UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Spring Basin Wilderness Study Area (OR-005-009), Wheeler County, Oregon

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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 values, if any. 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 Spring Basin Wilderness Study Area (OR-005-009), Wheeler County, Oregon.

INTRODUCTION

In July 1987, The U.S. Geological Survey conducted a reconnaissance geochemical survey of the Spring Basin Wilderness Study Area (WSA), Wheeler County, Oregon.

The Spring Basin Wilderness Study Area comprises 5,982 acres (about 9 mi^2 or 23 km^2) in northcentral Oregon. The study area is located 2 mi (km) southeast of Clarno, Oregon along the east side of the John Day River. The west side of the WSA is accessible by county road extending south from State Highway 218. The rugged interior of the study area is accessed by private ranch roads.

The terrain in the study area consists of moderately steep and rugged volcanic uplands, the elevation ranging from 1,300 ft (396 m) near the John Day River to 2,829 ft (862 m) on Horse Mountain.

The Spring Basin Wilderness Study Area is located in the northwestern Blue Mountains physiographic province of northcentral Oregon. The study area is primarily underlain by Eocene and early Oligocene age onlapping andesitic flows, plugs, and domes and associated intertonguing volcaniclastic rocks of the Clarno formation (Merriam, 1901; Swanson, 1969). Rhyolitic ash-flow tuff of the Oligocene age John Day Formation unconformably overlies these rocks in a small part of the study area. Mesozoic marine sedimentary basement rocks have been encountered in numerous holes drilled in the vicinity, and similar rocks are probably present a few thousand feet beneath the study area. Structurally the study area is quite simple; the rocks are generally tilted less than 5° and are cut by a few small displacement normal faults. An area of silicic and argillic alteration occurs north of Breo Flat.

METHODS OF STUDY

Sample Media

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. Heavy-mineral-concentrate samples provide information about the chemistry of certain minerals in rock material eroded from the drainage basin upstream from each sample site. The selective concentration of minerals, many of which may be ore related, permits determination of some elements that are not easily detected in stream-sediment samples.

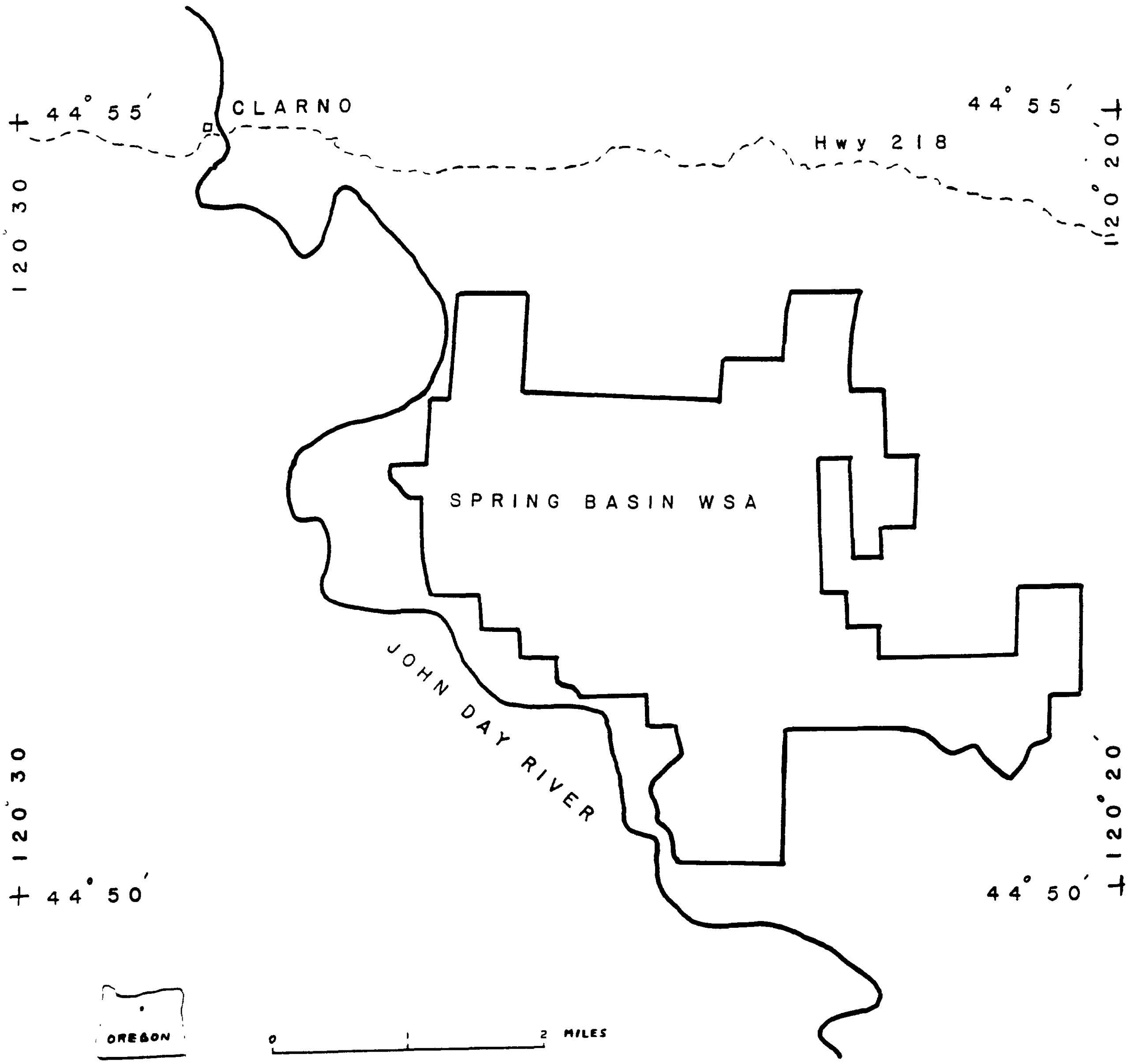

Figure 1. Location map of the Spring Basin Wilderness Study Area (OR-005-009), Wheeler County, Oregon.

Analyses of unaltered or unmineralized rock samples provide background geochemical data for individual rock units. On the other hand, analyses of altered or mineralized rocks, where present, may provide useful geochemical information about the major- and trace-element assemblages associated with a mineralizing system.

Sample Collection

Samples were collected at 60 sites (plate 1). Stream-sediment samples were collected at 28 of those sites and heavy-mineral-concentrate samples were collected at 22 of the stream-sediment sample sites. Eighteen rock samples, which were thought to be altered or mineralized, were collected from stream beds or from float (loose surface rock) at 13 sites, 11 of which were also stream-sediment sample sites, and two from sites where no other sample types were collected. An additional 31 rock samples were collected. Descriptions of the rock samples and their sources are given in table 6.

Stream-sediment samples

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 map (plate 1). Each sample was composited from several localities within an area that may extend as much as 20 ft from the site plotted on the map.

