UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

CHEMICAL ANALYSES AND STATISTICAL SUMMARIES FOR SAMPLES OF ROCK, MINUS-60-MESH (0.25-mm) STREAM SEDIMENT, AND NONMAGNETIC HEAVY-MINERAL CONCENTRATE, WINCHESTER ROADLESS AREA, COCHISE COUNTY, ARIZONA

by

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STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geochemical survey of the Winchester Roadless Area in the Coronado National Forest, Cochise County, Arizona. The Winchester Roadless Area (3122) was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

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INTRODUCTION

Geochemical sampling was conducted in the Winchester Roadless Area, Cochise County, Arizona, during 1980. This report includes a map showing the locations of all sites sampled in this program (plate 1), a tabulation of the lower limits of determination used in the various analytical methods (table 1), a tabulation of chemical analyses for samples of rock, minus-60-mesh (0.25-mm) stream sediment, and nonmagnetic heavy-mineral concentrate from stream sediment (tables 2, 3, and 4, respectively), and summary statistics for the elements listed in tables 2-4 (tables 5-7). Tables 2-4 and 5-7 list selected data provided by computer programs in the U.S. Geological Survey RASS-STATPAC System (VanTrump and Miesch, 1977).

SAMPLE COLLECTION AND PREPARATION

A set of samples was collected at most sites shown on plate 1; a complete set consisted of a rock sample, a stream-sediment sample, and a bulk stream-sediment sample used for panning. Chemical analyses for a total of 23 rock samples, 27 stream-sediment samples, and 25 nonmagnetic heavy-mineral-concentrate samples are tabulated in this report (tables 2-4). The number of samples analyzed for each medium yields an approximate sample density of 1 sample/1.0 mi^2 (1 sample/2.5 km^2) for the rock samples, 1 sample/0.8 mi^2 (1 sample/2.1 km^2) for the stream-sediment samples, and 1 sample/0.9 mi^2 (1 sample/2.3 km^2) for the concentrate samples.

Most of the rock samples are of unaltered material. The analyses of these samples provide background information for elements in rocks that have not been affected by hydrothermal alteration or mineralization. In addition, some altered and(or) mineralized rocks were collected to characterize mineralogically anomalous areas. Although each rock sample was selected to represent the rocks exposed in the vicinity of the sample site, the actual areal extent of influence of the chemical information provided by a specific sample is not known; the sampling program was designed only to provide some general information on the geochemical nature of the rock units present.

The chemical analyses of the stream-sediment samples reflect the chemistry of rock material eroded from the drainage basin upstream from each sample site and may reveal unusually high concentrations of elements that may be related to mineral deposits.

Concentrate samples were processed from the same active alluvium used to make minus-60-mesh (0.25-mm) stream-sediment samples. The heavy-mineral-concentrate samples provide information about the chemistry of a limited number of minerals present in rock material eroded from the drainage basin upstream from each sample site. Wet panning and a heavy-liquid gravity separation technique were used to remove most of the common rock-forming minerals, such as quartz, feldspars, and clay minerals; and a magnetic separation technique was used to remove the more magnetic minerals leaving a mineral assemblage potentially rich in minerals commonly associated with many types of mineral deposits. The selective concentration of ore-related minerals permits determination of some elements that are not easily detected in stream-sediment samples. The chemical composition of a nonmagnetic heavy mineral concentrate may also indicate specific minerals. For example, the barium content in a stream-sediment sample is predominantly the sum of barium

in the mineral barite plus barium substituted in feldspars, clay minerals, and possibly other minerals, whereas the barium in a concentrate sample is essentially all in barite.

Rock samples

All rock samples were collected from outcrops that were considered to be representative of exposures in the vicinity of the plotted site location. Wherever possible the samples were hand cobbed to remove any obviously weathered material. All samples were crushed and pulverized to at least minus-100-mesh (0.15-mm) material before analysis.

Minus-60-mesh (0.25-mm) stream-sediment samples

The material for the stream-sediment samples was collected primarily from first-order (unbranched) and second-order (below the junction of two first-order) streams as shown on 1:62,500-scale topographic maps. Each sample was composited from active alluvium collected from several locations within an area that may extend as much as 50 ft (15 m) from the site plotted on the map. The resulting sample was air dried and that portion passing through a screen with 0.25-mm openings (a 60-mesh screen) was saved and pulverized to at least minus-100-mesh (0.15-mm) material before analysis.

