UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results and sample locality map of stream-sediment, panned-concentrate, and rock samples from the South Providence Mountains Wilderness Study Area, San Bernardino County, California

By

David E. Detra, Allen L. Meier,

Richard J. Goldfarb, and Sarah C. Weaver

Open-File Report 84-118

1984

CONTENTS

TABLES

ILLUSTRATIONS

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 mineral survey of the South Providence Mountains Wilderness Study Area, California Desert Conservation Area, San Bernardino County, California.

INTRODUCTION

In 1982 we conducted a reconnaissance geochemical survey of the South Providence Mountains Wilderness Study Area, San Bernardino County, California.

The South Providence Mountains comprises about 36 mi^2 (93 km^2) in the northwest corner of the Needles 2° sheet, California. It lies just east of the Devils Playground at the southern end of the Death Valley depression within the Basin and Range geologic province. Access to the vicinity of the study area is provided on the west by the local access road between Baker, Kelso, and Amboy. Access to the South Providence Mountains is provided by unimproved dirt roads and jeep trails.

Geology

The study area is predominantly underlain by a Jurassic suite of plutonic rocks. The rocks are all highly altered and show evidence of a complex history of intrusion, faulting, and diking. Hypabyssal rocks of similar age are localized in the Hidden Hills region. Unaltered Cretaceous granodiorite and monzogranite outcrop in the southwestern part of the study area. Quaternary sand and gravel occur as alluvial fans and in many of the valleys.

The topographic relief in the study area is about 3000 ft (915 m), with a maximum elevation of 6533 ft (1991 m). The ground surface is mountainous terrane cut by intermittent streams. Alluvial fans extend from the base of the mountains into the valleys. The climate is arid to semiarid.

METHODS OF STUDY

Sample Collection

We collected samples at 74 sites (plate 1). At nearly all of those sites, we collected both a stream-sediment sample and a heavy-mineral concentrate. Where suitable outcrop was available, we collected rock samples. We analyzed 74 stream-sediment samples, 73 panned-concentrate samples, and 101 rock samples for a sediment sampling density of about 1 sample per 0.5 mi^2 for the stream sediment and heavy-mineral concentrate, and about 1 sample per 0.35 mi^2 for the rock.

Stream-sediment samples

Analyses of the stream-sediment samples represent the chemistry of the rock material eroded from the drainage basin upstream from each sample site. Such information is useful in identifying those basins which contain concentrations of elements that may be related to mineral deposits.

The stream-sediment samples consisted of active alluvium collected primarily from first-order (unbranched) and second-order (below the junction of two first-order) streams as shown on USGS topographic maps (scale = 1:62:500). Each sample was composited from several localities within an area that may extend as much as 100 ft from the site plotted on the map.

Heavy-mineral-concentrate samples

We panned heavy-mineral-concentrate samples from the same active alluvium as the stream-sediment samples. Each bulk sample was passed through a 2.0-mm (10-mesh) screen to remove the 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 sample was air dried at 32°C.

Rock samples

We collected rock samples from outcrops or exposures in the vicinity of the plotted site location. Most samples were collected from unaltered rock. Rock samples provide information on elements in rocks that have not been affected by alteration or mineralization. In addition, some altered and(or) mineralized rocks were collected.

Sample Preparation

Only the stream-sediment samples required extensive preparation. Rock samples were simply crushed and then pulverized with ceramic plates to minus 0.15 mm.

We sieved the stream-sediment samples at the collection site through a 2 mm screen and the minus 2 mm material was retained. The samples were air dried and sieved to 80 mesh using stainless steel sieves. The portion of the sediment passing through the sieve was saved for analysis.

After panning the sediment, we used bromoform 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 and ore-related minerals) 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.

Rock samples were crushed and then pulverized with ceramic plates to minus 0.15 mm.

Sample Analysis

Spectrographic method

We analyzed the stream-sediment, heavy-mineral-concentrate, and rock samples 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 unit at the 83 percent confidence level and plus or minus two reporting units at the 96 percent confidence level (Motooka and Grimes, 1976). 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) (table 1).

TABLE 1.--Limits of determination for the spectrographic analysis of rocks and stream sediments, based on a 10-mg sample

[The spectrographic limits of determination for heavy-mineral-concentrate samples are two reporting units higher than the limits given for rocks and stream sediments]

Elements	Lower determination limit	Upper determination limit
	Percent	
Iron (Fe)	0.05	20
Magnesium (Mg)	.02	10
Calcium (Ca)	.05	20
Titanium (Ti)	.002	1
	Parts per million	
Manganese (Mn)	10	5,000
Silver (Ag)	0.5	5,000
Arsenic (As)	200	10,000
Gold (Au)	10	500
Boron (B)	10	2,000
Barium (Ba)	20	5,000
Beryllium (Be)	1	1,000
Bismuth (Bi)	10	1,000
Cadmium (Cd)	20	500
Cobalt (Co)	5	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Lanthanum (La)	20	1,000
Molybdenum (Mo)	5	2,000
Niobium (Nb)	20	2,000
Nickel (Ni)	5	5,000
Lead (Pb)	10	20,000
Antimony (Sb)	100	10,000
Scandium (Sc)	5	100
Tin (Sn)	10	1,000
Strontium (Sr)	100	5,000
Vanadium (V)	10	10,000
Tungsten (W)	50	10,000
Yttrium (Y)	10	2,000
Zinc (Zn)	200	10,000
Zirconium (Zr)	10	1,000
Thorium (Th)	100	2,000

Chemical methods

Other methods of analysis used on rock samples from the South Providence Mountains Wilderness Study Area are summarized in table 2.

Table 2.--Chemical methods used

Sample type	Constituent determined	Analytical method	Determination limit[1]	Reference
Rocks	Au	AA	0.05	Thompson, 1968.
	Sb	AA	2	Modification of Viets, 1978.
	As	AA	5	Modification of Viets, 1978.
	Zn	AA	5	Modification of Viets, 1978.
	Bi	AA	1	Modification of Viets, 1978.
	Cd	AA	0.1	Modification of Viets, 1978.
	Hg	Instrumental	0.02	Modification of McNemey and others, 1972, and Vaughn and McCarthy, 1964.

[1]The determination limit is dependent upon sample weight. Given limits imply use of sample weight required by method. Higher limits of determination result from using less than required sample weight.

Analytical results for stream-sediment, heavy-mineral-concentrate, and rock samples are given in tables 3,4, and 5, respectively.

ROCK ANALYSIS STORAGE SYSTEM

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

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 geologic materials: U.S. Geological Survey Circular 591, 6 p.

McNerney, J. J., Buseck, P. R., and Hanson, R. C., 1972, Mercury detection by means of thin gold films: Science, v. 178, p. 611-612.

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

Thompson, C. E., Nakagawa, H. M., and Van Sickle, G. H., 1968, Rapid analysis for gold in geologic materials, in Geological Survey research 1968: U.S. Geological Survey Professional Paper 600-B, p. B130-B132.

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.

Vaughn, W. W., and McCarthy, J. H., Jr., 1964, An instrumental technique for the determination of submicrogram concentrations of mercury in soils, rocks, and gas, in Geological Survey research 1964: U.S. Geological Survey Professional Paper 501-D., p. D123-D127.

