DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1383-G

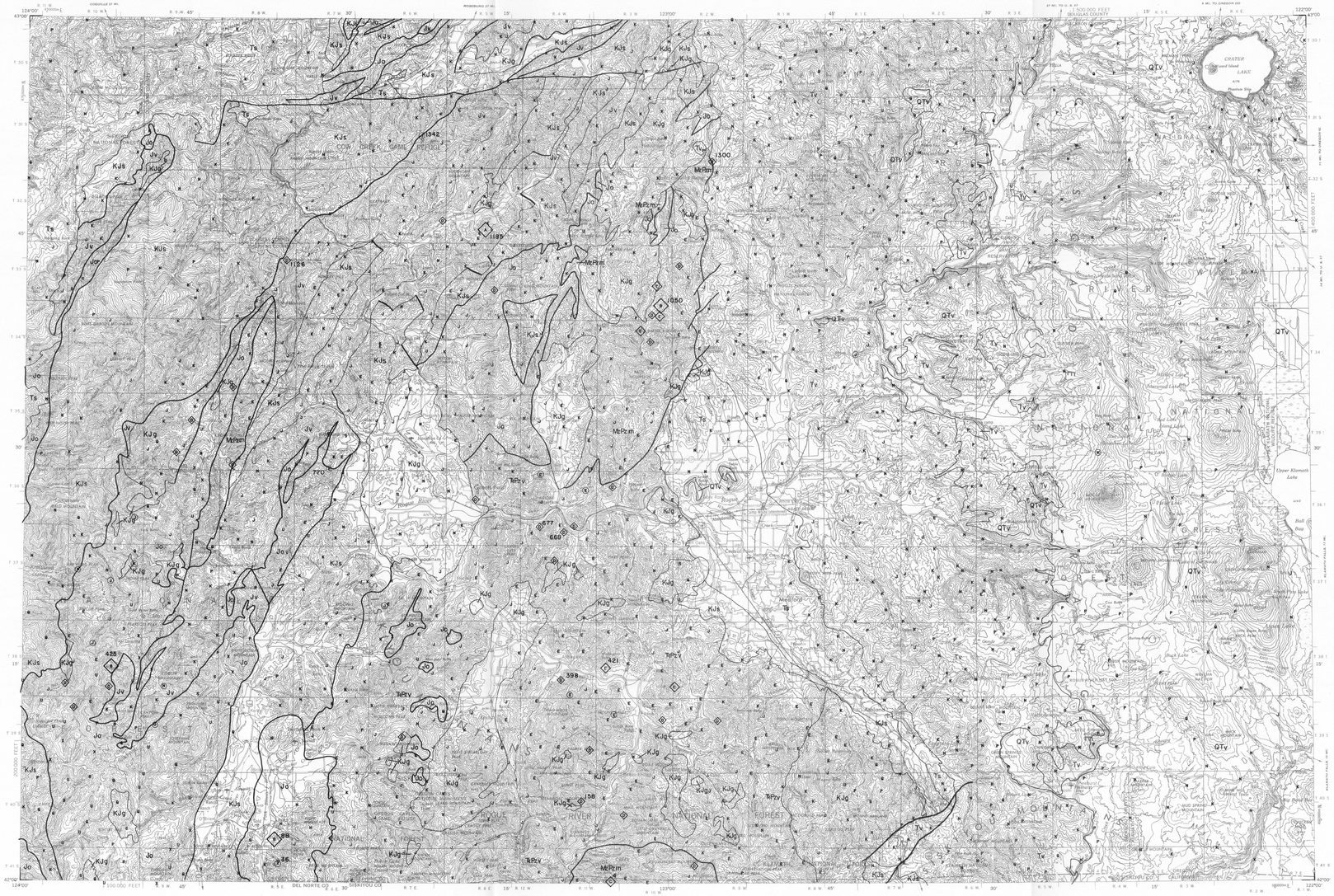

Figure 1.--Histogram showing the concentration of copper in the oxide residues of stream-sediment samples. <, present but less than determination limit; determination limit, 5 parts per million.

This map is part of a folio of maps of the Medford 1° by 2° quadrangle, Oregon-California, prepared under the Conterminous United States Mineral Assessment Program. Other publications in this folio include Page, Blakely, and Cannon (1983); Page, Johnson, and Peterson (1983); Singer and others (1983); Smith and others (1982); Whittington, Grimes, and Leinz (1985a,b); Whittington, Grimes, and Peterson (1983); Whittington, Leinz, and Grimes (1985a,b); and Whittington, Leinz, and Speckman (1983).

INTRODUCTION

The Medford quadrangle is located in mountainous southwestern Oregon adjacent to the California border and a short distance east of the Pacific coast. Various parts of this area lie in different geologic provinces. Most of the western half of the quadrangle is underlain by pre-Tertiary rocks of the Klamath Mountains province. However, the Coast Range province is represented by the Tertiary sedimentary rocks in the northwest corner. Much of the eastern half of the quadrangle lies in the Cascade Range. In Oregon, because of differences in physiographic expression and age of rocks, this province is commonly divided into the more rugged High Cascade Range on the east and the more subdued Western Cascade Range on the west. This division is approximated on the map by the contact between the Quaternary and Tertiary volcanic rocks of the High Cascade Range and the Tertiary volcanic rocks of the Western Cascade Range. The geology shown on the map is generalized from a more detailed compilation by Smith and others (1982).