Heavy-mineral-concentrate samples

Heavy-mineral-concentrate samples were collected from the same active alluvium as the stream-sediment samples. Each bulk sample was screened with a 2.0-mm (10-mesh) screen to remove the coarse material. The less than 2.0-mm fraction was panned until most of the quartz, feldspar, organic material, and clay-sized material were removed.

Rock samples

Rock samples were collected from outcrops, stream beds, or float in the vicinity of the plotted site location. Descriptions of rock samples are in table 6.

Sample Preparation

The stream-sediment samples were air dried, then sieved using 30-mesh (0.59-mm) stainless-steel sieves. The portion of the sediment passing through the sieve was saved for analysis.

After air drying, bromoform (specific gravity 2.8) was used to remove the remaining quartz and feldspar from the heavy-mineral-concentrate samples that had been panned in the field. The resultant heavy-mineral sample was separated into three fractions using a large electromagnet (in this case a modified Frantz Isodynamic Separator). The most magnetic material, primarily magnetite, was not analyzed. The second fraction, largely ferromagnesian silicates and iron oxides, was saved for archival storage. The third fraction (the least magnetic material which may include the nonmagnetic ore minerals, zircon, sphene, etc.) was split using a Jones splitter. One split was hand ground for spectrographic analysis; the other split was saved for mineralogical analysis. These magnetic separates are the same separates that would be produced by using a Frantz Isodynamic Separator set at a slope of 15° and a tilt of 10° with a current of 0.2 ampere to remove the magnetite and ilmenite, and a current of 0.6 ampere to split the remainder of the sample into paramagnetic and nonmagnetic fractions.

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

Sample Analysis

Spectrographic method

The stream-sediment, heavy-mineral-concentrate, and rock samples were analyzed for 35 elements using semiquantitative, direct-current arc emission spectrographic methods. In addition, heavy-mineral-concentrate samples were also scanned for platinum (Pt) and palladium (Pd). The analyses were performed using a modification of the methods of Grimes and Marranzino (1968), and of Myers and others (1961). 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). Values determined for the major elements, iron, magnesium, calcium, titanium, sodium, and phosphorus, are given in weight percent; all others are given in parts per million (micrograms/gram). Analytical data for samples from the Spring Basin Wilderness Study Area are listed in tables 3, 4, and 5.

Chemical methods

Samples from this study area were also analyzed by atomic absorption (AA), and inductively couped plasma-atomic emission spectroscopy (ICP). Stream-sediment and rock samples were analyzed for gold (Au), and mercury (Hg) using atomic absorption spectroscopy and for arsenic (As), antimony (Sb), zinc (Zn), bismuth (Bi) and cadmium (Cd) using inductively coupled plasma-atomic emission spectroscopy. See table 2 for a more detailed summary of these chemical methods.

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

DATA STORAGE SYSTEM

Upon completion of the analytical work, the results were entered into a U.S. Geological Survey Branch of Geochemistry computer data base called PLUTO. 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 (STATPAC, VanTrump and Miesch, 1977) for computerized statistical analysis or publication.

DESCRIPTION OF DATA TABLES

Tables 3-5 list the results of analyses for the samples of stream sediment, heavy-mineral concentrate, and rock, respectively. For the three tables, 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 map (plate 1). Columns in which the element headings show the letter "s" below the element symbol are emission spectrographic analyses; "aa" indicates atomic absorption analyses and "icp" indicates inductively coupled plasma-atomic emission spectroscopy. 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. For emission spectrographic analyses, a "less than" symbol (<) entered in the tables in front of the lower limit of determination indicates that an element was observed but was below the lowest reporting value. For AA and ICP analyses, a "less than" symbol (<) entered in the tables in front of the lower limit of determination indicates that an element was below the lowest reporting value. 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 tables 3-5 in place of an analytical value. Because of the formatting used in the computer program that produced table 5, some of the elements listed (Fe, Mg, Ca, Ti, Na, 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.

ACKNOWLEDGMENTS

Several of our colleagues also participated in preparation and analyses of these samples: preparation, Tom Peacock and Bob McGregor; analyses, Al Love and David Fey; data retrieval, Mary Lou Tompkins.

REFERENCES CITED

Crock, J.G., Briggs, P.H., Jackson, L.L., and Lichte, F.E., 1987, Analytical methods for the analysis of stream sediments and rocks from wilderness study areas: U.S. Geological Survey Open-File Report 87-84, 35 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.

Koirtyohann, S.R., and Khalil, Moheb, 1976, Variables in the determination of mercury by cold vapor atomic absorption: Analytical Chemistry, 48, p. 136-139.

Merriam, J.C., 1901, Geologic section through the John Day Basin [abs.]: Geological Society of America Bulletin, v. 12, p. 496-497.

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.

Myers, A.T., Havens, R.G., and Dunton, P.J., 1961, A spectrochemical method for the semiquantitative analyses of rocks, minerals, and ores: U.S. Geological Survey Bulletin 1084-I, p. 1207-1229.

Swanson, D.A., 1969, Reconnaissance geologic map of the east half of the Bend quadrangle, Crook, Wheeler, Jefferson, Wasco, and Deschutes Counties, Oregon: U.S. Geological Survey Miscellaneous Field Studies Map I-568, scale 1:250,000.

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., 1977, 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 rocks and stream sediments, based on a 10-mg sample**

[The values shown are the lower limits of determination assigned by the Grimes and Marranzino method. The spectrographic limits of determination for heavy-mineral-concentrate samples are based on a 5-mg sample, and are therefore two reporting intervals higher than the limits given for rocks.]

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
Sodium (Na)	.2	5
Phosphorus (P)	.2	10
	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)	10	2,000
Chromium (Cr)	10	5,000
Gallium (Ga)	5	500
Germanium (Ge)	10	100
Copper (Cu)	5	20,000
Lanthanum (La)	50	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)	20	10,000
Yttrium (Y)	10	2,000
Zinc (Zn)	200	10,000
Zirconium (Zr)	10	1,000
Thorium (Th)	100	2,000
Palladium (Pd)*	2	500
Platinum (Pt)*	10	500

*Scanned on heavy-mineral-concentrate samples only, reported only if detected.

TABLE 2.--Chemical methods used

[AA = atomic absorption and ICP = inductively coupled plasma-atomic emission spectroscopy]

Element or constituent determined	Sample type	Method	Determination limit (micrograms/ gram or ppm)	Reference
Gold (Au)	rock, and stream sediment	AA	.1	Modification of Thompson and others, 1968.
Mercury (Hg)	rock, and stream sediment	AA	0.02	Koirtyohann and Khalil, 1976.
Arsenic (As)	rock, and stream sediment	ICP	5	Crock and others, 1987.
Antimony (Sb)	rock, and stream sediment	ICP	2	
Zinc (Zn)	rock, and stream sediment	ICP	2	
Bismuth (Bi)	rock, and stream sediment	ICP	2	
Cadmium (Cd)	rock, and stream sediment	ICP	0.1	

TABLE 3. RESULTS OF ANALYSES OF STREAM SEDIMENTS COLLECTED FROM THE SPRING BASIN BLM WILDERNESS STUDY AREA, WHEELER COUNTY, OREGON.