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

Table 3. Spectrographic results from the analysis of minus-80-mesh stream sediment samples from South Providence Mountains Wilderness Study Area, California

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

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	B-ppm s	Ba-ppm s	Bi-ppm s	Co-ppm s
SP003S	34 53 28	115 33 47	15	2.0	3.0	>1	3,000	5.0	50	2,000	50	30
SP005S	34 53 16	115 33 54	20	5.0	7.0	>1	2,000	N	20	1,000	N	50
SP006S	34 53 11	115 33 47	>20	3.0	15.0	>1	2,000	2.0	30	1,500	N	70
SP007S	34 53 7	115 33 50	>20	3.0	10.0	>1	2,000	N	50	1,500	N	50
SP008S	34 53 7	115 33 45	15	2.0	15.0	>1	1,500	N	20	1,000	N	20
SP009S	34 53 38	115 34 3	15	2.0	20.0	>1	1,500	N	30	700	N	20
SP010S	34 53 41	115 33 59	>20	3.0	10.0	>1	2,000	N	20	1,500	N	70
SP011S	34 53 45	115 34 1	20	2.0	10.0	>1	1,000	N	30	1,000	N	30
SP012S	34 54 27	115 34 19	15	3.0	7.0	>1	1,000	N	20	1,000	N	30
SP013S	34 54 30	115 34 14	10	2.0	5.0	1	1,000	N	20	1,000	N	20
SP014S	34 53 40	115 34 39	20	3.0	10.0	>1	2,000	N	20	700	N	50
SP015S	34 53 30	115 34 55	10	5.0	7.0	>1	1,500	N	30	1,000	N	30
SP016S	34 52 5	115 35 8	>20	1.0	3.0	>1	1,500	N	10	300	N	100
SP017S	34 51 44	115 34 50	15	3.0	7.0	>1	1,500	N	20	1,000	N	30
SP018S	34 52 43	115 35 10	>20	7.0	10.0	>1	>5,000	N	10	1,500	N	70
SP019S	34 51 7	115 35 24	15	1.0	3.0	1	1,000	N	15	700	N	20
SP020S	34 50 48	115 36 1	>20	1.0	3.0	>1	1,000	N	20	1,000	N	30
SP021S	34 54 51	115 34 3	10	3.0	5.0	1	1,000	N	30	700	N	20
SP022S	34 54 53	115 33 38	10	5.0	7.0	1	1,500	N	50	1,500	N	50
SP023S	34 54 28	115 33 7	15	2.0	5.0	>1	1,500	N	50	1,000	N	50
SP024S	34 54 27	115 32 59	7	2.0	15.0	1	700	N	50	1,000	N	20
SP025S	34 54 45	115 32 31	10	5.0	7.0	>1	1,500	N	50	1,500	N	30
SP026S	34 54 49	115 31 58	10	2.0	10.0	>1	1,000	N	20	1,000	N	30
SP027S	34 54 28	115 31 1	10	2.0	7.0	>1	1,500	N	50	700	N	30
SP028S	34 54 12	115 30 19	15	2.0	7.0	>1	1,000	<.5	30	700	N	20
SP029S	34 52 56	115 30 39	7	1.5	5.0	1	1,000	N	50	700	N	15
SP030S	34 50 29	115 35 58	15	1.0	7.0	>1	1,000	N	15	1,000	N	10
SP031S	34 49 34	115 35 55	10	2.0	5.0	>1	1,000	N	20	700	N	15
SP032S	34 50 30	115 34 55	20	1.5	3.0	>1	1,000	N	20	500	N	20
SP033S	34 49 48	115 34 16	15	3.0	10.0	>1	1,500	N	20	700	N	50
SP034S	34 49 29	115 33 35	10	5.0	7.0	>1	1,500	N	20	700	N	30
SP035S	34 50 10	115 33 54	>20	2.0	5.0	>1	1,500	N	10	500	N	50
SP036S	34 51 46	115 31 58	15	2.0	5.0	>1	1,500	N	20	700	N	30
SP037S	34 51 27	115 32 5	15	2.0	3.0	>1	1,500	N	20	700	N	30
SP038S	34 51 13	115 31 57	10	2.0	5.0	>1	1,500	N	20	700	N	30
SP039S	34 50 41	115 30 23	7	3.0	7.0	>1	1,000	N	30	1,000	N	30
SP040S	34 52 52	115 31 41	10	3.0	10.0	>1	1,500	N	20	1,000	N	30
SP041S	34 52 40	115 32 3	10	2.0	7.0	1	1,500	1.0	30	1,000	N	30
SP042S	34 52 34	115 32 0	15	3.0	10.0	>1	1,500	N	20	700	N	50
SP043S	34 51 34	115 30 14	15	2.0	2.0	>1	1,000	N	20	1,000	N	20
SP044S	34 50 58	115 31 19	20	3.0	3.0	>1	1,500	N	20	700	N	50
SP045S	34 54 11	115 35 23	15	5.0	5.0	>1	1,500	.5	10	1,000	N	30
SP046S	34 53 11	115 36 12	15	5.0	3.0	>1	1,500	N	10	1,000	N	20
SP047S	34 52 6	115 36 53	15	5.0	3.0	>1	1,000	N	10	700	N	20
SP048S	34 49 1	115 36 7	10	2.0	3.0	>1	1,000	N	10	1,000	N	15

Table 3. Spectrographic results from the analysis of minus-80-mesh stream sediment samples from South Providence Mountains Wilderness Study Area, California

Sample	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s
SP003S	100	1,000	150	7	20	30	100	N	500	200	N
SP005S	200	70	150	N	<20	100	30	N	300	300	N
SP006S	100	50	200	N	N	70	50	N	1,000	500	N
SP007S	100	50	200	N	N	70	30	N	500	500	N
SP008S	70	20	200	N	<20	20	70	N	500	300	N
SP009S	100	30	200	N	N	50	50	N	700	200	N
SP010S	150	70	150	N	20	100	50	10	500	500	N
SP011S	100	50	100	N	<20	30	50	<10	300	300	N
SP012S	200	30	100	N	<20	50	30	N	500	300	N
SP013S	100	20	100	N	<20	20	20	N	500	200	N
SP014S	150	50	150	N	20	50	30	N	500	300	N
SP015S	100	50	100	N	20	30	50	N	500	200	N
SP016S	100	50	100	N	<20	50	N	10	N	700	N
SP017S	100	50	150	N	20	50	30	N	500	200	N
SP018S	150	100	100	N	<20	50	30	N	500	1,000	N
SP019S	50	50	150	N	20	15	50	N	500	300	N
SP020S	50	70	300	10	20	15	30	N	700	500	N
SP021S	70	30	100	N	20	30	30	N	300	200	N
SP022S	70	70	150	N	<20	50	50	N	500	200	N
SP023S	100	50	200	N	20	30	50	N	300	300	N
SP024S	50	20	100	N	<20	20	30	N	300	200	N
SP025S	70	50	150	N	20	30	50	N	500	200	N
SP026S	70	30	150	N	30	20	30	N	500	200	N
SP027S	50	30	200	N	20	30	50	N	700	200	N
SP028S	70	20	300	5	50	30	50	N	500	300	N
SP029S	70	20	200	N	20	20	30	N	700	150	N
SP030S	20	50	200	5	20	10	50	N	700	200	<50
SP031S	50	20	200	N	20	20	30	N	500	150	N
SP032S	70	30	300	N	20	15	20	N	200	300	N
SP033S	150	200	200	15	<20	50	30	N	700	300	N
SP034S	100	200	200	5	<20	30	20	N	500	200	N
SP035S	100	50	200	N	<20	30	10	N	300	500	N
SP036S	70	30	200	N	20	20	50	N	500	300	N
SP037S	70	30	200	N	30	30	30	N	500	300	N
SP038S	50	30	150	N	<20	30	30	N	500	200	N
SP039S	70	30	150	N	20	30	50	N	700	200	N
SP040S	50	30	200	N	20	30	50	N	500	200	N
SP041S	50	50	150	N	20	30	50	N	500	200	N
SP042S	50	50	200	N	20	30	50	N	300	200	N
SP043S	150	50	100	N	<20	30	70	N	300	200	N
SP044S	200	30	100	N	N	20	50	N	500	300	N
SP045S	150	50	100	N	<20	30	100	N	700	150	N
SP046S	100	30	100	N	<20	30	50	N	500	200	N
SP047S	150	30	100	N	<20	20	30	N	200	200	N
SP048S	70	30	100	N	<20	7	30	N	300	200	N

