CIRCULAR 92

Geochemical Anomalies in The Philmont Ranch Region, New Mexico

By F. LEO MISAQI
(Fazlollah Missaghi)

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Abstract

Stream sediment samples, taken at Philmont Scout Ranch and adjacent areas, were tested for arsenic, lead, zinc, molybdenum, and copper. Some locations in the south-central, southwestern, and southern parts of the investigated area were found anomalous in metal content of stream sediments. The economic significance of the anomalies is yet to be established.

Introduction

Philmont Scout Ranch, situated in northeastern New Mexico, includes the Baldy (Ute Creek) mining district, the most important metal producer in Colfax County. In this area, intrusions of dacite porphyry penetrated the sedimentary rock and produced both gold-bearing quartz veins and contact metamorphic deposits in the calcareous sedimentary rocks. The ore of the Aztec mine, the most important mine of the district, came from veins in a sandstone of early Tertiary age or from veins that followed the contact between the sandstone and underlying shale.

Ute Creek, a major placer mining section in the Baldy Mountains area, runs adjacent to the western boundary of Philmont Scout Ranch. Mining operations in this part of the district were conducted to within a mile of the Aztec mill.

The Baldy mining district has produced essentially gold. Mining activities in this area ceased after World War II.

Metal production of the district (gold, plus a lesser value of silver, copper, and lead) prior to 1904 is estimated at 4.5 million dollars. From 1904 to 1948, an additional 3 million dollars' worth of metals was produced.

The geology of Philmont Ranch region is described by Gershon D. Robinson et al. (1964) and in various articles in the guidebook of the New Mexico Geological Society edited by Stuart A. Northrop and Charles B. Read (1966).

Investigation

METHODS

One hundred and ninety eight stream-sediment samples were taken from locations indicated on the accompanying map (pl. **1).** They consisted of river silts taken along the beds of permanent and temporary water courses. Samples were dried and screened, and the —80-mesh fraction was used for chemical analyses. Table 1 shows the analytical results. Copper and zinc analyses were done by the atomic absorption method. Molybdenum, lead, and arsenic were determined by colorime tric methods.

Figures 1 through 6 show the frequency distribution of metal contents.

The following were taken as threshold values for stream sediment survey: lead, 20 ppm; zinc, 100 ppm; copper, 40 ppm; molybdenum, 4 ppm; arsenic, 10 ppm; total metal content, 150 ppm.

Total metal value for each sample is the rounded-off sum of values on each line of Table 1.

RESULTS

The map shows localities where stream sediment samples were taken. As expected, stream sediments of the Baldy Mountain area (northwestern corner of the region) extending into Ute Creek indicate classic anomalies for all assayed metals. Anomalous metal values are indicated by bold metal symbols and anomalous total metal contents are shown by large circles on the map.

In the south-central part of the map, three anomalous samples can be attributed to the Cyphers Mine (North Fork of Cimarroncito Creek), but there is no simple explanation for geochemical anomalies of Sawmill Canyon, Clarks Fork, and Bear Creek. These localities are in an area where the Sawmill Canyon fault and the extension of the Fowler Pass fault form an acute angle.

Another interesting area is in the southwestern and southern parts of the region. Agua Fria Creek and its tributaries, Turkey Creek and de Maiz Creek, have anomalous metal contents in their stream sediments. Two samples of Apache Creek, one sample taken in Bonito Creek, and three samples of Moras Creek are also anomalous.

Further detailed investigation in the south-central, southwestern, and southern areas of the region may lead to the discovery of new deposits of gold and base metals.

ACKNOWLEDGMENTS

Field work in the Philmont Ranch region was conducted during the summer of 1965. In this work, the writer was assisted by Shoa Tarifi, part-time field assistant and was given full co-operation by the owners

of the properties. Special thanks are extended to The Boy Scouts of America, W. J. Gourley of Vermejo Ranch, McDaniel Brothers, Atmore Brothers, and Homer Bennet. Geochemical sample analyses reported in this paper were done by the Rocky Mountain Geochemical Laboratories, Salt Lake City, Utah, George B. Griswold and Frank E. Kottlowski, New Mexico Bureau of Mines and Mineral Resources, reviewed the manuscript. Editorial work was done by Miss Teri Ray, and Mrs. Doris M. Jewell typed the manuscript. William E. Arnold drafted the illustrations. All are of the Bureau staff.