Sample	Latitude	Longitude	Fe-% s	Mg-% s	Ca-% s	Ti-% s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s
SB001S	44 51 13	120 23 33	5	.7	1.5	.7	1,000	N	N	N	10	300	1.5	N	N
SB002S	44 51 37	120 20 25	5	.7	2.0	.5	1,000	N	N	N	<10	200	1.5	N	N
SB003S	44 51 22	120 20 20	3	.7	1.5	.3	1,000	N	N	N	<10	200	1.5	N	N
SB004S	44 51 15	120 20 37	5	.7	1.5	.7	1,000	N	N	N	10	300	1.5	N	N
SB005S	44 51 2	120 20 47	3	.7	1.5	.3	1,000	N	N	N	10	300	1.5	N	N
SB006S	44 51 5	120 20 53	3	.7	1.5	.3	700	N	N	N	<10	300	1.5	N	N
SB007S	44 51 7	120 20 55	3	1.0	1.5	.5	1,000	N	N	N	<10	300	1.5	N	N
SB008S	44 50 54	120 21 18	3	1.0	1.5	.3	1,000	N	N	N	<10	200	1.5	N	N
SB010S	44 51 13	120 23 7	3	1.0	1.5	.3	700	N	N	N	<10	300	1.5	N	N
SB011S	44 51 18	120 23 7	3	1.0	2.0	.5	1,000	N	N	N	<10	300	1.5	N	N
SB012S	44 53 58	120 26 2	5	1.5	2.0	.5	1,000	N	N	N	<10	300	1.0	N	N
SB013S	44 53 17	120 26 7	3	1.5	1.5	.3	1,000	N	N	N	<10	300	1.0	N	N
SB014S	44 52 32	120 26 9	7	1.5	1.5	.7	1,500	N	N	N	<10	300	1.5	N	N
SB015S	44 52 32	120 26 5	5	1.5	2.0	.5	1,500	N	N	N	<10	300	1.0	N	N
SB016S	44 52 11	120 26 18	3	1.0	1.5	.3	1,000	N	N	N	<10	300	1.0	N	N
SB017S	44 51 32	120 25 40	3	1.0	2.0	.3	700	N	N	N	<10	500	1.5	N	N
SB018S	44 51 30	120 25 22	3	1.5	2.0	.5	1,000	N	N	N	<10	300	1.5	N	N
SB019S	44 51 55	120 23 25	3	1.0	2.0	.5	1,000	N	N	N	<10	300	1.5	N	N
SB020S	44 52 2	120 23 43	3	1.0	1.5	.3	700	N	N	N	<10	300	1.5	N	N
SB021S	44 52 38	120 23 19	5	.7	1.5	.5	700	N	N	N	<10	300	1.5	N	N
SB022S	44 52 40	120 23 22	5	.7	1.5	.5	700	N	N	N	<10	300	1.5	N	N
SB024S	44 51 44	120 24 13	3	.7	1.5	.3	700	N	N	N	10	500	1.5	N	N
SB025S	44 51 51	120 24 35	3	1.5	3.0	.3	1,000	N	N	N	<10	300	1.5	N	N
SB026S	44 52 31	120 24 40	5	1.0	1.5	.5	700	N	N	N	<10	300	1.5	N	N
SB027S	44 52 40	120 24 48	5	2.0	2.0	.5	1,000	N	N	N	<10	300	1.0	N	N
SB028S	44 52 27	120 24 50	5	.7	1.5	.5	700	N	N	N	10	500	1.5	N	N
SB029S	44 52 12	120 24 45	5	.7	1.5	.3	700	N	N	N	10	300	1.5	N	N
SB030S	44 50 53	120 23 55	3	.7	1.5	.5	700	N	N	N	10	200	1.5	N	N
ASHWOOD	44 45 5	120 40 10	3	.3	1.5	.3	700	N	N	N	<10	300	1.5	N	N

TABLE 3. RESULTS OF ANALYSES OF STREAM SEDIMENTS COLLECTED FROM THE SPRING BASIN BLM WILDERNESS STUDY AREA, WHEELER COUNTY, OREGON.--Continued

Sample	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s
SB001S	15	20	20	N	N	<20	20	10	N	15	N	500	200	N
SB002S	15	20	30	N	N	<20	20	<10	N	10	N	500	150	N
SB003S	15	20	30	N	N	<20	20	<10	N	7	N	300	150	N
SB004S	20	20	70	N	<5	<20	20	10	N	10	N	200	150	N
SB005S	15	20	30	N	N	<20	20	<10	N	7	N	300	150	N
SB006S	15	30	30	N	N	<20	20	<10	N	7	N	500	150	N
SB007S	15	30	30	N	N	<20	20	<10	N	7	N	500	150	N
SB008S	20	30	50	N	N	<20	30	<10	N	7	N	300	100	N
SB010S	15	20	30	N	N	<20	20	<10	N	7	N	300	100	N
SB011S	20	70	30	N	N	<20	30	<10	N	10	N	700	200	N
SB012S	20	300	50	N	N	<20	70	10	N	10	N	300	150	N
SB013S	15	150	50	N	N	<20	50	<10	N	7	N	200	150	N
SB014S	30	200	50	N	N	<20	50	<10	N	15	N	500	300	N
SB015S	20	200	70	N	N	<20	50	<10	N	15	N	300	150	N
SB016S	15	100	50	N	N	<20	30	15	N	15	N	200	150	N
SB017S	15	100	30	N	N	<20	50	<10	N	15	N	500	150	N
SB018S	15	150	50	N	N	<20	70	<10	N	10	N	300	150	N
SB019S	15	70	30	N	N	<20	30	<10	N	10	N	500	150	N
SB020S	15	100	30	N	N	<20	30	15	N	7	N	150	100	N
SB021S	20	70	30	N	N	<20	20	<10	N	7	N	500	200	N
SB022S	20	70	30	N	N	<20	20	10	N	10	N	300	150	N
SB024S	15	50	30	N	N	<20	20	10	N	10	N	300	150	N
SB025S	20	200	30	N	N	<20	70	<10	N	15	N	500	150	N
SB026S	20	100	30	N	N	N	50	10	N	15	N	500	200	N
SB027S	30	200	50	N	N	N	50	<10	N	15	N	300	300	N
SB028S	15	100	30	N	N	N	30	10	N	15	N	300	150	N
SB029S	20	150	50	N	N	N	50	10	N	15	N	150	150	N
SB030S	15	20	30	N	N	N	20	10	N	10	N	200	100	N
ASHWOOD	10	30	50	N	N	N	20	10	N	15	N	<100	70	N

