STATE OF ALASKA

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GEOCHEMICAL REPORT NO. 5

A Geochemical Investigation Between Chatanika and Circle Hot Springs, Alaska

By

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ILLUSTRATIONS

A GEOCHEMICAL INVESTIGATION BETWEEN CHATANIKA AND CIRCLE HOT SPRINGS, ALASKA

By

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ABSTRACT

A stream sediment geochemical investigation of the Chatanika-Circle Hot Springs area along the Steese Highway was conducted in the summer of 1964. It was only moderately successful in finding interesting concentrations of metals. Anomalies found on Deadwood Creek may be related to mineral deposits associated with the local granites and their fine-grained equivalents. Other anomalies may reflect a general increase in mineralization of the bedrock but the possibility of finding economic mineral deposits should not be ignored.

Insufficient sampling was done to provide the information necessary for a detailed report of the area. The streams heading in the highlands adjacent to Pedro Dome (southwest of Plate I) should be sampled in their upper reaches, and the headwaters of Sourdough and Faith Creeks should be sampled for tin and beryllium as well as copper, lead, zinc, and molybdenum. Areas adjacent to most of the granitic bodies should be investigated.

INTRODUCTION

A geochemical investigation of the region between Chatanika and Circle Hot Springs along the Steese Highway was made by the author during the summer of 1964 as a part of the program initiated in 1964 by the Division of Mines and Minerals to map the geochemistry of stream sediments throughout the State. The areas first investigated were selected because they are easily accessible by road, water, or air; have interesting prospects or a history of production; or are considered to have geology favorable to the deposition of economic mineral deposits.

The purposes of the program are to discover new mineralized areas, to extend favorable areas that are now known to contain minerals of economic interest, and to provide information that will help prospectors choose favorable areas for prospecting and guide them in their search.

GENERAL FEATURES

The Chatanika-Circle Hot Springs area is in interior Alaska northeast of Fairbanks. The area covered by this report is approximately 90 miles in

Vicinity Map

length and varies from 1 to 15 miles in width. It includes the Chatanika River and its tributaries lying east of the old town of Chatanika to Twelve Mile Summit and the headwater tributaries of Birch Creek east of Twelve Mile Summit to Circle Hot Springs.

The region is accessible from Fairbanks by the Steese Highway, mostly an improved gravel road for 152 miles from Fairbanks to Circle City on the Yukon River. It is open and maintained throughout the summer months but is closed by winter snows.

The region varies in elevation from about 1000 feet to over 4000 feet. The hills and mountains usually appear to be well rounded but are deceptively steep, often rising quite sharply from the valley floors. The slopes are generally covered with brush and timber (willow, alder, aspen, white birch, and spruce) up to about 3000 feet. The valley floors and lower slopes are often covered by tangled growths of black birch, willow, alder, blueberry bushes, and grass tussocks, or they may be quite marshy and covered with tall grass and moss. Beavers sometimes dam the streams so that flooding is added to the hazards of traversing the valley floors. Mosses, grasses, and small bushes usually cover the slopes above timber line so that even in the most mountainous terrain, few outcrops are available for study. Outcrops are also scarce along streams because of brush and timber lining on the sides of the streams and gravel in the stream bottoms.

HISTORY

Placer gold was discovered in 1894 in the Circle City area on Birch Creek and its tributaries. The most productive creeks flowed from both sides of the ridge between Crooked Creek and the North Fork of Birch Creek. Creeks tributary to Crooked Creek are Deadwood, Mammoth, Mastodon, Miller, and Independence Creeks. Those tributary to Birch Creek are Eagle Creek and its tributary Mastodon Fork. In succeeding years, placer gold was found by Birch Creek prospectors who crossed the divide into the Chatanika River drainage, making important discoveries on Faith, Hope, and Charity Creeks. The Birch Creek District produced over a million dollars a year during its more productive years. A few small placer mines are yet in operation on some of these creeks.

GEOLOGY

The geology of the area is described in U.S. Geological Survey Bulletins 525, 849-B and 872.

Bedrock is predominantly chloritic or micaceous schist of the Precambrian(?) Birch Creek Schist series of metasediments. Included are some schists and gneisses of igneous origin, quartz veins (usually barren) of at least two ages, and granitic intrusives generally believed to be Mesozoic in age, although some

Tertiary intrusion is not improbable. The predominant structural grain is northeasterly.

