UNITED STATES DEPARTMENT OF THE INTERIOR
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Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, rock, and soil samples from the Rincon Wilderness Study Area, Harney 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 Rincon Wilderness Study Area (OR-002-082), Harney County, Oregon.

INTRODUCTION

In August 1986, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Rincon Wilderness Study Area, Harney County, Oregon.

The Rincon WSA comprises about 32.0 mi^2 (83.3 km^2) (20,500 acres) in the southern part of Harney County, Oregon, and lies about 86 mi (138 km) south of Burns, and 10 mi (16 km) west of Fields (see fig. 1). Access to the study area is provided on the north by the Long Hollow Road, a county-maintained gravel road, on the west by a dirt road along the western boundary of the study area, and on the east by a dirt road which follows Box Canyon Creek and connects to the Long Hollow Road.

The study area is located on the western edge of a 30 by 90 mi (48 by 145 km) north-trending Basin and Range fault block; Steens Mountain and the Pueblo Mountains are on the eastern part of the fault block. The Catlow Rim fault escarpment, which forms the western edge of the fault block, extends through the study area. The northern part of the study area is predominantly underlain by the Miocene Steens Basalt. The southern part of the study area is underlain by andesite flows, which reach a thickness of about 800 ft (244 m) along the Catlow Rim escarpment. The study area is within the area of the geologic map of the Adel quadrangle at a scale of 1:250,000 (Walker and Repenning, 1965).

The topographic relief of the Rincon WSA is about 1,810 ft (552 m) with a maximum elevation of about 6,350 ft (1,935 m). The most prominent physical feature of the study area is the Catlow Rim escarpment. East of Catlow Rim is a plateau sloping gently to the southwest and eroded into rolling hills. Streams have cut deep canyons into the plateau adjacent to the Catlow Rim and Long Hollow. The climate is semiarid.

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.

