UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results and sample locality map for nonmagnetic heavy-mineral concentrates from stream sediments from the South Reveille Wilderness Study Area (NV-060-112), Nye County, Nevada

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Open-File Report 86-95

1986

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ILLUSTRATION

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 Congress. This report presents the results of a geochemical survey of part of the South Reveille Wilderness Study Area, Nye County, Nevada.

INTRODUCTION

In July of 1984 a reconnaissance geochemical survey of part of the South Reveille Wilderness Study Area (NV-060-112), Nye County, Nevada, was conducted. This report includes the analytical results of the survey, as well as a description of the sampling and analytical procedures used.

The South Reveille Wilderness Study Area comprises approximately 106,200 acres of which the Bureau of Land Management requested surveys on 33,000 (143 km^2) acres in east-central Nye County and lies approximately 95 km ESE of Tonopah. Access to the eastern edge of the study area is provided by Nevada Highway 25 that intersects U.S. Highway 6 at Warm Springs.

The study area lies at the southern end of the north-trending Reveille range. The study area is underlain by Quaternary and Tertiary volcanic rocks including tuffs, flows, and dikes, in order of decreasing abundance (Cornwall, 1972).

The study area is characterized by deeply-incised valleys developed in a generally rugged terrain with a topographic relief of approximately 1,000 m. Areas of higher elevation in the study area are forested by evergreen and aspen trees. Streams in the South Reveille Wilderness Study Area are intermittent, and all were dry at the time of sampling. The climate is arid to semi-arid.

METHODS OF STUDY

Sample Collection

Samples were collected at 26 sites, most of which were within the boundaries of the study area (fig. 1). In all cases, the majority of the drainage basins represented by the sample sites lie within the study area. Samples for heavy-mineral-concencetrate analysis were collected at each site. The samples were panned later, at a location where water was available, to produce the heavy-mineral concentrate. Twenty-six panned-concentrate samples were analyzed for a sampling density of one sample per 5.5 km^2. However, some drainage basins ranged up to 10 km^2.

Heavy-mineral-concentrate samples

Geochemical analyses of heavy-mineral-concentrate samples reflect the chemistry of the rocks underlying the drainage basin upstream from the sample site. The geochemical signature of the sample includes the contribution of elements adsorbed from the aqueous solution, as well as mechanically-eroded and transported particulate rock or mineral material. This information is useful in identifying those basins which contain concentrations of elements that may be related to mineral deposits.

Material for the heavy-mineral-concentrate samples was collected from active alluvium of primarily first-order (unbranched) and second-order (below the junction of two first-order) streams as shown on U.S. Geological Survey topographic maps (scale = 1:24,000). Each sample was composited from several localities within an area that might extend 5 m up or downstream. Each bulk sample was passed through a 2.0-mm screen to remove coarse material. The sediment passing through the screen was panned until most of the quartz, feldspar, organic material, and clay-sized material was removed. The samples were air dried.

Sample Preparation

After panning the stream sediment to produce the heavy-mineral concentrate, bromoform was used to separate and remove the remaining quartz and feldspar from the heavy-mineral concentrate. The heavy minerals (specific gravity >2.8) were separated into three fractions using a large electromagnet (in this case a modified Frantz Isodynamic Separator). The most magnetic material (largely magnetite) was discarded. The second fraction (largely ferromagnesian silicates and iron oxides) was saved for analysis/archival storage. The third fraction (the least magnetic material including nonmagnetic ore minerals, zircon, sphene, etc.) was divided into two splits using a Jones splitter. One split was hand ground for spectrographic analysis; the other split was saved for mineralogical analysis.

The magnetic separates discussed are the same separates that would be produced by removing the magnetite with a hand magnet and then using a Frantz Isodynamic Separator set at a slope of 15° and a tilt of 10° with a current of 0.1 ampere to remove the ilmenite, and a current of 1.0 ampere to split the remainder of the sample into magnetic and nonmagnetic fractions.

