UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

GEOCHEMICAL SIGNATURES OF ORE DEPOSITS AND MINERALIZED ROCKS IN THE CEDAR MOUNTAINS, MINERAL AND NYE COUNTIES, NEVADA

by

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ABSTRACT

The Cedar Mountains, Mineral and Nye Counties, Nevada, contain several mines that have produced gold, silver, lead, zinc, and tungsten from gold-quartz veins, base-metal replacements, and skarn-type deposits. Eighty-seven rock samples were collected from mines, prospects, and dumps and analyzed for 33 elements. The Simon mine, a former producer of silver from base-metal replacement deposits chiefly in carbonate rocks, is characterized by high contents of Fe, Mn, Ag, As, Cd, Cu, Pb, Sb, and Zn, and some samples contain detectable Au, Bi, Sn, and W. The Warrior mine that produced chiefly gold from quartz veins in Tertiary volcanic rocks has a relatively weak geochemical signature, but samples are modestly enriched in Au, As, and Sb. Copper and tungsten skarn deposits in Luning Formation marble adjacent to granitic rocks are enriched in Fe, Ca, Mn, Ag, As, B, Ba, Bi, Cd, Co, Cu, Mo, Pb, Sc, Sn, V, W, Zn, and Zr with scattered high values in Au. A zone of silicification in Luning Formation carbonate rocks is enriched in As and Sb, but surface samples contain only small amounts of Au and Ag.

Suites of elements can be used to identify and characterize specific types of geochemical systems. The suites can be deduced by inspection of data and simple statistics or calculated by multivariate analysis. Factor analysis of the Cedar Mountains data successfully classifies samples into groups that are consistent with known geologic features, but cannot reliably identify samples from gold prospects because they have relatively weak geochemical signatures compared to the base-metal rich deposits. Discriminant function analysis applied to the Cedar Mountains data not only documents significant differences in composition between types of deposits but also provides a useful classification of poorly exposed prospects in terms of better known deposits.

INTRODUCTION

The Cedar Mountains are in eastern Mineral County and Nye County, about 35 km northeast of Mina, Nevada. The area contains several old mining camps, the most productive of which was Simon (fig. 1). Total production from the area was slightly more than $1 million from ores containing silver, lead, zinc, and gold (Ross, 1961). Most of the production occurred in the 1920's. There also has been some small production of tungsten as recently as the 1950's, and there has been some exploration for precious metals and tungsten in the 1980's.

The Cedar Mountains have a subdued domelike form with relatively low relief compared to other ranges in the area. The highest point is Little Pilot Peak with an elevation of 2464 m, and valleys on all sides are at an elevation of about 1800 m. The area is generally covered with small pinyon and juniper trees.

This study was undertaken in 1982 as part of the Conterminous United States Mineral Appraisal Program (CUSMAP) in the Tonopah, Nevada $1^{o} \times 2^{o}$ AMS quadrangle to provide modern geochemical description and interpretation of some known mineralized areas and historic mines. Three days were spent in the field in September 1982, examining and sampling mines and prospects shown on the Simon 7.5' quadrangle (scale 1:24,000). Eighty-seven samples from outcrops, mine openings, prospect pits, and mine dumps were collected and

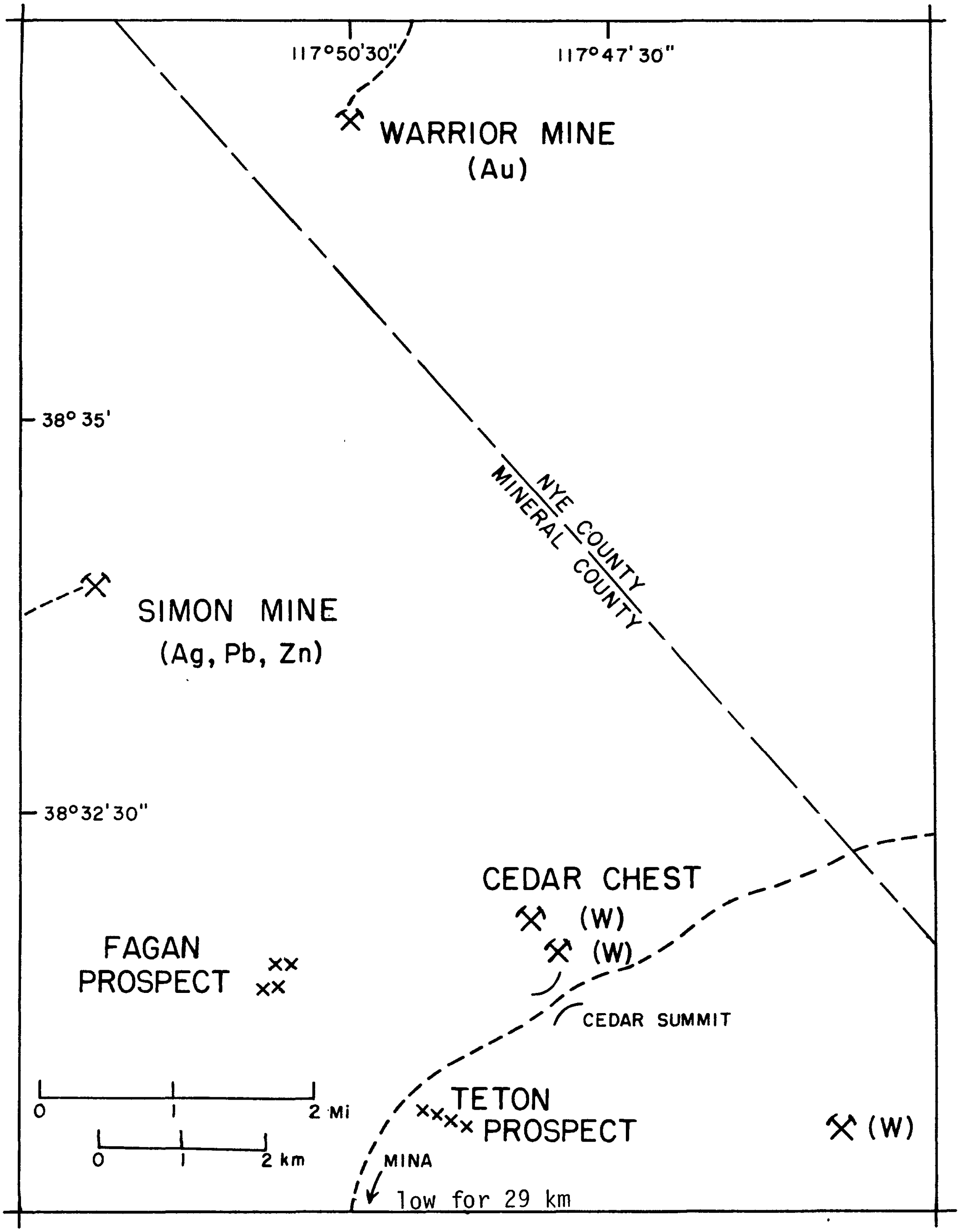

Figure 1.--Generalized map of the Cedar Mountains showing locations of some important mines and prospects. Base is the Simon 7.5' topographic quadrangle.

submitted for chemical analysis. Similar reconnaissance studies are underway at most known districts in the Tonopah quadrangle as a step in defining geochemical criteria for mineral resource assessment and to aid in the interpretation of regional stream-sediment geochemistry data.

GEOCHEMICAL STUDIES

Sample preparation and chemical analysis

All samples were crushed and then pulverized between ceramic plates to attain a grain size smaller than 100 mesh (0.15 mm). All samples were analyzed for 31 elements using a semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). Limits of determination are summarized in Table 1. Spectrographic results are obtained by visual comparison of spectra derived from the sample against spectra obtained from standards made of pure oxides and carbonates. Standard concentrations are geometrically spaced over any given order of magnitude of concentrations 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 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 reported in weight percent of the element; all other elements are reported in parts per million (micrograms per gram) (Table 1).

All samples were also analyzed by wet chemical procedures for determination of elements of special interest or which have high limits of determination by emission spectrography (such as As, Sb, and Zn). The wet chemical methods are summarized in Table 2.

Upon completion of the analytical work results were entered into a computer-based file called RASS (Rock Analysis Storage System) that contains both the analytical data and descriptive geologic and geographic information for each sample. Parts of the RASS data were retrieved under a slightly different format and manipulated using routines of the STATPAC system (VanTrump and Miesch, 1976).