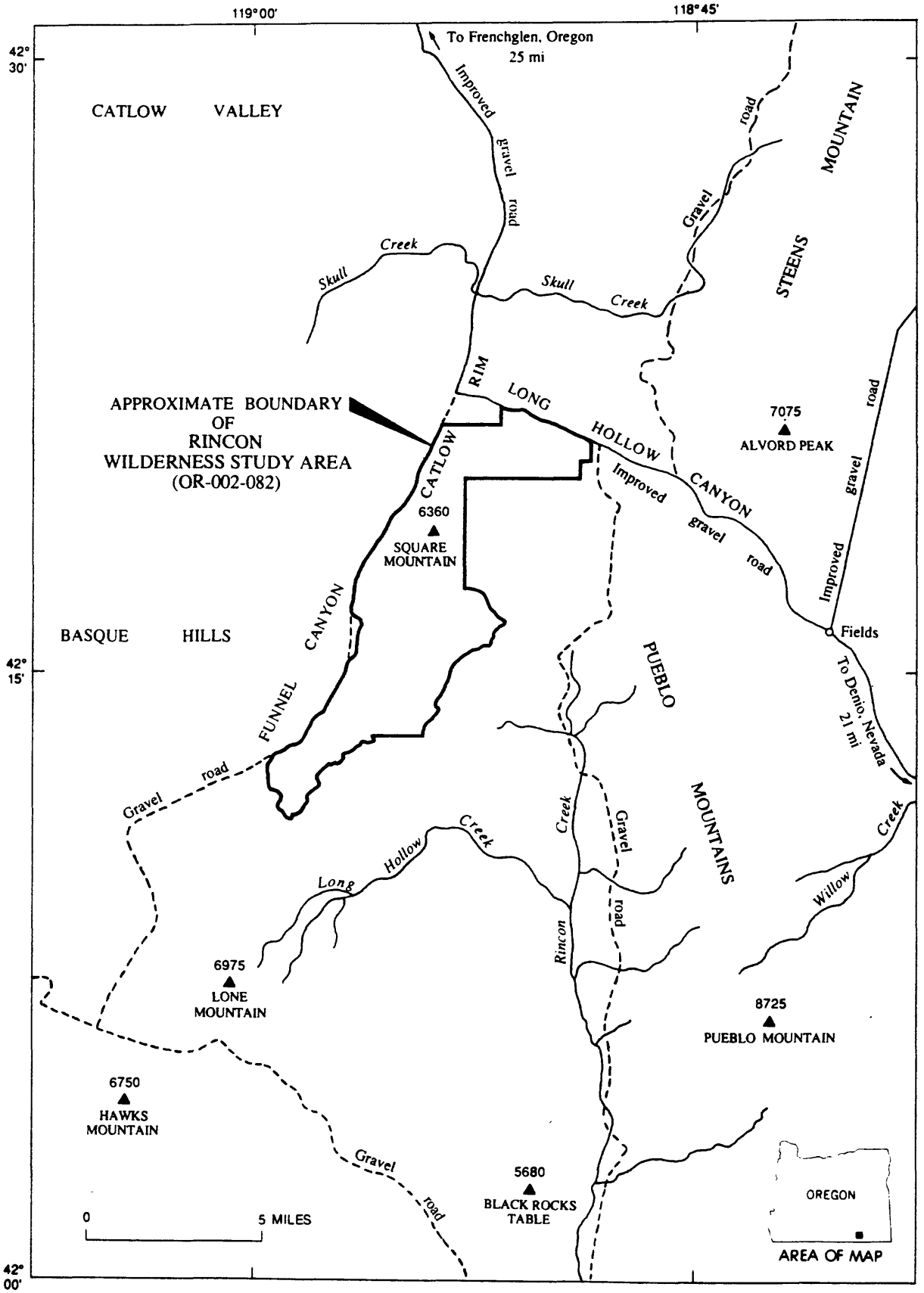

Figure 1. Location of the Rincon Wilderness Study Area, Harney County, Oregon.

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

Stream-sediment and heavy-mineral-concentrate samples were collected at 22 sites. The heavy-mineral-concentrate sample from site RI008 was insufficient for analysis; therefore, only 21 heavy-mineral-concentrate samples were analyzed. Eight of the rock samples and three soil samples were collected at one site (RI024). Sampling density was about one sample site per 1.45 mi^2 for the stream sediments. The area of the drainage basins sampled ranged from 0.35 mi^2 to 3 mi^2.

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 maps (scale = 1:24,000) (fig. 2). Each sample was composited from several localities within an area that may extend as much as 20 ft from the center of the site symbol plotted on the map.

Heavy-mineral-concentrate samples

Heavy-mineral-concentrate samples were collected from the same active alluvium as the stream-2 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 various types of occurrences in the vicinity of the plotted site location. The eight rock samples from site RI024 were collected from float (loose surface rock) within an area extending up to about 400 ft south of the plotted site location.

Soil samples

The three soil samples collected at site RI024 were taken from the A soil horizon in the vicinity of the plotted site location.

Sample Preparation

The stream-sediment and soil samples were air dried, then sieved using 80-mesh (0.17-mm) stainless-steel sieves. The portion of the sediment passing through the sieve was pulverized to minus 0.15 mm with ceramic plates and then saved for analysis.

Samples that had been panned in the field were air dried and sieved to -35 mesh; bromoform (specific gravity 2.85) was used to remove the remaining quartz and feldspar. The resultant heavy-mineral sample was separated into

