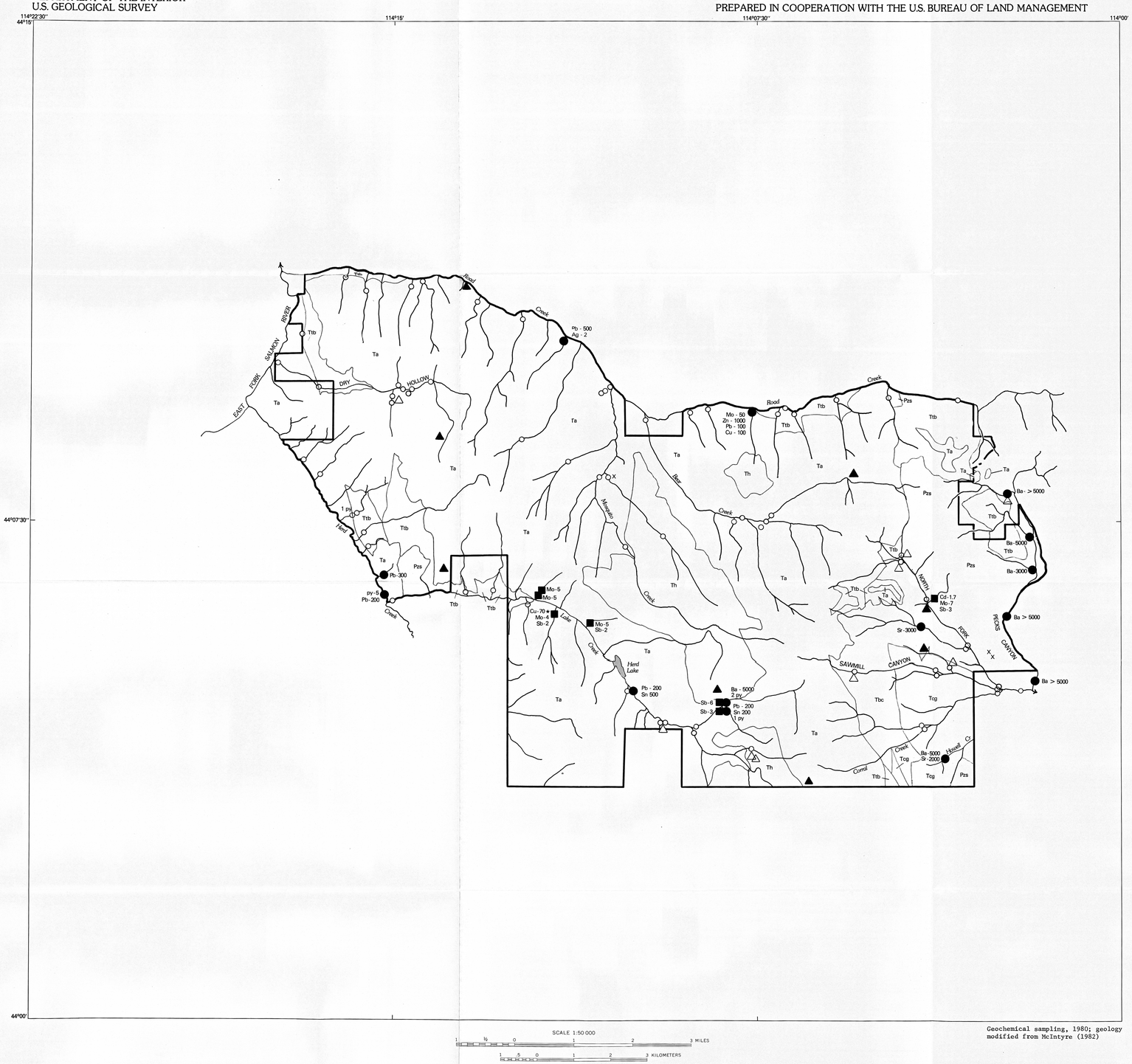
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE U.S. BUREAU OF LAND MANAGEMENT

MISCELLANEOUS FIELD STUDIES
MAP MF-1466-D



SCALE 1:50 000

1 ½ 0 1 2 3 MILES

1 .5 0 1 2 3 KILOMETERS

Geochemical sampling, 1980; geology modified from McIntyre (1982)