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TABLE 1. ANALYSES OF STREAM SEDIMENTS IN PARTS PER MILLION

SAMPLE NO.	COPPER	ZINC	LEAD	MOLYBDENUM	ARSENIC	TOTAL METAL
B-1	15	45	10	3	—5	70
B-2	15	40	5	2	5	70
B-3	15	40	5	4	—5	60
B-4	10	60	10	4	5	90
B-5	10	40	5	3	—5	60
B-6	20	50	10	2	5	90
B-7	10	45	10	2	5	70
B-8	10	35	5	1	—5	50
B-9	15	65	15	3	—5	100
B-10	15	45	10	3	—5	70
B-11	20	65	15	2	5	110
B-12	10	40	5	2	—5	60
B-13	**85**	70	20	3	—5	**180**
B-14	15	40	10	3	5	70
B-15	10	35	10	3	—5	60
B-16	15	45	10	2	5	80
B-17	15	40	5	3	—5	60
B-18	**170**	85	**70**	4	**335**	**640**
B-19	**145**	90	**70**	1	**330**	**640**
B-20	**100**	80	**40**	3	**185**	**410**
B-21	**90**	85	**40**	3	**120**	**340**
B-22	**65**	75	**35**	2	**50**	**230**
B-23	25	65	20	1	10	120
B-25	15	35	15	2	—5	70
B-26	15	50	15	3	5	90
B-27	20	55	15	3	5	100
B-28	20	55	15	4	5	100
B-29	20	50	10	3	5	90
B-30	10	45	**25**	3	5	90
B-31	10	45	10	1	5	70
B-32	20	**120**	20	2	5	**170**
B-34	20	45	10	3	10	90
B-35	20	75	20	3	5	120
B-36	25	85	15	3	5	130
B-39	40	85	20	3	5	**150**
B-40	15	80	**25**	3	5	130
B-41	15	50	15	2	—5	80
B-42	20	35	10	2	—5	70
B-46	10	40	10	3	5	70
B-47	20	85	15	5	5	130
B-52	10	60	15	1	5	90
B-53	10	45	10	1	—5	70
B-54	20	45	15	3	—5	80
B-55	20	55	15	2	5	100
B-56	15	45	10	1	5	80
B-57	10	30	10	1	—5	50
B-58	10	30	5	2	—5	50
B-59	10	30	5	2	5	50
B-60	35	70	15	1	—5	120
B-61	25	65	15	2	—5	110
B-62	30	70	15	3	—5	120
B-63	20	35	10	1	—5	70
B-64	30	65	15	2	—5	110
B-65	25	60	15	1	—5	100
B-66	20	55	10	2	—5	90
B-67	20	50	15	1	—5	90
B-69	20	55	10	2	—5	90
B-70	35	75	**35**	1	—5	**150**
B-71	**165**	75	**55**	**7**	**25**	**330**
B-72	**70**	5	**35**	**5**	**20**	140
B-73	**105**	65	**40**	**15**	**25**	**250**
B-74	**45**	45	15	4	**15**	120
B-75	20	50	10	1	5	90
B-76	15	50	10	3	—5	80

A minus sign (—) is to be read "less than" and a plus sign (+) "greater than".
Anomalous values are given in boldface numbers (for example, **85**, **170**).

TABLE 1. ANALYSES OF STREAM SEDIMENTS IN PARTS PER MILLION (Cont)

SAMPLE NO.	COPPER	ZINC	LEAD	MOLYBDENUM	ARSENIC	TOTAL METAL
B-77	40	45	15	4	10	110
B-78	20	40	10	2	—5	70
B-79	20	45	10	3	—5	80
B-80	15	40	10	2	—5	70
B-81	10	30	10	1	—5	50
B-82	15	35	10	1	5	70
B-83	20	45	10	1	—5	80
B-84	20	50	10	1	10	90
B-85	35	60	15	2	5	120
B-86	10	40	10	1	5	70
B-87	10	45	5	2	—5	60
B-88	**400**	**340**	**+1000[a]**	**44**	**940**	**+2,000**
B-89	**360**	**750**	**+1000[b]**	**62**	**+1000**	**+3,000**
B-90	**150**	90	**55**	2	**250**	**550**
B-91	30	**125**	**25**	3	10	**190**
B-92	15	85	20	2	5	130
B-93	20	65	10	3	5	100
B-94	10	30	5	2	5	50
B-95	15	50	5	2	5	80
B-96	15	65	15	3	10	110
B-97	10	40	5	2	5	60
B-98	15	80	20	4	10	130
B-99	30	**105**	20	3	10	**170**
B-100	10	60	10	4	5	90
B-101	20	60	20	3	10	110
B-102	25	100	20	2	10	**160**
B-103	20	85	15	3	5	130
B-104	**45**	90	**25**	4	5	**170**
B-105	**60**	**110**	20	2	10	**200**
B-106	20	80	15	1	10	130
B-107	**45**	**105**	**25**	3	10	**190**
B-108	**55**	**95**	**40**	1	5	**200**
B-109	20	65	10	2	10	110
B-110	20	50	10	2	5	90
B-111	20	50	10	2	5	90
B-112	15	65	10	2	10	100
B-113	**240**	100	**40**	4	**20**	**400**
B-114	**145**	90	**15**	2	**15**	**270**
B-115	20	55	5	1	—5	80
B-116	10	35	5	2	—5	50
B-117	10	45	10	1	5	70
B-118	30	70	10	1	5	120
B-119	25	60	10	3	5	100
B-120	15	60	5	2	10	90
B-121	30	55	10	3	5	100
B-122	25	60	15	2	5	110
B-123	20	80	20	1	10	130
B-124	35	85	15	1	10	**150**
B-125	**55**	**120**	15	1	5	**200**
B-126	20	75	10	1	**25**	130
B-127	20	75	10	2	5	110
B-128	40	100	15	1	10	**170**
B-129	20	40	10	1	10	80
B-130	30	85	15	3	10	140
B-131	20	75	10	2	5	110
B-132	25	70	15	1	5	120
B-133	15	60	10	2	5	90
B-134	15	85	10	2	10	120
B-135	15	60	10	4	—5	90
B-136	15	80	10	2	5	110
B-137	5	25	5	3	5	40
B-138	10	50	10	1	5	80