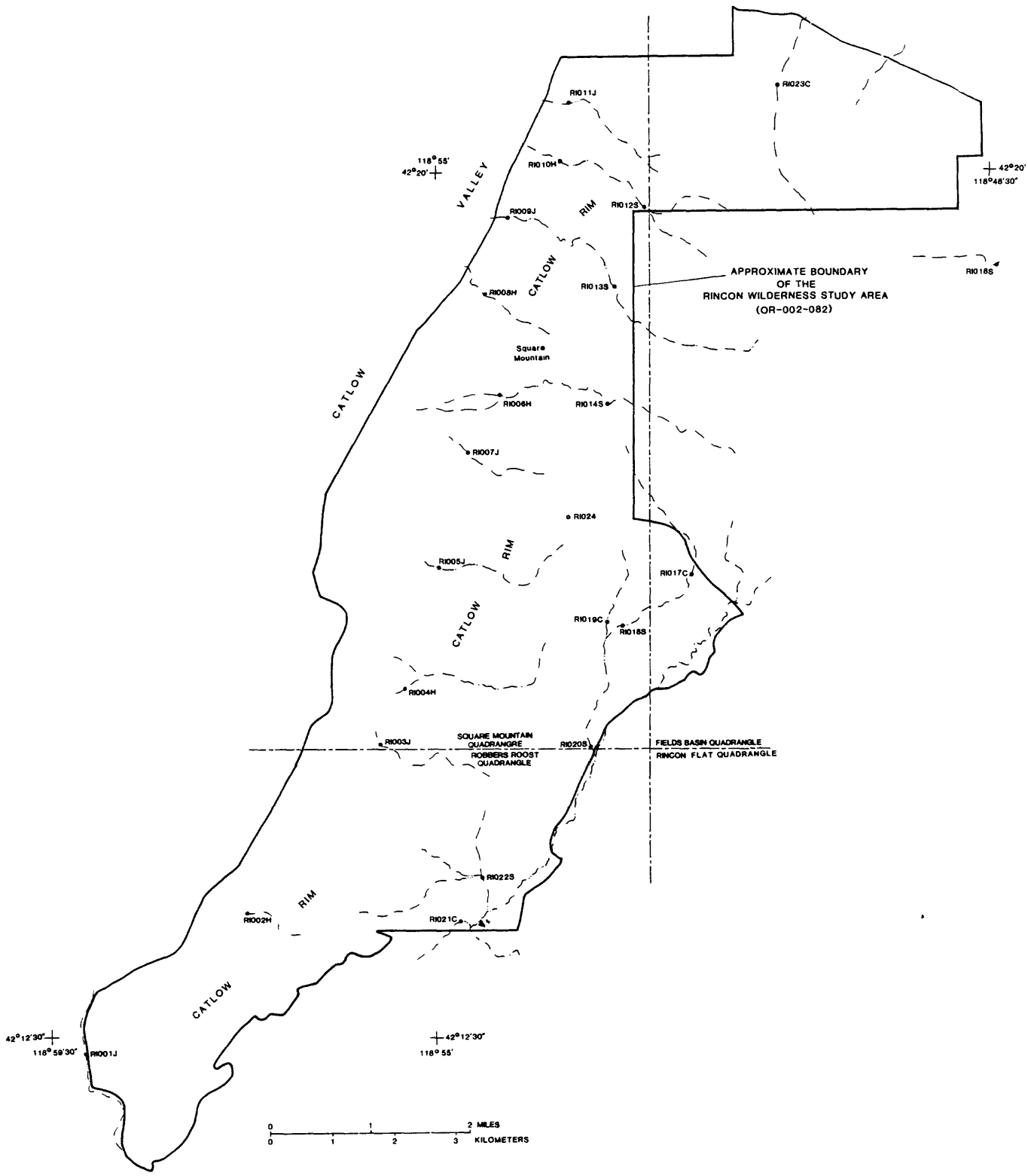

Figure 2. Localities of stream-sediment, heavy-mineral-concentrate, rock, and soil samples from the Rincon Wilderness Study Area, Harney County, Oregon.

three fractions using a large electromagnet (in this case, a modified Frantz Isodynamic Separator). The most magnetic material (removed at a setting of 0.25 ampere), primarily magnetite, was saved but not analyzed. The second fraction (removed at a setting of 1.75 ampere), largely ferromagnesian silicates and iron oxides, was saved for archival storage. The third fraction (the nonmagnetic 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 and rock samples were analyzed for 35 elements and the heavy-mineral-concentrate samples were analyzed for 37 elements using a semiquantitative, direct-current arc emission spectrographic method (modification of Grimes and Marranzino, 1968, and Myers and others, 1961). The elements analyzed and their lower limits of determination are listed in table 1.

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, and titanium, are given in weight percent; all others are given in parts per million (micrograms/gram). Analytical data for samples from the Rincon WSA are listed in tables 3-6.

Chemical methods

Samples from this study area were also analyzed by other analytical methods. Rocks, soils, and stream sediments were analyzed for arsenic, bismuth, cadmium, antimony, and zinc using inductively coupled plasma-atomic emission spectroscopy (ICP-AES). Stream sediments and selected rocks were analyzed for gold and mercury using atomic absorption spectroscopy (AA). Selected rocks were analyzed for arsenic, bismuth, cadmium, antimony, and zinc using atomic absorption spectroscopy (AA). See table 2 for a more detailed summary of these other chemical methods used.

Analytical results for stream-sediment, heavy-mineral-concentrate, rock, and soil samples are listed in tables 3, 4, 5, and 6, respectively.

DATA STORAGE SYSTEM

Upon completion of all analytical work, the analytical results were entered into the Branch of Geochemistry's computer data base. 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) for computerized statistical analysis or publication (VanTrump and Miesch, 1977).