Recrystallized limestones, sometimes silicified, occur as discontinuous, elongate bodies, notably at the head of Pilot Creek and near the head of Mastodon Creek. Quartzites and quartzose schists, because of superior resistence to erosion, form prominent topographical features in the more mountainous portions of the area.

Granitic intrusions are shown on the attached maps in accordance with published maps of the U.S. Geological Survey. Near the heads of Faith and Bachelor Creeks, dikes and sills of granite porphyry are common, and tourmaline is an important accessory mineral in the intrusion at the head of Hope Creek. Fluorite is found in the contact zones of intrusions and quartz-pyrite veins in this portion of the map area.

TESTING AND SAMPLING

Stream sediments were tested in the field for cold extractable (abbreviated Cx) heavy metals by following the procedure given in the University of Alaska Mining Extension Bulletin No. 2, Elementary Geochemical Prospecting Methods, by Leo Mark Anthony. A petroleum spirits paint thinner was used in place of Blazo (white gasoline) for the dithizone dye solvent. The method uses a cold sodium chloride solution as the extractor and a dithizone dye solution as the detector without adjusting for pH.

One hundred ninety-six stream sediment samples were taken, of which 59 were tested only for cold extractable metals and 137 were tested for both cold extractable metals and for copper, lead, zinc, and molybdenum soluble in a hot acid leach. The samples for laboratory analysis were dried, screened to -80 mesh, and sent to Rocky Mountain Geochemical Laboratories. The 59 samples for which no laboratory analyses were obtained were uniformly low in indicated Cx metal content. The field test results are reported as mililiters of dye solution used, while the laboratory results are reported as parts per million (ppm) of the above-named metals. Table 1 compares the field test results with the laboratory analyses and also shows the types of sediments and bedrock, if any, at the test site.

RESULTS OF SAMPLING

Frequency distribution graphs are shown in Figure 1. These show the frequency with which the various levels of concentrations of copper, lead, zinc, and molybdenum occur in the stream sediments. Solid diamonds on the maps indicate sampling locations at which cold extractable tests showed one ml of dye or less. Numbered circles, keyed to indicate various degrees of trace metal content in parts per million (ppm), indicate locations from which samples were sent to the laboratory.

Anomalous(?) quantities of copper, lead, zinc, and molybdenum are plotted on the maps as solid quadrants of circles. These may be considered to be anomalous for the area; however, when compared with geochemical results from areas of known metal deposits, they are found to be low. Because of this, the words "anomaly" and "anomalous" in this report should be regarded as indicating local highs only. Therefore, the anomalies reported here may indicate only an increase of trace amounts of metals in the underlying bedrock. This does not rule out the possibility that mineral deposits may occur in the area.

The stream sediments from Pilot Creek to Dexter Creek, tributaries of Chatanika River, were not found to contain anomalous amounts of metal. However, the samples were taken mostly in the lower portions of the streams, and this does not give a true indication of conditions in their upper reaches. These streams should be tested in their headwater areas before conclusions are drawn that they traverse only barren bedrock. Mineralized areas are known to occur south of the west portion of Plate I and many of these streams head in that area.

Ptarmigan Creek sediments contain relatively large amounts of copper. The creek to the immediate south of Sourdough Creek (named in this report Steep Creek) contains sediments with anomalous amounts of zinc, copper, and molybdenum.as do those streams to the east as far as Twelve Mile Summit.

Granites are known to occur in the headwaters of Sourdough, Faith, Hope, and Bachelor Creeks. Some of these granites and their contact zones are known to contain fluorite and tourmaline, minerals which are frequently associated with cassiterite and beryllium.

Trace amounts of metals appear to decrease east of Twelve Mile Summit, however, an insufficient number of sediment samples were taken to determine whether this condition may be more local than regional. Additional sampling must be done before this area can be properly evaluated.

Deadwood Creek, southwest of Central, is known to traverse a mineralized area. It has been explored and mined for placer gold, and wolframite and cassiterite have been found in placer concentrates. Sediment samples from several test sites indicated anomalous amounts of copper and zinc, and one of high lead. These anomalies may be related, very locally, to the granitic dikes that cut through the schists and quartzites in this area, or to the contact zone of the massive granite that outcrops at and above the mouth of Switch Creek.

Figure 1.