Results

Chemical data and locations for 87 samples are in Table 3. A statistical summary of analytical data is in Table 4. Thirty-six elements are reported in Table 3; Th and Nb are not reported because no sample contained more than 100 and 20 ppm, respectively, the limits of determination for these elements. Some elements are reported twice (both spectrographic and atomic absorption values) because of the different ranges of determination of the methods. Sample localities are shown on Plate 1 which uses the USGS Simon 7.5' topographic map (scale 1:24,000) as a base. Brief sample descriptions are in Appendix 1. Note that samples with the prefix NT (Table 3) were not analyzed by wet chemical methods and, therefore, these samples were not included in the statistical analyses.

GEOLOGY AND MINERAL DEPOSITS

The geology and mineral deposits of the Cedar Mountains are described by Knopf (1922), Vanderburg (1937), Ross (1961), and Kleinhampl and Ziony (1984). The area is called the Bell district in some reports. Oldest rocks in the study area are dark limestone and subordinate shale of the Triassic Luning Formation. Several stocks of granodiorite to monzonite composition intrude the Luning Formation; the age of the intrusions is probably Cretaceous (Ross, 1961). Thermal metamorphism is developed within a few hundred meters of the exposed stocks, but there has been negligible dynamothermal metamorphism. Tertiary volcanic rocks including andesite and quartz latite flows and dacite tuff are overlain by the late Eocene Esmeralda Formation that consists of lacustrine sandstone, shale, limestone, and tuff (Knopf, 1922). The Luning Formation is gently folded, and faults as young as Cenozoic are indicated by tilted or displaced Tertiary rocks, most notably along the west flank of the mountains.

The most important mineral deposits are located near the Simon mine where about three-quarters of a million dollars in silver-bearing lead-zinc ore was mined in the 1920's and 1930's. Knopf (1922) studied the deposits when in production and provides good description of the replacement zones in Luning limestone, and shows the influence of normal faults and an aphanitic "alaskite porphyry dike" that was presumed to be related to the nearby Cretaceous granodiorite stock. Some of the mineralization occurs in welded tuff that Knopf (1922) concluded was probably of Triassic age, largely because it is intruded by dikes thought to be of pre-Tertiary age. The basal volcanic unit near the Simon mine (Simon quartz keratophyre of Knopf) certainly does not resemble the Mesozoic volcanic rocks (greenstones) known farther west in the Tonopah quadrangle. This volcanic unit seems to be a mid-Tertiary unit, in our opinion, which would provide a maximum estimate for the age of the Simon deposits. The Olympic or OMCO gold mine, about 6 km northwest of Simon, was an important producer in the 1920's (Knopf, 1922). At OMCO, the quartz vein had an unusual concave upward form and contained no visible ore minerals; host rocks are highly argillized rhyolite flows just below Miocene Esmeralda-type lacustrine beds (Knopf, 1922). Analytical data for four samples from the OMCO mine (localities 61 and 62) are in Table 3.

The Warrior and similar vein-type deposits occur in Tertiary volcanic rocks 6 km north of Simon (fig. 1; Kleinhampl and Ziony, 1984). In these deposits gold occurs with some pyrite and possibly galena with abundant coarse- to fine-grained quartz and widespread argillic alteration. Tungsten-bearing skarn deposits have been prospected at many localities near the stocks where garnet and other calc-silicate minerals are developed in limy rocks of the Luning Formation. There has been some production from the Blue Bird and Cedar Chest mines as recently as the mid-1950's (Ross, 1961). Prominent zones rich in iron oxides and silica, that have the appearance of gossan, occur at the Fagan prospect (Knopf, 1922; fig. 1). Silver and lead has been produced from these highly oxidized rocks, but the nature of the deposits at depth is not certain. The intrusive contact projects under some of the workings at relatively shallow depth, and the presence of magnetite, garnet, and copper-stained material on some dumps suggests that a skarn-type environment probably exists below the oxidized near-surface zones. Alternatively, the highly siliceous replacements of limestone might be of Tertiary age, similar to silicified tuffs west of Simon.

In the past five years or so there have been a few new developments in the area. Some trenching was done at the Cedar Chest mine and a few holes were drilled to test for tungsten. There has been considerable trenching in Tertiary rocks 2 to 4 km southwest of Simon exploring for gold, and two shallow open cuts have been made in white marble (Luning Formation) on the north side of the Cedar Mountains (localities 593 and 639). A zone of silicification (jasperoid) 1 km west of Cedar Summit has been trenched and several holes drilled in what appears to be a gold prospect that will be decribed below.

COMMENTS ON GEOCHEMICAL SUITES

Ore systems of various types occur in specific geologic settings and tend to have an associated suite of elements that can be diagnostic of the environment in geochemical prospecting or in resource assessment. The diverse mineral systems in the Cedar Mountains produce contrasting suites of elements that should be of use in recognizing extensions of the known mineralized zones or new prospects in other areas. Discussion here will focus on geochemical suites and their utility in exploration or assessment. A caveat to this discussion is that the interpretations are based on a relatively small number of samples and are subject to revision in the light of other ongoing geologic, geophysical, and geochemical studies in the Tonopah quadrangle.

The Cedar Mountains are known from past studies and from visible features to contain diverse geochemical environments. Thus it comes as no surprise that there is a wide range in the chemistry of individual samples (Table 3). Extreme values and geometric means are summarized in Table 4. Rather than elaborate on those extremes, discussion will be directed to four groups of samples assembled by geographic and geologic traits known prior to chemical analysis. Comparison of subsets was done by inspection of means and standard deviations by "eyeball"; no tests of statistical significance were made because of the relatively small sample suite. We cannot emphasize enough our concern with the problem of reliably sampling an ore environment with about ten samples and with little or no access to mine workings.

The statistical measures of "threshold" and "anomalous" will not be investigated here because by definition all samples were selected as being "anomalous" in some geologic or chemical aspect when collected. Also, the sampling method deliberately "high grades" chemistry at that site by the selection of pieces with abundant iron oxide, sulfide, or gangue minerals rather than taking a "representative" sample that typically consists of mineralization diluted by wallrock. The sampling attempts to characterize the geochemical system rather than provide an "assay" as done by mining engineers. Because of the sampling method, relative enrichments in elements and ratios of elements are considered most reliable in evaluating the numbers. The term "enriched" is used here in a qualitative sense to describe element concentrations well above regional abundance in unaltered rocks (that was not determined in this study) and equal to or greater than the concentrations in numerous mineralized rocks from numerous other prospects and altered zones in the Tonopah quadrangle.

Simon mine suite

Nineteen samples were collected in or near the Simon mine. A glory hole at the mine, several trenches, and mine dumps provided good samples and exposed features that confirmed observations reported by Knopf (1922). Samples 59, 60, and 596 to 601 seem to be representative of the historic silver-rich base-metal deposits at Simon. Samples 594, 595, and 602 to 607 are from peripheral localities, but within 1 km of Simon, and are silicified but contain no visible sulfide minerals; these samples may reflect related peripheral processes or may be unrelated to processes in the central Simon deposits. The Simon subset of 19 samples is rich in many elements, notably Fe, Mn, Ag, As, Cd, Cu, Pb, Sb, and Zn; some samples contain detectable Au, Bi, Sn, and W. Compared with other subsets within the study area, the Simon subset has the highest contents of As, Cd, Sb, Zn, and Tl. As a gross generalization, Simon has a base-metal signature in which the economically important commodity Ag is evident but not by itself diagnostic.

The outlying seven samples of silicified limestone and volcaniclastic rocks do not have compositions closely resembling the base-metal-rich samples from the Simon mine; this is not surprising considering the fact that the outlying samples contain sparse sulfide or iron oxide minerals and are chiefly silicified. Element concentrations in the silicified outlying samples are generally low except for local enrichments in As, Sb, W, and Tl. The general composition of these samples is similar to the suite of samples from the Warrior mine area and the Teton prospect as described in later sections. Geochemistry does not answer the question of genetic relation to the central Simon deposits.

