29	6.5	2.1	1.08	.52	<.002	7.8
144	39 34 23	105 49 27	3.8	2.3	1.08	.75	.002	14.0
145	39 34 17	105 49 2	520.0	53.5	21.60	3.10	.014	21.0
146	39 27 37	105 39 48	7.8	2.1	2.18	.88	.003	10.0
147	39 29 4	105 48 27	8.5	6.3	4.30	1.78	.004	42.0
148	39 31 18	105 49 53	2.1	1.1	1.06	.64	<.002	16.0
149	39 36 2	105 48 35	56.5	19.3	3.49	.80	.012	18.0

TABLE 2.-ANALYTICAL RESULTS FOR 32 WATER SAMPLES FROM THE GENEVA CREEK AREA, COLORADO--Continued

Sample	ALK(mg/L)	SO ₄ (mg/L)	CL(mg/L)	F(mg/L)	ZN(ug/L)	CU(ug/L)	NO(ug/L)	AG(ug/L)
101	<1	301	.41	.56	1,300	140.0	2.5	.07
102	<1	97	.14	.22	320	44.0	2.1	.06
103	37	6	.09	.05	2	<1.0	1.8	.07
104	<1	136	.31	.34	420	62.0	1.6	.06
105	16	20	.54	.15	2	<1.0	2.0	.06
106	<1	90	.41	.25	360	17.0	1.7	.07
107	<1	184	.27	.30	520	103.0	1.7	.06
108	<1	53	.28	.18	460	16.0	2.1	.06
109	<1	370	.55	.71	820	400.0	1.9	.06
110	<1	323	.62	.80	820	440.0	1.8	.06
111	<1	54	.09	.15	180	10.0	1.7	.06
112	<1	356	.55	.80	130	360.0	3.0	.06
113	<1	66	.27	.22	190	1.6	1.6	.07
114	<1	59	.13	.35	170	<1.0	1.8	.06
115	<1	394	1.00	1.10	3,200	10.0	1.6	.07
116	<1	160	1.10	.81	4,800	45.0	1.5	.15
121	<1	6	.14	.11	60	2.4	1.6	.06
122	<1	27	.09	.20	110	11.0	1.7	.06
123	<1	11	.09	.12	53	6.2	1.8	.06
124	8	12	.21	.07	3	<1.0	1.7	.06
125	14	11	.09	.07	2	<1.0	1.7	.06
126	<1	14	.14	.11	62	2.8	1.8	.07
127	<1	172	.28	.35	680	110.0	1.9	.06
141	<1	26	.21	.11	460	68.0	1.8	.05
142	<1	115	.18	.45	1,400	13.0	1.8	.05
143	<1	21	.14	.07	150	2.2	1.7	.06
144	<1	50	.18	.10	410	42.0	1.5	.06
145	155	1,370	3.60	3.10	90	10.0	4.0	.08
146	9	18	.55	.14	40	1.7	1.8	.06
147	<1	196	.55	.32	120	160.0	1.8	.07
148	<1	120	.24	.21	27	6.4	1.8	.06
149	<1	472	.23	2.30	24,500	4,100.0	1.8	.06

TABLE 2.-ANALYTICAL RESULTS FOR 32 WATER SAMPLES FROM THE GENEVA CREEK AREA, COLORADO--Continued

Sample	AS (ug/L)	FE (mg/L)	MN (mg/L)	AL (mg/L)	U (ug/L)	V (ug/L)	SP.COND.	pH	TEMP. (C)
101	9.5	34.000	1.900	29.60	1.6	<5	780	3.1	7
102	1.7	2.700	.920	6.80	.7	<5	340	3.6	5
103	<1.0	.010	.001	.01	1.1	<5	90	7.1	7
104	2.1	6.300	1.200	9.40	.5	<5	460	3.4	5
105	<1.0	.052	.004	.01	1.8	<5	90	6.9	9
106	1.3	5.900	.700	8.40	.2	<5	350	3.6	7
107	2.5	7.700	1.700	12.10	.9	<5	570	3.3	8
108	<1.0	.700	1.300	3.60	<.2	<5	230	3.8	7
109	17.0	68.000	2.600	29.20	3.5	18	800	3.6	1
110	12.0	66.000	2.500	29.40	3.1	18	830	3.5	2
111	<1.0	.600	.560	2.70	.9	<5	160	4.8	10
112	6.0	71.000	.410	20.00	2.8	16	760	3.6	2
113	<1.0	3.900	.390	4.40	.5	<5	270	3.5	6
114	<1.0	.200	.460	2.40	.2	<5	220	3.7	2
115	8.8	34.000	4.900	29.30	.2	<5	940	3.3	1
116	<1.0	8.400	5.500	2.60	.2	<5	580	3.3	2
121	<1.0	.037	.090	.80	<.2	<5	40	5.0	13
122	<1.0	.010	.120	2.40	.5	<5	72	4.6	3
123	<1.0	.020	.070	1.20	<.2	<5	46	4.7	7
124	<1.0	.065	.002	.01	<.2	<5	56	7.0	7
125	<1.0	.006	.001	.01	<.2	<5	56	7.3	3
126	<1.0	.072	.080	1.10	<.2	<5	58	4.9	7
127	4.2	6.700	.930	16.50	2.2	<5	600	3.4	6
141	1.0	.300	1.300	2.20	<.2	<5	115	4.9	8
142	1.9	3.500	3.900	7.60	<.2	<5	450	3.5	2
143	<1.0	.008	.080	.14	<.2	<5	70	5.0	11
144	<1.0	.160	1.000	4.10	.2	<5	180	4.1	6
145	72.0	5.100	1.100	.06	2.4	15	2,520	6.1	7
146	<1.0	.017	.130	.03	<.2	<5	78	6.2	11
147	3.8	16.000	.240	15.20	.9	<5	670	3.3	3
148	<1.0	.025	.040	2.20	<.2	<5	105	3.9	6
149	5.3	29.000	16.000	14.30	.8	<5	1,120	3.5	4