A minus sign (—) is to be read "less than" and a plus sign (+) "greater than".
Anomalous values are given in boldface numbers (for example, **85**, **170**).
[a] 0.15%
[b] 0.34%
These absolute values were determined in consequent quantitative analyses.

TABLE 1. ANALYSES OF STREAM SEDIMENTS IN PARTS PER MILLION **(Cont)**

SAMPLE NO.	COPPER	ZINC	LEAD	MOLYBDENUM	ARSENIC	TOTAL METAL
B-139	10	60	10	2	5	90
B-140	15	40	5	2	10	70
B-141	5	50	5	3	5	70
B-142	5	40	—5	2	10	60
B-143	35	**110**	**25**	2	10	**180**
B-144	25	65	10	2	10	110
B-145	20	75	15	2	**15**	130
B-146	30	100	20	1	10	**160**
B-147	35	95	15	3	10	**160**
B-148	30	80	10	1	10	130
B-149	10	30	5	2	10	60
B-150	10	35	5	1	10	60
B-151	20	55	10	2	10	100
B-152	15	50	10	4	5	80
B-153	30	95	10	1	10	**150**
B-154	**50**	**270**	**85**	1	10	**420**
B-155	10	25	—5	1	5	40
B-156	15	50	5	4	10	80
B-157	**50**	95	15	2	10	**170**
B-158	25	**165**	**25**	1	5	**220**
B-159	**55**	90	20	1	10	**180**
B-160	25	80	15	2	10	130
B-161	**10**	30	5	1	10	60
B-162	10	60	5	1	5	80
B-163	25	75	5	1	—5	110
B-164	30	60	5	2	5	100
B-165	25	65	5	2	10	110
B-166	20	30	5	1	—5	60
B-167	20	60	5	3	10	100
B-168	30	80	10	2	10	150
B-169	25	55	5	3	10	100
B-170	25	75	10	2	10	120
B-171	30	55	10	1	—5	100
B-172	30	50	10	1	5	100
B-173	35	65	5	1	5	110
B-174	15	20	5	2	5	50
B-175	15	20	5	1	5	50
B-176	20	30	5	1	10	70
B-177	25	45	10	1	10	90
B-178	25	35	10	2	5	80
B-179	30	30	10	1	5	80
B-180	30	40	10	3	5	90
B-181	25	25	5	3	5	60
B-182	40	40	5	1	5	90
B-183	45	30	5	—1	10	90
B-184	**50**	30	—5	2	10	90
B-185	15	40	5	1	10	70
B-186	30	75	10	1	10	130
B-187	15	40	5	1	10	70
B-188	20	70	10	—1	10	110
B-189	30	75	15	—1	10	130
B-190	20	65	10	1	10	110
B-191	10	50	5	1	5	70
B-192	20	60	10	2	10	100
B-193	35	90	15	—1	10	**150**
B-194	20	60	10	3	10	100
B-195	10	40	5	3	10	70
B-196	20	65	10	1	5	100
B-197	15	35	5	2	10	70
B-198	10	35	5	2	5	60
B-199	25	55	10	2	10	100
B-200	15	45	5	2	5	70
B-201	15	45	5	1	10	80
B-202	20	55	10	1	10	100

A minus sign (—) is to be read "less than" and a plus sign (+) "greater than".
Anomalous values are given in boldface numbers (for example, **85**, **170**).

TABLE 1. ANALYSES OF STREAM SEDIMENTS IN PARTS PER MILLION (Cont)

SAMPLE NO.	COPPER	ZINC	LEAD	MOLYBDENUM	ARSENIC	TOTAL METAL
B-203	20	45	5	1	10	80
B-204	20	70	10	3	10	110
B-205	15	55	5	1	10	90
B-206	20	50	10	2	5	90
B-207	25	65	10	2	10	110
B-208	20	60	5	2	10	100
B-209	20	65	15	1	10	110
B-210	25	70	15	2	10	120