DISCUSSION

Stream-sediment sampling in the Medford 1° by 2° quadrangle was undertaken to provide data to aid in assessment of the mineral resource potential of the quadrangle. This map presents data on the abundance and distribution of copper in the oxide residues (oxalic-acid leachates) of stream sediments and in the minus-0.18-mm sieved fraction of selected stream sediments collected in the quadrangle.

For the stream-sediment sampling program, the quadrangle was divided on a grid system into about 1,600 cells. Cells 3 km on a side were laid out for the two-thirds of the quadrangle considered geologically favorable for undiscovered metalliferous mineral deposits. The areas considered unfavorable, the volcanic rocks of late Tertiary and Quaternary age in the east and the sedimentary rocks of Jurassic to Tertiary age in the northwest, were divided into cells 5 km on a side. So far as possible, one site per cell was sampled in all areas containing bedrock exposures. Where possible, samples were taken from the most active part of streams. Preference was given to sampling flowing streams having small drainage basins (5 km^2 or less) lying mostly or entirely within a cell. Where such streams could not be found or were not accessible, other streams or dry drainages were sampled. Attempts were made to avoid obvious contamination; however, some samples were deliberately taken below mines to determine trace-element signatures reflecting those known occurrences.

The stream-sediment samples were air dried in metal-free paper envelopes and sieved to minus 0.18 mm in stainless-steel sieves.

Oxide residues were prepared from minus-0.18-mm sieved sediments using an oxalic-acid leach (Almimas and Mosier, 1976). Oxalic-acid leaching of stream sediments dissolves much of the secondary mineral matter resulting from chemical weathering while leaving virtually unaffected the unweathered rock-forming minerals that constitute the bulk of the sediment. It dissolves secondary iron and manganese oxides and associated trace-metal components and considerable amounts of clay. The major components of the resulting anhydrous residue, derived by evaporation of the leaching solution and ignition of the resulting material, are iron and manganese oxides, alumina, and silica (Almimas and Mosier, 1976). The effectiveness of secondary iron and manganese oxides as scavengers for hydromorphically transported trace metals and the use of these oxides as a sample medium for mineral exploration is reported by Chao and Theobald (1976).

The minus-0.18-mm sieved sediments and the oxide residues were analyzed for 18 or more elements by an emission spectrographic method (Grimes and Marranzino, 1968). The precision of this method is reported by Motooka and Grimes (1976). The oxide residues were also analyzed for arsenic by a colorimetric method (Ward and others, 1963).

A Honeywell 60/68[3] computer equipped with Multics operating system and located at the U.S. Geological Survey Computer Center in Denver, Colo., was used to merge and manipulate the geochemical data sets for sediment and residue samples. The plot of copper distribution and abundance in oxide residues was produced on a Calcomp flat-bed plotter from parts of the data. To improve clarity, the plot was modified at eight places by deleting overlapping letter symbols, retaining in each case the symbol reflecting the higher concentration of copper.

This geochemical map shows the abundance and distribution of copper in oxide residues of stream sediments. The sample localities and concentration of copper at each site are represented by letters whose values are defined on figure 1.

Anomalous concentrations of copper are defined on the histogram and denoted on the map by diamond-shaped symbols for the 2.5 percent of samples containing the highest concentrations of copper. Additional samples, possibly anomalous, are indicated on the map by small circles enclosing letters for the 1.2 percent of samples containing 150 ppm (parts per million) or 200 ppm (locality 770 only) copper in the minus-0.18-mm sieved sediment but less than 1000 ppm in the oxide residue. For the most part, these additional samples probably represent areas that contain high background amounts of copper in silicates, and thus, are not related to known mineral deposits. In a few cases, however, they may represent samples containing copper in unweathered sulfides.

Partial analytical results for selected samples containing anomalous or near-anomalous amounts of copper are listed in table 1. Complete analytical data on all sediments and oxide residues of sediments are tabulated in Whittington, Leinz, and Speckman (1983), wherein sample sites are designated by numbers that increase from 1 to 1,529 with increasing values of the Y-coordinate (northing) in the Universal Transverse Mercator grid system. The selected sample sites referred to on this map are identified by the same series of numbers.

Almost all important copper deposits in the Medford quadrangle are classified as volcanogenic massive sulfides or can be inferred from published descriptions to fall in this category (Ramp and Peterson, 1979; Ramp, 1972). Five of the samples listed in table 1 were collected near or downstream from such copper deposits. A sediment sample collected near the Cowboy mine (locality 36) contained 150 ppm copper in the minus-0.18-mm sieved fraction. The sediment sample collected at locality 88, below the Queen of Bronze mine, contained 2000 ppm copper in the oxide residue. Copper in the sample from locality 1126 may reflect the nearby Gary Johnson (Mt. Reuben) prospect. Gossan samples from the prospect contained anomalous amounts of nine other metals in addition to copper (Whittington, Grimes, and Peterson, 1983). The 1000 ppm copper in the oxide residue of the sample at locality 1300 probably reflects the copper deposit at the Banfield mine. A rock sample from the dump at the mine (Whittington, Grimes, and Peterson, 1983) contained anomalous copper and mercury and small amounts of silver and gold. The sample collected at locality 1342 had 150 ppm copper in the sieved fraction and possibly is related to the Silver Peak and Golden Gate mines. Rock samples from these mines are high in copper and other metals (Whittington, Grimes, and Peterson, 1983).