TABLE 3. RESULTS OF ANALYSES OF STREAM SEDIMENTS COLLECTED FROM THE SPRING BASIN BLM WILDERNESS STUDY AREA, WHEELER COUNTY, OREGON.--Continued

Sample	Y-ppm s	Zn-ppm s	Zr-ppm s	Ga-ppm s	Ge-ppm s	Na-% s	P-% s	Th-ppm s	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp	Hg-ppm aa	Au-ppm aa
SB001S	15	N	100	15	N	2.0	N	N	<5	<2	.3	<2	70	.02	<.002
SB002S	10	N	70	15	N	1.5	N	N	<5	<2	.5	<2	70	.16	<.002
SB003S	10	N	100	10	N	1.5	N	N	7	<2	.4	<2	63	.16	.004
SB004S	10	N	100	15	N	1.5	N	N	44	<2	.8	<2	80	.30	.035
SB005S	10	N	100	15	N	1.5	N	N	6	<2	.4	<2	45	.02	<.002
SB006S	10	N	100	15	N	1.5	N	N	<5	<2	.4	<2	45	.04	.005
SB007S	10	N	100	10	N	1.5	N	N	<5	<2	.6	<2	54	.04	<.002
SB008S	10	N	100	10	N	1.5	N	N	<5	<2	.5	<2	63	.14	<.002
SB010S	10	N	100	10	N	1.5	N	N	<5	<2	.3	<2	51	<.02	<.002
SB011S	10	N	100	15	N	2.0	N	N	<5	<2	.4	<2	49	<.02	<.002
SB012S	15	N	100	10	N	1.5	N	N	<5	<2	.7	<2	49	<.02	<.002
SB013S	10	N	100	10	N	1.5	N	N	<5	<2	.8	<2	56	<.02	<.002
SB014S	15	N	100	10	N	1.5	N	N	<5	<2	.7	<2	78	<.02	<.002
SB015S	15	N	100	10	N	1.5	N	N	<5	<2	.6	<2	53	<.02	<.002
SB016S	10	N	70	7	N	1.5	N	N	<5	<2	.6	<2	49	.02	<.002
SB017S	15	N	150	10	N	2.0	N	N	<5	<2	.6	<2	57	<.02	<.002
SB018S	15	N	100	10	N	1.5	N	N	<5	<2	.6	<2	53	<.02	<.002
SB019S	10	N	100	15	N	2.0	N	N	<5	<2	.4	<2	54	<.02	<.002
SB020S	10	N	70	7	N	1.5	N	N	<5	<2	.5	<2	45	.04	<.002
SB021S	15	N	100	10	N	1.5	N	N	<5	<2	.4	<2	57	<.02	<.002
SB022S	15	N	100	10	N	1.5	N	N	<5	<2	.7	<2	58	<.02	<.002
SB024S	15	N	100	10	N	2.0	N	N	<5	<2	.5	<2	51	<.02	<.002
SB025S	15	N	100	10	N	1.5	N	N	<5	<2	.7	<2	43	<.02	<.002
SB026S	15	N	100	10	N	2.0	N	N	<5	<2	.5	<2	55	<.02	<.002
SB027S	10	N	100	10	N	1.5	N	N	<5	<2	.8	<2	58	<.02	<.002
SB028S	10	N	100	10	N	1.5	N	N	<5	<2	.5	<2	49	<.02	<.002
SB029S	30	N	100	10	N	1.5	N	N	<5	<2	.8	<2	55	<.02	<.002
SB030S	15	N	100	10	N	1.5	N	N	<5	<2	.5	<2	49	<.02	<.002
ASHWOOD	15	N	100	7	N	.7	N	N	19	<2	.9	7	84	.20	.004

Table 4. Results Of Analyses Of Heavy-Mineral-Concentrate Samples Collected From The Spring Basin BLM Wilderness Study Area, Wheeler County, Oregon.

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

Sample	Latitude	Longitude	Fe-% s	Mg-% s	Ca-% s	Ti-% s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
SB001C	44 51 13	120 23 33	.7	.20	10	.10	150	N	N	N	20	700
SB003C	44 51 22	120 20 20	1.0	.20	7	.70	150	N	N	N	20	>10,000
SB005C	44 51 2	120 20 47	1.0	.20	7	1.00	150	N	N	N	20	>10,000
SB007C	44 51 7	120 20 55	1.0	.20	7	.20	150	N	N	N	N	1,000
SB008C	44 50 54	120 21 18	1.0	.15	10	.07	150	N	N	N	N	>10,000
SB010C	44 51 13	120 23 7	.7	.15	10	.07	150	N	N	N	N	500
SB011C	44 51 18	120 23 7	.7	.15	10	.07	150	N	N	N	N	300
SB012C	44 53 58	120 26 2	.7	.15	10	.15	150	N	N	N	N	300
SB013C	44 53 17	120 26 7	.7	.15	15	.15	200	N	N	N	20	300
SB014C	44 52 32	120 26 9	.7	.10	10	.10	150	N	N	N	N	300
SB015C	44 52 32	120 26 5	.7	.10	15	.07	300	N	N	N	N	1,500
SB017C	44 51 32	120 25 40	.7	.15	10	.07	150	N	N	N	N	500
SB019C	44 51 55	120 23 25	.7	.10	10	.05	100	N	N	N	N	300
SB020C	44 52 2	120 23 43	.7	.10	10	.05	150	N	N	N	20	300
SB021C	44 52 38	120 23 19	.7	.15	10	.10	150	N	N	N	20	300
SB022C	44 52 40	120 23 22	.7	.15	15	.20	200	N	N	N	N	300
SB024C	44 51 44	120 24 13	.7	.15	10	.15	100	N	N	N	20	300
SB025C	44 51 51	120 24 35	.7	.20	20	.20	300	N	N	N	20	300
SB026C	44 52 31	120 24 40	.5	.10	15	.07	150	N	N	N	N	300
SB027C	44 52 40	120 24 48	.7	.15	15	.10	200	N	N	N	20	300
SB028C	44 52 27	120 24 50	.7	.15	10	.15	150	N	N	N	20	300
SB030C	44 50 53	120 23 55	.7	.15	15	.07	700	N	N	N	20	300

Table 4. Results Of Analyses Of Heavy-Mineral-Concentrate Samples Collected From The Spring Basin BLM Wilderness Study Area, Wheeler County, Oregon.--Continued