DESCRIPTION OF DATA TABLES

Tables 3-6 list the results of analyses for the samples of stream sediment, heavy-mineral concentrate, rock, and soil, respectively. For the four tables, the data are arranged so that column 1 contains the USGS-assigned sample numbers. The first six letters of these USGS-assigned sample numbers corresponds to the numbers shown on the site location map (fig. 2). 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 tables 3-6, some of the elements listed in these tables (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.

ACKNOWLEDGMENTS

A number of our colleagues also participated in the collection, preparation and analyses of these samples. We would like to extend our appreciation to these colleagues -- Paul Briggs, Suzi Erickson, Olga Erlich, Carol Gent, Janet Jones-Peace, Kay Kennedy, Alonza Love, Steve Smith, and Cliff Taylor.

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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 based on a 5-mg sample, and are therefore two reporting intervals higher than the limits given for rocks and stream sediments]

Elements	Lower determination limit	Upper determination limit
	Percent	
Calcium (Ca)	.05	20
Iron (Fe)	0.05	20
Magnesium (Mg)	.02	10
Sodium (Na)	0.2	5
Phosphorus (P)	0.2	10
Titanium (Ti)	.002	1
	Parts per million	
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
Copper (Cu)	5	20,000
Gallium (Ga)	5	500
Germanium (Ge)	10	100
Lanthanum (La)	50	1,000
Manganese (Mn)	10	5,000
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
Thorium (Th)	100	2,000
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
Palladium (Pd)*	5	1,000
Platinum (Pt)*	20	1,000

*Determined in heavy-mineral-concentrate samples only. Limits are for heavy-mineral-concentrate samples.

TABLE 2.--Chemical methods used

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

Element or constituent determined	Sample type	Method	Determination limit (micrograms/ gram or ppm)	Reference
Gold (Au)	rock and sediment	AA	.1	Modification of Thompson and others, 1968.
Mercury (Hg)	rock and sediment	AA	0.02	Koirtyohann and Khalil, 1976.
Arsenic (As)	rock	ICP	5	Crock and others, 1987.
Antimony (Sb)	and	ICP	2	
Zinc (Zn)	sediment	ICP	2	
Bismuth (Bi)		ICP	2	
Cadmium (Cd)		ICP	0.1	
Arsenic (As)	selected	AA	10	O'Leary and Viets, 1986.
Antimony (Sb)	rocks	AA	2	
Zinc (Zn)		AA	5	
Bismuth (Bi)		AA	1	
Cadmium (Cd)		AA	.1	

Table 3. Results of analyses of stream-sediments samples from the Rincon Wilderness Study Area, Harney County, Oregon.

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	B-ppm s	Ba-ppm s
RI001JS	42 12 21	118 59 7	3	1.0	1.5	1	1,000	N	N	N	30	500
RI002HS	42 13 35	118 57 13	7	1.5	2.0	>1	2,000	N	N	N	30	500
RI003JS	42 15 3	118 55 41	7	1.5	1.5	>1	1,500	N	N	N	30	300
RI004HS	42 15 32	118 55 23	5	1.0	1.5	>1	1,000	N	N	N	30	500
RI005JS	42 16 34	118 54 58	3	1.0	1.5	>1	1,500	1.5	N	N	50	500
RI006HS	42 17 58	118 54 20	5	1.0	1.5	>1	700	N	N	N	50	300
RI007JS	42 17 34	118 54 37	3	1.0	2.0	>1	1,000	N	N	N	50	500
RI008HS	42 18 56	118 54 26	5	1.5	3.0	>1	1,000	N	N	N	20	500
RI009JS	42 19 37	118 54 10	5	1.5	2.0	>1	1,000	N	N	N	30	500
RI010HS	42 20 5	118 53 33	7	1.5	3.0	>1	1,500	N	N	N	50	500
RI011JS	42 20 34	118 53 28	7	1.0	2.0	>1	1,500	N	N	N	30	500
RI012SS	42 19 42	118 52 34	5	1.0	1.5	>1	1,500	N	N	N	50	500
RI013SS	42 19 58	118 52 53	5	1.0	1.5	>1	1,500	N	N	N	50	500
RI014SS	42 18 0	118 53 0	5	1.0	1.5	>1	1,000	N	N	N	50	500
RI016SS	42 19 12	118 48 25	7	1.0	1.5	>1	1,000	N	N	N	20	500
RI017CS	42 16 31	118 52 0	7	.7	1.5	>1	2,000	N	N	N	50	500
RI018SS	42 16 4	118 52 49	7	.7	1.5	>1	1,500	N	N	N	30	500
RI019CS	42 16 6	118 53 1	10	1.5	2.0	>1	5,000	N	N	N	30	700
RI020SS	42 15 2	118 53 12	10	1.5	1.5	>1	3,000	N	N	N	50	500
RI021CS	42 13 31	118 54 43	5	1.0	1.0	1	700	N	N	N	30	500
RI022SS	42 13 53	118 54 28	7	1.0	1.5	>1	3,000	N	N	N	30	500
RI023CS	42 20 43	118 50 59	7	1.0	1.0	>1	1,000	N	N	N	30	500

