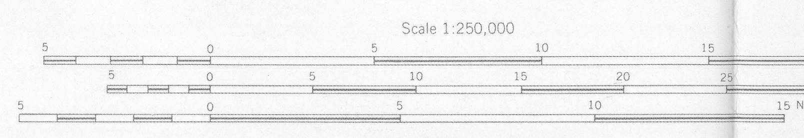
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1383-H

Base from U.S. Geological Survey, 1956-1976

Geology generalized from Smith and others (1982)



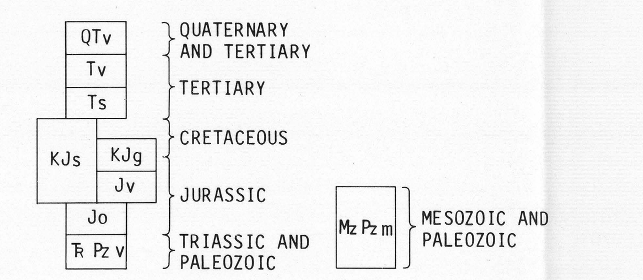
CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS
TRANSVERSE MERCATOR PROJECTION

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

By
Charles L. Whittington, David J. Grimes, and Reinhard W. Leinz

1985

CORRELATION OF MAP UNITS



LIST OF MAP UNITS

QTv	VOLCANIC ROCKS OF HIGH CASCADE RANGE (QUATERNARY AND TERTIARY)
Tv	VOLCANIC ROCKS OF WESTERN CASCADE RANGE (TERTIARY)
Ts	MARINE AND NONMARINE SEDIMENTARY ROCKS (TERTIARY)
KJs	SEDIMENTARY ROCKS (CRETACEOUS AND JURASSIC)
KJg	GRANITIC ROCKS (CRETACEOUS AND JURASSIC)
Jv	VOLCANIC ROCKS (JURASSIC)
Jo	OPHIOLITE (JURASSIC)
TRPzv	VOLCANIC ROCKS (TRIASSIC AND PALEOZOIC)
MzPzm	REGIONALLY METAMORPHOSED ROCKS (MESOZOIC AND PALEOZOIC)

CONTACT

FAULT

124 SAMPLE LOCALITY NUMBER--Corresponds to number in table 1 and(or) discussion

A SAMPLE LOCALITY--See figure 1 for letter values

SILVER CONCENTRATION OF 0.7 PPM OR GREATER IN SIEVED SEDIMENT--See figure 1 for values

K SILVER CONCENTRATION 0.5 PPM OR LESS THAN 0.5 PPM IN SIEVED SEDIMENT--See figure 1 for letter values

DETECTABLE SILVER IN OXIDE RESIDUE; NO DETECTABLE SILVER IN SIEVED SEDIMENT

\+ NO SILVER DETECTED IN EITHER OXIDE RESIDUE OR SIEVED SEDIMENT

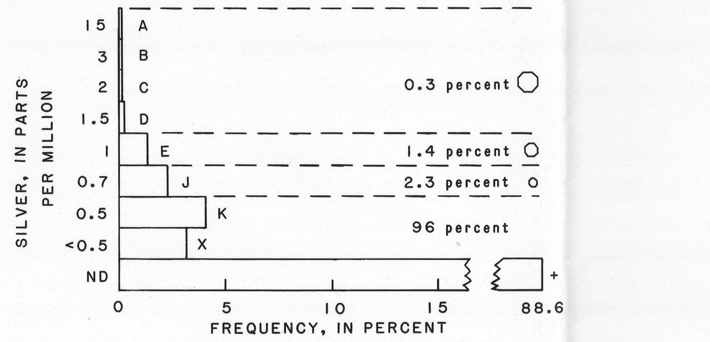


Figure 1.--Histogram showing the concentration of silver in stream-sediment samples. ND, not detected; <, present but less than determination limit; determination limit, 0.5 parts per million.

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 silver in stream sediments and in oxide residues (oxalic-acid leachates) of stream sediments from 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), but dry drainages or larger streams were substituted where necessary. Attempts were made to avoid obvious contamination, but some samples were deliberately taken downstream from 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 (Alminas and Mosier, 1976). In this procedure, the sample is boiled with a solution of oxalic acid and filtered hot through a fast filter. The filtrate is evaporated to dryness and converted to an anhydrous residue by heating for several hours at 450°C.