Warrior mine area

Nineteen samples were collected from dumps and mine portals in the Warrior area. Samples were selectively picked as chunks having visible coarse-grained to chalcedonic quartz or iron oxides because these aspects are known from our other studies to enhance the geochemical signature. The Warrior mine is the largest of several small mines in the Athens district with a total production of about $72,000 in gold and silver (Kleinhampl and Ziony, 1984). The main vein mined at the Warrior mine is more massive and thicker than most quartz veins in "epithermal" gold deposits, and occurs in a shear zone (Kleinhampl and Ziony, 1984), thus may be somewhat different in character than the typical gold-silver epithermal veins in volcanic host rocks in the Tonopah quadrangle such as at Divide or Round Mountain. The average composition of the Warrior samples is not very distinctive and is not nearly as enriched in metals as the Simon subset. Contents of Ca and Mg are low, reflecting the lack of carbonate in wallrocks and gangue, and the low level of some elements such as Mn, Co, and Ni may reflect a generally low sulfide content (or precursor prior to oxidation). Contents of Au, As, Hg, and Sb are relatively high, particularly in some quartz-rich samples. Silver content is low, yielding a mean Ag:Au of about 1.

Skarn-type deposits

Twenty-seven samples were collected from dumps or mine exposures in which garnets or other calc-silicate minerals were present and where impure carbonate rocks were intruded by granitic rocks. Six samples (608-613) from the Fagan prospects (fig. 1) were included in this subset on the basis of geologic setting and the presence of garnet and magnetite on some dumps, but this may not be the proper classification of all of the samples as will be discussed later. The majority of the sites sampled had been prospected for scheelite, and most displayed copper oxide or copper sulfide minerals. This subset has notably high contents of Fe, Ca, Mn, As, B, Ba, Bi, Cd, Co, Cu, Mo, Pb, Sc, Sn, V, W, Zn, and Zr. Silver content is relatively high (mean Ag is 46 ppm or 1.3 oz/ton), and two samples contained more than 10 ppm Au (determined by emission spectrography and therefore possibly not reproducible because of the tiny sample size burned). Compared with other mineral systems in the Cedar Mountains the skarn systems are characterized by high contents of the chalcophile elements Bi, Cu, and Mo, and by high contents of B, Ba, Sc, and Zr that might be considered to be of igneous origin and residing in wallrock gangue silicates. The high contents of elements such as As, Sb, Pb, Zn, and Cd are useful indicators, but are not diagnostic. In our opinion bismuth is highly diagnostic of the skarn environment, both here and elsewhere in the Tonopah quadrangle. The tungsten values reported for the skarn subset are higher than for other environments, but the values are probably systematically low due to the refractory nature of W in the carbon arc burn.

Examination of the data for six samples from the Fagan prospects suggests that the elemental suite is roughly the same as for the more obviously garnet-rich skarn samples, but they are not highly enriched in the "igneous" suite of B, Ba, Sc, and Zr, nor is Mo or W abundant. However, Ag, As, Au, Cd, Cu, Pb, Zn, and Tl are highly enriched and Bi is notably abundant in the samples. We have insufficient data and experience at this time to properly evaluate the Fagan samples and the implications of their chemistry to the assessment of its ore-forming character. The samples share some common attributes with both tungsten skarn deposits and base-metal-rich vein deposits mined for their content of silver (Nash and Siems, unpub. data, 1985).

Teton prospect

An interesting zone of silicification in Luning Formation carbonate rocks on the southeast flank of the Cedar Mountains was sampled because it appeared favorable for Carlin-type gold mineralization. This west-trending zone of silicification creates several craggy jasperoid bodies over a distance of about 700 m. It is marked by a prominent conical knob (teton) at its west end. A granitic stock occurs a few hundred meters north of this zone, and may underlie it, but the silicification is not obviously related to the stock. Teriary rhyolite dikes also occur in this area. Iron oxides (probably derived from pyrite) are relatively prominent in some places, but in most outcrops the alteration is only light-colored, fine-grained silica. Chemically, the 10 samples are not very distinctive except for high contents of As and Sb. Mean Ag and Au contents are 3.3 and 0.13 ppm, respectively. Five samples were analyzed for Hg, Te, and Tl and found to contain low concentrations of these elements except for sample 580 that contained 9 ppm Hg, 0.7 ppm Te, and 1.3 ppm Tl. The enrichment in As and Sb, local enrichments in Au, Hg, and Tl in surface samples, and the intense silicification of impure carbonate rocks are favorable for a gold system. However, similar silicified zones with comparable geochemical signatures elsewhere in the Tonopah quadrangle (Nash and Siems, unpub. data, 1984) have been drilled and yielded insuffiicent encouragement for further development; as for any mineral system, the intensity of alteration or geochemical anomalies does not translate to economic viability.

Classification by multivariate methods

Two multivariate statistical methods, factor analysis and discriminant function analysis (Davis, 1973) were used to find more relations in the Cedar Mountains dataset and to test the utility of these methods for geochemical classification of samples as a step in resource analysis. Factor analysis is one of several multivariate methods that are useful for finding simplified relations between variables and between samples in complex multivariate data sets (Davis, 1973). As a preliminary test of the method, several R-mode and Q-mode factor analyses were run to characterize groups of samples from the Cedar Mountains. There are many options in running factor analysis (Davis, 1973), several of which were tried here with generally similar results. A five factor model was selected as a compromise between a highly simplified model and more complex ones that would explain more of the variance in the data. The five factors explain 91 percent of the information, with 78 percent carried on the first factor. The R-mode analysis indicates the following associations of elements on the five factors:

factor 1: Fe, Ag, As. Bi, Cd, Cu, Pb, Zn (and Mo and Sb weakly);
factor 2: Mg, Ca, Mn, Co, Cr, Zn (and Ba, Cd, Ni, Sn, and Zr weakly);
factor 3: Ti, B, Ba, Be, La, Y (and Cr, Mo, Sn, and W weakly);
factor 4: Sb, Sr, Zn, and Zr, all weak;
factor 5: Au, Sr, and Sn, all weak.

In this tabulation elements are listed in the order of their listing in Table 3 and there is no indication of relative strength; "weak" means the factor loading is less than 0.5. The five factor model does not explain all elements equally well; in this dataset the elements Au, As, Mo, Ni, and W have low communalities and require a model with more factors to explain their variance. Some possible geochemical explanations can be offered for the element groups. Elements on factor 1 are chalcophile or ore elements. Factor 2 seems to be a group of elements enriched in carbonate rocks. Factor 3 seems to be a group of rock-forming elements, possibly those mobile in the skarn environment near stocks. Factors 4 and 5 are attempting to pick up the "leftovers" and might reflect a mix of processes or environments.

Samples can be grouped or classified by R-mode analysis that has an additional step in which sample scores are computed from the way in which sample compositions project onto the R-mode factors. In this computation five samples (597, 599, 681, 582, and 609) were found to have extreme compositions, and thus selected as compositional endmembers. Samples with a sample score greater than 0.5 are considered to be similar to the endmembers. The first group, similar to sample 597, consists of samples rich in As-Pb-Zn-Ag from the Simon mine and from the Fagan prospect. The second group, similar to sample 599, is rich in base metals and iron oxides and seems to represent gossans or supergene-altered portions of base-metal veins. Group 3 with endmember sample 681 consists of calc-silicate rocks rich in B-Ba-V-Sn-W and moderate amounts of Cu. Group 4 is samples of copper-rich skarn and veins in roof pendants; this group is similar to group 3 but has lower amounts of Sn and W in particular. Group 5 samples, similar to number 609, are notably rich in Bi-Zn-Pb-Cd; samples are from the Simon mine and Fagan Prospect. The samples from the Warrior mine and Teton prospect were not classified clearly in any single group. The best classification was as high negative scores (such as -0.79) on factor 2 (group 2); the negative score is not impossible and indicates an inverse relation based on extreme differences in composition. However, if there had been a typical population including barren background samples, the Warrior and Teton samples probably would have been mixed with them and thus not recognized as a distinct mineralized suite.

Discriminant function analysis (Dixon, 1965; Davis, 1973; Koch and Link, 1980) is a well known method of distinguishing populations with multivariate attributes, but has rarely been applied to problems of mineral deposit geochemistry. It provides some very useful insights to the present study. The first analysis was run with the four groups mentioned earlier: Simon mine (14 samples), Teton mine (10), Warrior mine (15), and Cu-W skarns (27); 29 chemical variables (log transformed) were employed. The following variables were found to be significant in discriminating between these groups of samples (most important to least important): Ca, Sb, Au, V, Ba, W, Cr, Be, Cu, and Mn. The first three elements (Ca, Sb, Au) were sufficient to properly classify 57 of 66 samples, and 9 elements improved the classification to point that only 5 samples were "misclassified" compared to prior estimates (but there are good reasons for these 5 samples being placed in other groups). Two important points emerge from this discriminant function analysis: (1) it focuses attention on the elements Ca, Sb, Au, V, Ba, W, Cr, Be, Cu, and Mn as being diagnostic of these environments, and (2) it demonstrates the utility of the method for examining relations between samples and grouping them by their chemistry.