Table 3. Spectrographic results from the analysis of minus-80-mesh stream sediment samples from South Providence Mountains Wilderness Study Area, California

Sample	Y-ppm s	Zn-ppm s	Th-ppm s	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa	Au-ppm aa	Hg-ppm inst
SP003S	50	N	N	10	100	N	46	4	3.00	1.00
SP005S	70	N	N	N	90	N	N	N	N	.02
SP006S	200	N	N	N	90	N	N	1	N	<.02
SP007S	300	N	N	<5	90	N	N	N	<.05	.02
SP008S	100	N	N	<5	50	N	N	N	N	.02
SP009S	70	N	N	N	70	N	N	1	N	<.02
SP010S	300	<200	N	N	35	N	N	N	N	<.02
SP011S	70	N	N	N	80	.1	N	1	N	<.02
SP012S	70	N	N	N	65	N	N	N	N	<.02
SP013S	70	N	N	N	60	N	N	N	N	<.02
SP014S	100	N	N	N	90	N	N	N	N	<.02
SP015S	70	N	N	<5	75	N	N	N	N	.02
SP016S	200	200	<100	N	85	N	N	N	N	<.02
SP017S	100	N	N	N	50	N	N	N	N	N
SP018S	50	<200	N	N	95	N	N	N	N	.02
SP019S	70	N	N	N	65	N	N	N	N	.02
SP020S	70	N	<100	N	80	N	<2	N	N	<.02
SP021S	100	N	N	N	85	.1	N	N	N	.02
SP022S	100	N	N	N	90	.2	N	N	N	.04
SP023S	70	N	N	N	75	N	N	N	.10	<.02
SP024S	50	N	N	N	35	N	N	N	N	.02
SP025S	100	N	N	<5	60	N	N	N	N	.02
SP026S	100	N	N	N	40	N	<2	N	N	<.02
SP027S	70	N	N	<5	60	N	N	N	N	.02
SP028S	100	N	N	<5	40	N	N	N	N	<.02
SP029S	70	N	N	N	35	N	N	N	N	<.02
SP030S	50	N	N	N	60	N	N	N	N	<.02
SP031S	70	N	N	N	55	N	N	N	N	.02
SP032S	70	N	N	N	55	N	N	N	N	.02
SP033S	70	N	N	N	65	N	N	N	N	.02
SP034S	70	N	N	N	60	N	N	N	N	<.02
SP035S	100	N	N	N	50	N	N	N	N	<.02
SP036S	70	N	N	N	55	N	N	N	N	.02
SP037S	70	N	N	<5	60	N	N	N	N	<.02
SP038S	70	N	N	N	50	N	N	N	N	<.02
SP039S	70	N	N	<5	70	N	N	N	N	.02
SP040S	100	N	N	<5	65	N	N	N	N	<.02
SP041S	70	N	N	<5	85	N	N	N	N	.02
SP042S	100	N	N	N	70	N	N	N	N	<.02
SP043S	70	200	N	N	85	.2	<2	1	N	.08
SP044S	70	<200	N	N	95	.1	N	N	N	.04
SP045S	100	<200	N	N	70	.1	N	1	N	<.02
SP046S	100	<200	N	N	65	.1	N	N	N	.04
SP047S	100	N	N	N	55	.1	N	N	N	.02
SP048S	70	N	N	N	55	.1	N	1	N	<.02

Table 3. Spectrographic results from the analysis of minus-80-mesh stream sediment samples from South Providence Mountains Wilderness Study Area, California--continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	B-ppm s	Ba-ppm s	Bi-ppm s	Co-ppm s
SP049S	34 50 21	115 34 7	15	5.0	3.0	>1	1,500	N	N	1,000	N	30
SP050S	34 49 12	115 34 23	10	7.0	3.0	>1	1,000	N	N	700	N	30
SP051S	34 48 20	115 33 5	15	2.0	2.0	>1	2,000	N	10	1,000	N	30
SP052S	34 48 0	115 33 1	20	1.5	2.0	>1	1,000	N	N	700	N	50
SP053S	34 48 32	115 32 43	10	2.0	2.0	>1	3,000	N	10	2,000	N	30
SP054S	34 48 42	115 32 32	10	2.0	3.0	>1	5,000	N	10	2,000	N	20
SP055S	34 49 12	115 32 49	15	3.0	2.0	>1	1,500	N	N	700	N	100
SP056S	34 48 21	115 34 9	15	5.0	3.0	>1	1,500	N	10	1,000	N	50
SP057S	34 48 25	115 34 0	10	3.0	3.0	>1	1,500	N	10	1,000	N	50
SP058S	34 48 57	115 34 43	10	2.0	2.0	>1	1,000	N	10	700	N	30
SP059S	34 48 45	115 35 24	>20	1.0	1.5	>1	700	N	N	1,000	N	20
SP060S	34 48 12	115 35 54	10	1.5	2.0	>1	1,000	N	10	1,000	N	20
SP061S	34 48 11	115 36 5	10	2.0	2.0	1	1,000	N	10	1,000	N	15
SP062S	34 47 10	115 34 43	20	1.0	2.0	>1	2,000	N	N	700	N	20
SP064S	34 50 30	115 32 31	15	2.0	10.0	>1	1,500	N	20	1,000	N	30
SP066S	34 50 28	115 32 21	15	1.0	3.0	>1	1,500	3.0	15	1,000	N	100
SP067S	34 50 16	115 31 44	>20	1.5	1.5	>1	5,000	N	N	500	N	50
SP068S	34 55 20	115 34 13	10	5.0	20.0	1	700	N	10	1,000	N	20
SP070S	34 53 44	115 29 21	5	1.5	20.0	1	1,000	2.0	50	1,500	N	15
SP072S	34 50 44	115 32 48	15	2.0	2.0	>1	1,000	N	20	700	N	50
SP073S	34 51 16	115 33 38	20	2.0	2.0	>1	1,500	N	10	700	N	50
SP074S	34 51 16	115 33 42	20	2.0	2.0	>1	1,000	N	10	1,000	N	50
SP075S	34 51 5	115 33 6	15	2.0	3.0	>1	700	N	10	700	N	30
SP076S	34 51 6	115 33 12	15	3.0	3.0	>1	1,500	N	10	700	N	30
SP077S	34 50 34	115 33 8	20	2.0	3.0	>1	1,500	N	N	700	N	50
SP078S	34 50 4	115 32 37	10	3.0	2.0	>1	1,000	N	15	1,000	N	30
SP079S	34 49 21	115 31 50	10	2.0	2.0	>1	700	N	10	1,000	N	20
SP080S	34 49 45	115 34 51	20	2.0	2.0	>1	700	N	10	700	N	20
SP081S	34 53 43	115 30 24	7	2.0	3.0	>1	700	N	30	700	N	15

Table 3. Spectrographic results from the analysis of minus-80-mesh stream sediment samples from South Providence Mountains Wilderness Study Area, California--continued