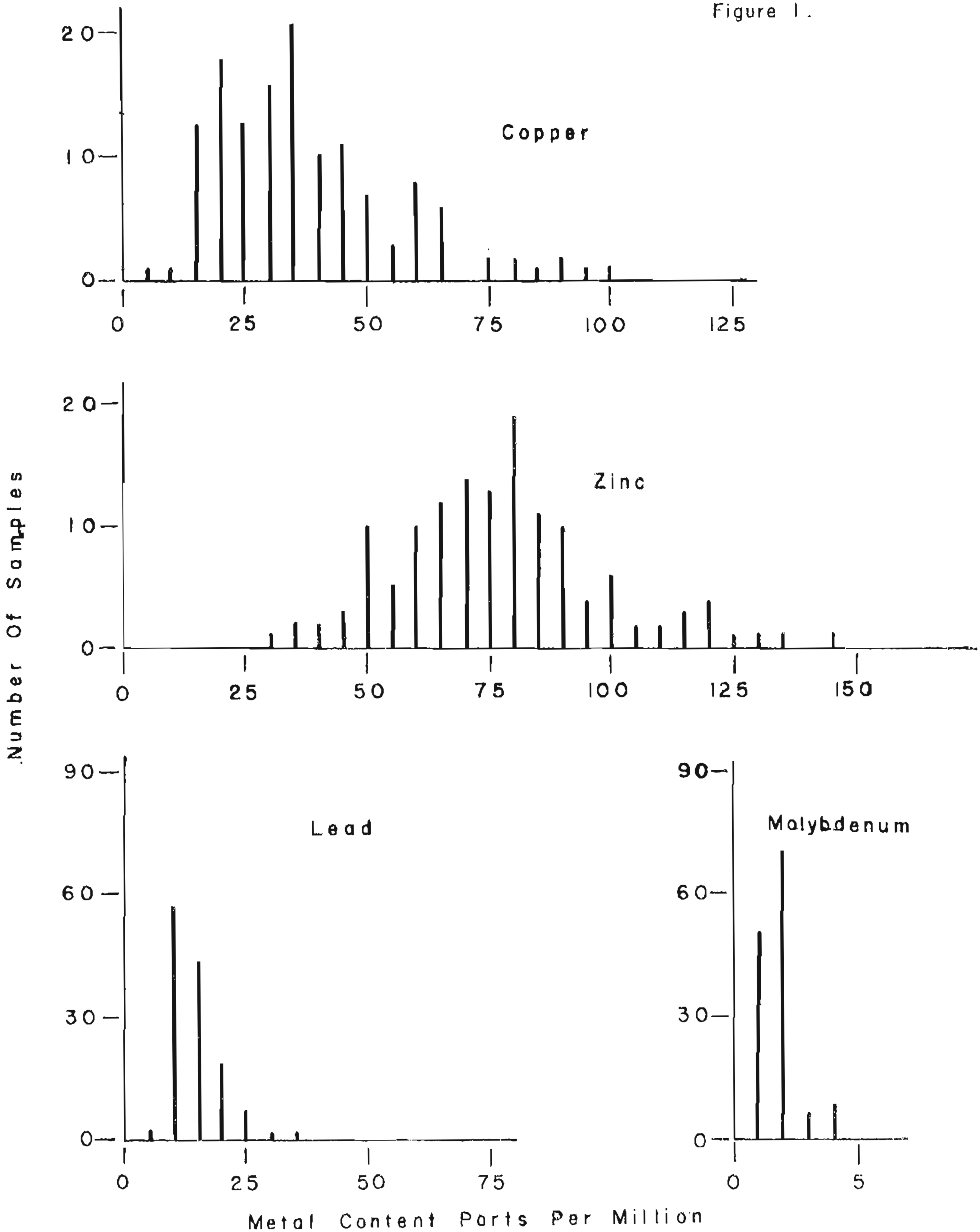

Copper
Zinc
Lead
Molybdenum
Number Of Samples
Metal Content Parts Per Million
0
10
20
30
60
90
0
25
50
75
100
125
150
5