Two other discriminant tests were made on subsets of the Cedar Mountains data to examine relatively smaller differences in chemistry and to try to resolve the chemical affinity of some problem samples. Base-metal-rich samples were placed in three groups: Cu-W skarn (21 samples), Simon mine (6 samples, peripheral silicified rocks not included), and Fagan prospect (6 samples). In this test the group means of the Cu-W skarns and Simon mine were compared and the Fagan samples were classified according to those group statistics. The elements Cd, Sb, Zr, Au, and Bi (in decreasing order of importance) were sufficient to discriminate between all of the skarn and Simon mine samples. Five Fagan prospect samples were classified with the Simon set and one with the Cu-W skarn set. Another discriminant test examined relations among 33 samples of silicified rock with precious metal signatures: Teton prospect (10), Warrior mine (15), and silicified rocks peripheral to Simon mine (8). For this test the elements Ca, Co, Be, Mn, Y and Au were found to be significant in discriminating between the Teton and Warrior groups; only three elements (Ca, Co, Be) are needed to properly distinguish the Teton and Warrior samples. Six of the Simon area samples were grouped with the Teton set and two were classified with the Warrior set, in good agreement with the carbonate and volcanic hostrock character of the eight samples.

These preliminary multivariate tests on a small dataset produced some useful results that are consistent with a priori classification of samples by ore types. The analyses focused attention on two varieties of skarns, one rich in Cu and the other richer in Sn-W, something that had not been identified in the complex data set. The classification also focused attention on a suite of oxidized samples and properly split the Simon and Fagan samples into two groups of oxidized and un- or less-oxidized samples. We like the way in which factor analysis identifies patterns in geochemical data, an important first step deriving geologic explanations of geochemical behavior. Samples from gold prospects are not reliably identified by factor analysis, possibly because this data set is dominated by many samples of very highly enriched material. Discriminant function analyses focuses attention on the elements Ca, Sb, Au, V, Ba, W, Cr, Be, Cu, and Mn in these samples and shows that there are statistically significant differences between the samples grouped by geologic criteria. This preliminary use of the discriminant function analysis shows that it is very useful for classifying poorly understood samples in terms of better-known ore deposits, an analysis that also focuses attention on a limited suite of diagnostic elements.

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Table 1.--Limits of determination for the spectrographic analysis of 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
	Parts per million	
Manganese (Mn)	10	5,000
Silver (Ag)	0.5	5,000
Arsenic (As)	200	10,000
Gold (Au)	10	500
Boron (B)	10	2,000
Barium (Ba)	20	5,000
Beryllium (Be)	1	1,000
Bismuth (Bi)	10	1,000
Cadmium (Cd)	20	500
Cobalt (Co)	5	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Lanthanum (La)	20	1,000
Molybdenum (Mo)	5	2,000
Niobium (Nb)	20	2,000
Nickel (Ni)	5	5,000
Lead (Pb)	10	20,000
Antimony (Sb)	100	10,000
Scandium (Sc)	5	100
Tin (Sn)	10	1,000
Strontium (Sr)	100	5,000
Vanadium (V)	10	10,000
Tungsten (W)	50	10,000
Yttrium (Y)	10	2,000
Zinc (Zn)	200	10,000
Zirconium (Zr)	10	1,000
Thorium (Th)	100	2,000

Table 2.--Description of chemical methods used for analysis of rock samples from the Cedar Mountains, Nevada.

Element determined	Analytical method	Determination limit (ppm)	Reference
Au	Atomic absorption	0.005	Thompson and others, 1968
Hg	Instrumental	0.02	Modification of Vaughn and McCarthy, 1964
As	Atomic absorption	5.0	Modification of Viets, 1978
Bi	--do--	1.0	--do--
Cd	--do--	0.1	--do--
Sb	--do--	2.0	--do--
Zn	--do--	5.0	--do--
Te	--do--	0.2	Modification of Hubert and Lakin, 1972
Tl	--do--	0.2	--do--

[1] The determination limit is dependent upon sample weight. Stated limits imply use of optimum sample weight; higher limits of determination result from use of smaller sample weights.

TABLE 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE CEDAR MOUNTAINS, MINERAL AND NYE COUNTIES, NEVADA
[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longtude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s	Be-ppm s
TNR00571	38 31 36	117 48 38	7.0	1.50	1.50	.500	1,000	<.5	N	N	<10	1,000	1.0
TNR00572	38 28 36	117 36 10	.7	5.00	15.00	.020	500	1.0	N	N	<10	300	N
TNR00573	38 28 44	117 36 6	.7	3.00	10.00	.005	500	1.0	N	N	<10	<20	N
TNR00574	38 28 36	117 36 7	10.0	.15	.50	.010	1,000	.7	200	N	20	100	1.0
TNR00575	38 28 36	117 36 6	3.0	1.00	7.00	.100	300	3.0	700	N	50	300	N
TNR00576	38 30 34	117 47 48	3.0	2.00	1.00	.300	300	.5	500	N	200	1,500	1.5
TNR00577	38 30 38	117 47 32	2.0	.70	1.00	.200	700	N	N	N	15	1,000	3.0
TNR00578	38 30 35	117 47 42	.1	.05	.70	.100	15	<.5	<200	N	10	2,000	N
TNR00579	38 30 35	117 47 39	7.0	.70	20.00	.070	1,000	3.0	1,500	N	30	150	<1.0
TNR00580	38 30 32	117 47 33	3.0	1.00	7.00	.030	200	7.0	500	N	30	1,000	N
TNR00581	38 30 31	117 47 27	2.0	.70	7.00	.300	200	7.0	500	N	50	1,000	1.0
TND00582	38 30 29	117 46 10	3.0	1.50	15.00	.007	1,000	30.0	500	N	70	N	N
TND00583	38 30 29	117 46 10	15.0	.20	.50	.002	100	200.0	5,000	N	50	N	<1.0
TND00584	38 30 32	117 44 51	20.0	.30	.50	.050	150	5.0	1,000	N	100	200	1.5
TNR00585	38 30 32	117 44 51	20.0	3.00	5.00	.030	2,000	3.0	700	N	50	<20	1.5
TND00586	38 30 32	117 44 51	7.0	5.00	10.00	.200	2,000	3.0	1,000	N	150	200	2.0
TNR00587	38 31 32	117 45 49	20.0	5.00	3.00	.100	>5,000	10.0	N	N	700	70	1.0
TND00588	38 31 32	117 45 49	10.0	3.00	7.00	.030	1,500	150.0	N	N	300	<20	<1.0
TND00589	38 31 30	117 46 54	10.0	2.00	15.00	.050	3,000	1.5	N	N	15	100	2.0
TND00590	38 31 30	117 46 54	7.0	1.00	15.00	.150	5,000	N	N	N	15	20	2.0
TNR00591	38 31 31	117 46 56	5.0	.70	20.00	.150	5,000	N	N	N	20	N	3.0
TNR00592	38 31 30	117 47 4	20.0	5.00	7.00	.020	3,000	50.0	N	N	300	<20	1.0
TND00593	38 32 39	117 47 23	.3	2.00	>20.00	.015	150	1.0	N	N	N	<20	N
TNH00594	38 32 55	117 50 12	3.0	1.50	20.00	.200	700	<.5	N	N	500	300	1.5
TNR00595	38 33 14	117 50 14	5.0	3.00	>20.00	.050	1,500	3.0	N	N	10	100	N
TND00596	38 33 52	117 50 52	15.0	.05	1.00	.070	1,500	200.0	>10,000	N	N	70	1.0
TND00597	38 33 52	117 50 52	7.0	.10	.07	.100	100	150.0	>10,000	N	20	200	1.0
TNR00598	38 33 49	117 50 48	5.0	.20	.30	.100	500	30.0	3,000	N	20	200	1.5
TNR00599	38 33 49	117 50 48	3.0	1.00	15.00	.200	5,000	30.0	3,000	N	30	500	2.0
TND00600	38 33 53	117 50 40	10.0	.10	5.00	.020	5,000	1,000.0	>10,000	N	N	20	1.0
TND00601	38 33 57	117 50 52	3.0	.10	1.00	.050	700	>5,000.0	1,000	N	N	20	<1.0
TNR00602	38 33 40	117 51 31	1.5	.05	.70	.020	200	10.0	500	N	20	100	1.5
TNR00603	38 33 30	117 51 25	5.0	1.00	1.00	.200	150	3.0	N	N	300	300	3.0
TNR00604	38 33 34	117 51 20	3.0	.30	.30	.200	150	3.0	500	N	200	500	5.0
TNR00605	38 33 23	117 51 0	3.0	.15	.20	.150	30	20.0	500	N	300	500	3.0
TNR00606	38 33 22	117 51 5	.7	.10	.50	.070	20	.5	300	N	70	500	3.0
TNR00607	38 33 21	117 51 9	2.0	.15	.70	.070	100	.5	700	N	70	300	2.0
TND00608	38 31 35	117 48 54	5.0	1.50	15.00	.030	2,000	300.0	1,000	N	30	<20	<1.0
TND00609	38 31 35	117 48 54	5.0	2.00	10.00	.015	3,000	100.0	700	N	30	150	1.5
TND00610	38 31 35	117 48 54	20.0	1.50	7.00	.030	3,000	100.0	N	N	15	<20	1.0
TND00611	38 31 24	117 49 4	20.0	.70	1.50	.005	500	20.0	5,000	N	50	70	2.0
TNR00612	38 31 23	117 48 59	15.0	.10	.30	.002	200	100.0	5,000	10	30	30	<1.0
TNR00613	38 31 23	117 48 59	15.0	.20	.50	.030	70	150.0	10,000	15	50	50	2.0
TNR00638	38 30 32	117 47 30	1.0	.07	5.00	.020	10	15.0	500	N	10	>5,000	<1.0
TNR00639	38 34 9	117 47 57	10.0	5.00	15.00	.010	2,000	2.0	N	N	150	<20	2.0