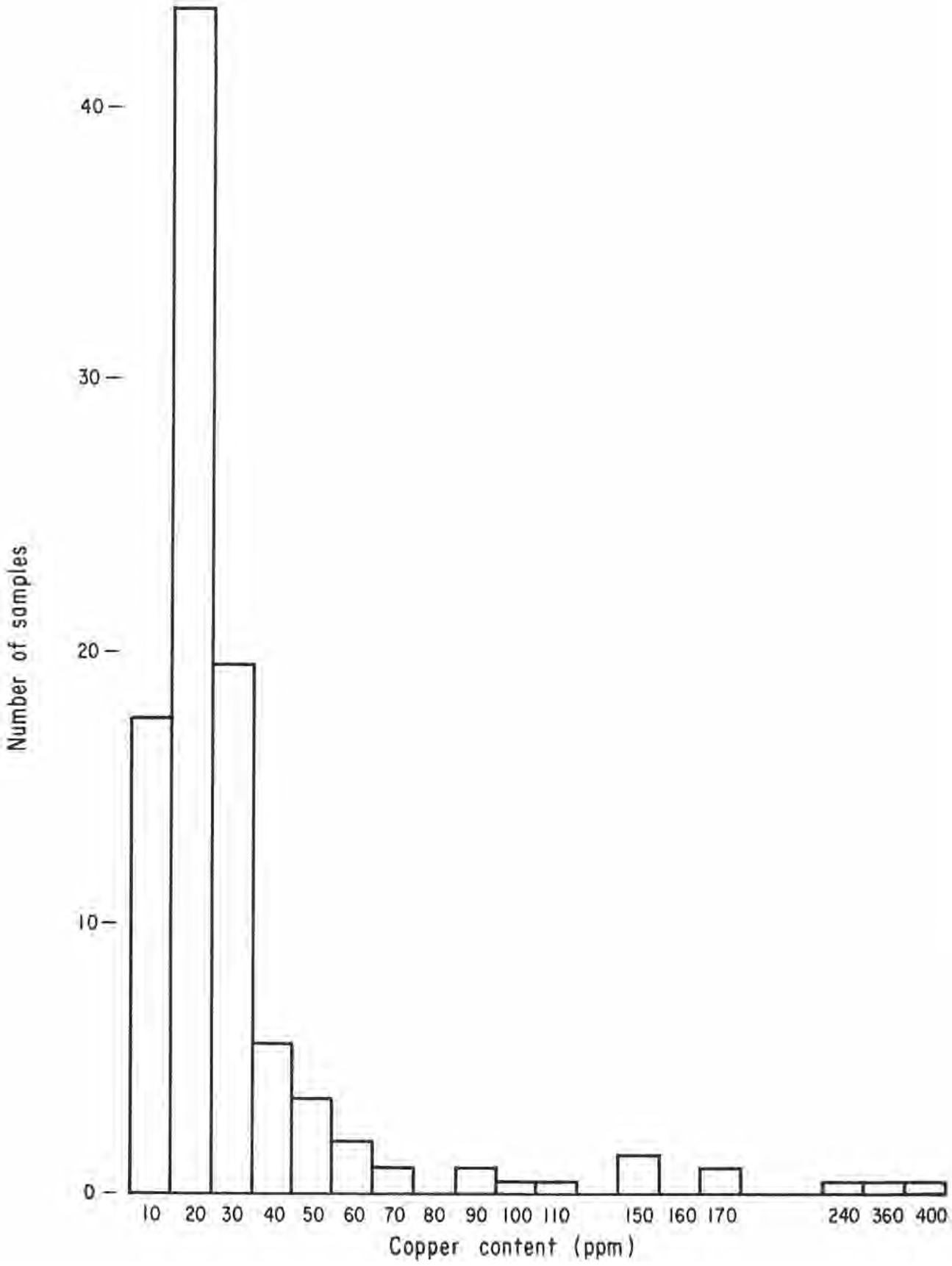

Figure 1

DISTRIBUTION OF COPPER IN STREAM SEDIMENT SAMPLES

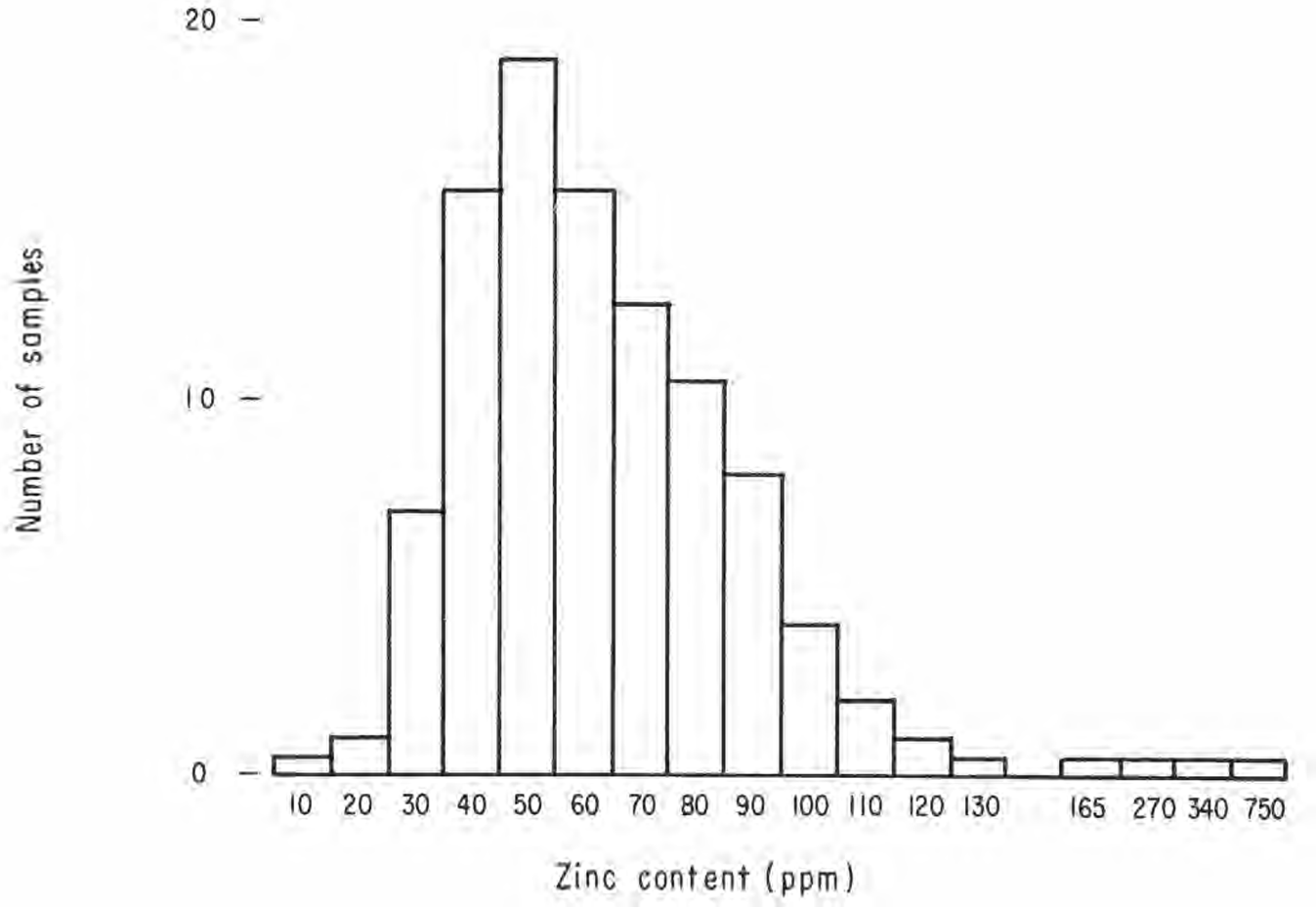

Figure 2
DISTRIBUTION OF ZINC IN STREAM SEDIMENT SAMPLES

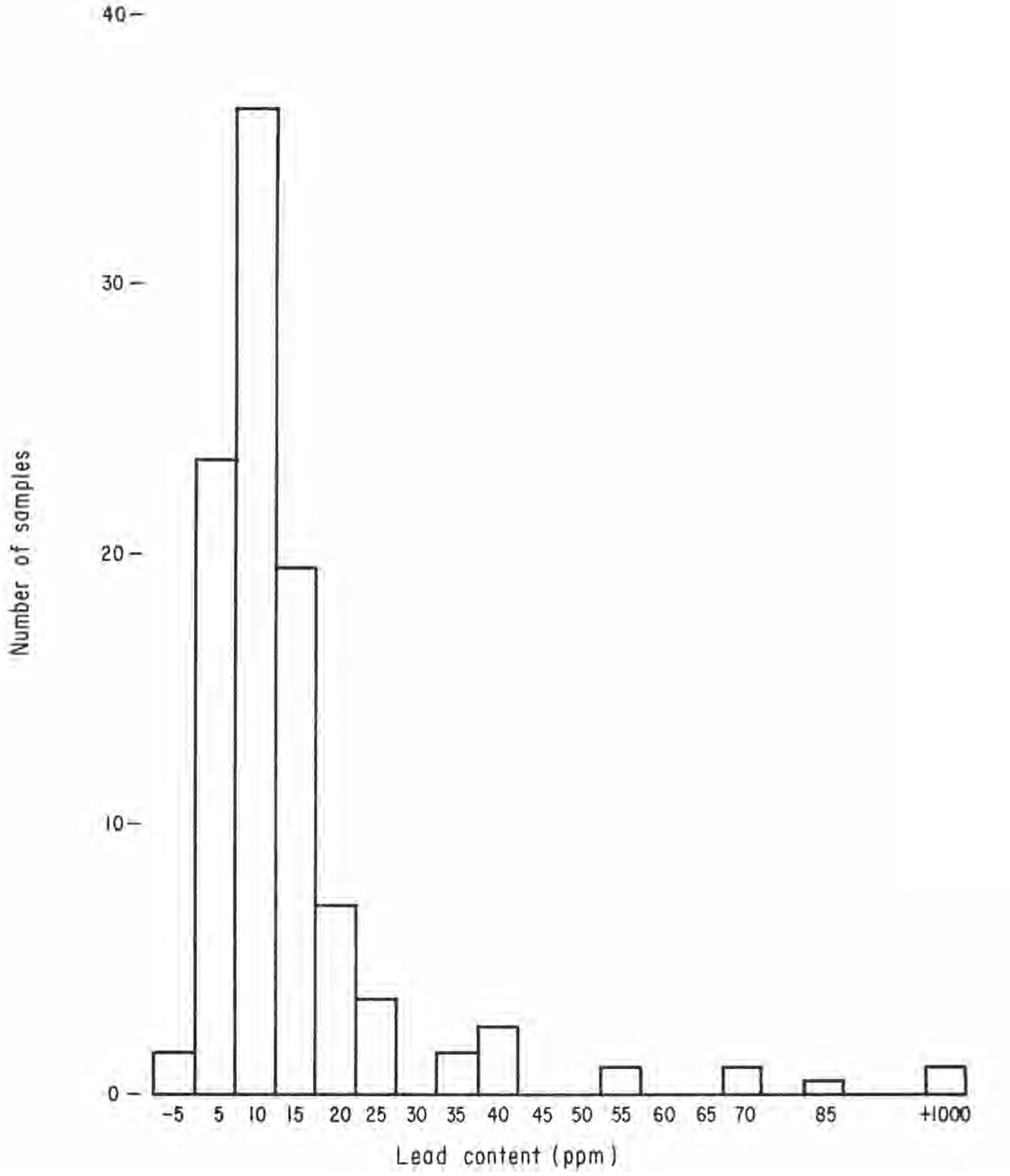

Figure 3
DISTRIBUTION OF LEAD IN STREAM SEDIMENT SAMPLES