Table 1

Types of Sediment
Birch Creek Schist=BC

Map No.	Field No.	Field Test Ml.	Cu	Pb	Zn	Mo	Bedrock	Coarse Sediments	Fine Sediments
1	224	1	35	15	90	2	No Bedrock	BC and Granite	Sand & Silt
2	223	6	30	15	80	2	None	BC	Sand, Silt & Clay
3	217	1	35	20	80	2	None	BC	Sand & Silt
4	218	18	35	15	70	3	None	BC	Sand & Silt
5	221	2	30	15	80	2	None	BC	Sand & Silt
6	222	2	20	15	50	2	None	BC	Sand & Silt
7	219	1	20	15	50	2	None	BC	Sands
8	220	1	25	10	75	3	None	BC	Sands
9	1	8	15	15	50	1	None	BC	Silt & Clay
10	2	8	15	10	40	1	None	BC	Sand & Silt
11	3	1	15	10	35	1	None	BC and Granites	Sands
12	4	1	35	15	85	2	None	BC and Granites	Sands
13	5	1	25	10	65	2	None	BC and Granites	Sands
14	6	1	20	10	70	2	None	BC and Granites	Sands
15	7	1	15	10	60	2	None	BC	Sands
16	8	1	20	10	55	1	None	BC	Sands
17	10	10	25	15	80	2	None	BC	Sands
18	11	8	30	10	60	1	None	BC and Granites	Sands
19	12	8	25	10	60	2	None	BC	Sands
20	13	2	35	10	65	1	None	BC	Sands
21	81	4	65	15	75	2	None	BC	Sands
22	79	2	55	15	90	2	None	BC	Sands
23	14	12	35	20	70	1	None	BC and Granites	Sands
24	21	4	40	10	65	2	None	BC	Sand & Silt
25	113	1	15	15	50	1	None	BC Schist	Sands
26	183	2	60	10	65	2	None	BC Schist	Sands
27	184	4	45	15	85	2	None	BC and Granites	Sand & Silt
28	186	2	30	10	50	2	None	BC and Granites	Sand
29	185	1	40	10	25	2	None	BC and Granite	Sands
30	27	1	85	15	90	1	None	BC Schists	Sands

Table 1 - Continued

31	28	1	50	10	75	2	None	BC	Sands
32	172	5	45	10	70	2	None	No Coarse	Silt & Clay
33	29	1	30	20	75	1	None	BC	Sand
34	146	3	35	15	60	1	None	BC	Sand & Silts
35	30	4	50	15	95	2	None	BC	Sand & Silts
36	153	1	80	10	85	1	None	No Coarse	Silts & Clay
37	149	1	20	15	60	2	None	No Coarse	Silts & Clay
38	151	1	25	25	120	1	None	BC	Sands
39	152	1	25	20	105	2	None	BC	Silts
40	31	1	45	10	90	2	None	BC	Silts
41	143	3	35	15	70	2	None	BC	Sands
42	32	1	50	15	125	1	None	BC	Sand
43	33	1	30	10	85	1	None	BC	Sand
44	34	1	35	15	120	1	BC Schists	BC	Sand
45	35	1	20	10	70	1	BC "	BC	Sand
46	115	12	25	15	65	2	None	BC	Sand
47	116	6	15	10	60	1	None	BC	Sand
48	117	7	20	10	65	1	None	BC	Sand
49	118	7	20	15	60	1	None	BC Schist	Silt, Clay & Sand
50	119	12	15	15	45	1	None	BC Schist	Sand & Silt
51	120	12	20	15	65	1	None	BC	Silt & Clay
52	65	3	15	15	40	1	None	BC	Sand
53	67	4	15	15	50	1	None	BC	Silt & Clay
54	62	4	30	10	50	1	None	BC	Sands
55	63	3	15	10	50	2	None	BC	Sands
56	61	5	20	10	30	1	None	BC and Granite	Sands
57	73	10	40	15	55	1	None	BC	Sands
58	187	3	45	15	80	3	None	BC	Sands
59	188	1	30	10	55	2	None	BC Schist & Granite	Sands
60	205	8	35	15	80	2	None	BC	Sands
61	206	1	65	15	110	4	None	BC	Sands
62	207	1	25	15	70	2	None	BC	Sands
63	208	1	75	15	95	2	BC Schist	BC	Sands
64	209	1	30	15	100	2	None	BC	Sands & Silt