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	Sb-ppm s
SB001C	2	N	N	N	<20	15	<100	N	<50	N	<20	N
SB003C	2	N	N	N	<20	15	N	N	<50	N	<20	N
SB005C	2	N	N	N	<20	15	N	N	<50	N	150	N
SB007C	2	N	N	N	<20	15	N	N	<50	N	20	N
SB008C	N	N	N	N	<20	10	<100	N	<50	N	30	N
SB010C	3	N	N	N	<20	<10	<100	N	<50	N	<20	N
SB011C	N	N	N	N	<20	15	<100	N	<50	N	7,000	N
SB012C	2	N	N	N	<20	10	<100	N	<50	N	300	N
SB013C	3	N	N	N	<20	15	<100	N	<50	N	20	N
SB014C	3	N	N	N	<20	20	N	N	<50	N	1,500	N
SB015C	3	N	N	N	<20	150	100	70	<50	N	20	N
SB017C	3	N	N	N	<20	20	<100	N	<50	N	500	N
SB019C	2	N	N	N	<20	<10	N	N	<50	N	N	N
SB020C	2	N	N	N	<20	<10	N	N	<50	N	N	N
SB021C	2	N	N	N	<20	30	N	N	<50	N	N	N
SB022C	2	N	N	N	<20	<10	150	50	<50	N	N	N
SB024C	2	N	N	N	<20	<10	N	N	<50	N	N	N
SB025C	2	N	N	N	20	<10	150	N	<50	N	N	N
SB026C	N	N	N	N	<20	<10	N	N	<50	N	N	N
SB027C	3	N	N	N	<20	30	<100	N	<50	N	<20	N
SB028C	2	N	N	N	<20	<10	N	N	<50	N	N	N
SB030C	7	N	N	N	<20	20	150	15	<50	N	70	N

Table 4. Results Of Analyses Of Heavy-Mineral-Concentrate Samples Collected From The Spring Basin BLM Wilderness Study Area, Wheeler County, Oregon.--Continued

Sample	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Ga-ppm s	Ge-ppm s	Na-% s	P-% s	Th-ppm s
SB001C	<10	N	1,500	20	N	100	N	>2,000	20	N	3	2.0	N
SB003C	10	N	3,000	50	N	70	N	>2,000	15	N	3	1.5	N
SB005C	15	N	2,000	70	N	100	N	>2,000	20	N	3	1.5	N
SB007C	<10	N	1,000	20	N	70	N	>2,000	20	N	3	1.5	N
SB008C	10	N	5,000	<20	N	150	N	>2,000	20	N	3	2.0	N
SB010C	<10	N	1,500	<20	N	150	N	>2,000	20	N	3	1.5	N
SB011C	N	N	1,500	<20	N	150	N	>2,000	30	N	3	3.0	N
SB012C	10	N	1,000	<20	N	150	N	>2,000	15	N	3	3.0	N
SB013C	15	N	1,000	20	N	200	N	>2,000	15	N	3	3.0	N
SB014C	<10	N	1,000	<20	N	150	N	>2,000	20	N	3	1.5	N
SB015C	15	N	1,500	30	N	300	N	>2,000	20	N	3	5.0	N
SB017C	10	N	1,000	<20	N	150	N	>2,000	30	N	3	2.0	N
SB019C	N	N	2,000	<20	N	70	N	>2,000	30	N	3	1.5	N
SB020C	N	N	1,500	<20	N	150	N	>2,000	20	N	3	2.0	N
SB021C	<10	N	1,500	<20	N	100	N	>2,000	20	N	3	2.0	N
SB022C	15	N	1,000	20	N	300	N	>2,000	20	N	2	7.0	N
SB024C	N	N	1,500	<20	N	70	N	>2,000	30	N	3	1.0	N
SB025C	10	N	1,500	20	N	200	N	>2,000	15	N	2	7.0	N
SB026C	N	N	1,500	N	N	100	N	>2,000	20	N	3	2.0	N
SB027C	10	N	1,500	20	N	200	N	>2,000	20	N	3	3.0	N
SB028C	N	N	1,500	<20	N	70	N	>2,000	20	N	3	1.5	N
SB030C	10	N	1,000	20	N	300	N	>2,000	15	N	3	3.0	N

TABLE 5. RESULTS OF ANALYSES OF ROCK SAMPLES COLLECTED FROM THE SPRING BASIN BLM WILDERNESS STUDY AREA, WHEELER COUNTY, OREGON.

Sample	Latitude	Longitude	Fe-%	Mg-%	Ca-%	Ti-%	Mn-ppm	Ag-ppm	As-ppm	Au-ppm	B-ppm	Ba-ppm	Be-ppm	Bi-ppm
			s	s	s	s	s	s	s	s	s	s	s	s
SSB-1	44 53 22	120 26 4	7.00	7.00	1.50	.300	1,000	N	N	N	<10	700	2.0	N
SSB-2	44 53 21	120 25 41	5.00	7.00	1.50	.300	1,000	N	N	N	<10	700	2.0	N
SSB-3	44 53 24	120 25 33	7.00	2.00	5.00	.500	1,000	N	N	N	<10	300	1.0	N
SSB-4	44 51 22	120 24 33	5.00	3.00	1.50	.300	700	N	N	N	<10	1,000	2.0	N
SSB-5	44 51 52	120 23 56	5.00	7.00	2.00	.300	700	N	N	N	<10	700	2.0	N
SSB-6	44 51 57	120 23 22	5.00	15.00	2.00	.300	1,000	N	N	N	<10	500	2.0	N
SSB-7	44 51 19	120 23 43	5.00	1.00	2.00	.300	700	N	N	N	20	700	1.5	N
SSB-8	44 51 13	120 23 5	5.00	1.00	1.50	.300	500	N	N	N	<10	500	1.5	N
SSB-9	44 53 19	120 23 37	2.00	.20	.70	.300	1,500	N	N	N	20	1,500	5.0	N
SSB-10	44 51 47	120 21 29	5.00	1.00	1.50	.300	700	N	N	N	<10	700	2.0	N
SSB-11	44 51 38	120 20 57	5.00	15.00	2.00	.300	500	N	N	N	<10	500	1.5	N
SSB-12	44 50 54	120 21 12	7.00	15.00	3.00	.300	1,000	N	N	N	<10	500	1.5	N
SSB-13	44 51 27	120 22 19	5.00	1.00	1.50	.300	700	N	N	N	<10	500	1.5	N
SSB-14	44 51 21	120 23 7	.05	1.00	20.00	.010	500	N	N	N	N	<20	N	N
SSB-15	44 51 20	120 20 31	3.00	2.00	7.00	.200	1,500	N	N	N	<10	1,500	N	N
SSB-16	44 51 23	120 20 32	1.50	2.00	20.00	.002	700	N	N	N	N	150	N	N
SSB-17	44 51 24	120 20 25	3.00	15.00	1.50	.200	500	N	N	N	20	150	1.0	N
SSB-18	44 50 25	120 23 10	7.00	15.00	3.00	.300	1,000	N	N	N	<10	500	1.5	N
87JA001	44 52 32	120 24 45	7.00	3.00	5.00	.300	1,500	N	N	N	10	300	1.0	N
87JA003	44 51 58	120 24 47	5.00	1.00	2.00	.300	500	N	N	N	<10	500	1.5	N
87JA004	44 51 24	120 24 32	5.00	7.00	2.00	.300	700	N	N	N	<10	700	3.0	N
87JA005	44 53 1	120 25 26	7.00	15.00	3.00	.300	1,000	N	N	N	10	700	1.5	N
87JA006A	44 53 19	120 23 37	3.00	2.00	1.00	.300	1,000	N	N	N	15	1,500	5.0	N
87JA007	44 52 42	120 22 55	7.00	15.00	3.00	.500	700	N	N	N	10	700	1.0	N
87JA008	44 52 50	120 22 13	5.00	1.00	3.00	.300	700	N	N	N	<10	700	3.0	N
87JA009	44 51 8	120 24 6	1.00	15.00	.30	.020	50	N	N	N	15	100	3.0	N
87JA010	44 51 18	120 20 32	.10	2.00	.20	.300	30	N	N	N	30	200	3.0	N
87JA011	44 51 23	120 20 35	1.00	<.02	.05	.300	30	N	N	N	10	70	3.0	N
87JA012	44 51 47	120 25 57	3.00	7.00	1.50	.300	1,000	N	N	N	<10	700	3.0	N
87JA006B	44 53 19	120 23 37	7.00	3.00	.50	.150	500	N	N	N	20	500	15.0	<10
87JA002	44 52 7	120 24 22	7.00	3.00	5.00	1.000	700	N	N	N	N	300	3.0	N
SB001R1	44 51 13	120 23 33	2.00	.70	1.00	.300	300	N	N	N	N	300	1.5	N
SB001R2	44 51 13	120 23 33	3.00	.50	3.00	.700	700	N	N	N	N	300	1.5	N
SB003R1	44 51 22	120 20 20	3.00	.20	3.00	.500	70	N	N	N	50	300	1.0	N
SB004R1	44 51 15	120 20 37	3.00	.30	3.00	.500	70	N	N	N	100	150	N	N
SB008R1	44 50 54	120 21 18	3.00	.30	2.00	.300	70	N	N	N	N	300	1.0	N
SB009R1	44 51 4	120 20 38	3.00	1.00	15.00	.300	70	N	N	N	N	70	N	N
SB009R2	44 51 20	120 20 37	3.00	.70	3.00	.500	70	N	N	N	N	150	N	N
SB010R1	44 51 13	120 23 7	1.50	.07	15.00	.050	20	N	N	N	N	150	1.0	N
SB012R1	44 53 58	120 26 2	.10	.07	>20.00	.015	500	N	N	N	N	N	N	N
SB013R1	44 53 17	120 26 7	3.00	1.00	15.00	.300	500	N	N	N	N	300	1.5	N
SB013R2	44 53 17	120 26 7	3.00	.70	15.00	.300	700	N	N	N	N	500	1.5	N
SB019R1	44 51 55	120 23 25	1.50	.70	2.00	.300	500	N	N	N	N	300	1.0	N
SB019R2	44 51 55	120 23 25	3.00	1.50	2.00	.500	700	N	N	N	N	200	1.5	N
SB022R1	44 52 40	120 23 22	1.00	.10	3.00	.150	500	N	N	N	15	1,000	3.0	N