Nonmagnetic heavy-mineral-concentrate samples

The bulk sample of active stream-sediment material was collected and composited in a manner similar to that used for the minus-60-mesh (0.25-mm) stream-sediment samples. Each bulk sample was passed through a 10-mesh (2.0-mm) screen to remove the coarse material. The sediment passing through the screen was wet-panned until most of the quartz, feldspar, organic material, and clay-sized material was removed. The sample was air dried and passed through a 18-mesh (1.0-mm) sieve; the minus-18-mesh material was saved. Any light material remaining in the concentrate was then removed by allowing the heavier fraction of the sample to settle through bromoform (specific gravity 2.86). The highly magnetic material was next removed with a hand magnet from the cleaned and dried heavy-mineral fraction. The remaining heavy-mineral material was then separated into a magnetic and a relatively nonmagnetic fraction using a Frantz Isodynamic Magnetic Separator set at 0.6 amperes, with a 15° forward setting and a 15° side setting. The resulting nonmagnetic sample was split into two fractions; one fraction was ground in an agate mortar for the analysis and the other fraction was saved for mineralogical studies.

CHEMICAL ANALYSIS

All three types of samples were analyzed for 31 elements (Ag, As, Au, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, La, Mg, Mn, Mo, Nb, Ni, Pb, Sb, Sc, Sn, Sr, Th, Ti, V, W, Y, Zn, and Zr) using a six-step semiquantitative emission spectrographic method (Grimes and Marranzino, 1968). Because of the limited amount of sample material, the nonmagnetic heavy-mineral concentrates were only analyzed spectrographically. The rock and stream-sediment samples were also analyzed for zinc and gold by atomic absorption spectrometry (Ward and others, 1969; Meier, 1980). Analysis for all three sample types was done in U.S. Geological Survey laboratories near Golden, Colorado.

The spectrographic analytical values are reported as the approximate geometric midpoints (0.15, 0.2, 0.3, 0.5, 0.7, and 1.0 or appropriate powers of ten of these values) of concentration ranges whose respective boundaries are 0.12, 0.18, 0.26, 0.38, 0.56, 0.83, and 1.2 (or appropriate powers of ten of these values). In general, the precision of the spectrographic method is plus or minus one reporting value of the value given by the analyst approximately 83 percent of the time and plus or minus two reporting values of the value given by the analyst 96 percent of the time (Motooka and Grimes, 1976). Because all of the samples for this report were analyzed by the same analyst using the same spectrographic instrument, our experience indicates that better precision can be expected in this study.

Each spectrographic film includes analytical spectra for up to 22 field samples and one reference standard sample. The reference standard sample is included with each set of field samples to monitor the quality of the analyses from film to film.

For the two elements analyzed by other than spectrographic methods the reporting values vary with the element and with the concentration level for each given element. Precision for the atomic absorption method is commonly reported as a percent relative standard deviation (% RSD), and is based on replicate analyses of samples selected to provide information at different concentration levels. In general, the precision for this method tends to be lowest for those samples containing a given element at or near its lower limit of determination. For the two elements discussed here, typical reported ranges of percent relative standard deviation, as determined by replicate analysis of a limited sample set, are as follows:

Element	Range of % RSD	Source of data
Zn	3.4-30.2	Ward and others, 1969, p. 21
Au	0.0-22.8	Meier, 1980

As an example to use in interpreting these ranges one might consider zinc, whose range is shown as 3.4-30.2% RSD. This range indicates that a reported zinc value listed in tables 2 or 3 should be within $\pm$ 30.2% (usually much less) of the mean value for that sample. As was the case for the spectrographic analyses, a reference standard sample was analyzed with each batch of field samples to monitor the quality of the analyses.

DESCRIPTION OF TABLES 1-4

Table 1 lists the lower limits of analytical determination for the three types of samples collected for this report. Because of matrix interference problems, the spectrographic technique was modified for the analysis of nonmagnetic heavy-mineral-concentrate samples. As a result, the lower limits of determination for the elements analyzed for this type of sample are all raised two reporting values above the normal lower-limit value.

Tables 2-4 list the chemical analyses for the samples of rock, minus-60-mesh (0.25-mm) stream sediment, and nonmagnetic heavy-mineral concentrate, respectively. For the three sample sets the data are arranged so that column 1 contains the USGS-assigned sample numbers. These numbers

coincide with the numbers on the site location map (plate 1). In tables 2-4, rock samples are suffixed by RK, stream-sediment samples by SS, and concentrate samples by KN. Columns 2 and 3 list latitude (north) and longitude (west), respectively, for each sample site in degrees, minutes, and seconds. Column headings showing the letter "s" below the element symbol indicate emission spectrographic analyses. Column headings showing the letters "aa" below the element symbol indicate atomic absorption analyses. All element concentrations are given in parts per million (ppm), except those for Fe, Mg, Ca, and Ti, which are given in percent (pct).