Sample Analysis

Spectrographic method

The heavy-mineral-concentrate samples were analyzed for 31 elements using a semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). Spectrographic results were obtained by visual comparison of spectra derived from the sample against spectra obtained from standards made from pure oxides and carbonates. Standard concentrations are geometrically spaced over any given order of magnitude of concentration as follows: 100, 50, 20, 10, and so forth. Samples whose concentrations are estimated to fall between those values are assigned values of 70, 30, 15, and so forth. The precision of the analytical method is approximately plus or minus one reporting interval at the 83 percent confidence level and plus or minus two reporting intervals at the 96 percent confidence level (Motooka and Grimes, 1976). The elements analyzed and their limits of determination are listed in table 1. Values determined for the major elements (iron, magnesium, calcium, and titanium) are given in weight percent; all others are given in parts per million (micrograms/gram).

ROCK ANALYSIS STORAGE SYSTEM

Upon completion of all analytical work, the analytical results were entered into a computer-based file called Rock Analysis Storage System (RASS). This data base contains both descriptive geological information and analytical data. Any or all of this information may be retrieved and converted to a binary form for computerized statistical analysis or publication using the STATPAC program library (VanTrump and Miesch, 1976).

DESCRIPTION OF DATA TABLE

Table 2 lists the analyses for 26 heavy-mineral concentrate samples. The data are arranged so that column 1 contains the USGS-assigned sample numbers. These numbers correspond to the numbers shown on the site location maps (fig. 1). Columns in which the element headings show the letter "s" below the element symbol are emission spectrographic analyses. A letter "N" in the tables indicates that a given element was looked for but not detected at the lower limit of determination shown for that element in table 1. If an element was observed but was below the lowest reporting value, a "less than" symbol (<) was entered in the tables in front of the lower limit of determination. If an element was observed but was above the highest reporting value, a "greater than" symbol (>) was entered in the tables in front of the upper limit of determination. If an element was not looked for in a sample, two dashes (--) are entered in place of an analytical value. Because of the formatting used in the computer program that produced table 2, some of the elements listed (Fe, Mg, Ca, Ti, Ag, and Be) carry one or more nonsignificant digits to the right of the significant digits. The analysts did not determine these elements to the accuracy suggested by the extra zeros.

REFERENCES CITED

Cornwall, H. R., 1972, Geology and mineral deposits of Southern Nye County, Nevada: Nevada Bureau of Mines and Geology Bulletin 77, 49 p.

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

Motooka, J. M., and Grimes, D. J., 1976, Analytical precision of one-sixth order semiquantitative spectrographic analyses: U.S. Geoloigcal Survey Circular 738, 25 p.

VanTrump, George, Jr., and Miesch, A. T., 1976, The U.S. Geological Survey RASS-STATPAC system for management and statistical reduction of geochemical data: Computers and Geosciences, v. 3, p. 475-488.

Table 1.--Limits of determination for the spectrographic analysis of heavy-mineral-concentrate samples, based on a 5-mg sample

Elements	Lower determination limit	Upper determination limit
	Percent	
Iron (Fe)	.1	50
Magnesium (Mg)	.05	20
Calcium (Ca)	.1	50
Titanium (Ti)	.005	2
	Parts per million	
Manganese (Mn)	20	10,000
Silver (Ag)	1	10,000
Arsenic (As)	500	20,000
Gold (Au)	20	1,000
Boron (B)	20	5,000
Barium (Ba)	50	10,000
Beryllium (Be)	2	2,000
Bismuth (Bi)	20	2,000
Cadmium (Cd)	50	1,000
Cobalt (Co)	10	5,000
Chromium (Cr)	20	10,000
Copper (Cu)	10	50,000
Lanthanum (La)	50	2,000
Molybdenum (Mo)	10	5,000
Niobium (Nb)	50	5,000
Nickel (Ni)	10	10,000
Lead (Pb)	20	50,000
Antimony (Sb)	200	20,000
Scandium (Sc)	10	200
Tin (Sn)	20	2,000
Strontium (Sr)	200	10,000
Vanadium (V)	20	20,000
Tungsten (W)	100	20,000
Yttrium (Y)	20	5,000
Zinc (Zn)	500	20,000
Zirconium (Zr)	20	2,000
Thorium (Th)	200	5,000