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 coprecipitated compounds of trace metals, and it also dissolves considerable amounts of clay. The major components of the resulting anhydrous residue are alumina, iron oxide, silica, and manganese oxide (Alminas 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), and the residues were also analyzed for arsenic by a colorimetric method (Ward and others, 1963).

A Honeywell 60/68[1/] 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 analytical and location data for the sediment and residue samples from the quadrangle. The plot of silver distribution and abundance in minus-0.18-mm stream sediments was produced on a Calcomp flat-bed plotter from parts of the data. In order to improve the clarity of the plot, it has been modified at eight places by deleting overlapping letter symbols, retaining in each case the symbol reflecting the higher concentration of silver.

Gold and silver are almost invariably associated in lode deposits in Oregon, the silver usually occurring both alloyed with native gold and as a constituent of associated sulfides (Brooks and Ramp, 1968, p. 30-31). Silver, because it is geochemically more mobile and has a much lower detection limit in the semiquantitative spectrographic method, serves as a pathfinder element for gold.

The geochemical map shows the abundance and distribution of silver in the minus-0.18-mm fraction of stream sediments. Sample sites and concentrations of silver are represented by letters or symbols whose values are defined in the histogram on figure 1. Sample sites with concentrations of silver of 0.7 ppm or more are indicated on the histogram and denoted on the map by variously sized octagons. Lesser concentrations of silver (0.5 ppm or <0.5 ppm) in sieved sediments are indicated by semicircles, and detectable silver concentrations in oxide residues, where not detectable in sieved sediments, are indicated by V-shaped symbols. Thus, all sample sites where silver was detected in either sediments or oxide residues are indicated by special symbols because this helps to give a better picture of the distribution of the element and because any detectable silver can in a certain sense be considered anomalous.

Partial analytical results for selected samples containing 1 ppm or more silver in sieved sediment are given in table 1. Complete analytical data on all sediment and residue samples are tabulated in Whittington, Leinz, and Speckman (1983). In that report sample locations 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.

Silver was found in 174 sieved stream-sediment samples in amounts ranging from less than 0.5 to 15 ppm and in 81 oxide residues in amounts ranging from less than 0.5 to 5 ppm. In only 28 cases was silver found in both sediment and residue from the same sample site. In these 28 sediment-residue pairs, the apparent solubility of silver in the leach is generally much lower than for other trace elements such as copper, lead, molybdenum, or zinc. The reason for the erratic "solubility" of silver is at present unknown. It seems unreasonable to suppose that it would tend to occur in insoluble mineral phases to a much greater extent than other trace elements. The problem merits further investigation.

In the eastern half of the quadrangle, silver is relatively sparsely distributed in sediments and residues of streams draining areas of Cenozoic volcanic rocks of the Cascade Range. The two samples from the quadrangle that contain the highest concentrations of silver, however, were collected downstream from gold mines in the Western Cascade Range. Sample locality 273, east of the city of Ashland, is about 300 m south of the Barron mine, and locality 1314, in the northern part of the quadrangle, is situated in a stream channel draining an adit at the Al Serena (Buzzard) mine. Analyses of mineralized rock from the mines (Whittington, Grimes, and Peterson, 1983) and descriptions of the mineralogy (Callaghan and Buddington, 1938, p. 131-132, 134-136) suggest that the two deposits are quite similar, more so than indicated by the data in table 1. Both of the mines lie in areas of extensive hydrothermal alteration as do the drainages sampled at localities 1204, 1312, 1398, and 1507 (J. G. Smith, written commun., 1981). Locality 599, due east of the city of Medford, lies in a less altered area. The remaining silver-bearing samples from the Western Cascade Range, as well as those scattered through the High Cascade Range in the northeastern part of the quadrangle, are not known to be related to areas of alteration or mineralization.

Although areas of altered volcanic rocks (greenstone) are considered most favorable for occurrence of lode deposits of gold and silver (Ramp and Peterson, 1979, p. 24), over a third of the silver-bearing stream-sediment samples in the western half of the quadrangle were collected in areas dominated by sedimentary rocks. The significance of these occurrences as guides to mineral deposits is suspect, because many of them may simply represent trace occurrences of silver in marine shale and graywacke. This is almost surely the case at locality 855, near the western edge of the quadrangle, and at other occurrences in the same broad area of outcrop of the Dothan Formation, which is not known to be mineralized except perhaps at its faulted eastern margin (Ramp and Peterson, 1979, p. 9). Farther east, most areas of sedimentary rocks consist largely of Jurassic shale and mudstone (Smith and others, 1982), rocks in which some mineralization is known (Ramp and Peterson, 1979, p. 7, pl. 1). However, the analytical results for locality 1010, in such Jurassic rocks, are similar enough to those for locality 855 to suggest that many of the more easterly sedimentary silver occurrences probably are no more significant than those farther west in the Dothan Formation.