CORRELATION OF MAP UNITS

Th, Ta, Ttb, Tbc, Tcg	Eocene	TERTIARY
Unconformity		
Pzs		PALEOZOIC

DESCRIPTION OF MAP UNITS

Th TUFF OF HERD LAKE (EOCENE)--Devitrified, flow-laminated, lavalike rhyolitic ash-flow tuff

Ta ANDESITE AND LATITE LAVA AND BRECCIA (EOCENE)

Ttb BRECCIA, VOLCANIC SANDSTONE, AND MUDSTONE (EOCENE)

Tbc QUARTZ LATITIC AND DACITIC ASH-FLOW TUFFS AND ASSOCIATED VOLCANOGENIC ROCKS (EOCENE)

Tcg CONGLOMERATE (EOCENE)

Pzs SEDIMENTARY ROCKS (PALEOZOIC)--Chiefly limestone in vicinity of Pecks Canyon, and in isolated outcrop on Road Creek. Minor jasperoid exposed in area west of the mouth of Pecks Canyon. Small wedge-shaped area at south boundary of study area is chiefly thin-bedded siltstone and mudstone and minor chert. Outcrops of siltstone, sandstone, and conglomerate exposed at the mouth of Lake Creek

○ STREAM-SEDIMENT AND PANNED-CONCENTRATE SAMPLE LOCATION

△ ROCK-SAMPLE LOCATION HAVING SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS FOR MINOR ELEMENTS

▲ ROCK-SAMPLE LOCATION HAVING MAJOR-ELEMENT CHEMICAL ANALYSIS AND SEMIQUANTITATIVE SPECTROGRAPHIC ANALYSIS FOR MINOR ELEMENTS

★ SAMPLE LOCATION HAVING ANOMALOUS CONCENTRATION IN THE MINUS-200-MESH STREAM-SEDIMENT FRACTION AS DETERMINED BY SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

● SAMPLE LOCATION HAVING ANOMALOUS METAL CONCENTRATION IN NON-MAGNETIC HEAVY-MINERAL FRACTION AS DETERMINED BY SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS--Concentration values (in ppm) for each element are shown

■ SAMPLE LOCATION WITH ANOMALOUS METAL CONCENTRATION IN THE MINUS-200-MESH STREAM SEDIMENT FRACTION AS DETERMINED BY ATOMIC ABSORPTION SPECTROPHOTOMETRY--Concentration values (in ppm) for each element are shown

py PYRITE PRESENT IN NONMAGNETIC HEAVY-MINERAL CONCENTRATE--Number of grains observed is indicated

X PROSPECT PIT

——— CONTACT--Dashed where approximately located

STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geochemical survey of the Jerry Peak Wilderness Study Area, Idaho.

INTRODUCTION

The Jerry Peak Wilderness Study Area is about 25 mi south of Challis in Custer County, central Idaho (fig. 1). The study area contains 46,150 acres of land administered by the Bureau of Land Management and 1 sq mi owned by the State of Idaho, a total of 46,790 acres. Most of the study area is readily accessible by roads along tributaries of the East Fork Salmon River, especially Road Creek, Herd Creek, and Lake Creek. The southeastern part of the area can be reached from Road Creek by the road down Peck's Canyon and by roads from Thousand Springs Valley, southeast of the study area. Several access roads to past logging operations extend up Sage Creek and its tributaries in the southeast part of the study area. Access to points within the northern part of the area is facilitated by jeep trails that connect with Road Creek and Lake Creek and by an improved road that extends northward from Herd Lake.

The study area is moderately rugged, with local relief approaching 2,000 ft. Jerry Peak (10,010 ft), the highest point within the area, is a low knoll on a north-trending linear ridge (fig. 1). The ridge has not been glaciated, despite its relatively high altitude. Most of the area is thinly covered by grass and low shrubs; trees, for the most part, are restricted to valley bottoms or to local, small groves on hillslopes.