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	Sc-ppm s	Sn-ppm s
RI001JS	1.5	N	N	30	30	20	50	N	<20	20	20	N	10	N
RI002HS	1.5	N	N	30	100	50	50	N	N	20	30	N	15	N
RI003JS	1.0	N	N	50	50	30	N	N	<20	30	20	N	15	N
RI004HS	1.5	N	N	20	50	50	30	N	N	20	20	N	15	N
RI005JS	1.5	N	N	30	50	50	50	N	N	20	30	N	.15	N
RI006HS	1.0	N	N	20	20	70	30	N	N	20	30	N	15	N
RI007JS	1.5	N	N	20	50	50	50	N	<20	30	20	N	15	N
RI008HS	1.5	N	N	30	70	100	N	N	N	50	20	N	20	N
RI009JS	1.5	N	N	30	100	100	30	N	<20	50	30	N	20	N
RI010HS	1.5	N	N	30	50	100	30	N	<20	30	20	N	20	N
RI011JS	1.5	N	N	30	30	70	30	N	N	30	30	N	20	N
RI012SS	1.5	N	N	30	100	70	50	N	<20	30	30	N	15	N
RI013SS	1.5	N	N	30	20	50	N	N	<20	20	30	N	15	N
RI014SS	1.5	N	N	20	20	50	N	N	N	20	20	N	15	N
RI016SS	.1.5	N	N	30	20	100	N	N	N	30	15	N	15	N
RI017CS	1.5	N	N	20	20	50	30	N	<20	20	20	N	15	N
RI018SS	1.0	N	N	30	20	30	30	N	<20	20	20	N	15	N
RI019CS	1.0	N	N	30	100	50	30	N	<20	20	30	N	20	N
RI020SS	1.0	N	N	30	100	50	30	N	<20	20	30	N	20	N
RI021CS	1.0	N	N	20	20	30	30	N	<20	20	20	N	10	N
RI022SS	1.0	N	N	30	150	30	N	N	<20	30	30	N	15	N
RI023CS	1.0	N	N	30	50	70	N	N	N	30	20	N	15	N

Table 3. Results of analyses of stream-sediments samples from the Rincon Wilderness Study Area, Harney County, Oregon.--Continued

Sample	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm aa	Hg-ppm aa	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp
RI001JS	500	100	N	20	<200	200	N	N	.04	<5	<2	.4	<2	50
RI002HS	500	150	N	30	<200	150	N	N	.04	<5	<2	.3	<2	52
RI003JS	300	150	N	15	<200	100	N	N	.02	<5	<2	.5	<2	70
RI004HS	300	100	N	20	<200	150	N	N	.04	<5	<2	.4	<2	57
RI005JS	500	70	N	30	<200	150	N	N	.06	<5	<2	.4	<2	60
RI006HS	300	100	N	20	<200	150	N	N	.06	<5	<2	.5	<2	73
RI007JS	300	100	N	30	<200	200	N	N	.04	<5	<2	.5	<2	62
RI008HS	500	150	N	20	<200	150	N	N	.02	<5	<2	.3	<2	53
RI009JS	500	150	N	30	<200	200	N	N	.04	<5	<2	.4	<2	59
RI010HS	500	150	N	30	<200	200	N	N	.02	<5	<2	.4	<2	69
RI011JS	300	100	N	30	<200	100	N	N	.04	<5	<2	.3	<2	64
RI012SS	500	100	N	30	<200	500	N	N	.04	<5	<2	.4	<2	69
RI013SS	300	100	N	30	<200	200	N	N	.04	<5	<2	.3	<2	67
RI014SS	200	100	N	30	<200	200	N	N	.02	<5	<2	.5	<2	95
RI016SS	300	150	N	30	<200	100	N	N	.02	<5	<2	.4	<2	82
RI017CS	300	100	N	30	<200	200	N	N	.06	<5	<2	.6	<2	80
RI018SS	200	100	N	20	<200	500	N	N	.02	<5	<2	.5	<2	110
RI019CS	500	150	N	30	<200	200	N	N	.02	<5	<2	.3	<2	100
RI020SS	300	150	N	30	<200	500	N	N	.02	<5	<2	.7	<2	110
RI021CS	200	70	N	20	<200	150	N	N	N	<5	<2	.3	<2	54
RI022SS	500	150	N	20	<200	300	N	N	N	<5	<2	.4	<2	75
RI023CS	300	150	N	20	<200	150	N	N	.04	<5	<2	.8	<2	71