Sample	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s
SP049S	100	30	150	N	N	10	20	N	300	200	N
SP050S	150	100	70	15	N	20	20	N	300	300	N
SP051S	100	150	100	5	N	10	20	N	200	150	N
SP052S	200	70	200	N	<20	10	30	N	300	500	N
SP053S	150	70	50	<5	N	15	70	N	200	300	N
SP054S	150	70	100	N	N	20	50	N	300	200	N
SP055S	200	500	100	N	N	30	300	N	200	300	N
SP056S	150	200	50	15	N	50	20	N	500	300	N
SP057S	150	70	100	N	<20	30	20	N	500	200	N
SP058S	150	70	100	N	<20	20	10	N	300	300	N
SP059S	100	50	200	N	<20	15	10	N	100	500	N
SP060S	70	30	100	N	<20	20	30	N	500	200	N
SP061S	50	20	20	N	N	10	20	N	300	150	N
SP062S	70	30	50	N	<20	15	50	N	300	300	N
SP064S	70	50	150	N	<20	30	50	N	500	150	N
SP066S	100	1,000	100	<5	<20	20	150	N	200	200	N
SP067S	300	50	100	N	N	20	20	N	200	700	N
SP068S	70	20	70	5	N	20	50	N	500	150	N
SP070S	50	500	50	N	N	20	5,000	N	200	200	N
SP072S	100	50	70	<5	N	30	50	N	200	200	N
SP073S	200	50	150	N	N	30	30	N	200	300	N
SP074S	100	50	200	N	<20	20	20	N	300	200	N
SP075S	100	50	150	N	N	20	30	N	200	200	N
SP076S	150	50	200	N	N	20	15	N	300	200	N
SP077S	150	50	150	N	N	30	10	N	300	300	N
SP078S	70	30	150	N	<20	20	30	N	300	150	N
SP079S	70	30	100	N	N	20	20	N	300	100	N
SP080S	50	200	200	5	<20	15	50	N	200	300	N
SP081S	100	15	150	N	N	20	30	N	500	150	N

Table 3. Spectrographic results from the analysis of minus-80-mesh stream sediment samples from South Providence Mountains Wilderness Study Area, California--continued

Sample	Y-ppm s	Zn-ppm s	Th-ppm s	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa	Au-ppm aa	Hg-ppm inst
SP049S	100	N	N	N	75	.1	N	N	N	.02
SP050S	70	N	N	N	50	.1	N	1	N	<.02
SP051S	70	N	N	5	95	.3	<2	1	1.00	.04
SP052S	70	<200	N	N	65	.1	N	2	N	<.02
SP053S	50	N	N	5	80	.2	N	1	1.20	.06
SP054S	50	N	N	5	80	.2	N	1	N	.06
SP055S	100	<200	N	N	120	.4	2	<1	.05	.02
SP056S	70	N	N	N	50	.1	N	N	N	<.02
SP057S	100	N	N	N	55	.1	N	N	N	<.02
SP058S	70	N	N	N	65	.1	N	N	N	.02
SP059S	150	<200	N	N	80	.1	N	N	N	.02
SP060S	70	N	N	N	40	.1	N	N	N	<.02
SP061S	50	N	N	N	55	.1	N	N	N	<.02
SP062S	50	<200	N	N	75	.1	N	2	N	<.02
SP064S	70	<200	N	<5	60	.1	N	1	N	.02
SP066S	70	N	N	5	80	.1	18	N	.90	2.00
SP067S	30	300	N	N	110	N	N	N	N	.02
SP068S	30	N	N	10	30	N	N	N	N	<.02
SP070S	50	N	N	5	95	1.3	N	N	N	.06
SP072S	50	N	N	<5	70	.1	N	N	N	.02
SP073S	70	N	N	N	70	N	N	N	N	<.02
SP074S	100	N	N	N	60	N	N	N	N	.08
SP075S	70	N	N	N	55	N	N	N	N	<.02
SP076S	70	N	N	N	65	N	N	N	N	<.02
SP077S	50	<200	N	N	50	N	N	N	N	<.02
SP078S	50	N	N	N	55	N	N	N	N	<.02
SP079S	50	N	N	N	55	N	N	N	N	<.02
SP080S	100	<200	N	<5	65	.1	N	1	N	<.02
SP081S	70	N	N	<5	45	N	N	N	N	.02

Table 4. Spectrographic results from the analysis of nonmagnetic heavy-mineral concentrates from South Providence Mountains Wilderness Study Area, California

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

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	Au-ppm s
SP005C	34 53 16	115 33 54	.5	.20	7	>1.0	300	5	N
SP006C	34 53 11	115 33 47	.5	.20	7	>1.0	500	5	N
SP007C	34 53 7	115 33 50	.5	.20	3	>1.0	500	3	N
SP009C	34 53 38	115 34 3	1.0	.20	5	2.0	150	N	N
SP010C	34 53 41	115 33 59	2.0	1.00	50	>2.0	1,000	N	N
SP011C	34 53 45	115 34 1	.7	.30	15	>2.0	500	N	N
SP012C	34 54 27	115 34 19	2.0	.70	20	>2.0	700	N	N
SP013C	34 54 30	115 34 14	1.5	.50	10	>2.0	500	N	N
SP014C	34 53 40	115 34 39	1.5	.30	10	2.0	500	N	N
SP015C	34 53 30	115 34 55	.5	1.00	7	>1.0	500	5	N
SP016C	34 52 5	115 35 8	.5	.20	5	2.0	200	N	N
SP017C	34 51 44	115 34 50	1.0	.20	5	>2.0	300	N	N
SP018C	34 52 43	115 35 10	1.5	.50	15	>2.0	1,000	N	N
SP019C	34 51 7	115 35 24	.5	.10	10	>1.0	700	5	N
SP020C	34 50 48	115 36 1	3.0	.50	20	>2.0	1,000	N	N
SP021C	34 54 51	115 34 3	1.5	.50	10	>1.0	700	<1	N
SP022C	34 54 53	115 33 38	1.5	.50	15	>1.0	1,000	<1	N
SP023C	34 54 28	115 33 7	1.0	.20	7	>1.0	500	5	N
SP024C	34 54 27	115 32 59	1.0	.20	10	>1.0	300	2	N
SP025C	34 54 45	115 32 31	1.5	.50	10	>1.0	500	5	N
SP026C	34 54 49	115 31 58	1.0	.20	10	>1.0	300	2	N
SP027C	34 54 28	115 31 1	1.0	.20	7	>1.0	300	2	N
SP028C	34 54 12	115 30 19	1.0	.30	7	>1.0	300	2	N
SP029C	34 52 56	115 30 39	1.0	.30	7	>1.0	200	5	N
SP030C	34 50 29	115 35 58	.5	.10	10	>1.0	700	5	N
SP031C	34 49 36	115 36 16	.5	.10	2	>1.0	700	2	N
SP032C	34 50 30	115 34 55	.5	.20	7	>1.0	300	5	N
SP033C	34 49 48	115 34 16	.5	.20	5	>1.0	500	<1	N
SP034C	34 49 29	115 33 35	.3	.20	7	>1.0	500	<1	N
SP035C	34 50 10	115 33 54	.3	.20	5	>1.0	500	<1	N
SP036C	34 51 46	115 31 58	.5	.20	10	>1.0	500	<1	N
SP037C	34 51 27	115 32 5	.5	.20	7	>1.0	500	<1	N
SP038C	34 51 13	115 31 57	.5	.20	20	>1.0	700	<1	N
SP039C	34 50 41	115 30 23	2.0	.30	20	>1.0	1,000	<1	N
SP040C	34 52 52	115 31 41	.5	.20	20	>1.0	700	<1	N
SP041C	34 52 40	115 32 3	.7	.50	20	>1.0	1,000	<1	N
SP042C	34 52 34	115 32 0	1.0	.20	20	>1.0	700	<1	N
SP043C	34 51 34	115 30 14	1.0	.20	10	>1.0	500	<1	N
SP044C	34 50 58	115 31 19	2.0	.50	20	>1.0	1,500	2	N
SP045C	34 54 11	115 35 23	1.0	.20	20	>1.0	1,000	<1	N
SP046C	34 53 11	115 36 12	1.0	.30	10	>1.0	1,000	<1	N
SP047C	34 52 6	115 36 53	1.0	.30	7	>1.0	700	<1	N
SP048C	34 49 1	115 36 7	2.0	.50	7	>1.0	1,000	<1	N
SP049C	34 50 21	115 34 7	1.0	.30	7	>1.0	1,000	<1	N
SP050C	34 49 12	115 34 23	1.0	.50	7	>1.0	1,000	1	N