If a given element was looked for in a sample but not detected, then the letter "N" was entered in the tables in place of an analytical value. If an element was observed but was below the lowest reporting value, then a "less than" symbol (<) was entered in the tables in front of the lower limit of determination. If an element was observed but was above the highest reporting value, then a "greater than" symbol (>) was entered in the tables in front of the upper limit of determination.

Because of the formatting used in the computer program that produced tables 2-4, some of the elements listed in these tables (Fe, Mg, Ca, Ti, and Be) carry one or more nonsignificant zeroes to the right of the significant digits. The analysts did not determine these elements to the accuracy suggested by the extra zeroes. The last column in table 2 gives the formation name for each rock sample. These names are taken from the units shown on the geologic maps of the Winchester Roadless Area (Creasey, 1961; Keith and others, 1982).

For the semiquantitative spectrographic method used, the elements Au and Zn have lower limits of analytical determination that are usually above normal concentrations for these elements in the selected sample media. To obtain more useful analytical data these elements were also analyzed by using the more sensitive atomic absorption method on the rock and stream-sediment samples. The spectrographic values for these two elements have been deleted from the rock and stream-sediment data sets (tables 2 and 3). The spectrographic values for As, Bi, Cd, Sb, Sn, W, and Th in the rock samples; for Ag, As, Bi, Cd, Sb, Sn, W, and Th in the stream-sediment samples; and for Ag, As, Au, Cd, Sb, W, and Zn in the concentrate samples were in every case below the respective lower limits of determination for these elements. Consequently, these elements have been deleted from tables 2, 3, and 4, respectively. In addition, the atomic absorption values for Au in the stream-sediment samples were also deleted for the same reason.

Table 1.--Lower limits of analytical determination for samples of rock, minus-60-mesh (0.25-mm) stream sediment, and nonmagnetic heavy-mineral concentrate, Winchester Roadless Area, Arizona

[(--) indicates not analyzed. "aa" following the element symbol indicates atomic absorption analysis; no suffix indicates spectrographic analysis. The values listed for Fe, Mg, Ca, and Ti are in percent; all others are in parts per million]

Element	Lower limit of determination	
	Rock and stream sediment	Nonmagnetic heavy-mineral concentrate
Fe	0.05	0.1
Mg	0.02	0.05
Ca	0.05	0.1
Ti	0.002	0.005
Mn	10	20
Ag	0.5	1.0
As	200	500
Au	10	20
B	10	20
Ba	20	50
Be	1	2
Bi	10	20
Cd	20	50
Co	5	10
Cr	10	20
Cu	5	10
La	20	50
Mo	5	10
Nb	20	50
Ni	5	10
Pb	10	20
Sb	100	200
Sc	5	10
Sn	10	20
Sr	100	200
V	10	20
W	50	100
Y	10	20
Zn	200	500
Zr	10	20
Th	100	200
Zn-aa	5	--
Au-aa	0.002	--

