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GEOLOGICAL SURVEY

GEOCHEMICAL MAPS OF AN AREA NORTHWEST OF THE CHULITNA RIVER, CENTRAL ALASKA RANGE

By

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ABSTRACT

An area northwest of the Chulitna River in west-central Alaska Range locally shows local anomalous concentrations of gold, silver, arsenic, copper, zinc, and lead in stream-sediment samples. Most stream sediments showing anomalous concentrations of metals can be correlated with either known or newly discovered deposits or occurrences described in Circular 617.

INTRODUCTION

The six geochemical maps of this report show the composition of stream-sediment samples from an area northwest of the Chulitna River, described in Geological Survey Circular 617 by Hawley and others (1969).

The area is in the western part of the central Alaska Range (fig. 1), and it includes the mineralized area described by Capps (1919), Ross (1933), and Hawley and Clark (1968). It has one well-known lode deposit--the Golden Zone.

GEOCHEMISTRY AND GEOCHEMICAL DATA

The main mineral deposits and occurrences of the area are characterized by arsenic, copper, and gold and subordinately by zinc, silver, lead, tin, bismuth, and antimony. Molybdenum occurs locally. Of the elements listed above, six--copper, arsenic, gold, zinc, silver, and lead--are sufficiently abundant in stream-sediment samples to be particularly useful in geochemical prospecting. Arsenic, zinc, and silver have high limits of analytical detection relative to their abundance but will be more useful for geochemical prospecting in the area with analytical methods capable of detecting smaller concentrations.

Concentrations of metals considered anomalous in stream-sediment samples were determined with reference to the mean concentration estimated from frequency distribution diagrams (figs. 2 and 3). Listed below are the mean concentrations, the lower limit of analytical detection, and concentrations considered moderately and strongly anomalous.

Table 1.--Geochemical data on the concentration of copper, arsenic, gold, zinc, silver, and lead in stream-sediments, calculated from a group of about 165 samples.

	Parts per million			
	Approximate mean	Moderately anomalous concentration	Strongly anomalous concentration	Analytical limit of determination
Ag	< 0.5	0.5	2	0.5
As	<200	If detected	200	200
Au	< .02	.02	.07	.02
Cu	70	150	200	5
Pb	15	30	50	10
Zn	<200	200	300	200

Reading from the top of the diagrams shows that a concentration characterized as strongly anomalous was found in 5 percent or less of the samples. These concentrations are shown as a bull's-eye pattern on the geochemical maps (figs. 4, 5, 6, 7, 8, and 9). Concentrations characterized as moderately anomalous were found in about 5 to 15 percent of the samples; these concentrations are shown as solid or in some cases half-filled circles on the maps.

GEOCHEMICAL MAPS

Analytical data on the stream-sediment samples are shown in the following six maps, commented on briefly below:

Copper

Besides showing the distribution of copper, figure 4 shows the location of known mines and prospects and of newly identified occurrences. It also shows the approximate locations of two major faults and two areas containing mineralized rocks described in Circular 617.

Arsenic and antimony

Arsenic and antimony are considered anomalous if they are detected by the spectrographic method used. Arsenic was detected in about 18 percent of the samples from the area, but antimony in less than 6 percent.

The highest arsenic concentrations, exceeding 1,000 ppm, are in the Golden Zone mine area (fig. 5). A concentration of 700 ppm arsenic found in upper Partin Creek is related to the Partin Creek copper occurrence (fig. 4). All antimony-bearing sites are in the southern part of the area; the sites in Partin and Ohio Creeks are near known mineralized rocks, but those in a tributary to McCallie Creek are of unknown origin.

Gold

Gold, like arsenic and antimony, is anomalous if detected even at the minimum concentration (0.02 ppm). The areas near anomalous sample sites in upper Long Creek and Coal Creek are not near known occurrences and should be prospected (fig. 6).

Zinc and silver

Zinc and silver are shown on the same map (fig. 7). The Coal Creek area shows the highest silver content (3 ppm) of any area where the existence of nearby mineralized rocks is currently unknown.

Lead

Lead (fig. 8) is not strongly enriched in most deposits of the region, but an area centered approximately about the Golden Zone mine (figs. 4 and 8) shows relatively high concentrations of lead in stream sediments.