TABLE 5. RESULTS OF ANALYSES OF ROCK SAMPLES COLLECTED FROM THE SPRING BASIN BLM WILDERNESS STUDY AREA, WHEELER COUNTY, OREGON.--Continued

Sample	Cd-ppm	Co-ppm	Cr-ppm	Cu-ppm	La-ppm	Mo-ppm	Nb-ppm	Ni-ppm	Pb-ppm	Sb-ppm	Sc-ppm	Sn-ppm	Sr-ppm	V-ppm	W-ppm
	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s
SSB-1	N	15	10	50	<50	N	<20	5	15	N	15	N	700	150	N
SSB-2	N	15	15	30	N	N	<20	10	15	N	7	N	700	100	N
SSB-3	N	50	300	70	N	N	20	70	<10	N	3	N	500	300	N
SSB-4	N	30	15	15	<50	N	<20	10	15	N	1	N	700	100	N
SSB-5	N	20	50	30	50	N	<20	50	15	N	1	N	500	150	N
SSB-6	N	30	50	30	<50	N	<20	30	15	N	15	N	700	150	N
SSB-7	N	20	15	20	N	N	<20	20	10	N	1	N	500	150	N
SSB-8	N	20	50	30	N	N	<20	20	<10	N	15	N	700	200	N
SSB-9	N	<10	10	20	70	N	<20	5	30	N	1	<10	100	50	N
SSB-10	N	15	20	15	<50	N	<20	10	15	N	1	<10	500	150	N
SSB-11	N	30	50	50	N	N	<20	30	10	N	1	<10	700	200	N
SSB-12	N	20	50	50	N	N	<20	50	<10	N	1	<10	700	150	N
SSB-13	N	20	30	20	N	N	<20	20	10	N	7	<10	1,000	150	N
SSB-14	N	N	<10	<5	N	N	<20	N	N	N	0	<10	<100	<10	N
SSB-15	N	<10	15	15	N	N	<20	5	<10	N	7	<10	1,000	70	N
SSB-16	N	N	N	<5	N	N	<20	<5	N	N	0	<10	2,000	10	N
SSB-17	N	15	15	70	N	<5	<20	10	10	N	7	<10	100	100	N
SSB-18	N	30	20	50	N	<5	20	20	10	N	1	<10	700	150	N
87JA001	N	50	500	50	N	<5	20	70	<10	N	3	<10	700	300	N
87JA003	N	15	20	15	N	<5	<20	10	10	N	7	<10	500	100	N
87JA004	N	10	10	15	N	<5	<20	5	10	N	1	<10	1,500	100	N
87JA005	N	50	70	30	N	N	<20	30	10	N	15	<10	500	300	N
87JA006A	N	<10	<10	15	70	N	20	<5	30	N	1	<10	150	50	N
87JA007	N	N	50	30	N	N	<20	30	10	N	15	N	700	150	N
87JA008	N	N	70	30	N	N	<20	30	10	N	15	N	700	150	N
87JA009	N	N	50	5	N	N	<20	5	N	N	N	N	<100	200	N
87JA010	N	20	20	<5	N	N	<20	<5	N	N	7	N	200	100	N
87JA011	N	15	<10	20	N	50	<20	<5	N	N	N	N	N	10	N
87JA012	N	20	10	15	N	N	<20	5	10	N	7	N	700	100	N
87JA006B	N	100	<10	15	50	N	<20	5	15	N	5	N	100	200	N
87JA002	N	N	700	70	50	N	20	200	N	N	2	N	1,000	300	N
SB001R1	N	<10	10	15	N	N	<20	<5	<10	N	7	N	500	70	N
SB001R2	N	15	<10	30	N	N	<20	<5	<10	N	7	N	700	70	N
SB003R1	N	7	20	50	N	N	<20	<5	N	N	10	N	300	70	N
SB004R1	N	N	15	5	N	5	<20	<5	N	N	7	N	<100	150	N
SB008R1	N	<10	50	50	N	N	<20	<5	N	N	10	N	300	100	N
SB009R1	N	N	15	30	N	N	<20	<5	N	N	10	N	<100	70	N
SB009R2	N	N	20	30	N	<5	<20	<5	N	N	10	N	<100	70	N
SB010R1	N	N	<10	15	N	7	<20	<5	N	N	N	N	300	20	N
SB012R1	N	N	10	<5	N	N	N	<5	<10	N	N	N	N	<10	N
SB013R1	N	2	10	15	N	N	<20	5	10	N	7	N	300	150	N
SB013R2	N	1	15	15	N	N	<20	<5	<10	N	7	N	300	70	N
SB019R1	N	1	10	15	N	N	<20	5	N	N	7	N	700	70	N
SB019R2	N	15	15	20	N	N	<20	10	N	N	7	N	500	70	N
SB022R1	N	N	<10	10	50	N	<20	<5	20	N	5	N	<100	20	N