Table 4. Spectrographic results from the analysis of nonmagnetic heavy-mineral concentrates from South Providence Mountains Wilderness Study Area, California

Sample	B-ppm s	Ba-ppm s	Bi-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s
SP005C	<20	50	N	N	20	50	300	N	N
SP006C	<20	150	N	N	N	50	300	N	N
SP007C	<20	>5,000	N	N	N	30	100	N	N
SP009C	20	200	N	10	<20	N	100	N	50
SP010C	20	2,000	N	10	200	N	2,000	N	100
SP011C	<20	7,000	N	N	20	N	1,500	N	70
SP012C	20	7,000	N	15	200	10	2,000	N	<50
SP013C	<20	5,000	N	N	70	N	500	N	100
SP014C	20	1,000	N	N	<20	<10	1,000	N	<50
SP015C	<20	100	N	N	100	20	200	N	50
SP016C	20	300	N	N	<20	<10	200	N	N
SP017C	20	200	N	N	N	N	500	N	N
SP018C	30	100	N	N	50	<10	2,000	N	150
SP019C	<20	1,000	150	N	N	20	500	N	50
SP020C	<20	7,000	N	10	50	10	1,000	N	70
SP021C	20	500	N	50	30	100	500	N	<50
SP022C	20	<50	N	50	20	100	1,000	N	70
SP023C	20	5,000	N	50	20	50	500	N	<50
SP024C	20	500	N	10	50	70	500	N	70
SP025C	20	5,000	N	<10	100	100	300	N	50
SP026C	20	>5,000	N	<10	20	50	300	N	100
SP027C	20	>5,000	N	<10	20	50	300	N	50
SP028C	20	>5,000	N	<10	30	50	200	N	70
SP029C	20	>5,000	N	10	100	70	300	N	70
SP030C	20	>5,000	1,000	10	N	50	500	300	50
SP031C	20	5,000	100	<10	N	50	500	<10	<50
SP032C	20	>5,000	200	<10	N	50	500	50	<50
SP033C	20	700	N	<10	N	50	200	N	<50
SP034C	20	2,000	N	N	N	50	300	N	<50
SP035C	20	2,000	N	N	N	20	200	N	<50
SP036C	20	5,000	N	N	N	50	700	N	<50
SP037C	100	>5,000	N	30	20	50	700	N	<50
SP038C	20	5,000	N	<10	20	50	1,000	N	<50
SP039C	20	150	N	50	20	50	1,000	N	<50
SP040C	20	700	N	N	<20	20	>1,000	N	<50
SP041C	20	150	N	20	<20	50	1,000	N	<50
SP042C	20	100	N	<10	N	30	1,000	N	<50
SP043C	20	150	N	<10	N	20	700	N	<50
SP044C	100	700	N	<10	<20	20	1,000	N	<50
SP045C	70	2,000	N	<10	20	70	1,000	N	<50
SP046C	20	50	N	<10	<20	70	700	N	<50
SP047C	20	<50	N	<10	N	100	700	N	<50
SP048C	20	1,000	300	<10	20	100	1,000	N	<50
SP049C	20	<50	N	<10	<20	50	700	N	<50
SP050C	20	1,500	N	<10	20	150	500	N	50

Table 4. Spectrographic results from the analysis of nonmagnetic heavy-mineral concentrates from South Providence Mountains Wilderness Study Area, California

Sample	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Th-ppm s
SP005C	20	N	N	50	<20	<200	150	N	500	N
SP006C	20	N	N	50	N	<200	150	N	500	N
SP007C	20	N	N	20	N	200	100	N	500	N
SP009C	N	N	N	--	N	N	100	N	100	N
SP010C	N	500	N	--	100	N	500	N	1,000	700
SP011C	N	N	N	--	N	200	300	N	700	200
SP012C	N	20	N	--	50	200	700	N	1,000	200
SP013C	N	N	N	--	N	N	500	N	500	500
SP014C	N	N	N	--	N	200	200	N	500	N
SP015C	30	<20	N	20	<20	<200	200	N	300	<200
SP016C	20	N	N	--	N	N	100	N	700	N
SP017C	N	N	N	--	N	N	200	N	500	N
SP018C	N	500	N	--	150	N	500	N	1,500	1,500
SP019C	<10	100	N	20	30	<200	150	200	500	2,000
SP020C	N	30	N	--	70	N	300	3,000	700	1,500
SP021C	50	100	N	20	50	<200	300	N	700	<200
SP022C	50	300	N	20	50	<200	300	N	1,000	N
SP023C	50	500	N	30	<20	<200	300	N	1,000	200
SP024C	20	70	N	30	100	<200	500	N	700	<200
SP025C	20	3,000	N	50	100	<200	500	N	700	N
SP026C	20	70	N	30	100	<200	500	N	700	N
SP027C	20	200	N	20	50	2,000	500	N	700	200
SP028C	20	70	N	50	70	<200	500	N	500	N
SP029C	10	2,000	N	50	70	<200	500	N	500	700
SP030C	10	2,000	N	20	N	1,000	200	2,000	700	2,000
SP031C	30	100	N	100	N	<200	300	<100	1,500	>2,000
SP032C	20	3,000	N	20	N	300	200	1,000	500	2,000
SP033C	50	50	N	100	N	<200	200	N	1,500	700
SP034C	50	30	N	70	N	<200	200	N	1,000	500
SP035C	50	20	N	100	N	<200	150	N	1,000	200
SP036C	20	20	N	<10	N	200	150	N	700	500
SP037C	20	50	N	30	N	200	200	N	700	2,000
SP038C	20	50	N	20	<20	<200	200	N	1,000	500
SP039C	20	70	N	30	<20	<200	200	N	700	<200
SP040C	10	20	N	10	N	<200	200	N	1,000	<200
SP041C	30	150	N	10	20	<200	200	N	1,000	<200
SP042C	10	20	N	20	20	<200	200	N	1,000	<200
SP043C	10	20	N	30	20	<200	200	N	1,000	200
SP044C	20	50	N	50	30	200	200	N	2,000	200
SP045C	20	500	N	30	50	<200	200	N	2,000	200
SP046C	10	20	N	30	70	<200	200	N	2,000	200
SP047C	20	20	N	50	70	<200	200	N	2,000	1,000
SP048C	20	70	N	100	70	<200	200	N	2,000	1,000
SP049C	30	N	N	100	20	<200	150	N	1,500	<200
SP050C	20	50	N	50	100	<200	200	N	1,500	<200