Table 1 - Continued

65	210	2	25	20	75	2	None	BC	Sands & Silt
66	211	1	35	25	85	2	BC Schist	BC	Sands
67	212	2	20	20	65	1	None	BC	Sands & Silt
68	213	3	25	15	80	1	None	BC	Sands & Silt
69	215	2	45	20	85	2	None	BC	Sands
70	214	1	30	15	45	2	None	BC Schist & Granites	Sands
71	148	1	55	10	90	2	None	BC	Sands
72	147	1	35	15	70	1	None	BC	Sands
73	181	1	35	10	80	3	None	BC Schist	Sand & Silts
74	180	2	20	10	70	2	None	BC	Sands
75	182	2	50	15	110	3	None	BC	Sands
76	179	1	50	10	90	2	None	BC	Sand & Silts
78	176	1	40	10	70	3	None	BC	Sand & Silt
79	175	1	50	10	75	1	None	BC Schist & Granite	Sands
80	174	1	45	10	80	2	None	BC	Sand & Silt
81	173	1	60	10	80	2	None	BC	Sands
82	170	1	65	10	80	2	None	BC	Sand & Silt
83	169	1	60	10	85	2	None	BC	Sand & Silt
84	163	1	65	10	80	2	None	BC	Sands
85	168	1	60	10	75	1	None	BC	Sands
86	164	1	75	10	120	2	None	BC	Sand
87	165	2	40	20	80	2	None	BC	Silt & Clay
88	167	1	30	10	80	1	None	BC	Silt & Clay
89	166	3	40	10	90	1	None	BC	Sand
90	162	1	40	5	60	1	None	BC	Sand
91	161	1	60	15	105	2	None	BC	Sand & Silt
92	160	1	95	15	120	2	None	BC	Sand & Silt
93	157	1	35	10	70	2	None	BC	Sand
94	155	1	45	15	95	2	None	BC	Sand
95	156	1	50	10	85	2	None	BC	Sand
96	154	1	40	10	65	2	None	BC	Sand
97	145	2	20	25	65	2	None	BC	Sands
98	144	1	65	10	50	1	None	BC	Sands