TABLE 5. RESULTS OF ANALYSES OF ROCK SAMPLES COLLECTED FROM THE SPRING BASIN BLM WILDERNESS STUDY AREA, WHEELER COUNTY, OREGON.--Continued

Sample	Y-ppm s	Zn-ppm s	Zr-ppm s	Ga-ppm s	Ge-ppm s	Na-% s	P-% s	Th-ppm s	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp	Hg-ppm aa	Au-ppm aa
SSB-1	15	N	150	20	N	3.00	N	N	<5	<2	<.1	<2	66	<.02	<.05
SSB-2	10	N	150	15	N	3.00	N	N	<5	<2	.2	<2	52	<.02	<.05
SSB-3	15	N	70	20	N	2.00	N	N	<5	<2	.2	<2	25	<.02	<.05
SSB-4	15	N	150	15	N	3.00	N	N	<5	<2	.4	<2	53	<.02	<.05
SSB-5	30	N	200	20	N	3.00	N	N	<5	<2	.4	<2	53	<.02	<.05
SSB-6	15	N	150	20	N	3.00	N	N	<5	<2	<.1	<2	15	<.02	<.05
SSB-7	10	N	100	20	N	3.00	N	N	<5	<2	.2	<2	37	<.02	<.05
SSB-8	10	N	100	20	N	3.00	N	N	<5	<2	.3	<2	55	<.02	<.05
SSB-9	70	N	300	30	N	3.00	N	N	<5	<2	.1	<2	88	<.02	<.05
SSB-10	15	N	150	20	N	3.00	N	N	<5	<2	.1	<2	42	<.02	<.05
SSB-11	10	N	100	20	N	3.00	N	N	<5	<2	.4	<2	42	<.02	<.05
SSB-12	10	N	150	20	N	3.00	N	N	<5	2	.5	<2	56	<.02	<.05
SSB-13	10	N	70	20	N	3.00	N	N	<5	<2	.3	<2	38	.10	<.05
SSB-14	<10	N	N	N	N	.70	N	N	<5	<2	<.1	<2	<2	<.02	<.05
SSB-15	15	N	100	15	N	2.00	N	N	<5	<2	.8	<2	11	<.02	<.05
SSB-16	<10	N	N	<5	N	<.20	N	N	<5	<2	.4	<2	3	<.02	<.05
SSB-17	10	N	150	20	N	1.00	N	N	<5	<2	.5	<2	58	.26	<.05
SSB-18	15	N	150	20	N	2.00	N	N	<5	<2	.4	<2	58	<.02	<.05
87JA001	15	N	100	20	N	2.00	N	N	<5	<2	.4	<2	28	<.02	<.05
87JA003	10	N	100	20	N	3.00	N	N	<5	<2	.5	<2	55	<.02	<.05
87JA004	15	N	150	20	N	2.00	N	N	<5	<2	.3	<2	48	.04	<.05
87JA005	20	N	150	20	N	2.00	N	N	<5	<2	<.1	<2	16	<.02	<.05
87JA006A	200	N	300	30	N	3.00	N	N	<5	<2	.2	<2	77	<.02	<.05
87JA007	15	N	150	20	N	3.00	N	N	<5	<2	.2	<2	47	<.02	<.05
87JA008	15	N	150	20	N	3.00	N	N	<5	<2	.3	<2	42	<.02	<.05
87JA009	<10	N	10	N	N	<.20	N	N	<5	<2	<.1	<2	7	.02	<.05
87JA010	<10	N	150	30	N	1.50	N	N	<5	<2	<.1	<2	6	.04	<.05
87JA011	<10	N	150	N	N	<.20	N	N	34	<2	<.1	<2	3	.14	<.05
87JA012	10	N	100	20	N	2.00	N	N	<5	<2	.3	<2	49	<.02	<.05
87JA006B	100	<200	100	15	N	1.00	N	N	24	<2	.4	<2	84	<.02	<.05
87JA002	50	N	150	20	N	2.00	N	N	<5	<2	.6	<2	49	<.02	<.05
SB001R1	15	N	100	15	N	1.50	N	N	<5	<2	<.1	<2	33	<.02	<.05
SB001R2	15	N	200	20	N	2.00	N	N	<5	<2	.3	<2	61	.04	<.05
SB003R1	<10	N	100	15	N	1.50	N	N	--	--	--	--	--	--	--
SB004R1	10	N	150	15	N	1.50	N	N	11	<2	.3	<2	20	.22	<.05
SB008R1	<10	N	100	15	N	1.50	N	N	<5	<2	<.1	<2	16	.52	<.05
SB009R1	10	N	100	15	N	.30	N	N	<5	<2	.5	<2	42	.18	<.05
SB009R2	<10	N	150	15	N	1.50	N	N	5	<2	.4	<2	14	.14	<.05
SB010R1	N	N	20	N	N	.70	N	N	19	<2	.4	<2	5	.10	<.05
SB012R1	N	N	<10	N	N	.20	N	N	<5	<2	<.1	<2	2	<.02	<.05
SB013R1	15	N	100	15	N	2.00	N	N	<5	<2	.3	<2	38	.02	<.05
SB013R2	15	N	150	15	N	3.00	N	N	<5	<2	.3	<2	91	.02	<.05
SB019R1	10	N	70	7	N	1.00	N	N	<5	<2	.4	<2	30	.14	<.05
SB019R2	10	N	100	10	N	1.00	N	N	<5	<2	.4	<2	36	.10	<.05
SB022R1	50	N	300	15	N	2.00	N	N	<5	<2	<.1	<2	75	.02	<.05

TABLE 5. RESULTS OF ANALYSES OF ROCK SAMPLES COLLECTED FROM THE SPRING BASIN BLM WILDERNESS STUDY AREA, WHEELER COUNTY, OREGON.--Continued