Table 4. Spectrographic results from the analysis of nonmagnetic heavy-mineral concentrates from South Providence Mountains Wilderness Study Area, California--continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	Au-ppm s
SP051C	34 48 20	115 33 5	2.0	.50	7	>1.0	1,000	150	>500
SP052C	34 48 0	115 33 1	1.0	.30	5	>1.0	700	2	<20
SP053C	34 48 32	115 32 43	.7	.10	7	>1.0	700	7	30
SP054C	34 48 42	115 32 32	1.5	.10	2	>1.0	2,000	5	20
SP055C	34 49 12	115 32 49	1.0	.50	5	>1.0	500	<1	N
SP056C	34 48 21	115 34 9	1.0	.50	7	>1.0	500	2	N
SP057C	34 48 25	115 34 0	1.0	.50	10	>1.0	1,000	<1	N
SP058C	34 48 57	115 34 43	.7	.50	7	>1.0	700	<1	N
SP059C	34 48 45	115 35 24	.5	.30	5	>1.0	1,500	<1	N
SP061C	34 48 11	115 36 5	2.0	.30	7	>1.0	5,000	N	N
SP062C	34 47 10	115 34 43	.5	.15	15	>2.0	500	N	N
SP063C	34 48 25	115 32 38	1.0	.20	5	>1.0	1,000	1,000	>500
SP064C	34 50 30	115 32 31	1.0	.20	15	>1.0	1,500	10	20
SP066C	34 50 28	115 32 21	15.0	.10	20	>1.0	700	100	50
SP067C	34 50 16	115 31 44	.7	.20	5	1.0	500	2	N
SP068C	34 55 20	115 34 13	1.0	.50	7	>1.0	700	5	N
SP070C	34 53 44	115 29 21	.2	.15	10	.5	300	500	N
SP072C	34 50 44	115 32 48	.5	.10	5	>1.0	500	20	N
SP073C	34 51 16	115 33 38	.5	.10	7	>1.0	500	<1	N
SP074C	34 51 16	115 33 42	.5	.20	7	>1.0	500	<1	N
SP075C	34 51 5	115 33 6	.5	.10	5	>1.0	500	<1	N
SP076C	34 51 6	115 33 12	.3	.20	5	>1.0	500	<1	N
SP077C	34 50 34	115 33 8	.5	.15	20	>1.0	500	N	N
SP078C	34 50 4	115 32 37	.5	.15	10	>1.0	700	N	N
SP079C	34 49 21	115 31 50	.2	.10	5	>1.0	500	N	N
SP080C	34 49 45	115 34 51	1.5	.20	7	>1.0	300	N	N
SP081C	34 53 43	115 30 24	.7	.20	5	>1.0	300	N	N
SP200C	34 48 34	115 35 56	.5	.30	10	>2.0	200	N	N

Table 4. Spectrographic results from the analysis of nonmagnetic heavy-mineral concentrates from South Providence Mountains Wilderness Study Area, California--continued

Sample	B-ppm s	Ba-ppm s	Bi-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s
SP051C	30	>5,000	500	<10	<20	150	700	N	70
SP052C	30	700	N	<10	N	100	500	N	<50
SP053C	20	>5,000	50	<10	N	70	300	N	50
SP054C	20	>5,000	N	<10	N	1,500	200	N	70
SP055C	20	>5,000	300	50	20	500	300	70	<50
SP056C	20	>5,000	N	<10	20	150	500	N	<50
SP057C	20	300	N	<10	50	100	1,000	N	<50
SP058C	20	300	N	<10	20	100	500	N	<50
SP059C	20	>5,000	150	<10	N	70	1,000	50	<50
SP061C	20	1,500	N	<10	50	70	1,000	N	<50
SP062C	<20	150	N	N	20	N	300	N	150
SP063C	20	>5,000	1,000	10	N	5,000	1,000	50	<50
SP064C	20	>5,000	50	10	N	100	1,000	N	<50
SP066C	20	>5,000	500	300	<20	5,000	1,000	100	<50
SP067C	20	500	N	10	<20	10	200	N	N
SP068C	20	700	N	70	N	100	500	30	70
SP070C	20	>5,000	N	N	N	5,000	50	100	<50
SP072C	20	>5,000	N	N	N	100	500	N	N
SP073C	20	100	N	N	N	20	500	N	N
SP074C	20	50	N	N	N	20	500	N	N
SP075C	20	700	N	N	N	20	500	N	N
SP076C	20	1,000	N	N	N	10	500	N	N
SP077C	20	500	N	15	N	30	500	N	N
SP078C	20	700	N	N	N	30	1,000	N	N
SP079C	20	200	N	N	N	10	300	N	N
SP080C	20	500	N	N	20	50	200	N	70
SP081C	20	200	N	N	<20	50	200	N	N
SP200C	<20	7,000	N	N	20	N	200	N	150

Table 4. Spectrographic results from the analysis of nonmagnetic heavy-mineral concentrates from South Providence Mountains Wilderness Study Area, California--continued

Sample	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Th-ppm s
SP051C	15	15,000	N	30	50	500	150	1,000	1,500	1,000
SP052C	20	50	N	30	150	<200	150	<100	1,500	1,500
SP053C	10	300	N	N	N	>5,000	100	N	500	<200
SP054C	10	2,000	N	N	N	>5,000	100	N	500	200
SP055C	50	3,000	N	70	<20	<200	1,000	500	2,000	500
SP056C	20	200	N	70	100	<200	200	N	2,000	<200
SP057C	20	20	N	70	70	<200	200	N	2,000	<200
SP058C	20	20	N	100	100	<200	200	<100	2,000	200
SP059C	20	300	N	50	<20	200	200	200	2,000	500
SP061C	20	100	N	100	70	<200	200	N	2,000	<200
SP062C	N	N	N	--	50	N	200	N	500	1,000
SP063C	50	20,000	200	20	500	5,000	700	N	1,000	500
SP064C	20	3,000	N	20	50	500	150	N	1,500	200
SP066C	300	>20,000	N	20	300	500	500	N	1,500	500
SP067C	10	20	N	<10	70	500	50	N	500	N
SP068C	100	1,000	N	N	200	<200	150	N	1,000	200
SP070C	<10	>20,000	N	N	N	2,000	1,000	N	50	N
SP072C	15	20,000	N	<10	100	500	100	N	700	200
SP073C	20	500	N	50	<20	<200	100	N	700	<200
SP074C	20	300	N	50	<20	<200	100	N	700	<200
SP075C	20	200	N	30	20	<200	100	N	700	N
SP076C	20	70	N	50	N	<200	100	N	700	N
SP077C	50	70	N	70	20	<200	100	N	1,000	200
SP078C	10	700	N	50	50	<200	100	N	500	N
SP079C	30	30	N	70	N	<200	100	N	1,000	200
SP080C	10	500	N	20	100	<200	200	N	300	N
SP081C	10	100	N	30	20	<200	100	N	1,000	300
SP200C	30	N	N	--	70	N	200	N	700	N

Table 5. Spectrographic results from the analysis of rocks from South Providence Mountains Wilderness Study Area, California