GEOCHEMISTRY

Stream sediments and panned concentrates were collected at about 90 locations from streams draining the Jerry Peak Wilderness Study Area. Stream sediments were sieved and the minus-200-mesh (0.074 mm) fraction from each sample was submitted for analysis. Nonmagnetic heavy-mineral fractions were prepared from the panned concentrates by first sieving to minus-20-mesh (0.841 mm). These samples were then separated by settling in bromoform and further treated in the Frantz magnetic separator set at 0.6 amp with a forward and side tilt of 15°. The resulting nonmagnetic concentrate was ground in an agate mortar and submitted for analysis.

After laboratory treatment both fractions were subjected to a six-step semiquantitative spectrographic analysis as described by Grimes and Marranzino (1968) for the following elements: Ag, As, Au, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, La, Mg, Mn, Mo, Nb, Ni, Pb, Sb, Sc, Sn, Sr, Ti, Th, V, W, Y, Zn, Zr. The minus-200-mesh, when sufficient quantities were available, or the minus-80-mesh plus-200-mesh stream sediment fraction was also analyzed by atomic absorption spectrometry utilizing a partial extraction technique described by Viets (1978) for the following elements: Bi, Cd, Co, Pb, Mo, Sb, and Zn. In addition, eight rock samples were analyzed for major elements by X-ray fluorescence spectroscopy and a total of seventeen rocks were analyzed by the six-step semiquantitative spectrographic method for trace elements (table 1). All nonmagnetic heavy-mineral concentrates were examined using a short-wave ultraviolet light to determine if fluorescent minerals were present. The nonmagnetic heavy-mineral concentrates also were examined for sulfide minerals and gold using a binocular microscope prior to being ground. No gold was seen in any of the concentrates and no sulfide minerals were found except for nine grains of pyrite in four samples. The only fluorescent mineral observed was zircon, in trace amounts.

The analytical results obtained were studied to determine if anomalous values, those significant above background values for rocks and stream sediments in the area, are present. The threshold level (upper limit of normal background) was subjectively determined for each element by inspection of the following information: 1. breaks in the cumulative frequency distribution and histograms; 2. geometric mean and standard deviation; and 3. comparison of the to that of the normal range for each lithology and the range of values obtained for the stream sediment samples (tables 2 and 3).

RESULTS

No detectable values were obtained by the spectrographic technique for As, Au, Bi, Cd, Sb, Th, and W. Samples analyzed for the elements B, Be, Co, La, Nb, Ni, Sc, V, Y, Yr are considered to either have a normal distribution (table 2) or are unlikely to occur in economic concentrations because the rock types observed in the area are not those commonly associated with economic deposits of these minerals.

Most of the anomalous values occur in the nonmagnetic heavy-mineral fraction. Anomalous values for several elements (Ag, Ba, Cd, Cu, Pb, Mo, Sb, Sn, Sr, Zn) were found principally in four areas: in the vicinity of Herd Lake (including tributaries draining into Lake Creek), along Road Creek, in the northwestern part of the wilderness study area and near the eastern boundary of the wilderness study area. Three concentrates collected east of Herd Lake from Lake Creek and a tributary contain high values of Pb or Ba and two contained grains of pyrite. In addition, two sediment samples from this area analyzed by atomic absorption and contained detectable Sb. An unaltered rock sample from the tuff of Herd Lake, which crops out at the headwaters of these drainages, also contains high values for Pb (70 ppm) and for Ba (3,000 ppm) and could have contributed to the high values found in the concentrates. Sb was not detected in the rock sample from the tuff of Herd Lake, so the source for this anomaly remains unknown. The pyrite in the concentrates, however, suggests that the high values could as well be associated with an occurrence of hydrothermally altered rock not discovered during field work in the upper Lake Creek drainage.

Four samples from tributaries draining into Lake Creek downstream from Herd Lake contain anomalous concentrations of Mo and several contain Sb. One contains anomalous Cu. A search of this area revealed no hydrothermally altered rock so the cause of these anomalous values remains obscure.

Two samples with anomalous Pb, one of which contained 5 grains of pyrite, were collected from Herd Creek and a tributary to it near the junction of Lake Creek. The tributary drains the outcrop of Paleozoic rock north of the junction of Lake Creek. Pyrite was noted in one of these samples. The source for the anomalous Pb and the pyrite has not been determined.