Molybdenum, tin, and tungsten

These three elements were detected in only a few stream-sediment samples although, as discussed in Circular 617 (Hawley and others, 1969), tin occurs in unusual amounts in several mineral occurrences of the area. Tin was detected in stream-sediments in the Ohio Creek drainage where it was found below tin-bearing greisen in a granite stock and at Canyon Creek where it is known to occur in arsenopyrite-rich veins and other mineralized rocks. The map also shows the location of two other granite plutons which contain tin. The tin occurrence near the West Fork is in a small copper-bearing zone near the contact of a stock. South of Costello Creek abnormal amounts of tin (30 ppm) were detected with beryllium and silver in a small and apparently unmineralized granite plug.

Molybdenum occurs in trace amounts at sites also generally anomalous in other metals. On lower Long and Copeland Creeks and in a tributary to Colorado Creek, it is in samples which also contain detectable to moderately anomalous amounts of silver, zinc, and arsenic.

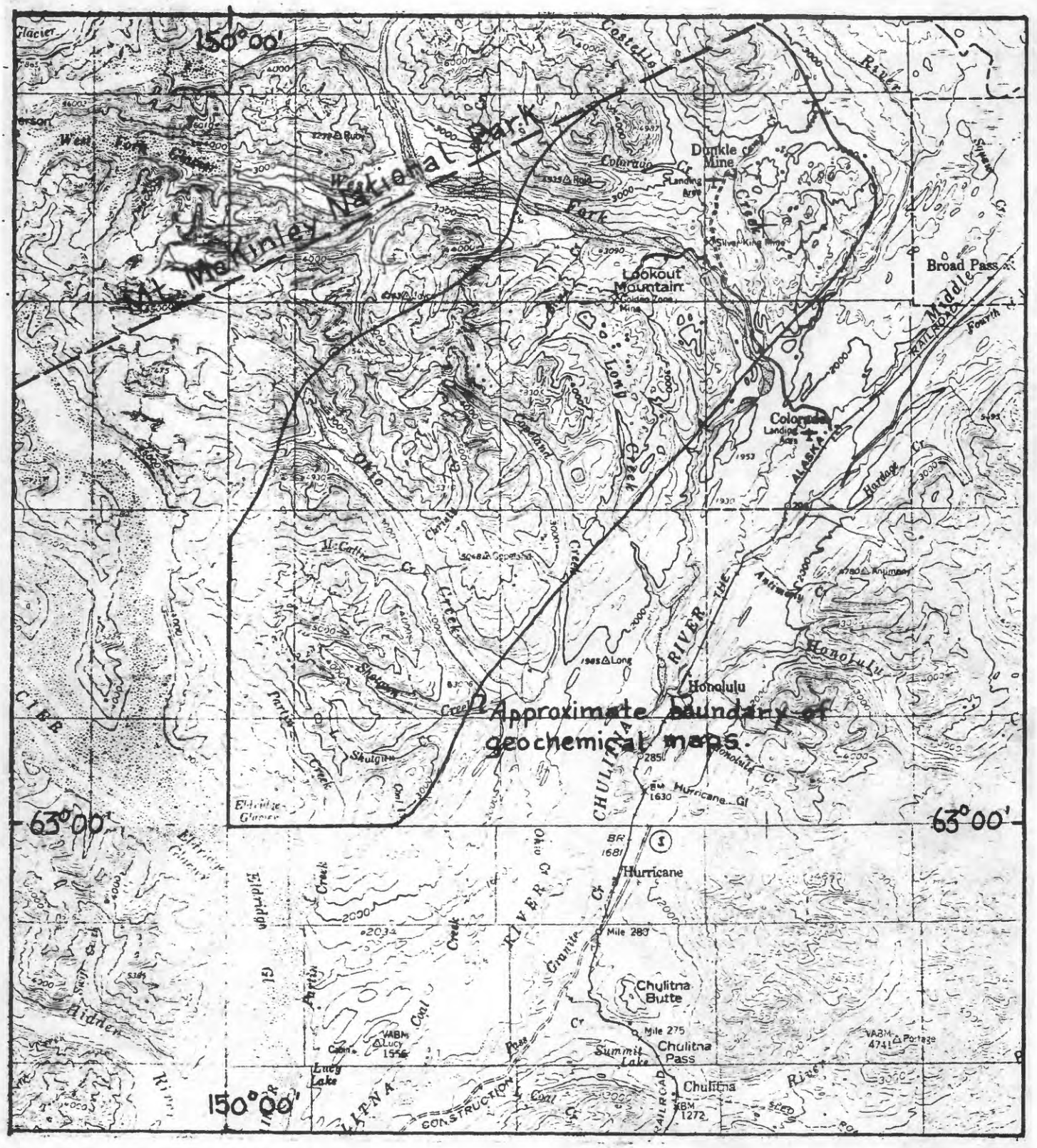
REFERENCES CITED

Capps, S. R., 1919, Mineral resources of the Upper Chulitna region [Alaska]: U.S. Geol. Survey Bull. 692, p. 207-232.

Hawley, C. C., and Clark, A. L., 1968, Occurrences of gold and other metals in the Upper Chulitna district, Alaska: U.S. Geol. Survey Circ. 564, 21 p.

Hawley, C. C., Clark, Allen L., Herdrick, M. H., and Clark, S. H. B., 1969, Results of geological and geochemical investigations in an area northwest of the Chulitna River, Alaska, 1968: U.S. Geol. Survey Circ. 617.

Ross, C. P., 1933, Mineral deposits near the West Fork of the Chulitna River, Alaska: U.S. Geol. Survey Bull. 849-E, p. 289-333.



Base from U. S. Geological Survey Healy, Mt. McKinley, Talkeetna and Talkeetna Mountains 1: 250,000 quadrangles.

Figure 1. — Index map of an area northwest of the Chulitna River, Central Alaska Range.