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

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
SP001RX	34 53 34	115 33 42	5.0	2.00	.70	1.000	1,000	N	N	N
SP002RX	34 53 30	115 33 36	5.0	3.00	1.00	.500	1,500	N	N	N
SP003RXA	34 53 28	115 33 47	20.0	10.00	10.00	>1.000	3,000	N	N	N
SP003RXB	34 53 28	115 33 47	10.0	5.00	10.00	>1.000	3,000	N	N	N
SP003RXC	34 53 28	115 33 47	10.0	5.00	10.00	>1.000	3,000	N	N	N
SP004RXA	34 53 5	115 35 3	>20.0	1.00	.50	.020	2,000	N	N	N
SP004RXB	34 53 5	115 35 3	1.5	.30	.30	.010	300	.5	N	N
SP007RX	34 53 7	115 33 50	10.0	5.00	3.00	>1.000	1,500	N	N	N
SP010RX	34 53 41	115 33 59	>20.0	.50	.50	.020	100	N	N	N
SP050RX	34 49 12	115 34 23	15.0	10.00	20.00	>1.000	3,000	N	N	N
SP054RXA	34 48 42	115 32 32	10.0	1.50	1.50	>1.000	1,500	<.5	N	N
SP054RXB	34 48 42	115 32 32	7.0	1.00	.70	.700	2,000	N	N	N
SP063RXA	34 48 25	115 32 38	7.0	.50	1.00	.700	700	2.0	N	N
SP063RXB	34 48 25	115 32 38	5.0	.50	.70	1.000	150	.5	N	N
SP063RXC	34 48 25	115 32 38	3.0	.30	.10	.300	200	5.0	N	N
SP063RXD	34 48 25	115 32 38	2.0	.05	<.05	.030	700	20.0	N	N
SP065RXA	34 50 32	115 32 22	10.0	2.00	10.00	>1.000	>5,000	N	N	N
SP065RXB	34 50 32	115 32 22	7.0	2.00	20.00	>1.000	>5,000	N	N	N
SP065RXC	34 50 32	115 32 22	10.0	2.00	5.00	1.000	1,500	N	N	N
SP065RXD	34 50 32	115 32 22	>20.0	.10	3.00	.030	700	N	N	N
SP065RXE	34 50 32	115 32 22	5.0	.10	7.00	.030	2,000	15.0	N	N
SP065RXF	34 50 32	115 32 22	10.0	5.00	20.00	.300	>5,000	N	N	N
SP065RXY	34 50 32	115 32 22	7.0	.20	2.00	.200	500	30.0	N	N
SP065RXZ	34 50 32	115 32 22	10.0	.70	5.00	1.000	>5,000	50.0	N	N
SP066RX	34 50 28	115 32 21	10.0	5.00	10.00	>1.000	3,000	N	N	N
SP068RXA	34 55 20	115 34 13	>20.0	1.00	1.00	.020	700	<.5	N	N
SP068RXB	34 55 20	115 34 13	>20.0	1.50	.50	.010	500	N	N	N
SP068RXC	34 55 20	115 34 13	>20.0	3.00	1.00	.700	200	N	N	N
SP068RXD	34 55 20	115 34 13	>20.0	2.00	15.00	.020	2,000	N	N	N
SP068RXE	34 55 20	115 34 13	2.0	1.00	2.00	.500	700	N	N	N
SP068RXF	34 55 20	115 34 13	>20.0	3.00	1.00	.020	500	N	N	N
SP068RXG	34 55 20	115 34 13	>20.0	7.00	10.00	.070	1,500	N	N	N
SP069RXA	34 55 1	115 33 53	10.0	7.00	1.00	>1.000	1,000	N	N	N
SP069RXB	34 55 1	115 33 53	7.0	5.00	10.00	>1.000	1,000	N	N	N
SP070RXA	34 53 44	115 29 21	10.0	>10.00	>20.00	.050	1,500	N	N	N
SP070RXB	34 53 44	115 29 21	2.0	1.00	.50	.700	30	700.0	N	N
SP070RXC	34 53 44	115 29 21	10.0	.20	7.00	.070	10	50.0	N	N
SP070RXD	34 53 44	115 29 21	5.0	.20	1.00	.150	150	1,000.0	N	N
SP070RXE	34 53 44	115 29 21	7.0	.50	20.00	.100	5,000	2.0	N	N
SP070RXF	34 53 44	115 29 21	7.0	.20	10.00	.070	>5,000	1.0	N	N
SP070RXG	34 53 44	115 29 21	10.0	5.00	>20.00	.100	>5,000	N	N	N
SP071RXA	34 52 51	115 30 1	5.0	1.00	.70	.500	700	3.0	N	N
SP071RXB	34 52 51	115 30 1	15.0	7.00	20.00	.500	3,000	N	N	N
SP073RX	34 51 16	115 33 38	>20.0	.05	.10	.300	100	N	N	N
SP075RX	34 51 5	115 33 6	>20.0	1.00	10.00	.050	500	N	N	N

Table 5. Spectrographic results from the analysis of rocks from South Providence Mountains Wilderness Study Area, California

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s
SP001RX	10	700	N	N	N	10	70	5	70	N
SP002RX	15	1,000	N	N	N	20	50	20	150	7
SP003RXA	50	5,000	N	N	N	100	700	100	200	N
SP003RXB	50	5,000	N	N	N	30	100	20	200	N
SP003RXC	30	5,000	N	N	N	50	100	50	200	N
SP004RXA	N	<20	N	N	N	70	N	10	N	N
SP004RXB	20	20	N	N	N	N	10	5	100	N
SP007RX	20	500	N	N	N	30	200	7	150	N
SP010RX	N	70	N	N	N	100	N	15	1,000	50
SP050RX	30	700	N	N	N	100	1,000	150	100	N
SP054RXA	100	3,000	5	N	N	50	100	30	200	N
SP054RXB	70	5,000	<5	N	N	15	20	10	200	N
SP063RXA	70	5,000	N	N	N	5	30	100	100	N
SP063RXB	70	5,000	<5	N	N	10	50	30	200	<5
SP063RXC	70	1,000	<5	N	N	10	10	3,000	300	<5
SP063RXD	30	200	N	30	N	10	N	7,000	100	N
SP065RXA	100	5,000	5	N	N	70	200	200	200	N
SP065RXB	150	500	<5	N	N	30	500	50	150	N
SP065RXC	50	1,000	<5	N	N	20	100	50	300	30
SP065RXD	N	100	N	N	N	15	30	50	200	5
SP065RXE	15	200	N	10	N	15	20	>20,000	100	N
SP065RXF	100	1,000	<5	N	N	50	50	150	100	<5
SP065RXY	30	200	<5	100	N	50	70	>20,000	50	N
SP065RXZ	50	500	7	200	N	100	200	20,000	100	7
SP066RX	30	2,000	N	N	N	50	300	100	300	N
SP068RXA	N	N	N	N	N	500	N	1,500	N	N
SP068RXB	10	N	N	N	N	200	N	500	N	N
SP068RXC	50	30	N	N	N	1,000	70	700	N	N
SP068RXD	N	N	N	N	N	100	20	20	N	N
SP068RXE	50	1,500	<5	N	N	5	30	<5	500	N
SP068RXF	20	<20	N	N	N	300	10	1,000	N	N
SP068RXG	N	20	N	N	N	150	N	15	N	N
SP069RXA	20	100	N	N	N	30	100	<5	100	N
SP069RXB	100	1,000	N	N	N	20	700	5	100	N
SP070RXA	30	200	7	N	N	30	30	N	50	N
SP070RXB	150	300	<5	10	20	5	50	20,000	100	N
SP070RXC	50	3,000	N	15	70	10	15	20,000	50	10
SP070RXD	70	5,000	N	70	100	15	20	>20,000	50	N
SP070RXE	50	500	5	N	N	20	70	2,000	50	N
SP070RXF	50	700	<5	N	N	15	20	2,000	150	5
SP070RXG	50	700	7	N	N	20	20	50	100	N
SP071RXA	20	5,000	N	N	N	20	20	5,000	100	N
SP071RXB	30	700	N	N	N	50	150	20	70	N
SP073RX	N	100	N	N	N	30	N	30	N	N
SP075RX	N	50	N	N	N	70	50	10	N	N

Table 5. Spectrographic results from the analysis of rocks from South Providence Mountains Wilderness Study Area, California