Anomalous concentrations of Ag, Cu, Mo, Pb, and Zn have been found in pan concentrates collected at the mouths of several tributaries that join Road Creek from the south. No hydrothermally altered zones or fault zones have been seen in these drainages.

Along the eastern boundary of the study area relatively high values of Ba (3,000->5,000 ppm) occurred in pan concentrates collected at six localities associated with Paleozoic sedimentary rocks, chiefly limestones. These pan concentrates commonly contain more than 50 percent small (1-2 mm), clear barite grains. In addition, a high Sr value (2,000 ppm) was noted in one sample where Ba exceeded 5,000 ppm. These data suggest the presence of barite-rich veins or beds in the sedimentary rocks.

An interesting feature of many stream sediments and nonmagnetic panned concentrates collected from streams draining the area underlain by K-rich andesite and latite are the high concentrations of Cr, as much as 5,000 ppm, in the sediments and greater than 5,000 ppm in the concentrates. High Cr (as much as 1,000 ppm; table 1) also was found in the lavas that supply most of the sediment to the streams that have the high-Cr values. Tschanz and others (1974) have noted high concentrations of Cr in volcanic rocks exposed west of the wilderness study area. Diopside, identified by T. Botinelly (written communication, 1982), makes up more than 50 percent of the material in most of these panned concentrates. The electron probe showed that the diopside contained minute grains of opaque oxide with a high Cr content, so the diopside is an obvious source for the high Cr values in the nonmagnetic pan concentrates.

SUMMARY

In conclusion, the geochemical study indicates that most of the anomalous values occur in the nonmagnetic heavy-mineral fraction. High values for Pb occur in two concentrates from streams draining the Paleozoic rocks locally exposed in the western part of the study area. Anomalous concentrations of one or more of the elements Ag, Ba, Cd, Cu, Mo, Pb, Sn, and Sb occur at nine other locations and are not readily explained by known geologic relationships. In addition, seven nonmagnetic panned concentrates contain anomalous Ba. These samples are associated with Paleozoic sedimentary rocks, mainly limestones, at the eastern boundary of the study area. These high values for Ba may indicate the presence of barite mineralization within the Paleozoic rocks.

REFERENCES CITED

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analysis of geological materials: U.S. Geological Survey Circular 591, 6 p.

McIntyre, D. H., 1982, Geologic map of the Jerry Peak Wilderness Study Area, Custer County, Idaho: U.S. Geological Survey Miscellaneous Field Studies Map MF-1466-A, scale 1:50,000.

Tschanz, C. M., Killsgaard, T. H., and Seeland, D. A., 1974, Mineral resources of the eastern part of the Sawtooth National Recreation Area, Custer and Blaine Counties, Idaho: U.S. Geological Survey Open-File Report 74-1100, 314 p.

Viets, J. G., 1978, Determination of silver, bismuth, cadmium, copper, lead and zinc in geologic materials by atomic absorption spectrometry with tricaprylylmethylamonium chloride: Analytical Chemistry, v. 50, p. 1097-1101.

[1]Use of brand names in this report is for descriptive purposes and in no way constitutes endorsement by the U.S. Geological Survey.

Table 1.--Measured values for chemical elements in fresh, unaltered rocks, Jerry Peak Wilderness Study Area

[Values expressed as percent (pct) (8 samples) were determined by X-ray fluorescence spectroscopy by J. S. Wahlberg, J. W. Baker, and J. E. Taggart, Jr. Values expressed in parts per million (ppm) (17 samples) are semiquantitative spectrographic analyses by E. P. Cooley, M. J. Malcom, and J. C. Hamilton. <, less than]