TABLF 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE CEDAR MOUNTAINS, MINERAL AND NYE COUNTIES, NEVADA--Continued

Sample	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s
TNR00571	N	N	50	15	150	20	N	N	30	10	N	20	N	200
TNR00572	N	N	5	15	50	20	N	7	50	N	<5	N	150	15
TNR00573	N	N	5	10	50	<20	N	5	10	<100	<5	N	<100	10
TNR00574	N	N	50	10	200	<20	N	15	10	N	<5	N	<100	30
TNR00575	N	N	7	10	70	<20	5	7	30	100	5	N	200	100
TNR00576	N	N	10	30	20	300	N	15	50	N	7	N	200	150
TNR00577	N	N	7	15	10	50	N	5	30	N	5	N	300	50
TNR00578	N	N	5	10	7	20	N	5	10	<100	N	N	200	10
TNR00579	N	N	10	50	20	20	20	70	30	200	10	N	300	100
TNR00580	N	N	5	30	150	<20	N	10	50	200	<5	N	200	70
TNR00581	N	N	10	150	150	50	N	30	200	200	10	N	300	100
TND00582	N	N	10	<10	>20,000	N	5	N	7	10	200	<5	N	100
TND00583	N	20	7	10	15,000	20	N	N	10	20	300	<5	N	100
TND00584	N	N	100	20	5,000	30	20	N	50	20	150	<5	N	200
TNR00585	N	N	700	10	20,000	20	N	N	200	70	<100	5	N	100
TND00586	30	N	500	<10	>20,000	<20	N	N	150	70	100	7	30	150
TNR00587	N	70	30	20	3,000	30	10	N	20	15	N	5	200	<100
TND00588	50	100	20	<10	>20,000	<20	N	N	15	30	N	<5	30	N
TND00589	N	N	10	20	200	50	30	N	10	15	N	<5	300	150
TND00590	N	N	5	15	70	<20	50	N	7	50	N	5	200	<100
TNR00591	N	N	<5	15	50	20	300	N	5	100	N	5	100	<100
TNR00592	20	N	50	20	15,000	20	N	N	20	50	N	N	300	N
TND00593	N	N	N	<10	150	N	N	N	<5	10	N	<5	N	1,000
TNH00594	N	N	10	100	30	30	N	20	50	N	10	N	700	70
TNR00595	N	N	7	20	10	<20	N	15	700	N	7	N	700	50
TND00596	N	200	50	20	3,000	20	10	N	20	20,000	300	5	N	200
TND00597	10	70	5	15	500	20	15	N	5	>20,000	500	7	N	300
TNR00598	N	150	5	50	1,000	20	15	5	2,000	150	10	N	200	100
TNR00599	N	100	10	70	>20,000	<20	10	20	700	<100	15	N	1,500	150
TND00600	150	>500	10	10	1,500	<20	N	10	>20,000	1,000	<5	N	300	20
TND00601	20	100	5	10	15,000	20	50	<5	>20,000	>10,000	<5	N	300	20
TNR00602	N	N	7	10	50	<20	15	7	100	200	<5	N	<100	20
TNR00603	N	N	10	100	100	70	15	30	200	<100	15	N	200	70
TNR00604	N	20	30	50	150	50	15	50	50	200	5	N	200	100
TNR00605	N	N	10	50	150	30	7	20	30	500	7	N	700	100
TNR00606	N	N	10	20	150	<20	N	20	10	150	5	N	1,000	50
TNR00607	N	N	7	30	150	<20	N	20	10	200	5	N	1,000	70
TND00608	500	150	70	30	>20,000	70	10	30	150	N	<5	100	100	50
TND00609	200	200	150	<10	>20,000	70	50	50	150	N	<5	70	100	70
TND00610	150	30	100	20	10,000	20	15	15	100	N	<5	N	100	70
TND00611	50	70	N	20	2,000	20	20	15	1,500	200	N	N	200	500
TNR00612	200	70	N	15	1,000	<20	30	20	15,000	300	N	N	1,000	700
TNR00613	300	100	<5	20	1,000	<20	70	20	10,000	500	N	N	500	700
TNR00638	N	N	N	<10	50	<20	7	5	70	300	<5	N	300	50
TNR00639	15	N	50	10	15,000	N	N	N	5	20	N	<5	100	200

TABLE 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE CEDAR MOUNTAINS, MINERAL AND NYE COUNTIES, NEVADA--Continued