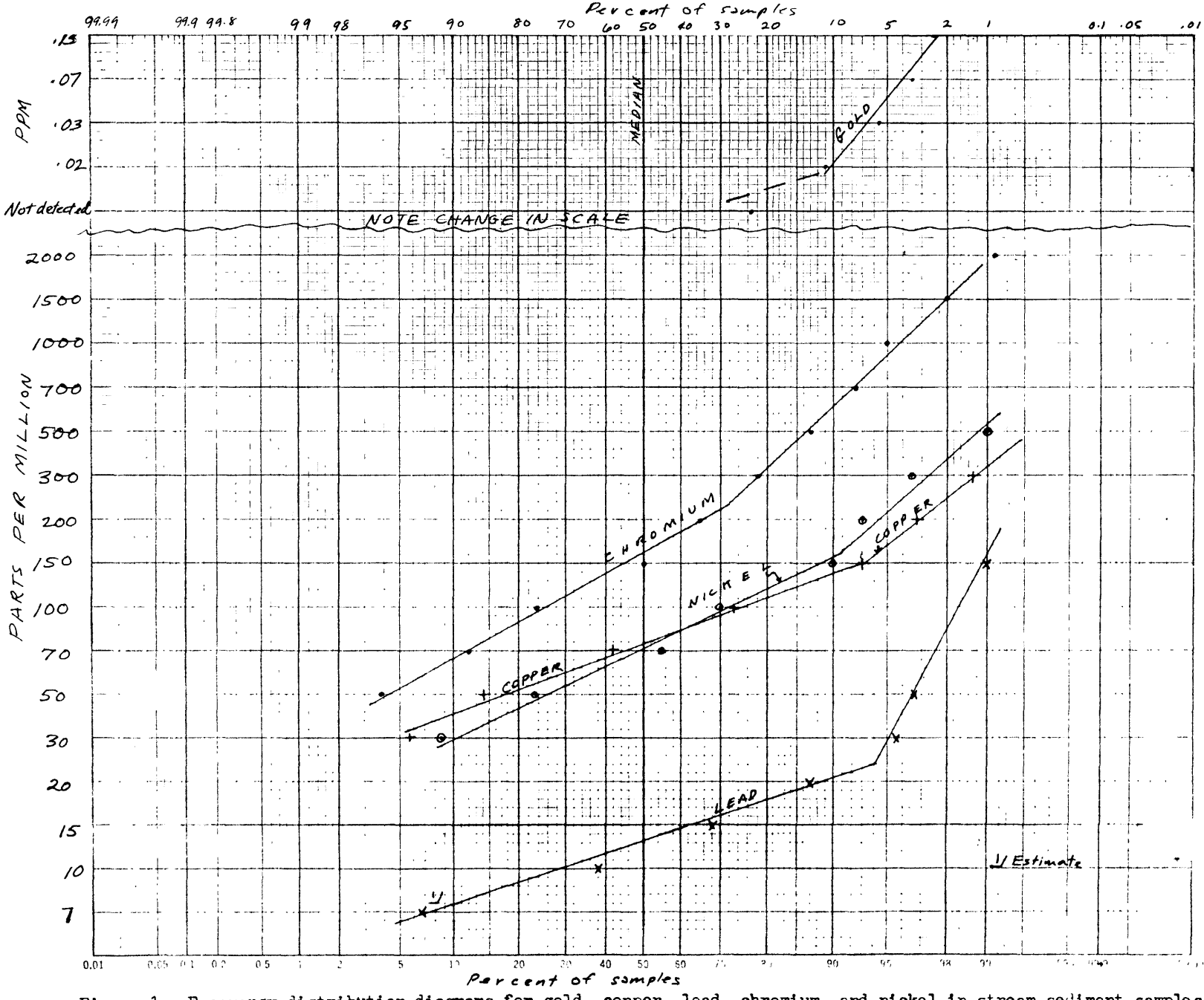


Figure 2. Frequency distribution diagrams for gold, copper, lead, chromium, and nickel in stream sediment samples.