Element	Measured values	Element	Measured values
Ag	<0.5 ppm	Mn	<0.01 to 0.09 pct
As	<200 ppm	Mo	<5 ppm
Au	<10 ppm	Rb	10 to 20 ppm
B	<10 to 100 ppm	Ni	<5 to 150 ppm
Ba	50 to 3,000 ppm	Pb	<10 to 70 ppm
Be	<1 to 7 ppm	Sb	<100 ppm
Bi	<10 ppm	Sc	7 to 30 ppm
Ca	0,90 to 5.96 pct	Sn	<10 ppm
Cd	<20 ppm	Sr	300 to 1,500 ppm
Co	<5 to 50 ppm	Th	<100 ppm
Cr	7 to 1,000 ppm	V	<10 to 300 ppm
Cu	7 to 150 ppm	W	<50 ppm
Fe	1.39 to 5.80 pct	Y	<10 to 50 ppm
La	<20 to 150 ppm	Zn	<200 ppm
Mg	0,18 to 4.72 pct	Zr	<10 to 300 ppm

Table 2.--Measured semiquantitative spectrographic analyses and threshold values for selected elements from the minus-200-mesh fractions of 90 stream-sediment samples and from 88 nonmagnetic heavy-mineral concentrates, Jerry Peak Wilderness Study Area, Idaho

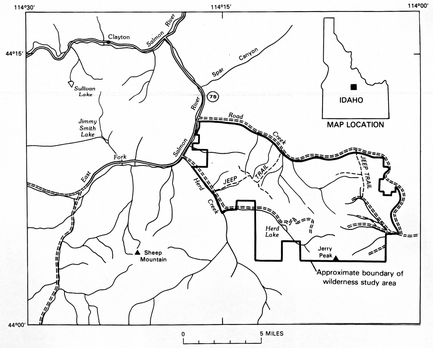
[N, not detected; L, detected but below limit of determination; NT, no threshold value set as little possibility for economic mineralization, or range of values in samples within normal limits for the lithologies in this area; ppm, parts per million; >, greater than; <, less than. Analyses by K. F. Cooley]

Element	Minus 200-mesh fraction			Nonmagnetic heavy-mineral concentrates		
	Lower limit of determination (ppm)	Measured value (ppm)	Threshold value (ppm)	Lower limit of determination (ppm)	Measured value (ppm)	Threshold value (ppm)
Ag	0.5	N-10	1	1	N-2	1.5
As	200	N		500	N	
Au	10	N		20	N	
B	10	20-150	NT	20	L-200	NT
Ba	20	100-1500	1500	50	L->5000	2000
Be	1	1.5-5.0	NT	2	N-3	NT
Bi	10	N		20	N	
Cd	20	N		50	N	
Co	5	10-50	NT	10	15-70	NT
Cr	10	100-5000	NT	20	700->5000	NT
Cu	5	10-70	50	10	L-100	70
La	20	50-100	NT	50	L->1000	
Mo	5	N	10	10	N-50	10
Nb	20	L-20	NT	50	L-50	NT
Ni	5	15-200	NT	10	20-700	NT
Pb	10	L-70	70	20	N-500	50
Sb	100	N		200	N	
Sc	5	5-30	NT	10	N-100	NT
Sn	10	N		20	N-500	NT
Sr	100	200-700	NT	200	N-3000	1500
Th	100	N		200	N	
V	10	50-200	NT	20	100-500	NT
W	50	N		100	N	
Y	10	10-70	NT	20	L-300	NT
Zn	200	N		500	N-1000	500
Zr	10	70-1000	NT	20	50->1000	NT

Table 3.--Measured and threshold values for selected elements for 90 samples in the minus 80 plus 200-mesh or minus 200 mesh stream-sediment fractions, Jerry Peak Wilderness Study Area, Idaho

[Atomic absorption spectrophotometry analyses by C. Cole, B. Arbogast, and R. Martin; ppm, parts per million]

Element.	Lower limit of determination (ppm)	Measured value (ppm)	Threshold value (ppm)
Bi	0.1	0.1-1	1
Cd	0.1	0.1-1.7	1.5
Mo	1	1-7	3
Sb	1	1-6	1



MAP SHOWING LOCATION OF THE JERRY PEAK WILDERNESS STUDY AREA, IDAHO

MAP SHOWING GEOCHEMISTRY OF STREAM SEDIMENTS IN THE JERRY PEAK WILDERNESS STUDY AREA, CUSTER COUNTY, IDAHO

By

J. E. Callahan, D. H. McIntyre, E. F. Cooley, and T. M. Cookro

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