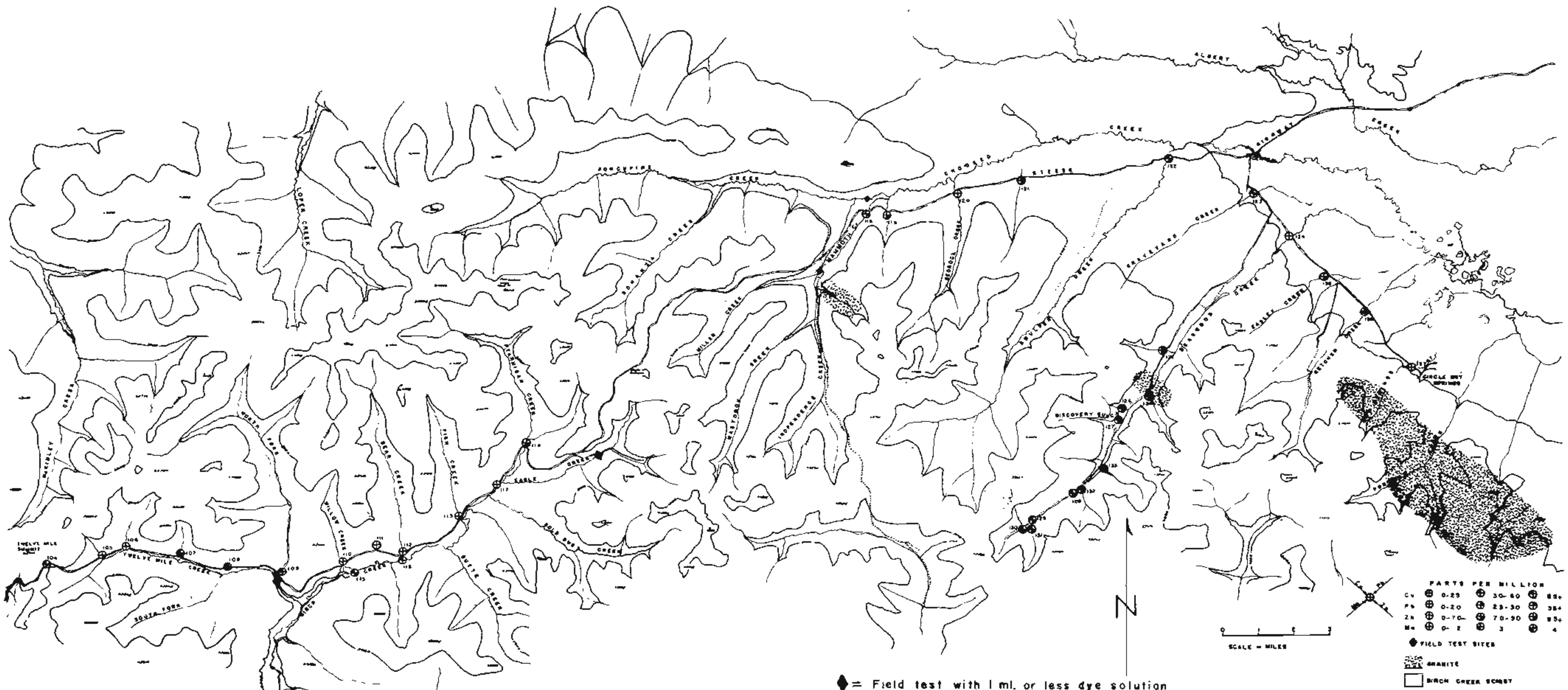
Table 1 - Continued

99	142	3	60	20	100	1	None	BC	Sands
100	141	4	45	10	70	2	None	BC	Sands
101	139	2	60	15	80	1	None	BC	Sands
102	138	2	25	10	80	2	None	BC	Sand & Silt
103	137	5	35	15	50	2	Birch Creek Schist	BC	Sands
104	40	3	40	10	75	2	None	BC	Sands
105	136	3	65	15	90	2	None	BC	Sands & Silt
106	135	4	30	20	55	1	None	BC	Sands
107	41	1	55	10	145	2	None	BC	Sands
108	134	4	90	20	100	3	None	BC	Sands
109	36	1	35	10	65	1	None	BC and Granites	Sands
110	38A	1	20	5	45	2	Birch Creek Schist	BC	Sands
111	133	3	5	10	35	1	None	BC & 1% quartz	Sand & Silt
112	43	2	30	10	65	1	None	BC	Sands
113	44	2	25	15	75	1	None	BC	Sands
114	46	3	20	15	75	1	None	BC	Sands
115	38B	1	35	10	75	2	Birch Creek Schist	BC	Sands
116	42	3	35	10	70	1	None	BC	Sands
117	45	2	30	10	60	2	None	BC	Sands
118	50	7	45	20	90	1	None	BC and Granites & 1% quartz	Silt & Clay
119	51	9	20	20	75	1	None	BC and Granites	Sand
120	52	4	10	20	60	1	None	BC and Granites	Sand
121	53	9	15	30	75	1	None	BC and Granite	Sands
122	54	1	30	20	85	1	None	BC and Granite	Sands
123	55	14	35	25	90	1	None	BC and Granite	Sands
124	56	10	20	20	70	1	None	BC and Granite	Sands
125	131	20	20	25	115	1	None	Granites	Sands
126	129	19	100	25	100	1	None	Vegetation-Grasses	Sands
127	128	14	40	35	130	2	None	BC and Granites	Sands
128	126	20	60	20	80	2	Birch Creek Schist	BC & 1% Vein quartz	Sands

129	124	8	35	20	100	2	None	BC & 1% Vein quartz	Sands
130	123	10	80	15	80	2	None	BC & 1% Vein quartz	Sands
131	122	6	90	15	115	2	Birch Creek Schist	BC & 2% Vein quartz	Sands
132	125	20	45	25	115	2	Birch Creek Schist	BC & 1% Vein quartz	Sands
133	127	9	30	35	100	2	Birch Creek Schist	Granites and BC	Sands
134	130	11	35	70	135	1	Granites	Granites and BC	Sands
135	57	3	15	15	80	1	No Bedrock	BC and Granites	Sands
136	58	8	25	15	95	1	None	Granites and BC	Sands
137	59	13	15	10	50	1	None	Granites and BC	Sands


Chatanika
♦ = Field test with 1ml. or less dye solution
PARTS PER MILLION
0-25
30-40
0-20
0-70
FIELD TEST SITES
GRANITE
BIRCH CREEK SCHIST
0 1 2 3
SCALE — MILES

PLATE I



PARTS PER MILLION
Cu 0-25 30-60 65+
Pb 0-20 25-30 35+
Zn 0-70 70-90 95+
Mo 0-2 3 4
FIELD TEST SITES
GRANITE
BIRCH CREEK SCHIST
SCALE = MILES
N
= Field test with I ml. or less dye solution
TWELVE MILE CREEK
SOUTH FORK
NORTH FORK
WILLOW CREEK
BEAR CREEK
FISH CREEK
BUTTE CREEK
EAGLE CREEK
LOPER CREEK
PORCUPINE CREEK
MAMMOTH C.
MILLER CREEK
INDEPENDENCE CREEK
CROOKED CREEK
GEORGE CREEK
DISCOVERY GULCH
DEADWOOD CREEK
CIRCLE HOT SPRINGS
ALBERT CREEK

PLATE II