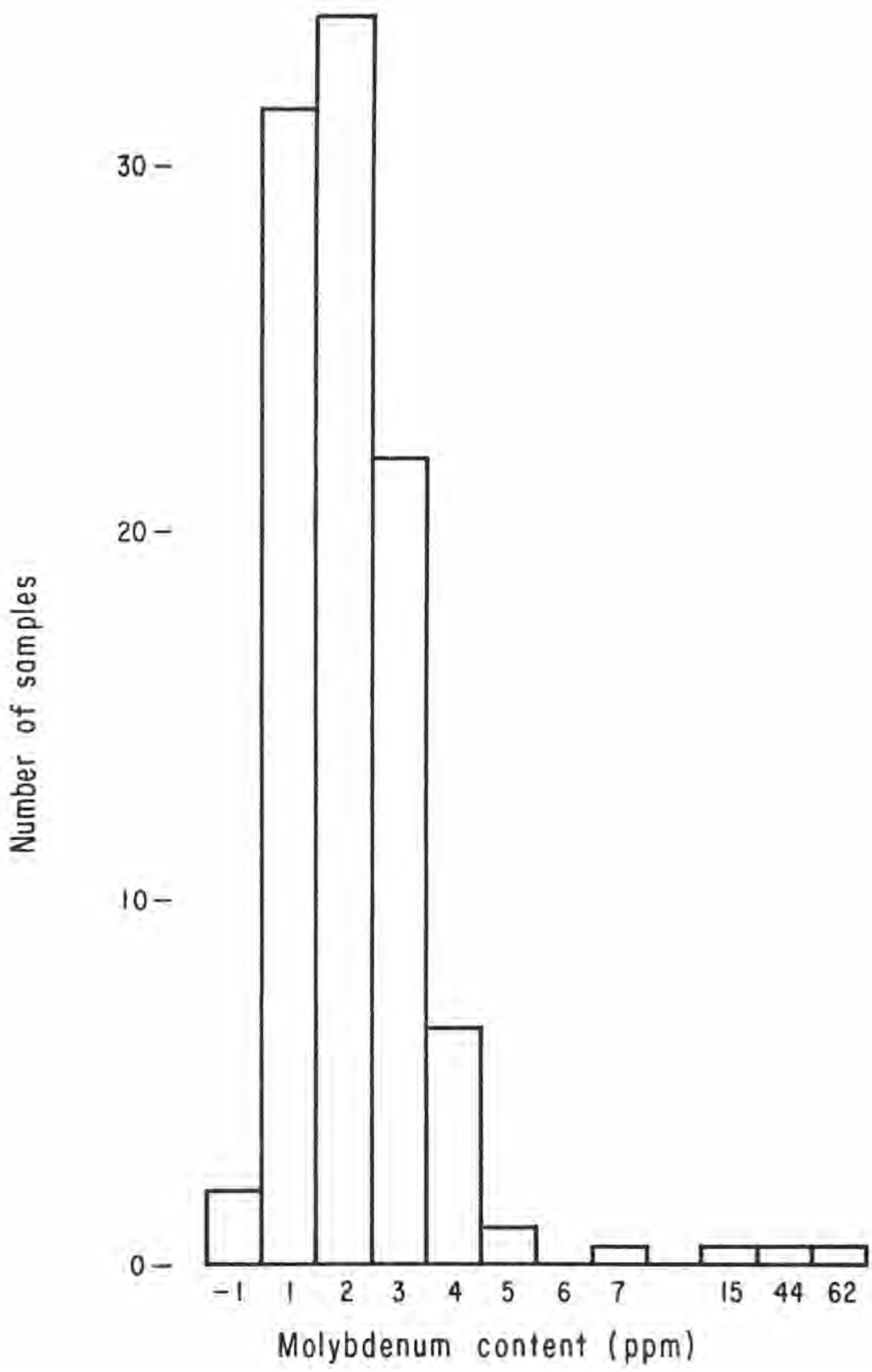

Figure 4

DISTRIBUTION OF MOLYBDENUM IN STREAM SEDIMENT SAMPLES

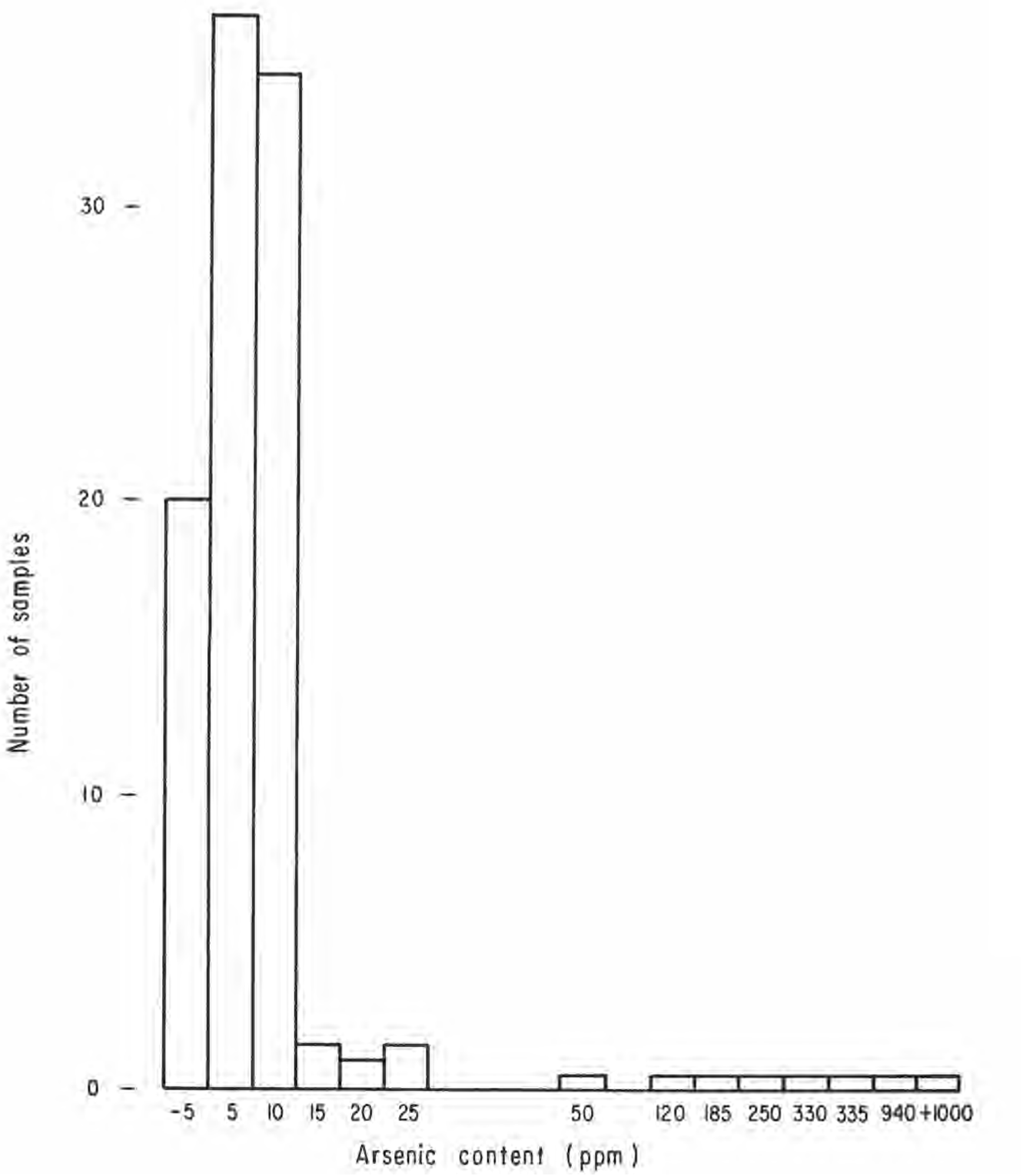

Figure 5

DISTRIBUTION OF ARSENIC IN STREAM SEDIMENT SAMPLES

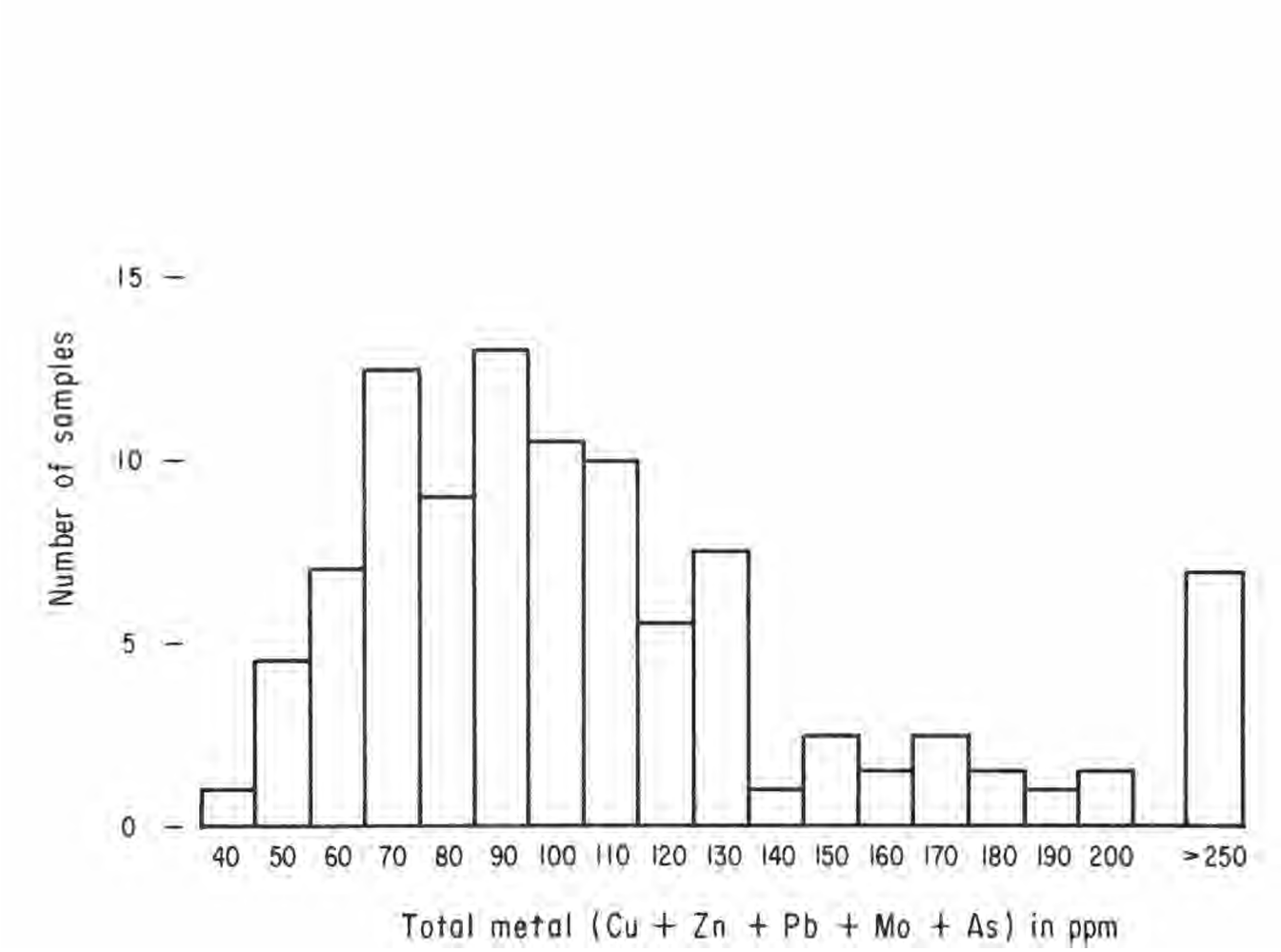

Figure 6

DISTRIBUTION OF TOTAL METAL CONTENT IN STREAM SEDIMENT SAMPLES

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ALBUQUERQUE, NEW MEXICO 87108

EXPLANATION

STREAM SEDIMENT SURVEY

12
Zn Pb As Cu Mo

The number is the sample number
Assay values are given in table I

Anomalous total metal content
(over 150 parts per million)

As
10
parts per million

Pb
20
parts per million

Cu
40
parts per million

Zn
100
parts per million

Mo
4
parts per million

Topographic mapping by the U.S. Geological Survey from portions of the Cimarron, Ute Park, Tooth of Time and Miami 15 minute quadrangles, surveyed 1955 – 1956
Geochemistry by F. Leo Misaqi, 1966

STREAM SEDIMENT SURVEY OF THE PHILMONT SCOUT RANCH & VICINITY

Colfax County, New Mexico

INDEX MAP OF NEW MEXICO

0 1 2 3 MILES

Contour Interval 80 feet
Datum is mean sea level