Table 4. Results of analyses of heavy-mineral-concentrate samples from the Rincon Wilderness Study Area, Harney 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-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
RI001JC3	42 12 21	118 59 7	.5	.20	5	.15	200	N	N	N
RI002HC3	42 13 35	118 57 13	.7	.30	5	.20	300	N	N	N
RI003JC3	42 15 3	118 55 41	.5	.15	7	.15	200	N	N	N
RI004HC3	42 15 32	118 55 23	1.0	1.00	15	.30	700	N	N	N
RI005JC3	42 16 34	118 54 58	1.0	.30	10	.15	300	N	N	N
RI006HC3	42 17 58	118 54 20	.7	.20	7	1.00	500	N	N	N
RI007JC3	42 17 34	118 54 37	1.0	.20	15	.30	200	N	N	N
RI009JC3	42 19 37	118 54 10	1.0	.20	10	.20	150	N	N	N
RI010HC3	42 20 5	118 53 33	1.0	.50	2	.50	200	N	N	N
RI011JC3	42 20 34	118 53 28	1.0	.15	5	.20	150	N	N	N
RI012SC3	42 19 42	118 52 34	1.0	.20	5	.50	200	N	N	N
RI013SC3	42 18 58	118 52 53	.7	.20	5	.30	200	N	N	N
RI014SC3	42 18 0	118 53 0	.5	.10	3	.20	150	N	N	N
RI016SC3	42 19 12	118 48 25	.7	.20	3	.20	200	N	N	N
RI017CC3	42 16 31	118 52 0	1.5	.50	2	.70	500	N	N	N
RI018SC3	42 16 4	118 52 49	1.0	.50	5	.20	500	N	N	N
RI019CC3	42 16 6	118 53 1	1.0	.30	3	.20	200	N	N	N
RI020SC3	42 15 2	118 53 12	.7	.20	3	.20	200	N	N	N
RI021CC3	42 13 31	118 54 43	2.0	2.00	5	1.50	2,000	N	N	N
RI022SC3	42 13 53	118 54 28	.2	.20	1	.30	200	N	N	N
RI023CC3	42 20 43	118 50 59	.7	.30	7	.20	200	N	N	N

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	Nb-ppm s
RI001JC3	30	700	<2	N	N	N	<20	N	70	N	N
RI002HC3	50	500	5	N	N	N	<20	N	150	N	N
RI003JC3	30	700	<2	N	N	N	<20	N	70	N	N
RI004HC3	70	300	7	N	N	N	100	N	300	N	N
RI005JC3	50	700	2	N	N	N	50	N	200	N	N
RI006HC3	70	100	5	N	N	N	70	N	200	N	N
RI007JC3	30	700	<2	N	N	N	<20	N	100	N	N
RI009JC3	20	500	<2	N	N	N	<20	N	50	N	N
RI010HC3	50	100	2	N	N	N	20	N	50	N	N
RI011JC3	30	300	<2	N	N	N	<20	N	<50	N	N
RI012SC3	30	700	<2	N	N	N	<20	N	100	N	N
RI013SC3	50	500	2	N	N	N	20	N	150	N	N
RI014SC3	30	500	2	N	N	N	<20	N	100	N	N
RI016SC3	30	300	2	N	N	N	50	N	100	N	N
RI017CC3	50	700	<2	N	N	N	30	N	<50	N	N
RI018SC3	30	700	<2	N	N	N	20	N	150	N	N
RI019CC3	30	700	<2	N	N	N	20	N	70	N	N
RI020SC3	30	700	<2	N	N	N	30	N	70	N	N
RI021CC3	50	500	7	N	N	10	300	N	200	N	N
RI022SC3	30	300	5	N	N	N	<20	N	<50	N	N
RI023CC3	20	500	<2	N	N	N	<20	N	<50	N	N