Table 2.--Data for rock samples, Winchester Roadless Area, Arizona

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	Be-ppm s	Co-ppm s
WN001RK	32 26 0	110 5 35	.5	.20	.5	.05	150	N	10	150	2.0	N
WN002RK	32 25 34	110 7 7	2.0	.30	.3	.20	700	N	20	1,000	1.5	N
WN003RK	32 25 34	110 5 15	7.0	2.00	2.0	.50	1,000	N	20	1,000	1.0	30
WN004RK	32 23 18	110 5 14	1.0	.20	.2	.10	700	N	15	300	3.0	N
WN006RK	32 24 10	110 5 2	1.5	.50	.7	.15	500	N	50	700	2.0	5
WN008RK	32 24 37	110 3 8	1.0	.30	.5	.15	700	N	10	300	3.0	N
WN010RK	32 23 19	110 2 27	2.0	.20	.3	.30	500	N	10	1,500	1.0	N
WN011RK	32 22 20	110 2 30	3.0	.30	.7	.30	700	N	10	1,500	1.0	10
WN013RK	32 20 24	110 2 50	1.5	.20	.2	.20	300	N	10	500	1.5	<5
WN014RK	32 20 51	110 2 30	1.5	.70	.7	.20	500	N	30	500	3.0	5
WN015RK	32 21 2	110 2 18	2.0	.30	.5	.30	700	N	10	2,000	1.5	7
WN016RK	32 19 50	110 1 55	2.0	.50	.3	.30	500	N	10	1,500	1.0	5
WN017RK	32 19 35	110 4 40	1.5	.15	.1	.20	300	N	20	700	2.0	N
WN018RK	32 20 17	110 6 57	.5	.20	.5	.10	200	N	10	500	2.0	N
WN019RK	32 20 33	110 7 24	.5	.20	.3	.20	100	.5	15	150	2.0	<5
WN020RK	32 21 28	110 7 58	1.5	.50	.5	.20	300	N	10	300	3.0	N
WN021RK	32 21 5	110 8 0	1.0	.15	.1	.15	300	N	10	500	2.0	N
WN022RK	32 22 36	110 6 37	1.0	.10	.1	.15	300	N	15	100	2.0	N
WN023RK	32 22 52	110 8 22	5.0	2.00	2.0	.50	700	N	10	1,000	1.5	20
WN024RK	32 23 40	110 8 10	7.0	2.00	2.0	.70	700	N	15	1,500	1.0	20
WN025RK	32 24 40	110 8 17	5.0	2.00	1.5	.50	700	N	20	1,500	1.5	20
WN027RK	32 20 42	110 8 8	7.0	2.00	2.0	.50	1,000	N	<10	700	1.0	30
WN028RK	32 19 45	110 6 19	1.5	.20	.2	.20	200	N	15	700	1.5	N

Table 2.--Data for rock samples, Winchester Roadless Area, Arizona

Sample	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sc-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zr-ppm s	Zn-ppm aa
WN001RK	<10	<5	30	N	N	N	15	<5	200	10	20	70	20
WN002RK	N	5	100	N	20	<5	30	10	200	30	30	500	40
WN003RK	70	100	70	N	<20	50	20	20	500	150	20	200	10
WN004RK	N	<5	100	N	30	5	30	7	N	15	30	150	15
WN006RK	10	7	70	7	<20	10	30	5	300	30	10	100	15
WN008RK	N	<5	100	N	20	<5	50	5	500	10	20	200	15
WN010RK	N	<5	150	7	20	5	30	10	150	20	30	700	10
WN011RK	10	5	150	N	20	15	30	10	200	50	30	500	10
WN013RK	20	7	70	N	<20	5	30	7	100	50	20	200	15
WN014RK	<10	7	70	7	20	7	30	7	300	30	15	150	40
WN015RK	10	10	150	7	<20	10	30	15	300	50	50	500	30
WN016RK	<10	7	100	N	<20	10	20	10	150	50	30	300	40
WN017RK	N	<5	100	5	20	<5	50	5	N	20	30	200	5
WN018RK	N	<5	50	N	20	<5	15	5	1,000	15	20	150	15
WN019RK	N	<5	100	10	30	5	50	7	N	10	20	200	10
WN020RK	10	5	70	N	30	5	20	7	300	20	30	200	10
WN021RK	N	<5	100	N	20	<5	30	5	N	20	30	200	15
WN022RK	N	<5	70	N	30	<5	30	5	N	15	30	200	45
WN023RK	50	50	100	N	<20	50	20	20	700	100	30	200	25
WN024RK	70	70	100	N	<20	50	20	20	500	100	30	300	5
WN025RK	50	30	100	N	<20	50	20	15	500	70	20	200	10
WN027RK	300	50	70	N	<20	100	20	20	700	100	20	150	50
WN028RK	N	<5	100	N	20	<5	30	7	100	20	30	300	<5

Table 2.--Data for rock samples, Winchester Roadless Area, Arizona

Sample	Au-ppm aa	FORMATION NAME
WN001RK	N	GALIURO VOLCANICS
WN002RK	N	GALIURO VOLCANICS
WN003RK	N	GALIURO VOLCANICS
WN004RK	N	GALIURO VOLCANICS
WN006RK	N	GALIURO VOLCANICS
WN008RK	N	GALIURO VOLCANICS
WN010RK	N	GALIURO VOLCANICS
WN011RK	N	GALIURO VOLCANICS
WN013RK	N	GALIURO VOLCANICS
WN014RK	.003	GALIURO VOLCANICS
WN015RK	N	GALIURO VOLCANICS
WN016RK	N	GALIURO VOLCANICS
WN017RK	N	GALIURO VOLCANICS
WN018RK	N	GALIURO VOLCANICS
WN019RK	N	GALIURO VOLCANICS
WN020RK	N	GALIURO VOLCANICS
WN021RK	N	GALIURO VOLCANICS
WN022RK	N	GALIURO VOLCANICS
WN023RK	N	BASALT
WN024RK	N	BASALT
WN025RK	N	BASALT
WN027RK	N	BASALT
WN028RK	N	GALIURO VOLCANICS