The largest concentration of silver-bearing stream-sediment sample sites is found in the southern part of the quadrangle in the southwest corner of Jackson County, largely south and west of the Applegate River. In this area, mineralization may be widespread as suggested by the extent of placer mining on the Applegate River and a number of its major tributaries (Brooks and Ramp, 1968, p. 167-169, 241-242, fig. 35). Seven or eight of the silver-bearing sediments were collected adjacent to or downstream from known mines or prospects; those at localities 162 and 379 contained the greatest amounts of silver. Locality 379 lies upstream from an extensive placer mine on Ferris Gulch (not named on map) and near the site of the Great I Am lode mine (Brooks and Ramp, 1968, p. 167, 241, 254-255). Locality 162 is near a small antimony mine (Wagner, 1944, p. 10-13). Probably the most significant silver occurrences from areas lacking known mineralization are those where additional elements are also anomalous, such as copper and zinc at locality 248 or arsenic at 373, and, at localities not listed in table 1, molybdenum at 166 and copper at 370 and 421. The analytical results for locality 373, particularly the arsenic content, are of special interest because they are so very similar to those at 162, suggesting, perhaps, that the area near locality 373 may have potential for undiscovered antimony mineralization.

In the remaining parts of the western half of the quadrangle, the silver-bearing sample sites are not so concentrated, but a majority lie in a semicircular arcuate belt within about 30 km of the city of Grants Pass. Again, the most significant silver localities are probably those in which additional metals are anomalous, such as zinc at 564 or lead at 577. The sample at 577 is one of three samples containing 1 ppm silver that delineate an area of possible mineralization between Slate and Cheney Creeks, mostly lying in the northeastern part of T. 37 S., R. 7 W. In the oxide residues from some or all of these localities, arsenic, lead, molybdenum, and zinc are present in near-anomalous or anomalous amounts. Localities that are not listed in table 1 and that combine silver with anomalous amounts of other elements are: copper at 530, copper and arsenic at 677, copper and lead at 1074, zinc at 532, 686, 689, 790, 883, and 928, zinc and molybdenum at 876, and molybdenum at 620 and 960. Three of these that are connected with known mineral deposits are: 1074, near the Spotted Fawn mine; 689, downstream from the Queen mine; and 620, probably downstream from the Glenda Lou prospect (Ramp and Peterson, 1979, table 1).

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

[Field numbers ending in S 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; >, greater than value shown; --, 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 Ag (0.5)	As (10)	Cu (5)	Mn (10)	Pb (20)	Zn (200)	Others
162	78M025S	1	--	100	1,500	ND	ND	
	78M025X	1	120	700	5,000	ND	500	Mo, 15
248	78M002S	1.5	--	200	1,500	20	1,000	
	78M002X	ND	40	1,000	10,000	50	5,000	
273	80M1383S	3	--	20	1,000	100	300	Mo, 10
	80M1383X	0.7	600	200	>10,000	300	700	Mo, 50
373	78M533S	2	--	100	1,500	20	ND	
	78M533X	ND	100	700	7,000	100	500	Mo, 10
379	78M572S	1	--	70	1,000	<20	ND	Mo, <5
	78M572X	ND	40	700	3,000	30	500	Mo, 15
564	79M1221S	1	--	70	2,000	<20	300	
	79M1221X	ND	30	500	>10,000	70	1,000	
577	78M586S	1	--	30	1,000	30	ND	
	78M586X	ND	60	500	10,000	150	700	Mo, 15
855	78M189S	1	--	50	1,500	20	ND	
	78M189X	ND	30	300	7,000	100	500	
1010	78M122S	1	--	30	700	20	<200	
	78M122X	ND	20	300	5,000	100	700	Mo, 5
1314	80M010DS	15	--	30	>5,000	300	700	
	80M010DX	ND	6,000	200	>10,000	3,000	3,000	Sb, 200

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