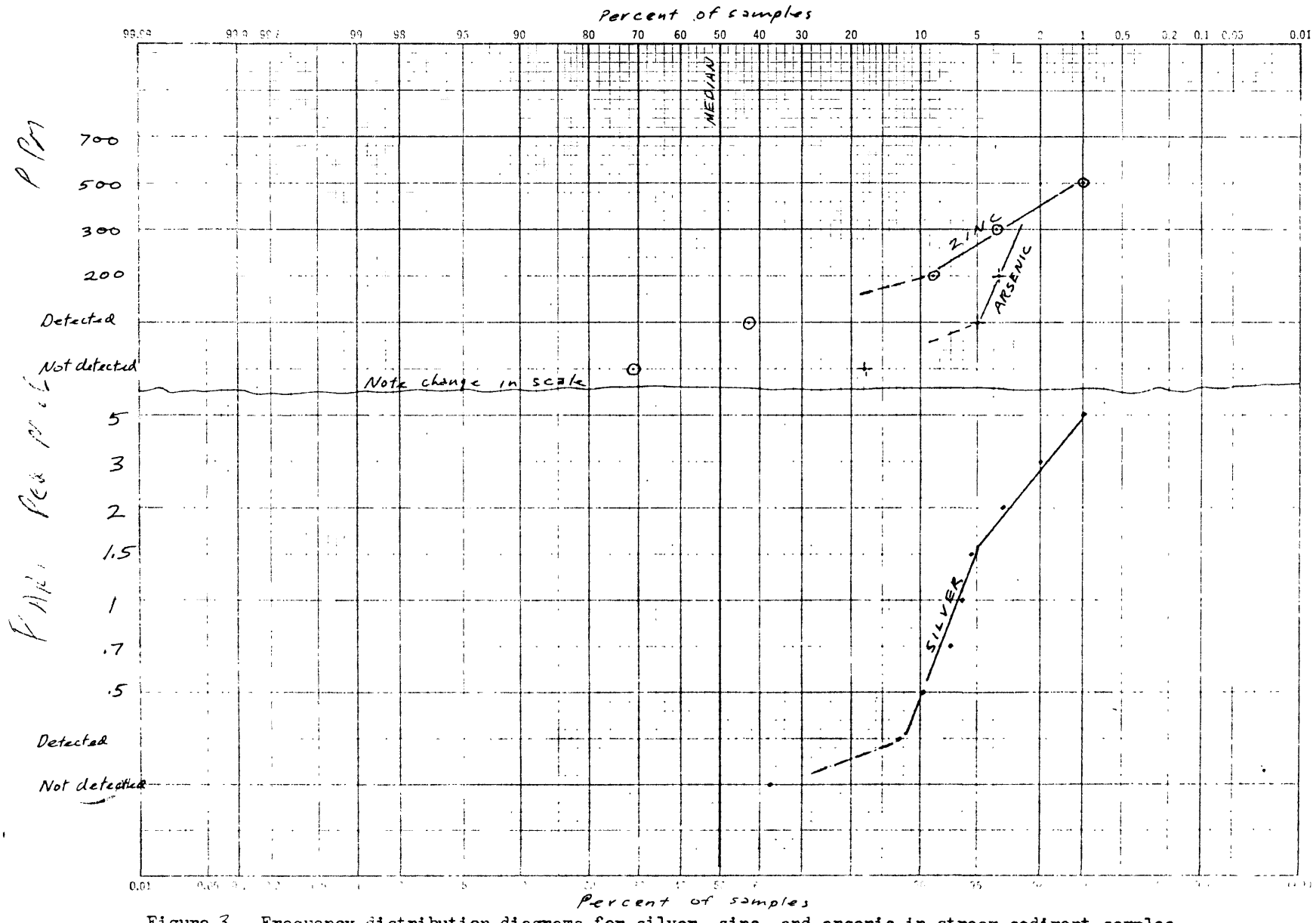


Figure 3. Frequency distribution diagrams for silver, zinc, and arsenic in stream sediment samples.

EXPLANATION

Fault, approximately located

Copper concentration in parts per million:

C-70

100

150

>200

Value shown if >300

Small deposit or occurrence of copper minerals

Copper or copper-gold occurrence described in U.S.G.S. Circular by Cowley, and others, [illegible].

Prospect

Mine

Camp Creek

FIGURE 5 OF CIRCULAR

Silver King

Costello Creek occurrence

GOLDEN ZONE

Copper King

LONG CREEK PROSPECT

FIGURE 4 OF CIRCULAR 617

CANYON CREEK OCCURANCE

Ready Cash

FAULT

OCHULITNA

UPPER

PARTIN CREEK OCCURRENCE

CHULITNA RIVER

Honolulu

T 21 S

T 22 S

63°00'

150°00'

R 12 W

R 11 W

R 10 W

Base enlarged from Healy 1:250,000 quadrangle.

FIGURE 4. -- Copper concentration in stream sediment samples and location of major faults and copper-bearing deposits.

1 0 1 2 3 4 Miles

69-123

Datum is mean sea level -- Contour interval 200-feet

EXPLANATION

Concentration of arsenic in parts per million:

0
Not detected

Less than 200

200

>200
Concentrations shown

200 As

Limonitic stream deposit, showing concentration of arsenic

Antimony shown as L if detected.

LSb 700 As
700 ppm arsenic, antimony present

LSb
<200 ppm arsenic, antimony present

500 As
200 As

Dinkle Mine

Lookout Mountain

Colorado

Honolulu

T. 19 S.

T. 20 S.

T. 21 S.

T. 22 S.

63°00'

150°00'

R. 12 W.

R. 11 W.

30' R. 10 W.

3 300 000 FEET (ZONE 4)

Base enlarged from Healy, 1:250,000 quadrangle

FIGURE 5 .-- Arsenic and Antimony concentrations in stream sediment samples.

69-123

1 0 1 2 3 4 Miles

Datum is mean sea level -- Contour interval 200 feet

EXPLANATION

Gold concentration in parts per million:

○ Not detected

● .04-.04

● .05-.08

◉ >.08 Concentration shown.

Eagle Pass

Lookout Mountain

Colorado

Honolulu

Base enlarged from Healy 1:250,000 quadrangle

FIGURE 6 .-- Gold concentration in stream sediment samples.