Table 4. Results of analyses of heavy-mineral-concentrate samples from the Rincon Wilderness Study Area, Harney County, Oregon.--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	Zn-ppm s	Zr-ppm s	Th-ppm s
RI001JC3	15	N	N	<10	N	1,000	<20	<100	500	N	>2,000	N
RI002HC3	20	N	N	50	N	3,000	50	<100	1,000	N	>2,000	N
RI003JC3	10	N	N	<10	N	1,000	20	<100	300	N	>2,000	N
RI004HC3	70	N	N	<20	N	1,000	50	<200	2,000	N	>5,000	N
RI005JC3	20	N	N	<10	N	2,000	30	<100	700	N	>2,000	N
RI006HC3	30	N	N	100	N	500	30	<200	3,000	N	>5,000	N
RI007JC3	10	N	N	<10	N	1,000	<20	<100	700	N	>2,000	N
RI009JC3	10	N	N	<10	N	1,000	30	<100	500	N	>2,000	N
RI010HC3	20	N	N	<10	N	300	50	<100	1,500	N	>2,000	N
RI011JC3	10	N	N	<10	N	500	30	<100	1,500	N	>2,000	N
RI012SC3	10	N	N	<10	N	1,000	20	<100	2,000	N	>2,000	N
RI013SC3	15	N	N	<10	N	1,000	20	<100	1,500	N	>2,000	N
RI014SC3	10	N	N	<10	N	700	20	<100	1,500	N	>2,000	N
RI016SC3	15	N	N	50	N	500	50	<100	1,500	N	>2,000	N
RI017CC3	20	N	N	30	N	700	50	<100	1,000	N	>2,000	N
RI018SC3	15	N	N	30	N	1,000	30	<100	1,000	N	>2,000	N
RI019CC3	15	N	N	<10	N	2,000	50	<100	1,000	N	>2,000	N
RI020SC3	20	N	N	50	N	1,000	30	<100	1,000	N	>2,000	N
RI021CC3	30	N	N	70	N	700	100	<100	1,000	N	>2,000	N
RI022SC3	20	N	N	100	N	700	30	<100	1,500	N	>2,000	N
RI023CC3	20	N	N	<10	N	1,000	30	<100	700	N	>2,000	N

Table 5. Results of analyses of rock samples from the Rincon Wilderness Study Area, Harney County, Oregon.

Sample	Latitude	Longitude	Ca-pct s	Fe-pct s	Mg-pct s	Na-pct s	P-pct s	Ti-pct s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s
RI001JR	42 12 21	118 59 7	10.00	5	2.00	--	--	>1.00	N	N	N	20
RI002HR	42 13 35	118 57 13	5.00	5	1.50	--	--	>1.00	N	N	N	50
RI004HR	42 15 32	118 55 23	5.00	5	1.50	--	--	1.00	N	N	N	20
RI024R1	42 17 3	118 53 27	1.50	3	1.50	2	.2	.70	N	N	N	10
RI024R2	42 17 3	118 53 27	1.50	3	.05	3	N	.15	N	N	N	30
RI024R3	42 17 3	118 53 27	1.50	3	1.00	2	.2	.50	N	N	N	20
RI024R4	42 16 59	118 53 27	.10	2	.05	3	N	.10	N	N	N	30
RI024R5	42 16 59	118 53 27	.15	3	.10	2	N	.15	N	N	N	30
RI024R6	42 16 59	118 53 27	.20	3	.15	5	<.2	.20	N	N	N	30
RI024R7	42 16 59	118 53 27	.10	3	.05	3	<.2	.15	N	N	N	30
RI024R8	42 16 58	118 53 27	.10	2	.07	2	N	.10	N	N	N	30

Sample	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	Ga-ppm s	Ge-ppm s	La-ppm s	Mn-ppm s	Mo-ppm s
RI001JR	1,500	1	N	N	15	20	50	--	--	100	700	N
RI002HR	1,500	1	N	N	15	20	20	--	--	100	1,000	N
RI004HR	1,500	1	N	N	15	<10	20	--	--	70	700	N
RI024R1	1,000	2	N	N	10	<10	20	50	N	70	1,000	<5
RI024R2	150	5	N	N	N	<10	5	100	N	100	700	7
RI024R3	1,000	3	N	N	10	<10	15	50	N	50	1,000	5
RI024R4	70	7	N	N	N	N	<5	70	N	100	500	<5
RI024R5	300	5	N	N	N	<10	7	70	N	100	700	<5
RI024R6	500	7	N	N	N	10	7	100	N	100	1,000	10
RI024R7	300	7	N	N	N	10	7	50	N	100	1,000	5
RI024R8	70	7	N	N	N	<10	<5	30	N	70	700	N