TABLE 2.--SPECTROGRAPHIC ANALYSES OF THE NONMAGNETIC FRACTION OF HEAVY-MINERAL CONCENTRATES FROM STREAM SEDIMENTS, SOUTH REVEILLE WILDERNESS STUDY AREA, NYE COUNTY, NEVADA

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longtude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
TFC58002	37 55 52	116 7 39	.5	.15	1.0	2.0	500	N	N	N	20	1,000
TFC58003	37 55 56	116 7 43	1.0	.30	10.0	>2.0	1,500	N	N	N	20	5,000
TFC58006	37 54 6	116 6 25	1.0	.30	2.0	>2.0	700	N	N	N	150	2,000
TFC58008	37 53 46	116 5 3	1.5	1.00	2.0	>2.0	1,000	N	N	N	70	700
TFC58010	37 58 31	116 6 47	.5	.30	2.0	2.0	500	N	N	N	20	1,500
TFC58014	37 52 30	116 5 47	.7	.15	1.0	1.0	1,500	N	N	N	<20	1,500
TFC58018	37 52 53	116 9 43	1.5	.70	2.0	>2.0	1,000	N	N	N	70	1,500
TFC58022	37 55 18	116 10 39	1.0	.20	1.0	>2.0	1,000	N	N	N	30	2,000
TFC58024	37 54 48	116 10 35	1.5	.30	1.5	>2.0	1,500	N	N	N	70	2,000
TFC58026	37 57 13	116 10 45	1.0	.20	5.0	>2.0	500	N	N	N	20	1,500
TGC58040	37 58 42	116 6 37	.7	1.00	2.0	2.0	500	N	N	N	20	1,500
TGC58041	37 52 13	116 5 17	1.0	.20	1.5	>2.0	1,000	N	N	N	20	1,000
TSC58004	37 55 2	116 6 15	1.0	.30	1.0	>2.0	700	N	N	N	20	1,500
TSC58005	37 54 38	116 6 4	.7	.30	2.0	>2.0	700	N	N	N	30	1,500
TSC58007	37 53 43	116 6 33	1.0	.30	1.5	>2.0	1,000	N	N	N	20	1,500
TSC58011	37 57 28	116 6 55	1.0	.50	3.0	>2.0	700	N	N	N	50	1,500
TSC58012	37 53 7	116 5 6	.7	.10	1.0	1.5	500	N	N	N	30	3,000
TSC58013	37 56 37	116 7 49	1.5	.50	3.0	>2.0	1,500	N	N	N	70	1,000
TSC58015	37 50 15	116 6 14	1.5	.30	1.0	2.0	1,500	N	N	N	30	>10,000
TSC58017	37 49 52	116 8 16	1.0	.50	2.0	>2.0	2,000	N	N	N	30	1,500
TSC58019	37 50 20	116 8 45	.5	.15	1.0	>2.0	2,000	N	N	N	20	7,000
TSC58021	37 50 34	116 8 45	1.0	.15	1.0	>2.0	700	N	N	N	30	3,000
TSC58023	37 53 52	116 9 34	.7	.30	2.0	>2.0	700	N	N	N	50	10,000
TSC58025	37 54 27	116 9 45	.5	.20	1.5	>2.0	500	N	N	N	70	1,000
TSC58027	37 55 45	116 10 46	1.0	.30	3.0	2.0	700	N	N	N	100	1,500
TSC58029	37 56 23	116 10 57	1.5	.30	5.0	>2.0	700	N	N	N	70	1,000