69-123

Datum is mean sea level -- Contour interval 200-feet

EXPLANATION

Concentration of zinc in parts per million

O
Not detected

⊖
Less than 200

●
200

◉
>300 Concentration shown

Silver shown numerically if detected

L = <0.5 ppm

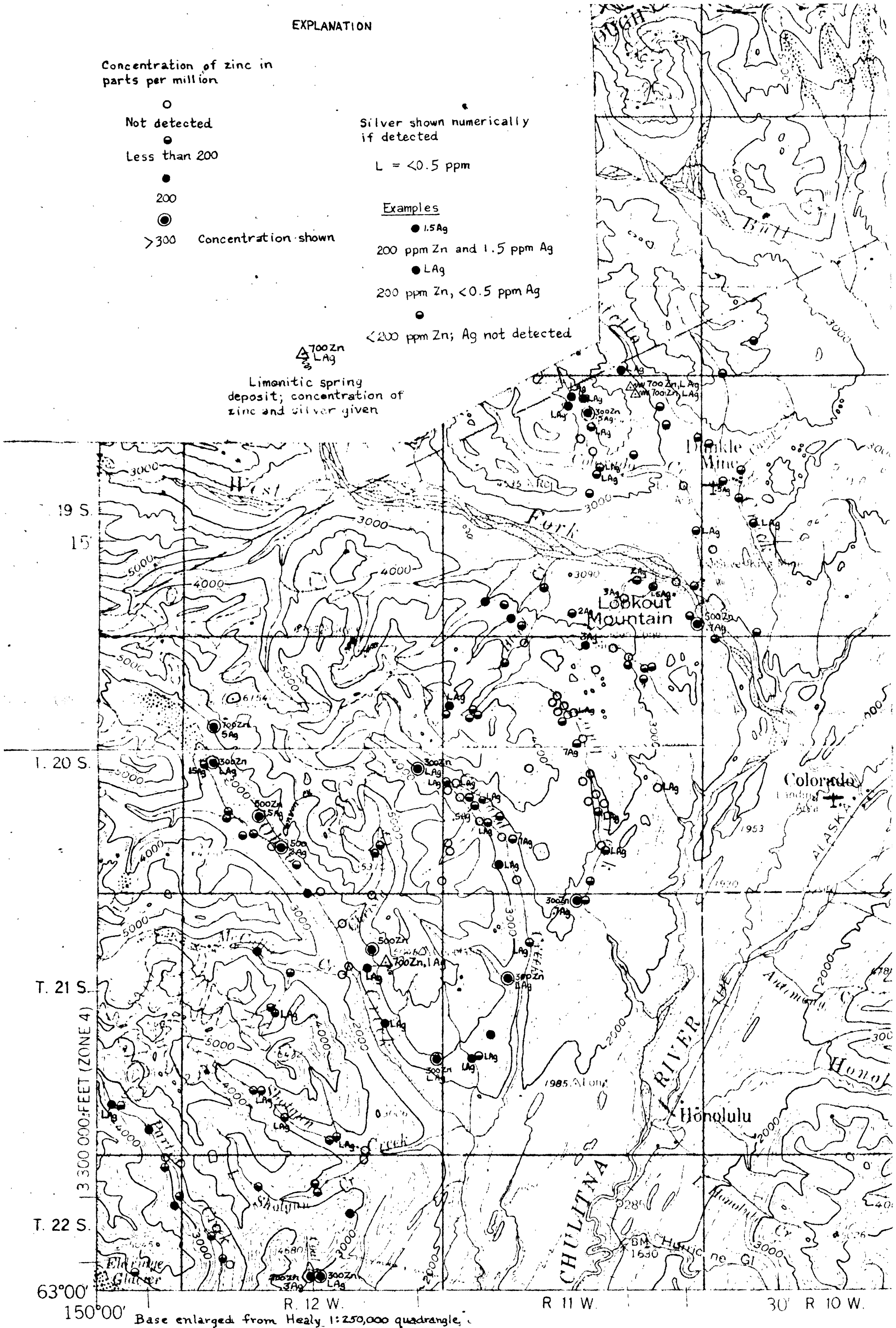
Examples

● 1.5Ag
200 ppm Zn and 1.5 ppm Ag

● LAg
200 ppm Zn, <0.5 ppm Ag

⊖
<200 ppm Zn; Ag not detected

△ 700Zn LAg
Limonitic spring deposit; concentration of zinc and silver given



Base enlarged from Healy 1:250,000 quadrangle

FIGURE 7.--Zinc and silver concentrations in stream-sediment samples.