Table 3.--Data for stream-sediment samples, Winchester Roadless Area, Arizona

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	B-ppm s	Ba-ppm s	Be-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s
WN001SS	32 26 0	110 5 35	7	1.0	1.0	1.0	1,000	15	700	1.0	20	70	20
WN002SS	32 25 34	110 7 7	10	1.0	1.0	.7	500	15	1,000	1.0	30	500	50
WN003SS	32 25 34	110 5 15	5	1.0	1.0	1.0	700	15	700	1.5	15	70	20
WN004SS	32 23 18	110 5 14	2	.5	.7	.3	700	15	500	2.0	7	30	20
WN005SS	32 23 22	110 5 20	5	.5	.7	.5	1,000	15	700	2.0	10	50	10
WN006SS	32 24 10	110 5 2	10	.5	.5	.5	1,000	15	500	1.5	15	50	15
WN007SS	32 24 10	110 5 5	3	.5	.7	.5	700	20	1,000	1.5	10	20	15
WN008SS	32 24 37	110 3 8	5	.5	.5	.7	700	20	700	1.0	15	30	30
WN009SS	32 23 22	110 2 34	5	.3	.2	.7	1,000	10	1,000	1.0	10	20	20
WN011SS	32 22 20	110 2 30	10	.3	.2	1.0	1,500	10	1,000	1.0	15	20	10
WN012SS	32 22 16	110 2 28	3	.2	.2	.5	700	10	1,500	1.5	10	20	10
WN013SS	32 20 24	110 2 50	5	.5	.3	.7	1,000	20	700	1.5	10	30	10
WN014SS	32 20 51	110 2 30	15	.3	.2	1.0	1,500	<10	700	1.0	15	30	15
WN015SS	32 21 2	110 2 18	3	.3	.2	.5	700	15	1,000	1.5	10	20	50
WN016SS	32 19 50	110 1 55	7	.7	.3	.7	1,000	20	700	1.5	15	70	30
WN017SS	32 19 35	110 4 40	5	.5	.5	.5	1,000	20	700	2.0	10	30	20
WN018SS	32 20 17	110 6 57	2	.3	.2	.3	500	20	500	2.0	10	30	15
WN019SS	32 20 33	110 7 24	5	.7	.7	.5	1,000	20	500	2.0	15	150	20
WN020SS	32 21 28	110 7 58	5	.7	.5	.5	700	20	500	2.0	15	70	20
WN021SS	32 21 5	110 8 0	3	.5	.3	.5	700	20	500	2.0	10	50	15
WN022SS	32 22 36	110 6 37	10	.7	.5	.7	1,000	15	500	2.0	20	200	20
WN023SS	32 22 52	110 8 22	7	1.0	.7	.7	700	15	700	1.5	20	500	30
WN024SS	32 23 40	110 8 10	10	1.0	1.0	.7	1,000	20	1,000	1.0	30	500	50
WN025SS	32 24 40	110 8 17	5	1.0	1.0	.7	700	20	1,000	1.0	20	200	20
WN026SS	32 24 47	110 8 15	7	1.0	.7	1.0	1,000	20	1,000	1.5	20	100	50
WN027SS	32 20 42	110 8 8	5	1.0	1.0	.5	700	10	700	1.0	20	300	30
WN028SS	32 19 45	110 6 19	3	.3	.5	.5	1,000	20	500	3.0	10	30	15