Sample	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa	Au-ppm aa	Tl-ppm aa	Hg-ppm inst	Te-ppm aa
TNR00571	300	N	30	<200	150	70	.5	6.2	5	--	--	--	--
TNR00572	N	<10	N	10	25	10	.2	1.0	10	N	N	.04	<0
TNR00573	N	<10	N	<10	40	5	.1	N	10	N	--	--	--
TNR00574	N	10	<200	<10	220	200	1.6	N	60	N	--	--	--
TNR00575	N	15	N	70	>200	170	1.5	N	90	.430	N	.40	N
TNR00576	N	30	N	200	>200	90	.4	N	4	.013	--	--	--
TNR00577	N	15	N	150	N	25	.2	N	2	N	--	--	--
TNR00578	N	<10	N	10	110	<5	.2	N	20	.006	N	.30	N
TNR00579	N	30	N	20	>200	50	1.9	N	>100	.970	--	--	--
TNR00580	N	10	N	20	>200	35	.5	N	>100	.040	1.3	9.00	.7
TNR00581	50	50	N	200	>200	110	.8	N	>100	.022	--	--	--
TND00582	10	N	N	500	>200	>200	2.5	N	4	--	--	--	--
TND00583	<10	N	N	700	>200	>200	>10.0	N	>100	--	--	--	--
TND00584	20	N	N	1,000	>200	>200	2.3	N	>100	--	--	--	--
TNR00585	15	N	N	300	>200	>200	.4	N	20	--	--	--	--
TND00586	50	N	15	700	>200	>200	2.1	19.7	>100	--	--	--	--
TNR00587	70	N	N	7,000	20	>200	>10.0	2.0	11	--	--	--	--
TND00588	150	N	<10	>10,000	110	>200	>10.0	35.0	14	--	--	--	--
TND00589	50	<50	15	300	10	>200	9.5	4.0	8	--	--	--	--
TND00590	50	100	20	N	15	170	.5	60.0	6	--	--	--	--
TNR00591	50	N	20	200	180	>200	3.8	N	11	--	--	--	--
TNR00592	20	N	N	1,500	170	>200	1.3	13.0	6	--	--	--	--
TND00593	10	N	N	N	>200	40	2.5	4.0	9	--	--	--	--
TNH00594	N	20	N	70	130	40	.4	N	10	N	--	--	--
TNR00595	N	30	200	15	120	190	1.7	N	7	.004	--	--	--
TND00596	30	N	10	>10,000	>200	>200	>10.0	2.4	>100	--	--	--	--
TND00597	30	N	<10	1,000	>200	>200	>10.0	5.5	>100	--	--	--	--
TNR00598	N	<10	2,000	30	>200	>200	>10.0	N	>100	1.300	1.3	6.00	.7
TNR00599	N	70	10,000	30	>200	>200	>10.0	N	45	.006	--	--	--
TND00600	N	10	>10,000	10	>200	>200	>10.0	90.0	>100	1.400	--	--	--
TND00601	N	15	10,000	15	>200	>200	>10.0	10.0	>100	1.200	--	--	--
TNR00602	N	10	200	10	>200	210	.8	N	>100	.400	<.2	28.00	.4
TNR00603	N	50	N	70	30	100	.2	N	9	.014	N	.12	1.0
TNR00604	<50	20	500	50	>200	>200	>10.0	N	>100	.005	--	--	--
TNR00605	150	15	N	30	>200	60	1.0	N	>100	.009	N	40.00	.4
TNR00606	50	20	N	20	>200	40	.5	N	>100	N	1.9	5.50	.3
TNR00607	100	20	N	20	>200	40	.5	N	>100	N	--	--	--
TND00608	N	10	>10,000	30	>200	>200	>10.0	>100.0	4	.060	N	4.00	N
TND00609	N	<10	>10,000	10	>200	>200	>10.0	>100.0	7	.960	--	--	--
TND00610	N	N	3,000	N	120	>200	>10.0	>100.0	2	1.200	--	--	--
TND00611	N	10	7,000	N	>200	>200	>10.0	>100.0	>100	1.200	--	--	--
TNR00612	N	<10	5,000	N	>200	>200	>10.0	>100.0	>100	--	--	--	--
TNR00613	50	<10	7,000	15	>200	>200	>10.0	>100.0	>100	--	.2	6.00	.4
TNR00638	N	20	N	<10	>200	75	.6	3.0	>100	.044	--	--	--
TNR00639	70	N	10	1,500	40	>200	.3	7.5	20	--	--	--	--

TABLE 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE CEDAR MOUNTAINS, MINERAL AND NYE COUNTIES, NEVADA--Continued

Sample	Latitude	Longtude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s	Be-ppm s
TND00640	38 36 33	117 49 48	1.0	.02	.05	.002	15	3.0	<200	N	<10	500	<1.0
TND00641	38 36 33	117 49 48	3.0	.15	.05	.100	300	2.0	200	N	20	150	1.5
TND00642	38 36 30	117 49 40	10.0	.15	.07	.070	500	.5	200	N	20	200	5.0
TND00643	38 36 29	117 49 42	.7	.02	.05	.007	200	2.0	<200	N	10	70	1.0
TND00644	38 36 29	117 49 42	.5	.15	.70	.100	200	<.5	N	N	30	500	1.0
TND00645	38 36 32	117 49 52	.7	.07	<.05	.050	100	1.0	<200	N	15	300	1.0
TND00646	38 36 32	117 49 52	.7	.20	<.05	.100	150	.7	<200	N	20	500	1.0
TND00647	38 36 33	117 49 57	1.5	.20	<.05	.100	150	1.0	<200	N	20	500	1.0
TND00648	38 36 24	117 49 47	5.0	.15	.05	.070	150	1.0	500	N	30	200	1.0
TND00649	38 36 30	117 49 55	3.0	.15	.07	.100	300	1.5	300	N	20	100	1.5
TND00650	38 36 30	117 49 55	.5	.03	.05	.020	100	2.0	N	N	10	50	1.0
TNR00651	38 36 21	117 49 51	10.0	.20	.20	.100	500	.5	1,000	N	30	1,500	5.0
TNR00652	38 36 20	117 49 50	10.0	.20	.20	.100	100	.5	1,000	N	20	1,000	2.0
TNR00653	38 36 22	117 49 52	10.0	.20	.10	.100	150	<.5	1,500	N	20	1,500	3.0
TND00654	38 36 58	117 49 48	.2	<.02	<.05	<.002	<10	3.0	N	N	15	100	1.0
TNR00674	38 31 50	117 47 17	.7	2.00	5.00	.100	150	3.0	N	N	10	300	N
TNR00675	38 31 50	117 47 17	2.0	5.00	>20.00	.100	1,000	N	N	N	10	1,500	<1.0
TNR00676	38 31 50	117 47 17	3.0	1.50	1.50	.300	150	N	N	N	200	1,000	2.0
TNR00677	38 31 50	117 47 17	2.0	1.50	.70	.300	150	N	N	N	300	1,000	2.0
TNR00678	38 31 50	117 47 17	3.0	1.50	.30	.300	100	N	N	N	200	700	3.0
TNR00679	38 31 50	117 47 15	3.0	1.50	3.00	.300	300	N	N	N	300	1,000	2.0
TNR00680	38 31 50	117 47 15	3.0	1.00	1.00	.300	100	N	N	N	300	700	2.0
TNR00681	38 31 50	117 47 15	5.0	2.00	20.00	.300	3,000	1.0	1,000	N	1,500	1,000	3.0
TND00682	38 31 51	117 47 12	5.0	2.00	>20.00	.200	2,000	1.0	700	N	700	500	5.0
TND00683	38 31 51	117 47 13	3.0	2.00	2.00	.500	300	.5	N	N	300	2,000	3.0
NT42A	38 31 31	117 46 52	10.0	2.00	15.00	.050	>5,000	N	N	N	10	20	1.0
NT42C	38 31 31	117 46 52	.5	2.00	20.00	.015	300	1.0	N	N	50	30	N
NT42D	38 31 30	117 46 49	10.0	2.00	15.00	.015	3,000	50.0	N	N	20	20	1.5
NT43	38 30 31	117 47 30	3.0	3.00	15.00	.200	500	3.0	N	N	100	700	1.5
NT56	38 36 58	117 49 48	2.0	.20	.07	.150	70	10.0	<200	15	50	1,500	2.0
NT57A	38 36 55	117 49 44	2.0	.30	.15	.150	70	20.0	<200	15	20	1,000	2.0
NT57B	38 36 55	117 49 44	2.0	.30	.10	.150	200	2.0	<200	N	30	2,000	2.0
NT58	38 36 8	117 50 1	3.0	.50	.50	.500	300	1.5	N	N	50	1,000	3.0
NT59A	38 33 51	117 50 53	3.0	1.00	2.00	.300	2,000	1.0	300	N	50	2,000	3.0
NT59B	38 33 51	117 50 53	5.0	1.00	10.00	.200	3,000	30.0	7,000	N	30	1,000	1.5
NT59C	38 33 51	117 50 53	10.0	.20	3.00	.150	1,500	50.0	>10,000	N	50	1,500	1.0
NT60A	38 33 52	117 51 0	5.0	1.00	>20.00	.200	5,000	20.0	1,000	N	50	1,000	1.5
NT60B	38 33 56	117 51 3	7.0	.70	.70	.500	300	<.5	N	N	50	1,500	3.0
NT61	38 33 40	117 51 29	7.0	1.00	2.00	.700	100	.5	500	N	70	2,000	1.5
NT52A	38 36 28	117 53 32	7.0	.50	.20	.300	700	5.0	<200	N	50	1,000	3.0
NT62B	38 36 31	117 53 30	3.0	.30	1.00	.200	700	15.0	N	N	30	500	3.0
NT62C	38 36 30	117 53 36	7.0	1.00	1.00	.700	500	.7	N	N	70	1,500	2.0

TABLE 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE CEDAR MOUNTAINS, MINERAL AND NYE COUNTIES, NEVADA--Continued