69-123

0 1 2 3 4 Miles

Datum is mean sea level -- Contour interval 200 feet

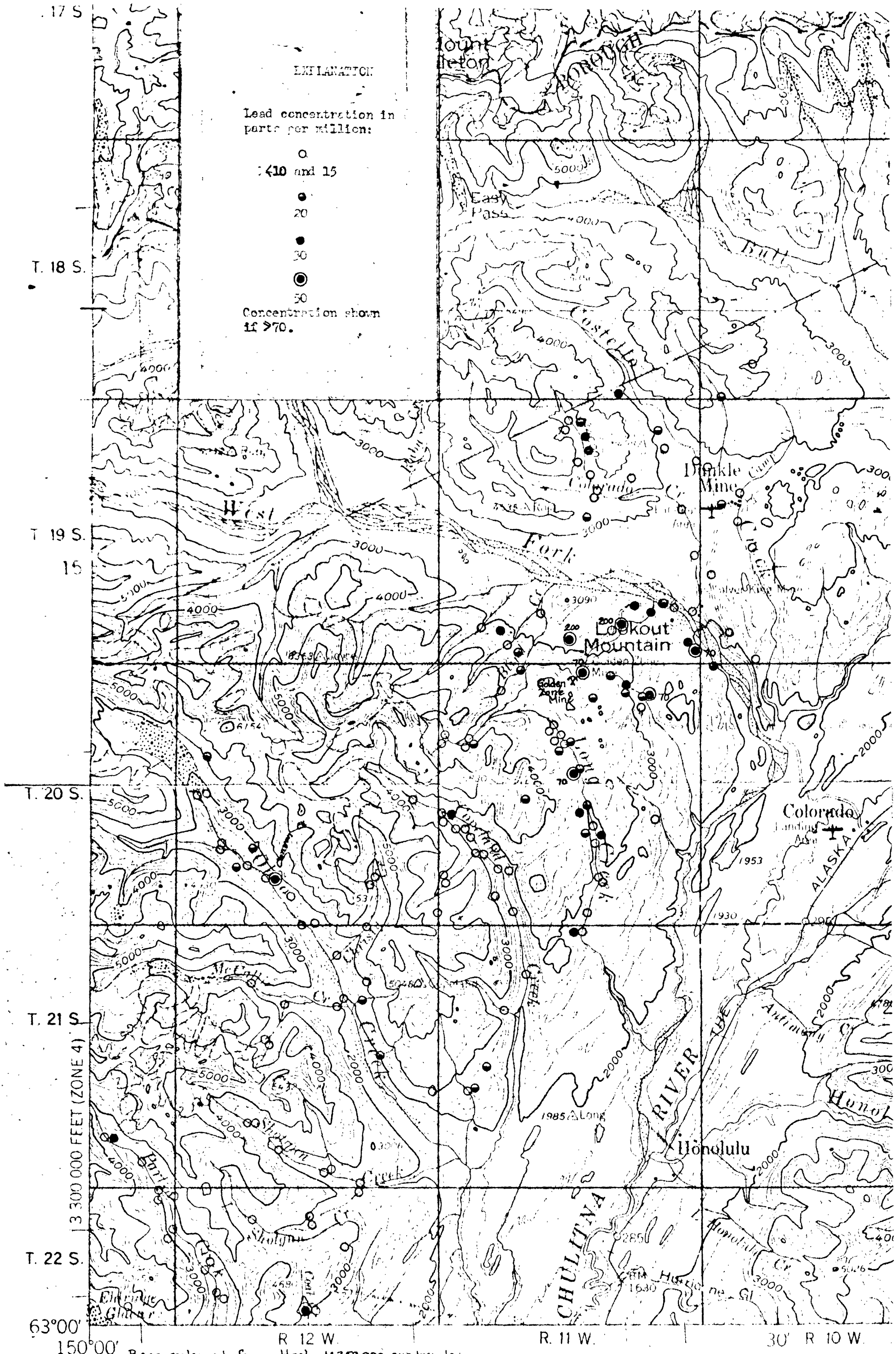


FIGURE 8.—Lead concentration in stream sediment samples.

69-123

Datum is mean sea level -- Contour interval 200+feet

EXPLANATION

Granitic pluton with anomalous tin content (Contact dotted under glacier)

△15 Rock sample locality; tin concentration given (ppm)

Molybdenum concentration in parts per million:

○ Not detected

◔ Less than 5

● 5–10

◉ Greater than 10

Concentration of tin or tungsten shown by numerical value or L/I if detected, but below measurable concentration

Examples

○ LSn,LW

Molybdenum not detected; tin and tungsten detected, but below measurable concentration

◔ 150 Sn

Less than 5 ppm molybdenum; 150 ppm tin.