Table 3.--Data for stream-sediment samples, Winchester Roadless Area, Arizona

Sample	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sc-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zr-ppm s	Zn-ppm aa
WN001SS	50	N	20	30	30	15	500	100	30	700	40
WN002SS	100	N	<20	50	30	15	500	150	30	200	45
WN003SS	50	N	<20	30	30	15	500	100	20	200	40
WN004SS	70	N	20	15	50	10	300	70	50	200	30
WN005SS	70	<5	20	7	30	10	300	70	30	300	30
WN006SS	100	N	30	20	50	10	300	100	50	700	40
WN007SS	70	N	20	15	30	10	500	50	30	300	25
WN008SS	70	7	20	20	30	10	200	70	30	1,000	30
WN009SS	200	5	30	15	30	10	200	70	50	1,000	30
WN011SS	150	5	30	20	30	15	150	100	50	>1,000	30
WN012SS	70	5	20	10	30	10	200	50	20	700	25
WN013SS	70	N	20	10	30	10	150	70	30	500	30
WN014SS	150	5	30	10	50	10	150	100	50	>1,000	40
WN015SS	70	5	30	15	50	15	200	50	30	700	30
WN016SS	70	<5	20	20	30	10	150	100	50	1,000	60
WN017SS	100	5	20	20	50	10	200	70	20	300	40
WN018SS	70	N	20	15	30	10	200	50	20	150	30
WN019SS	70	5	20	30	50	10	300	100	20	200	30
WN020SS	70	N	20	20	30	10	300	100	30	500	30
WN021SS	70	N	20	20	30	10	200	70	20	200	25
WN022SS	150	<5	30	30	50	10	300	150	50	700	40
WN023SS	100	N	20	50	50	15	500	150	50	300	40
WN024SS	100	N	20	70	30	15	500	150	20	300	40
WN025SS	50	N	N	30	20	15	500	100	20	200	40
WN026SS	70	N	20	50	20	15	300	100	20	500	40
WN027SS	50	7	20	70	30	20	500	100	30	150	40
WN028SS	70	N	20	15	50	10	200	70	30	200	30

Table 4.--Data for concentrate samples, Winchester Roadless Area, Arizona

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	B-ppm s	Ba-ppm s
WN001KN	32 26 0	110 5 35	1.5	2.0	5.00	>2.0	1,000	30	500
WN002KN	32 25 34	110 7 7	5.0	5.0	3.00	2.0	2,000	50	300
WN003KN	32 25 34	110 5 15	5.0	5.0	3.00	2.0	1,500	20	300
WN004KN	32 23 18	110 5 14	1.5	.3	1.00	>2.0	700	50	200
WN005KN	32 23 22	110 5 20	1.0	.2	2.00	>2.0	1,500	<20	200
WN006KN	32 24 10	110 5 2	2.0	.3	3.00	>2.0	1,000	<20	200
WN007KN	32 24 10	110 5 5	1.5	.5	3.00	>2.0	1,000	<20	300
WN008KN	32 24 37	110 3 8	5.0	.5	1.00	>2.0	2,000	30	700
WN009KN	32 23 22	110 2 34	5.0	.3	.10	>2.0	1,000	20	300
WN011KN	32 22 20	110 2 30	1.5	.3	.30	>2.0	1,000	20	700
WN012KN	32 22 16	110 2 28	1.5	.1	.15	2.0	700	20	300
WN013KN	32 20 24	110 2 50	5.0	.5	.70	>2.0	1,000	20	700
WN014KN	32 20 51	110 2 30	1.0	.1	.50	2.0	500	30	500
WN015KN	32 21 2	110 2 18	7.0	.3	.20	>2.0	3,000	20	200
WN016KN	32 19 50	110 1 55	5.0	.2	2.00	>2.0	2,000	20	1,500
WN017KN	32 19 35	110 4 40	2.0	.2	2.00	>2.0	1,500	<20	200
WN018KN	32 20 17	110 6 57	5.0	.2	1.50	>2.0	2,000	30	200
WN019KN	32 20 33	110 7 24	5.0	1.0	1.50	>2.0	2,000	30	300
WN020KN	32 21 28	110 7 58	5.0	.5	2.00	>2.0	3,000	20	300
WN021KN	32 21 5	110 8 0	7.0	.7	2.00	>2.0	2,000	20	500
WN022KN	32 22 36	110 6 37	2.0	.3	2.00	>2.0	3,000	20	300
WN023KN	32 22 52	110 8 22	2.0	.2	2.00	>2.0	2,000	20	200
WN025KN	32 24 40	110 8 17	5.0	3.0	3.00	>2.0	1,000	200	300
WN027KN	32 20 42	110 8 8	7.0	7.0	7.00	1.5	1,500	<20	300
WN028KN	32 19 45	110 6 19	1.5	.2	5.00	>2.0	1,500	20	200