Sample	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s
TND00640	N	N	N	<10	15	<20	5	5	15	100	N	N	100	<10
TND00641	N	N	N	<10	20	20	10	7	30	<100	5	N	<100	30
TND00642	N	<20	5	<10	15	30	10	5	20	<100	5	N	<100	50
TND00643	N	N	N	<10	5	<20	N	7	<10	<100	<5	N	<100	<10
TND00644	N	N	N	<10	15	20	N	5	10	N	5	N	100	20
TND00645	N	N	N	<10	10	<20	N	5	10	N	<5	N	100	15
TND00646	N	N	N	<10	7	30	7	<5	30	N	5	N	100	20
TND00647	N	N	N	<10	15	30	10	<5	30	<100	5	N	100	20
TND00648	N	N	N	<10	15	20	10	5	20	<100	5	N	150	30
TND00649	N	N	N	<10	15	20	15	5	20	<100	5	N	100	30
TND00650	N	N	N	<10	10	<20	N	5	<10	<100	<5	N	<100	<10
TNR00651	N	N	7	<10	20	50	20	5	30	100	7	N	200	100
TNR00652	N	N	5	<10	20	50	20	5	30	<100	5	N	150	50
TNR00653	N	N	5	10	30	70	20	5	50	100	7	N	300	70
TND00654	N	N	N	<10	5	<20	N	5	10	N	<5	N	<100	<10
TNR00674	N	N	N	10	15	<20	N	N	10	50	N	<5	N	100
TNR00675	N	N	5	20	15	20	N	N	15	15	N	5	N	300
TNR00676	N	N	5	100	30	20	N	N	30	20	N	20	N	150
TNR00677	N	N	10	100	20	20	5	N	30	15	N	20	N	100
TNR00678	N	N	7	100	30	20	N	<20	30	<10	N	20	N	100
TNR00679	N	N	15	100	10	30	N	N	30	20	N	20	N	200
TNR00680	N	N	7	100	50	30	15	N	30	20	N	20	N	150
TNR00681	200	N	N	150	70	70	70	N	20	50	500	30	100	300
TND00682	200	N	5	100	30	30	200	N	20	50	200	15	70	200
TND00683	N	N	7	100	15	50	7	<20	50	15	N	20	N	300
NT42A	N	N	7	30	15	20	20	7	20	N	<5	300	100	50
NT42C	N	N	5	30	20	30	10	5	10	N	<5	N	500	20
NT42D	70	100	30	50	7,000	20	20	5	50	N	<5	300	100	20
NT43	N	N	15	50	100	30	20	30	500	500	10	N	200	100
NT55	N	N	<5	10	15	50	10	<5	50	<100	5	N	200	20
NT57A	N	N	<5	10	15	50	7	5	30	<100	5	N	200	30
NT57B	N	N	5	15	10	70	15	<5	50	N	5	N	300	20
NT58	N	N	5	100	20	70	20	5	20	N	10	N	500	100
NT59A	N	N	10	30	50	100	7	5	100	N	10	N	300	100
NT59B	20	100	10	50	150	20	7	10	20,000	<100	7	N	500	100
NT59C	N	100	15	30	300	30	20	7	>20,000	500	5	N	1,000	70
NT60A	10	50	10	30	50	30	20	10	7,000	<100	7	N	500	100
NT60B	N	N	7	30	15	50	15	<5	70	N	10	N	300	100
NT61	N	N	7	70	20	50	15	<5	30	N	15	N	500	150
NT62A	N	N	7	15	20	50	10	<5	30	N	7	N	200	70
NT62B	N	N	5	30	30	50	7	<5	30	N	7	N	200	30
NT62C	N	N	10	30	15	70	10	5	20	N	10	N	300	150

TABLE 3.--ANALYTICAL DATA FOR ROCK SAMPLES FROM THE CEDAR MOUNTAINS, MINERAL AND NYE COUNTIES, NEVADA--Continued

Sample	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa	Au-ppm aa	Tl-ppm aa	Hg-ppm inst	Te-ppm aa
TND00640	N	<10	N	N	110	15	.2	N	>100	.036	--	--	--
TND00641	N	10	N	70	170	10	.2	N	40	.012	--	--	--
TND00642	N	15	200	70	180	200	.3	N	10	N	N	.18	.9
TND00643	N	<10	N	N	100	5	.2	N	2	3.600	--	--	--
TND00644	N	10	N	70	80	10	.2	2.0	5	.030	--	--	--
TND00645	N	10	N	100	90	25	.2	N	7	.025	N	.20	.7
TND00646	N	15	N	100	100	25	.3	N	8	.010	N	.06	1.2
TND00647	N	15	N	100	110	5	.2	N	10	.023	--	--	--
TND00648	N	10	N	70	>200	5	.2	N	15	.150	--	--	--
TND00649	N	10	N	50	>200	10	.2	N	20	.039	--	--	--
TND00650	N	<10	N	15	100	<5	.1	N	3	.022	N	.12	3.0
TNR00651	N	20	N	70	>200	100	.3	N	80	.021	N	24.00	.7
TNR00652	N	15	N	50	>200	30	.3	N	15	.250	--	--	--
TNR00653	N	20	<200	70	>200	200	.9	N	75	11.000	N	45.00	3.0
TND00654	N	N	N	<10	40	10	.1	N	1	.050	N	.10	3.7
TNR00674	30	<50	<10	N	50	30	.3	N	12	--	--	--	--
TNR00675	50	N	15	N	--	15	.1	N	10	--	--	--	--
TNR00676	150	N	20	N	30	60	<.1	N	10	--	--	--	--
TNR00677	150	N	20	N	30	30	<.1	N	6	--	--	--	--
TNR00678	150	N	30	N	20	45	<.1	N	14	--	--	--	--
TNR00679	100	N	30	N	20	30	.1	N	4	--	--	--	--
TNR00680	150	N	20	N	20	30	.1	N	8	--	--	--	--
TNR00681	200	200	30	N	--	90	.4	--	--	--	--	--	--
TND00682	100	300	20	N	--	60	.3	--	--	--	--	--	--
TND00683	150	N	30	N	30	55	.1	N	10	--	--	--	--
NT42A	50	20	N	50	--	--	--	--	--	--	--	--	--
NT42C	N	15	N	10	--	--	--	--	--	--	--	--	--
NT42D	50	<10	2,000	<10	--	--	--	--	--	--	--	--	--
NT43	N	20	N	150	--	--	--	--	--	--	--	--	--
NT56	N	10	N	100	--	--	--	--	--	--	--	--	--
NT57A	N	15	N	150	--	--	--	--	--	--	--	--	--
NT57B	N	20	N	100	--	--	--	--	--	--	--	--	--
NT58	N	30	N	300	--	--	--	--	--	--	--	--	--
NT59A	N	30	N	300	--	--	--	--	--	--	--	--	--
NT59B	N	15	5,000	150	--	--	--	--	--	--	--	--	--
NT59C	N	10	10,000	50	--	--	--	--	--	--	--	--	--
NT60A	N	15	1,000	100	--	--	--	--	--	--	--	--	--
NT60B	N	20	N	200	--	--	--	--	--	--	--	--	--
NT61	70	20	N	300	--	--	--	--	--	--	--	--	--
NT62A	<50	30	N	200	--	--	--	--	--	--	--	--	--
NT62B	<50	20	N	200	--	--	--	--	--	--	--	--	--
NT62C	<50	20	N	200	--	--	--	--	--	--	--	--	--

Table 4.--Summary of analytical data for rock samples from the Cedar Mountains, Nevada.