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Sample	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s
TFC58002	7	N	N	N	N	N	100	N	N	<10	N
TFC58003	2	N	N	N	N	N	2,000	N	100	N	N
TFC58006	10	N	N	N	N	N	200	N	50	<10	N
TFC58008	7	N	N	N	N	N	700	N	50	<10	N
TFC58010	7	N	N	N	N	N	200	N	N	<10	N
TFC58014	7	N	N	N	N	N	200	N	N	<10	N
TFC58018	7	N	N	N	N	N	500	N	<50	<10	200
TFC58022	10	N	N	N	N	N	200	N	<50	<10	500
TFC58024	7	N	N	N	N	N	150	N	<50	<10	N
TFC58026	5	N	N	N	N	N	300	N	50	N	N
TGC58040	10	N	N	N	N	20	100	N	N	<10	700
TGC58041	10	N	N	N	N	N	200	N	N	<10	N
TSC58004	15	N	N	N	N	N	150	N	N	<10	N
TSC58005	10	N	N	N	N	N	100	N	N	<10	N
TSC58007	7	N	N	N	N	N	300	N	<50	<10	N
TSC58011	5	N	N	N	N	N	200	N	<50	N	N
TSC58012	7	N	N	N	N	N	100	N	N	<10	N
TSC58013	7	N	N	N	N	N	500	N	50	<10	N
TSC58015	10	N	N	N	N	N	150	N	N	<10	N
TSC58017	10	N	N	N	N	N	700	N	200	<10	100
TSC58019	15	N	N	N	N	N	1,000	N	50	<10	200
TSC58021	10	N	N	N	N	10	700	N	50	<10	N
TSC58023	10	N	N	N	N	N	300	N	50	<10	2,000
TSC58025	10	N	N	N	N	N	150	N	<50	<10	N
TSC58027	3	N	N	N	N	N	200	N	N	N	N
TSC58029	7	N	N	N	N	N	300	N	<50	<10	<20

TABLE 2.--SPECTROGRAPHIC ANALYSES OF THE NONMAGNETIC FRACTION OF HEAVY-MINERAL CONCENTRATES FROM STREAM SEDIMENTS, SOUTH REVEILLE WILDERNESS STUDY AREA, NYE COUNTY, NEVADA--Continued

Sample	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
TFC58002	N	100	150	N	70	N	1,000	N	>2,000	N
TFC58003	N	30	<20	1,000	100	N	1,000	N	>2,000	N
TFC58006	N	150	N	N	100	N	1,000	N	>2,000	<200
TFC58008	N	150	N	N	100	N	1,000	N	>2,000	200
TFC58010	N	100	N	N	100	N	500	N	>2,000	200
TFC58014	N	100	N	N	50	N	700	N	>2,000	<200
TFC58018	N	150	N	N	150	N	1,000	N	>2,000	<200
TFC58022	N	100	N	N	150	N	700	N	>2,000	200
TFC58024	N	100	N	N	150	N	700	N	>2,000	<200
TFC58026	N	20	70	1,000	100	N	300	N	>2,000	<200
TGC58040	N	100	N	N	200	N	500	N	>2,000	<200
TGC58041	N	150	N	N	100	N	1,000	N	>2,000	200
TSC58004	N	150	N	N	150	N	1,000	N	>2,000	200
TSC58005	N	150	50	N	100	N	1,000	N	>2,000	N
TSC58007	N	70	N	N	70	N	700	N	>2,000	200
TSC58011	N	30	N	1,000	100	N	300	N	>2,000	N
TSC58012	N	150	100	N	50	N	1,000	N	>2,000	<200
TSC58013	N	100	N	N	150	N	1,000	N	>2,000	200
TSC58015	N	100	N	N	100	N	1,000	N	>2,000	<200
TSC58017	N	150	N	<200	100	N	1,000	N	>2,000	N
TSC58019	N	150	N	N	100	N	1,500	N	>2,000	700
TSC58021	N	150	N	N	70	N	1,000	N	>2,000	<200
TSC58023	N	100	N	N	100	N	1,000	N	>2,000	200
TSC58025	N	100	N	N	100	N	1,000	N	>2,000	500
TSC58027	N	20	N	1,000	100	N	300	N	>2,000	N
TSC58029	N	70	N	500	150	N	700	700	>2,000	<200