Table 4.--Data for concentrate samples, Winchester Roadless Area, Arizona

Sample	Be-ppm s	Bi-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s
WN001KN	<2	N	15	70	15	1,500	10	50	100
WN002KN	N	N	50	500	700	>2,000	<10	50	200
WN003KN	N	N	50	100	20	500	N	<50	200
WN004KN	<2	N	N	20	<10	700	N	70	N
WN005KN	<2	N	N	20	<10	2,000	20	150	50
WN006KN	<2	N	N	30	<10	1,000	15	100	50
WN007KN	N	N	N	20	15	1,500	15	100	20
WN008KN	<2	N	10	50	20	1,500	20	70	30
WN009KN	2	N	N	<20	10	2,000	N	50	N
WN011KN	2	N	10	<20	10	2,000	N	50	N
WN012KN	2	N	N	N	<10	500	N	<50	30
WN013KN	<2	50	10	20	20	500	10	70	30
WN014KN	2	N	N	<20	<10	500	N	50	20
WN015KN	2	N	10	<20	15	2,000	10	70	N
WN016KN	2	N	20	50	20	1,000	10	50	50
WN017KN	<2	N	N	30	10	1,500	10	100	50
WN018KN	<2	N	10	30	10	1,500	20	150	20
WN019KN	<2	50	15	70	20	1,000	50	100	70
WN020KN	<2	N	15	50	20	1,500	50	150	70
WN021KN	2	N	15	70	10	1,500	10	70	50
WN022KN	<2	100	N	30	10	1,000	20	150	50
WN023KN	<2	30	N	30	<10	2,000	20	150	50
WN025KN	<2	N	20	100	10	1,000	10	100	150
WN027KN	N	N	30	1,500	50	200	15	70	200
WN028KN	<2	N	N	30	N	2,000	20	100	50

Table 4.--Data for concentrate samples, Winchester Roadless Area, Arizona

Sample	Pb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zr-ppm s	Th-ppm s
WN001KN	70	100	30	<200	150	1,500	>2,000	200
WN002KN	100	100	700	<200	150	1,000	>2,000	3,000
WN003KN	20	70	20	300	200	1,000	>2,000	<200
WN004KN	20	100	30	N	150	2,000	>2,000	500
WN005KN	20	100	200	N	100	5,000	>2,000	500
WN006KN	20	150	70	N	150	3,000	>2,000	<200
WN007KN	30	70	100	<200	150	2,000	>2,000	<200
WN008KN	30	100	30	N	150	2,000	>2,000	N
WN009KN	50	150	N	N	100	2,000	>2,000	<200
WN011KN	20	100	N	N	100	1,500	>2,000	<200
WN012KN	N	150	N	N	70	2,000	>2,000	<200
WN013KN	70	70	1,000	N	150	1,000	>2,000	200
WN014KN	30	150	20	N	100	1,000	>2,000	200
WN015KN	N	150	20	N	100	1,000	>2,000	<200
WN016KN	200	100	20	N	200	2,000	>2,000	200
WN017KN	50	150	100	N	150	1,500	>2,000	<200
WN018KN	100	150	500	N	150	2,000	>2,000	500
WN019KN	150	200	700	N	200	2,000	>2,000	300
WN020KN	200	100	150	N	150	3,000	>2,000	200
WN021KN	100	100	50	N	200	2,000	>2,000	200
WN022KN	100	150	500	N	150	2,000	>2,000	200
WN023KN	50	100	1,500	N	100	3,000	>2,000	300
WN025KN	50	100	30	500	150	1,500	>2,000	<200
WN027KN	70	100	1,500	N	200	200	>2,000	<200
WN028KN	50	100	150	N	150	3,000	>2,000	<200

DESCRIPTION OF TABLES 5-7

Tables 5, 6, and 7 give summary statistics for the analyses of the samples of rock, minus-60-mesh (0.25-mm) stream sediment, and nonmagnetic heavy-mineral concentrate listed in tables 2, 3, and 4, respectively. All values in the Range of values and Percentiles columns are significant to the number of digits shown.

Table 5.--Summary statistics for the analytical values determined for the 23 rock samples in table 2, Winchester Roadless Area, Arizona

[All concentrations are in parts per million except those for Fe, Mg, Ca, and Ti, which are in percent. "aa" following the element symbol indicates atomic absorption analysis; no element suffix indicates emission spectrographic analysis. "N" means not detected at the lower limit of determination shown in parentheses]