Table 1.--Partial analytical results of selected stream-sediment samples containing anomalous or near-anomalous amounts of copper, Medford 1° by 2° quadrangle, Oregon-California

[Field numbers ending in S or SS indicate minus-0.18-mm fraction of sieved stream sediments; those ending in X indicate oxide residue (oxalic-acid leachate) prepared from minus-0.18-mm stream sediments. Values in parts per million; number in parentheses (5) indicates determination limit for method used; ND, not detected; <, present but less than determination limit; --, no data collected. Analytical methods: As by colorimetry, other elements by emission spectroscopy. Analysts: D. J. Grimes, C. L. Whittington, and R. T. Hopkins]

Sample locality No.	Field No.	Elements					
		Cu (5)	As (10)	Mn (10)	Pb (20)	Zn (200)	Others
4	78M516S	150	--	1,000	<20	<200	Ag, <0.5
	78M516X	1,500	30	10,000	70	1,500	Mo, 10
36	78M761S	150	--	1,500	ND	ND	Co, 100; Cr, 5,000; Ni, 5,000
	78M761X	10	30	300	20	200	Co, 10; Cr, 5,000; Ni, 50
88	78M762S	700	--	3,000	ND	<200	Co, 300; Cr, 5,000; Ni, 3,000
	78M762X	2,000	ND	5,000	30	300	Co, 300; Cr, 2,000; Ni, 2,000
421	80M1314S	70	--	700	ND	ND	Ag, 0.7
	80M1314X	1,500	<10	5,000	<20	<200	
425	K60SS	100	--	2,000	30	ND	
	K60X	2,000	<10	3,000	50	300	Mo, 30
677	78M604S	100	--	1,000	30	ND	Ag, 0.7
	78M604X	1,000	80	10,000	50	500	
1050	80MD090S	70	--	1,500	ND	ND	
	80MD090X	2,000	ND	10,000	70	700	
1126	78M185S	300	--	2,000	<20	<200	
	78M185X	1,000	ND	7,000	50	700	
1185	79M382S	500	--	1,500	<20	<200	
	79M382X	5,000	ND	10,000	70	700	
1300	79M461S	100	--	700	<20	ND	
	79M461X	1,000	<10	3,000	70	500	
1342	78M259S	150	--	2,000	ND	<200	
	78M259X	500	20	7,000	70	500	Ag, 0.5

The sample at locality 425 is from an area of gabbroic rocks and contained copper apparently derived from local copper-bearing mineralization in the gabbro. Three other anomalous samples within 7 km to the south and west of locality 425 were collected in areas of gabbroic rocks.

Copper in the sample from locality 4 is probably related to a nearby prospect in sulfide-bearing schist. Rock samples collected near the prospect contained anomalous amounts of silver, arsenic, copper, mercury, molybdenum, lead, antimony, tellurium, and zinc, and small amounts of gold (Whittington, Grimes, and Peterson, 1983).

The scattered anomalous samples in the south-central part of the quadrangle, collected in areas of Paleozoic and Triassic volcanic rocks, are exemplified by the samples at localities 421 and 677. The copper in these samples may be derived from unrecognized local occurrences. Copper in samples from localities 158, 398, and 668 appears to be a reflection of mining activity.

The sample at locality 1050 is one of seven anomalous samples in an area where the country rocks are schists, amphibolites, and gneisses. Many of these rocks contain disseminated sulfides, and their analyses showed copper as high as several hundred ppm. The disseminated sulfides are probably the source of the anomalous copper in the oxide residues.

The highly anomalous sample at locality 1185 is associated with four other samples that were near-anomalous and that occurred in a belt a few kilometers long. The only evidence of mineralization in this vicinity was found in road cuts several hundred meters north of locality 1185 where vein quartz (Whittington, Grimes, and Peterson, 1983) contained 300 ppm copper and 500 ppm molybdenum and where soft limonitic material from a shear zone in greenstone contained 200 ppm copper and 7 ppm molybdenum (oxide residue contained 1500 ppm copper and 30 ppm molybdenum). A second stream-sediment sample collected at locality 1185 contained considerably less copper, 200 ppm in the sieved sediment and 1500 ppm in the oxide residue, but still fell in the anomalous range.

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MAP SHOWING ABUNDANCE AND DISTRIBUTION OF COPPER IN OXIDE RESIDUES OF STREAM-SEDIMENT SAMPLES, MEDFORD 1° BY 2° QUADRANGLE, OREGON-CALIFORNIA

By

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