Sample	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	Th-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s
RI001JR	<20	10	20	N	20	N	1,000	N	150	N	30	N	300
RI002HR	<20	7	30	N	20	N	500	N	150	N	30	N	500
RI004HR	N	5	20	N	15	N	500	N	150	N	30	N	200
RI024R1	N	<5	30	N	10	N	500	N	70	N	50	N	150
RI024R2	20	<5	70	N	<5	10	N	N	10	N	100	<200	500
RI024R3	N	5	30	N	10	N	500	N	70	N	30	<200	150
RI024R4	<20	<5	50	N	<5	<10	N	N	<10	N	50	200	200
RI024R5	20	<5	70	N	<5	<10	N	N	20	N	50	200	700
RI024R6	30	<5	70	N	<5	10	N	N	15	N	150	200	1,000
RI024R7	30	<5	50	N	5	N	N	N	30	N	200	200	700
RI024R8	20	<5	50	N	<5	N	N	N	<10	N	30	200	300

Table 5. Results of analyses of rock samples from the Rincon Wilderness Study Area, Harney County, Oregon.--Continued

Sample	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp	Au-ppm aa	Hg-ppm aa	As-ppm aa	Bi-ppm aa	Cd-ppm aa	Sb-ppm aa	Zn-ppm aa
RI001JR	--	--	--	--	--	N	.03	N	N	.1	N	35
RI002HR	--	--	--	--	--	N	.03	N	N	.1	N	50
RI004HR	--	--	--	--	--	N	.03	N	N	.1	N	60
RI024R1	<5	<2	.1	<2	14	--	--	--	--	--	--	--
RI024R2	<5	<2	<.1	<2	12	--	--	--	--	--	--	--
RI024R3	<5	<2	.2	<2	11	--	--	--	--	--	--	--
RI024R4	<5	<2	<.1	<2	13	--	--	--	--	--	--	--
RI024R5	<5	<2	<.1	<2	21	--	--	--	--	--	--	--
RI024R6	<5	<2	<.1	<2	17	--	--	--	--	--	--	--
RI024R7	<5	<2	<.1	<2	18	--	--	--	--	--	--	--
RI024R8	<5	<2	<.1	<2	19	--	--	--	--	--	--	--

Table 6. Results of analyses of soil samples from the Rincon Wilderness Study Area, Harney County, Oregon.

Sample	Latitude	Longitude	Ca-pct s	Fe-pct s	Mg-pct s	Na-pct s	P-pct s	Ti-pct s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s	Be-ppm s
RI024S1	42 17 3	118 53 27	1.5	3	1.0	2	<.2	.7	N	N	N	20	700	5
RI024S2	42 17 3	118 53 27	2.0	3	1.0	2	<.2	.7	N	N	N	30	700	5
RI024S3	42 17 3	118 53 27	1.5	5	.7	2	<.2	.7	N	N	N	50	500	5

Sample	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	Ga-ppm s	Ge-ppm s	La-ppm s	Mn-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s
RI024S1	N	N	10	70	50	50	N	50	1,500	<5	<20	10	50	N
RI024S2	N	N	10	70	30	50	N	50	2,000	<5	<20	10	50	N
RI024S3	N	N	10	100	50	50	N	70	700	<5	20	10	50	N

Sample	Sc-ppm s	Sn-ppm s	Sr-ppm s	Th-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp
RI024S1	15	N	300	N	100	N	100	<200	500	<5	<2	.2	<2	31
RI024S2	15	N	300	N	150	N	70	<200	300	<5	<2	.1	<2	25
RI024S3	10	N	300	N	70	N	100	<200	700	<5	<2	.2	<2	29

Table 7. Description of rock samples

RI001JR	andesite
RI002HR	andesite flow
RI004HR	andesite
RI024R1	welded tuff
RI024R2	welded tuff
RI024R3	andesite flow
RI024R4	welded tuff
RI024R5	welded tuff
RI024R6	welded tuff
RI024R7	welded tuff
RI024R8	welded tuff