Element	Range of values	Percentiles				
		50	75	90	95	98
Fe	0.5 - 7	1.5	3	7	7	7
Mg	0.1 - 2	0.3	0.7	2	2	2
Ca	0.1 - 2	0.5	0.7	2	2	2
Ti	0.05 - 0.7	0.2	0.3	0.5	0.5	0.7
Mn	100 -1000	500	700	700	1000	1000
Ag	N(0.5) - 0.5	N(0.5)	N(0.5)	N(0.5)	N(0.5)	0.5
B	<10 - 50	10	20	20	30	50
Ba	100 -2000	700	1500	1500	1500	2000
Be	1 - 3	1.5	2	3	3	3
Co	N(5) - 30	<5	10	20	30	30
Cr	N(10) - 300	<10	20	70	70	300
Cu	<5 - 100	5	10	50	70	100
La	30 - 150	100	100	150	150	150
Mo	N(5) - 10	N(5)	5	7	7	10
Nb	N(20) - 30	20	20	30	30	30
Ni	N(5) - 100	5	15	50	50	100
Pb	15 - 50	30	30	50	50	50
Sc	<5 - 20	7	15	20	20	20
Sr	N(100) -1000	200	500	700	700	1000
V	10 - 150	30	50	100	100	150
Y	10 - 50	30	30	30	30	50
Zr	70 - 700	200	300	500	500	700
Zn-aa	<5 - 50	15	25	40	45	50
Au-aa	N(0.005) - 0.003	N(0.002)	N(0.002)	N(0.002)	N(0.002)	0.003

Table 6.--Summary statistics for the analytical values determined for the 27 minus-60-mesh (0.25-mm) stream-sediment samples in table 3, Winchester Roadless Area, Arizona

[All concentrations are in parts per million except those for Fe, Mg, Ca, and Ti, which are in percent. "aa" following the element symbol indicates atomic absorption anaysis; no element suffix indicates emission spectrography analysis. "N" means not detected at the lower limit of determination shown in parentheses]

Element	Range of values	Percentiles				
		50	75	90	95	98
Fe	2 - 15	5	7	10	10	15
Mg	0.2 - 1	0.5	1	1	1	1
Ca	0.2 - 1	0.5	0.7	1	1	1
Ti	0.3 - 1	0.7	0.7	1	1	1
Mn	500 - 1500	1000	1000	1000	1500	1500
B	<10 - 20	15	20	20	20	20
Ba	500 - 1500	700	1000	1000	1000	1500
Be	1 - 3	1.5	2	2	2	3
Co	7 - 30	15	20	20	30	30
Cr	20 - 500	50	150	500	500	500
Cu	10 - 50	20	30	50	50	50
La	50 - 200	70	100	150	150	200
Mo	N(5) - 7	N(5)	5	5	7	7
Nb	N(20) - 30	20	20	30	30	30
Ni	7 - 70	20	30	50	70	70
Pb	20 - 50	30	50	50	50	50
Sc	10 - 20	10	15	15	15	20
Sr	150 - 500	300	500	500	500	500
V	50 - 150	100	100	150	150	150
Y	20 - 50	30	50	50	50	50
Zr	150 ->1000	300	700	1000	>1000	>1000
Zn-aa	25 - 60	30	40	40	45	60

Table 7.--Summary statistics for the analytical values determined for the 25 nonmagnetic heavy-mineral-concentrate samples in table 4, Winchester Roadless Area, Arizona

[All concentrations are in parts per million except those for Fe, Mg, Ca, and Ti, which are in percent. All analyses are by emission spectroscopy. "N" means not detected at the lower limit of determination shown in parentheses]

Element	Range of values	Percentiles				
		50	75	90	95	98
Fe	1 - 7	5	5	7	7	7
Mg	0.1 - 7	0.3	0.7	5	5	7
Ca	0.1 - 7	2	3	5	5	7
Ti	1.5 - >2	>2	>2	>2	>2	>2
Mn	500 - 3000	1500	2000	3000	3000	3000
B	<20 - 200	20	30	50	50	200
Ba	200 - 1500	300	500	700	700	1500
Be	N(2) - 2	<2	2	2	2	2
Bi	N(20) - 100	N(20)	N(20)	50	50	100
Co	N(10) - 50	10	15	30	50	50
Cr	N(20) - 1500	30	70	100	500	1500
Cu	N(10) - 700	10	20	20	50	700
La	200 - >2000	1500	2000	2000	2000	>2000
Mo	N(10) - 50	10	20	20	50	50
Nb	<50 - 150	70	100	150	150	150
Ni	N(10) - 200	50	70	200	200	200
Pb	N(20) - 200	50	100	150	200	200
Sc	70 - 200	100	150	150	150	200
Sn	N(20) - 1500	70	500	1000	1500	1500
Sr	N(200) - 500	N(200)	N(200)	<200	300	500
V	70 - 200	150	150	200	200	200
Y	200 - 5000	2000	2000	3000	3000	5000
Zr	>2000 - >2000	>2000	>2000	>2000	>2000	>2000
Th	N(200) - 3000	200	200	500	500	3000

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