[Explanation: S (as in S-Fe), determined by emission spectrography; AA (as in AA-As) determined by atomic absorption. Valid means analytical data are not qualified (L, N, G). L, less than limit of determination (Tables 1 and 2); N, not detected; G, greater than upper limit of determination. Major elements reported as weight percent, all other elements reported in parts per million]

Element	Minimum	Maximum	Geometric mean	Geometric deviation	Valid	L	N	G
S-Fe%	.10	20.	3.6	3.1	87	0	0	0
S-Mg%	.02	5.	.55	4.1	86	1	0	0
S-Ca%	.05	20.	1.4	6.6	78	4	0	5
S-Ti%	.002	.70	.07	3.9	86	1	0	0
S-Mn	10.	5000.	396.	4.4	84	1	0	2
S-Ag	.5	1000.	5.5	7.1	70	6	10	1
S-As	200.	10000.	875.	2.7	38	10	35	4
S-Au	10.	15.	13.	1.2	4	0	83	0
S-B	10.	1500.	48.	3.3	79	4	4	0
S-Ba	20.	2000.	335.	3.8	75	8	3	1
S-Be	1.	5.	1.8	1.6	68	9	10	0
S-Bi	10.	500.	64.	3.5	18	0	69	0
S-Cd	20.	200.	80.	1.9	19	1	66	1
S-Co	5.	700.	12.	3.0	66	4	17	0
S-Cr	10.	150.	28.	2.3	67	20	0	0
S-Cu	5.	20000.	82.	9.2	81	0	0	6
S-La	20.	300.	33.	1.8	62	22	3	0
S-Mo	5.	300.	15.	2.3	56	0	31	0
S-Ni	5.	70.	9.8	2.1	52	11	24	0
S-Pb	5.	20000.	46.	5.8	81	3	0	3
S-Sb	10.	20000.	81.	4.6	44	17	24	2
S-Sc	5.	500.	13.	4.1	46	19	22	0
S-Sn	5.	300.	18.	3.6	21	8	58	0
S-Sr	30.	1500.	226.	2.2	63	8	16	0
S-V	10.	1000.	77.	2.7	78	7	2	0
S-W	10.	300.	60.	2.3	33	5	49	0
S-Y	10.	300.	20.	2.1	51	13	23	0
S-Zn	10.	10000.	188.	13.0	31	5	48	3
S-Zr	10.	7000.	88.	4.3	62	6	17	2
AA-As	10.	220.	61.	2.4	33	0	1	33
AA-Zn	5.	210.	38.	3.0	44	2	0	24
AA-Cd	.10	9.5	.43	3.0	51	3	0	16
AA-Bi	1.	90.	7.2	3.6	16	0	46	6
AA-Sb	1.	90.	9.7	2.6	47	0	0	21
AA-Au	.004	11.	.08	8.8	34	0	8	0
AA-Tl	.20	1.9	.89	2.8	4	1	13	0
INST-Hg	.04	45.	1.3	12.	18	0	0	0
AA-Te	.30	3.7	.88	2.2	14	1	3	0

Appendix 1--Brief descriptions of chemically analyzed rock samples from the Cedar Mountains, Nevada

[The sample number code character three indicates the source of the sample: R, outcrop or mine exposure (rock in place); D, dump; H, drill hole cuttings. The following abbreviations are used to indicate classification of sample for the statistical computations: S, Simon mine area (N=19); W, Warrior mine area (19); T, Teton prospect (10); SK, Cu-W skarn prospects (27). Samples with NT prefix were not used in statistical computations. Sample localities shown on Plate 1.]

TNR00571--Rusty weathering garnet-rich skarn bed, barren(?)
TNR00572--Silicified and quartz-veined Luning limestone (T)
TNR00573--Silicified limestone, low FeOx content (T)
TNR00574--Silicified limestone, rich in FeOx, prospect pit (T)
TNR00575--Reddish earthy FeOx zone in jasperoid (T)
TNH00576--Composite of drill cuttings, rusty and dark gray carbonate (T)
TNR00577--Very fresh biotite granodiorite
TNR00578--Milky white quartz from silicified limestone (T)
TNR00579--Red earthy hematitic clay(?) in jasperoid zone (T)
TNR00580--Jasperoid with some porous FeOx (T)
TNR00581--Rusty jasperoid drill cuttings (T)
TND00582--Dump chips rich in FeOx and CuOx, with chalcedonic quartz (SK)
TND00583--Same as above (SK)
TND00584--Magnetite-rich skarn with CuOx coatings (SK)
TNR00585--Magnetite-rich skarn with CuOx, upper pit (SK)
TND00586--Select chips of CuOx with opaline silica, supergene altered(?) (SK)
TNR00587--Dark skarn with garnet(?), old shaft (SK)
TND00588--High-graded chips with FeOx and CuOx from skarn (SK)
TNR00589--Garnet-epidote skarn at contact with Kqm, Cedar Chest open cut (SK)
TNR00590--Garnetite xenolith inside Kqm (SK)
TNR00591--Chips of garnetite across 2 m (SK)
TNR00592--Picked garnet-magnetite pieces (SK)
TND00593--White crystalline marble, crushed to 5 cm pieces
TNH00594--Cuttings dark gray jasperoid from Luning Formation (S)
TNR00595--Bright red alteration on small fault in Luning Fm (S)
TND00596--Simon mine dump north of road, high graded heavy sulfidic chips with galena, sphalerite and pyrite (S)
TNR00597--Simon mine glory hole, silvery mica-rich altered tuff that looks like Tertiary rocks elsewhere (S)
TNR00598--Trench or caved stope, gossany material rich in FeOx in fault cutting tuff (S)
TNR00599--Gossan similar to 598, 4 m east, in fault cutting black carbonate rock (S)
TND00600--North Simon shaft, dump picks rich in galena, sphalerite, and pyrite (S)
TND00601--Dump picks with sulfides, not very high grade (S)
TNR00602--Jasperoid outcrop at headframe west of Simon, some FeOx (S)
TNR00603--Red clay alteration along fault contact of tuff with black Luning carbonate (S)
TNR00604--FeOx-rich gossan in fault in tuff (S)
TNR00605--Silicified or tuff (S)
TNR00606--Silicified tuff with some FeOx (S)
TNR00607--Silicified tuff with sparse FeOx (S)

TND00608--Ax or Fagan prospect; garnet, epidote, FeOx skarn(?) (SK)
TND00609--Garnet, siderite(?), alt. marble (SK)
TND00610--Garnet-magnetite-rich picks from skarn(?) (SK)
TND00611--FeOx-rich gossan or manto, subhorizontal (SK)
TNR00612--FeOx-silica gossan in Luning carbonate (SK)
TNR00613--FeOx-rich gossan, no Cu colors, sparse silica (SK)
TNR00638--Jasperoid with sparse FeOx (T)
TNR00639--Open cut in white marble and greenstone; sample is greenstone with CuOx
TND00640--Warrior mine area, milky to chalcedonic quartz veins in welded tuff (W)
TNR00641--White clay and black MnOx(?) from altered tuff (W)
TNR00642--Quartz veining in tuff with some FeOx (W)
TND00643--Quartz vein picks from dump (W)
TNR00644--Reddish-orange alteration of tuff (W)
TND00645--Quartz vein picks, sparse FeOx (W)
TND00646--Altered tuff with some FeOx (W)
TND00647--Dump chunks with yellow FeOx in joints in tuff (W)
TND00648--Screened fines from miner's high-graded pile (W)
TND00649--Altered tuff with a bit more FeOx than most samples (W)
TND00650--Quartz vein picks with some FeOx (W)
TNR00651--Altered tuff rich in FeOx (W)
TNR00652--Rusty alteration in tuff along vein (W)
TNR00653--Rusty alteration in tuff (W)
TND00654--Silicified and quartz-veined tuff, Warrior dump (W)
TNR00674--Weathered carbonate and calc-silicate hornfels (SK)
TNR00675--Rusty gauge in calc-silicate hornfels (SK)
TNR00676--Biotitic hornfels bed, Cedar Chest trench (SK)
TNR00677--Biotitic hornfels bed (SK)
TNR00678--Biotitic zone with fine garnets(?) (SK)
TNR00679--Brown biotitic hornfels layer in marble (SK)
TNR00680--Brown biotite-garnet(?) hornfels (SK)
TNR00681--Diopside-rich skarn in pit (SK)
TND00682--Diopside-garnet skarn pieces from small shaft (SK)
TND00683--Chips of brown biotitic hornfels (SK)
NT42A-----Garnet-epidote chips from skarn in black marble
NT42C-----Black marble chips 3 m from skarn
NT42D-----Garnetite chunks with CuOx stains
NT43------Cuttings of gray jasperoid Teton prospect
NT56------Warrior mine, chunks fine-grained milky quartz
NT57A-----Warrior mine big dump, quartz-rich pieces
NT57B-----Average dump material, mostly argillized tuff
NT58------Yellowish clay-rich tuff, average dump material
NT59A-----Simon mine, argillized tuff from gloryhole
NT59B-----Average dump sample, mostly altered carbonate
NT59C-----FeOx-rich chips picked from dump
NT60A-----Average dump pieces, altered carbonate
NT60B-----Argillic-limonitic alteration of tuff, outcrop west of main Simon headframe
NT61------Quartz veining in clay rich tuff, 1 km west of OMCO
NT62A-----OMCO mine, argillized tuff rich in light clays, sparse FeOx
NT62B-----Average sample from tailings at OMCO mine
NT62C-----Altered tuff very rich in clays