Sample	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s
SP001RX	<20	10	20	N	N	100	200	N	70
SP002RX	<20	20	100	N	N	100	200	N	50
SP003RXA	<20	200	20	N	N	1,500	500	N	70
SP003RXB	<20	30	100	N	N	2,000	300	N	100
SP003RXC	<20	30	150	N	N	2,000	200	N	100
SP004RXA	N	100	N	N	N	N	300	N	N
SP004RXB	N	5	N	N	N	N	30	N	N
SP007RX	20	70	30	N	N	100	300	N	100
SP010RX	<20	30	N	N	50	N	3,000	70	N
SP050RX	N	100	N	N	N	1,500	500	N	70
SP054RXA	20	30	100	N	N	200	200	N	100
SP054RXB	<20	15	50	N	N	100	150	N	70
SP063RXA	<20	10	100	N	N	200	200	N	70
SP063RXB	20	15	70	N	N	100	200	N	100
SP063RXC	<20	5	20	N	N	N	100	N	70
SP063RXD	N	5	30	N	N	N	30	N	N
SP065RXA	<20	50	100	N	N	300	500	N	70
SP065RXB	<20	50	100	N	N	500	300	N	70
SP065RXC	30	20	100	N	N	500	300	N	100
SP065RXD	<20	10	N	N	N	100	1,500	300	70
SP065RXE	N	10	20	N	N	N	50	N	10
SP065RXF	N	30	50	N	N	200	100	N	100
SP065RXY	N	30	N	N	N	N	100	N	20
SP065RXZ	<20	50	100	N	N	100	200	N	50
SP066RX	20	50	70	N	N	1,500	500	N	100
SP068RXA	N	2,000	10	N	N	N	200	N	N
SP068RXB	N	1,000	N	N	N	N	200	N	N
SP068RXC	N	50	N	N	N	N	50	N	N
SP068RXD	N	50	N	N	N	100	500	N	N
SP068RXE	20	10	70	N	N	500	150	N	70
SP068RXF	N	100	N	N	N	N	50	N	10
SP068RXG	N	150	N	N	N	N	500	N	N
SP069RXA	30	20	N	N	N	200	300	N	70
SP069RXB	<20	50	10	N	N	1,000	500	N	100
SP070RXA	N	100	N	N	N	200	300	N	70
SP070RXB	20	20	>20,000	N	N	200	500	N	70
SP070RXC	N	20	15,000	N	N	100	150	N	30
SP070RXD	N	15	>20,000	N	N	700	150	N	30
SP070RXE	N	50	3,000	N	N	100	500	N	30
SP070RXF	N	30	3,000	N	N	N	500	N	30
SP070RXG	N	70	200	N	N	200	300	N	50
SP071RXA	<20	20	10	N	N	500	100	N	20
SP071RXB	N	100	10	N	N	500	300	N	70
SP073RX	N	10	70	N	N	N	700	N	N
SP075RX	N	50	20	N	N	N	1,000	50	100

Table 5. Spectrographic results from the analysis of rocks from South Providence Mountains Wilderness Study Area, California

Sample	Zn-ppm s	Th-ppm s	Au-ppm aa	Hg-ppm inst	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa
SP001RX	N	N	N	<.02	N	40	N	N	N
SP002RX	N	N	N	.04	N	70	N	N	1
SP003RXA	N	N	<.05	.02	N	75	N	N	N
SP003RXB	N	N	N	.14	N	50	N	N	N
SP003RXC	N	N	.15	.04	N	50	N	N	N
SP004RXA	N	N	N	<.02	N	75	N	N	N
SP004RXB	N	N	N	.02	N	5	N	N	N
SP007RX	N	N	N	<.02	N	65	N	N	N
SP010RX	N	N	N	<.02	N	<5	N	N	N
SP050RX	N	N	<.05	.10	N	30	N	N	2
SP054RXA	N	N	<.05	.18	N	65	N	N	N
SP054RXB	N	N	<.05	.04	5	20	N	N	N
SP063RXA	N	N	<.05	.06	N	5	N	N	2
SP063RXB	N	N	<.05	1.50	<5	10	N	N	5
SP063RXC	N	N	N	.10	25	10	N	N	2
SP063RXD	N	N	11.00	.22	10	15	N	44	N
SP065RXA	1,500	N	<.05	.10	N	400	N	N	2
SP065RXB	700	N	N	.08	N	400	N	N	2
SP065RXC	N	N	N	<.02	N	35	N	N	3
SP065RXD	N	N	N	.02	10	<5	N	N	N
SP065RXE	N	N	.30	.28	N	65	.7	4	N
SP065RXF	N	N	N	.04	N	70	.1	N	N
SP065RXY	N	N	.40	1.50	N	50	N	72	N
SP065RXZ	N	N	.65	4.00	N	80	.2	104	N
SP066RX	<200	N	N	.02	N	80	N	N	N
SP068RXA	N	N	N	.02	65	25	N	N	N
SP068RXB	N	N	N	<.02	100	20	N	N	N
SP068RXC	N	N	N	.02	55	20	N	N	N
SP068RXD	N	N	N	<.02	N	15	N	N	N
SP068RXE	N	N	<.05	.02	N	10	N	N	N
SP068RXF	N	N	N	.02	30	20	N	N	N
SP068RXG	N	N	N	<.02	15	15	N	N	N
SP069RXA	N	N	<.05	.02	N	20	N	N	N
SP069RXB	N	N	<.05	<.02	N	10	N	N	1
SP070RXA	N	<100	N	.02	N	15	N	N	2
SP070RXB	2,000	<100	.50	.08	5	220	3.8	N	N
SP070RXC	5,000	N	.05	.06	25	1,200	14.0	2	N
SP070RXD	7,000	N	2.50	.31	15	1,200	25.0	30	2
SP070RXE	N	N	.05	.02	15	65	N	N	N
SP070RXF	N	N	N	<.02	10	110	N	N	N
SP070RXG	N	N	N	<.02	10	110	.5	N	N
SP071RXA	N	N	N	.02	N	25	N	N	N
SP071RXB	200	N	<.05	.04	N	150	N	N	N
SP073RX	N	N	N	.02	N	5	N	N	N
SP075RX	N	N	N	.02	10	10	N	N	N

Table 5. Spectrographic results from the analysis of rocks from South Providence Mountains Wilderness Study Area, California--continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
SP080RXA	34 49 45	115 34 51	5.0	.10	.10	.020	50	30.0	N	N
SP080RXB	34 49 45	115 34 51	.5	.07	<.05	.005	200	N	N	N
SP082RX	34 51 35	115 31 37	7.0	.10	.05	.100	50	2.0	N	N
SP101RX	34 54 49	115 32 32	7.0	3.00	7.00	1.000	2,000	N	N	N
SP107RX	34 52 45	115 35 28	15.0	10.00	15.00	>1.000	3,000	N	N	N

Table 5. Spectrographic results from the analysis of rocks from South Providence Mountains Wilderness Study Area, California--continued

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s
SP08CRXA	20	100	N	N	N	70	10	10,000	50	2,000
SP08ORXB	30	700	N	N	N	N	10	200	50	N
SP082RX	20	70	N	N	N	70	20	500	50	N
SP101RX	50	2,000	N	N	N	20	100	100	200	N
SP107EX	20	700	N	N	N	70	500	100	70	N

Table 5. Spectrographic results from the analysis of rocks from South Providence Mountains Wilderness Study Area, California--continued

Sample	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s
SP080RXA	N	10	10	N	N	N	50	N	10
SP080RXB	N	5	N	100	N	N	30	N	10
SP082PX	N	5	70	N	N	N	70	N	10
SP101RX	<20	20	50	N	N	300	200	N	100
SP107RX	N	200	10	N	N	1,000	300	N	70

Table 5. Spectrographic results from the analysis of rocks from South Providence Mountains Wilderness Study Area, California--continued

Sample	Zn-ppm s	Th-ppm s	Au-ppm aa	Hg-ppm inst	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa
SP080RXA	N	N	.10	.12	<5	70	N	<2	N
SP080RXB	N	N	N	<.02	N	10	N	N	N
SP082RX	N	N	.15	.06	N	15	N	2	N
SP101RX	N	N	<.05	<.02	N	40	N	N	N
SP107RX	N	N	N	.02	N	40	N	N	N