Sample	Latitude	Longitude	Fe-% s	Mg-% s	Ca-% s	Ti-% s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s
SB023R1	44 52 11	120 23 28	3.00	.05	15.00	.015	500	N	N	N	10	100	7.0	N
SB023R2	44 52 11	120 23 28	3.00	.70	15.00	.300	700	N	N	N	N	500	1.5	N
SB025R1	44 51 51	120 24 35	2.00	1.00	2.00	.300	500	N	N	N	N	300	1.5	N
SB026R1	44 52 31	120 24 40	1.50	.70	2.00	.100	70	N	N	N	N	150	N	N
SB031R1	44 45 15	120 44 25	7.00	<.02	<.05	.050	70	30.0	200	N	N	300	N	N
SB031R2	44 45 15	120 44 25	3.00	.03	<.05	.070	100	70.0	N	N	N	300	N	N
SB031R3	44 45 15	120 44 25	2.00	.70	15.00	.300	1,000	1.0	N	N	N	300	1.5	N
SB032R1	44 45 5	120 40 10	1.00	.30	<.05	.500	30	.7	N	N	100	150	1.5	N
SB032R2	44 45 5	120 40 10	1.00	.15	7.00	.200	20	3.0	1,500	N	50	300	1.5	N
SB032R3	44 45 5	120 40 10	.20	<.02	<.05	.010	20	5.0	N	N	10	150	N	N

TABLE 5. RESULTS OF ANALYSES OF ROCK SAMPLES COLLECTED FROM THE SPRING BASIN BLM WILDERNESS STUDY AREA, WHEELER COUNTY, OREGON.--Continued

Sample	Cd-ppm	Co-ppm	Cr-ppm	Cu-ppm	La-ppm	Mo-ppm	Nb-ppm	Ni-ppm	Pb-ppm	Sb-ppm	Sc-ppm	Sn-ppm	Sr-ppm	V-ppm	W-ppm
	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s
SB023R1	N	<10	<10	15	N	N	20	<5	N	N	N	N	N	30	N
SB023R2	N	1	<10	20	N	N	<20	<5	<10	N	7	N	700	70	N
SB025R1	N	15	30	15	N	N	<20	10	<10	N	7	N	300	70	N
SB026R1	N	1	<10	15	N	N	<20	10	N	N	5	N	N	30	N
SB031R1	N	<10	<10	70	N	N	<20	<5	2,000	N	N	N	N	10	N
SB031R2	N	N	<10	200	N	N	<20	<5	3,000	100	N	N	N	10	N
SB031R3	N	1	15	30	N	N	<20	5	15	N	10	N	200	70	N
SB032R1	N	N	15	15	N	N	<20	<5	<10	N	10	N	N	70	N
SB032R2	N	N	<10	5	N	N	<20	<5	<10	150	7	N	N	30	N
SB032R3	N	N	<10	<5	N	N	N	<5	20	<100	N	N	N	N	N

TABLE 5. RESULTS OF ANALYSES OF ROCK SAMPLES COLLECTED FROM THE SPRING BASIN BLM WILDERNESS STUDY AREA, WHEELER COUNTY, OREGON.--Continued

Sample	Y-ppm s	Zn-ppm s	Zr-ppm s	Ga-ppm s	Ge-ppm s	Na-% s	P-% s	Th-ppm s	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp	Hg-ppm aa	Au-ppm aa
SB023R1	10	N	15	N	N	<.05	N	N	<5	<2	.2	3	59	.02	<.05
SB023R2	10	N	70	10	N	1.50	N	N	<5	<2	<.1	<2	21	.02	<.05
SB025R1	10	N	70	10	N	1.50	N	N	<5	<2	.2	<2	34	<.02	<.05
SB026R1	<10	N	50	N	N	.30	N	N	<5	<2	<.1	<2	13	.02	<.05
SB031R1	N	200	20	N	N	.30	N	N	160	<2	.5	13	140	.36	.35
SB031R2	N	1,000	20	N	N	.20	N	N	190	<2	2.8	10	980	1.30	.75
SB031R3	15	N	200	15	N	1.50	N	N	13	<2	.5	<2	82	.28	<.05
SB032R1	15	N	150	15	N	.20	N	N	100	<2	<.1	24	4	4.80	<.05
SB032R2	50	N	70	7	N	<.05	N	N	2,700	<2	<.1	190	6	3.20	1.70
SB032R3	N	N	N	N	N	<.05	N	N	88	<2	<.1	44	5	12.00	.10

Table 6. Description of rock samples

SSB-1	Outcrop andesitic breccia
SSB-2	Outcrop andesitic breccia
SSB-3	Outcrop andesite flow
SSB-4	Outcrop andesite breccia
SSB-5	*Fluvial gravel
SSB-6	Outcrop andesitic flow(?)
SSB-7	Outcrop dacitic plug
SSB-8	Outcrop andesitic breccia
SSB-9	Outcrop rhyolitic tuff
SSB-10	Outcrop andesitic plug
SSB-11	Outcrop dacitic plug
SSB-12	Outcrop andesitic flow (?)
SSB-13	Outcrop dacitic plug
SSB-14	Outcrop calcite vein
SSB-15	Outcrop Altered andesite (?)
SSB-16	Outcrop calcite vein
SSB-17	Outcrop altered andesite (?)
SSB-18	Outcrop andesitic plug
87JA001	Outcrop andesite
87JA003	Outcrop andesite
87JA004	Outcrop conglomerate
87JA005	Outcrop andesite
87JA006A	Outcrop rhyolite tuff
87JA007	Outcrop basalt
87JA008	Outcrop andesite
87JA009	Outcrop chalcedony
87JA010	Outcrop dacite
87JA011	Outcrop dacite
87JA012	Outcrop conglomerate
87JA006B	Outcrop rhyolite tuff
87JA002	Outcrop andesite
SB001R1	Float tuff, green
SB001R2	Float andesite: limonite stained
SB003R1	Stream cobble andesite with disseminated pyrite
SB004R1	Float andesite with argillic alteration
SB008R1	Stream cobble andesite, limonite stained
SB009R1	Outcrop andesite, argillic alteration with selenite
SB009R2	Float andesite, argillic alteration, limonitic
SB010R1	Outcrop volcanic breccia with quartz veins
SB012R1	Stream cobble calcite vein
SB013R1	Stream cobble tuff, green
SB013R2	Stream cobble andesite, green
SB019R1	Stream cobble andesite with zeolite (?) veins
SB019R2	Stream cobble andesite with chalcedony veins
SB022R1	Stream cobble quartz latite
SB023R1	Stream cobble jasper
SB023R2	Stream cobble quartz veins in green andesite
SB025R1	Outcrop quartz veins in aphanitic volcanic
SB026R1	Stream cobble silicified ash brown green
SB031R1	Float quartz-pyrite vein; Oregon King Mine
SB031R2	Float quartz-pyrite vein; Oregon King Mine Road
SB031R3	Float disseminated pyrite in quartz latite; Oregon King Mine Road
SB031R1	Float dissemnated pyrite in argillic alt andesite; Ashwood Mining District
SB032R2	Float disseminated pyrite in silicic alt andesite; Ashwood Mining district
SB032R3	Float vein quartz; Ashwood Mining District