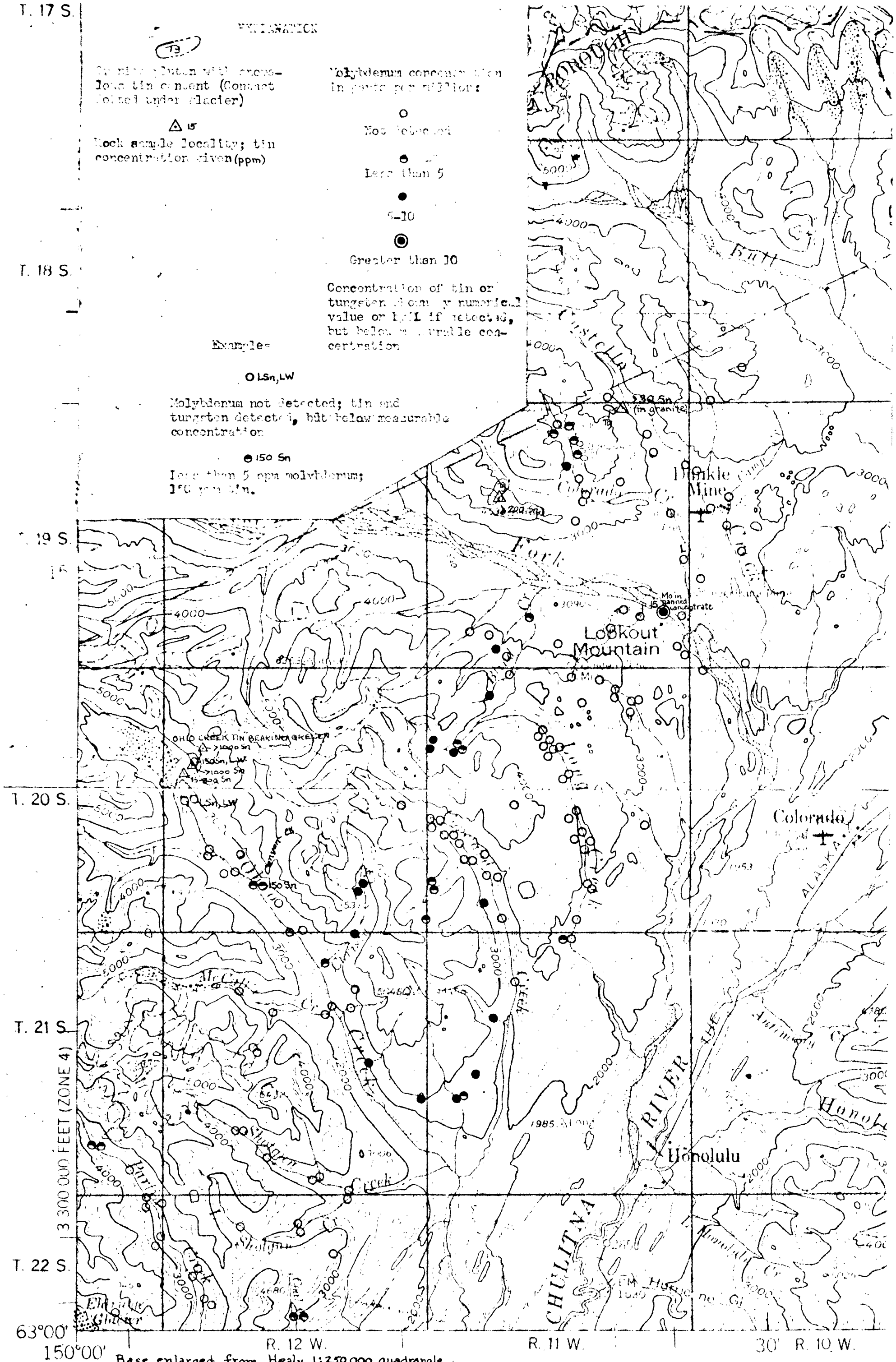


FIGURE 9.--- Molybdenum, tin, and tungsten in stream sediments and location of tin-bearing greisen and granite.

64.123

Datum is mean sea level -- Contour interval 200 feet