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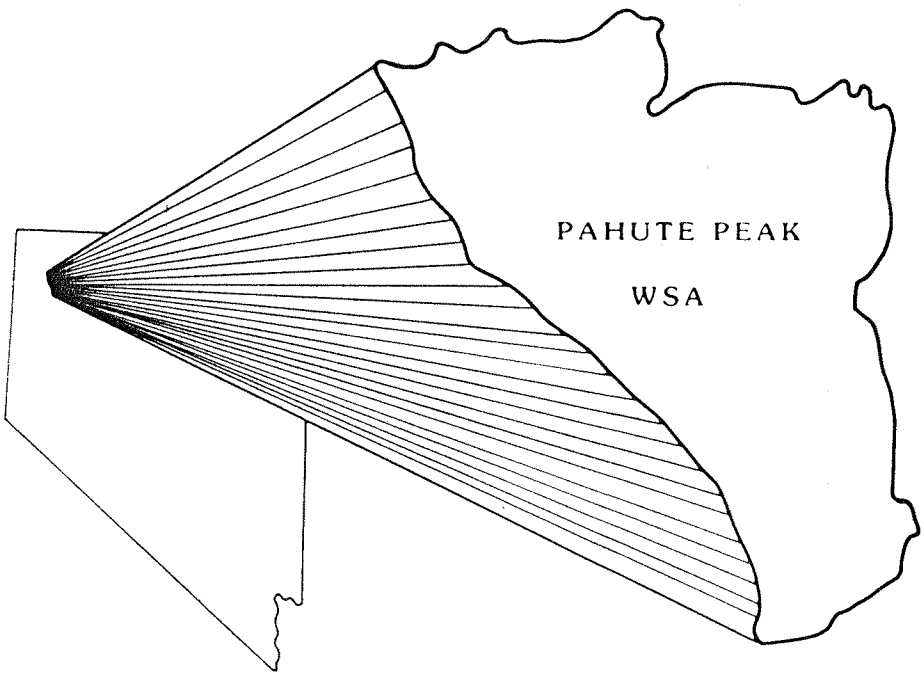
Open File Report

Mineral Resources of the Pahute Peak Wilderness Study Area, Humboldt County, Nevada



BUREAU OF MINES
UNITED STATES DEPARTMENT OF THE INTERIOR

MINERAL RESOURCES OF THE PAHUTE PEAK WILDERNESS STUDY AREA, HUMBOLDT COUNTY, NEVADA

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PREFACE

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and U.S. Bureau of Mines to conduct mineral surveys on U.S. Bureau of Land Management administered land designated as Wilderness Study Areas ". . . to determine the mineral values, if any, that may be present. . . ." Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a Bureau of Mines mineral survey of the Pahute Peak Wilderness Study Area (NV-020-621), Humboldt County, NV.

This open-file report will be summarized in a joint report published by the U.S. Geological Survey. The data were gathered and interpreted by Bureau of Mines personnel from Western Field Operations Center, E. 360 Third Avenue, Spokane, WA 99202. The report has been edited by members of the Branch of Mineral Land Assessment at the field center and reviewed at the Division of Mineral Land Assessment, Washington, D.C.

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SUMMARY

In 1984, the U.S. Bureau of Mines conducted a mineral survey of the Pahute Peak Wilderness Study Area (WSA) (NV-020-621), which covers 57,529 acres in Humboldt County, NV. About 90 percent of the WSA is underlain by Tertiary volcanic and shallow intrusive rocks. Of the remainder, metasedimentary rocks of unknown age are in contact with Cretaceous intrusive rocks in the northwest corner of the WSA. The entire WSA is within an upthrown fault block of the Basin and Range physiographic province. Portions of the WSA, especially south of Pahute Peak (Big Mountain), may be part of an eroded caldera structure.

No mines or evidence of major exploration were identified within the WSA. Workings in Copper Canyon, claim blocks along the northwest boundary, and zones of anomalous character as defined by the Bureau of Land Management were examined. No mineral resources were identified, but sample results indicate three significantly mineralized sites, one with indications for zinc skarns in Copper Canyon, another favorable for precious metals 2 miles south of Copper Canyon, and another area near the northwest boundary with geologic conditions characteristic of molybdenum deposits. Further investigation of these sites is warranted. Petrified wood is present in small amounts near the west central range front.

Hot spring activity occurs within the Double Hot Springs Known Geothermal Resource Area adjacent to the southern boundary of the WSA.

INTRODUCTION

This report describes the U.S. Bureau of Mines (USBM) portion of a cooperative study with the U.S. Geological Survey (USGS) to evaluate mineral resources and potential of the Pahute Peak (NV-020-621) WSA (Wilderness Study Area). The USBM examined and evaluated claims, prospects, and mineralized zones; the USGS conducted broader geological, geochemical, and geophysical surveys.

Information from these mineral surveys relates to one aspect of the area's suitability for wilderness classification. Although the near-term goal is to provide data for land-use decisions, the long-term objective is to help ensure that the Nation has an adequate and dependable supply of minerals at reasonable cost.

Setting

The Pahute Peak Wilderness Study Area (WSA) encompasses 57,529 acres in the western half of Humboldt County, NV (fig. 1). Elevations range from 4,050 ft (feet) on the desert floor to 8,594 ft at the summit of Pahute Peak (Big Mountain). The area is mostly accessible year-round on the east and west boundaries via county and BLM roads. The southern boundary is a jeep trail requiring a four-wheel-drive vehicle; the northern route, connecting the east and west sides, may be blocked by snow until late June (fig. 2). Sparse vegetation is comprised mostly of saltbush, grass, and greasewood.

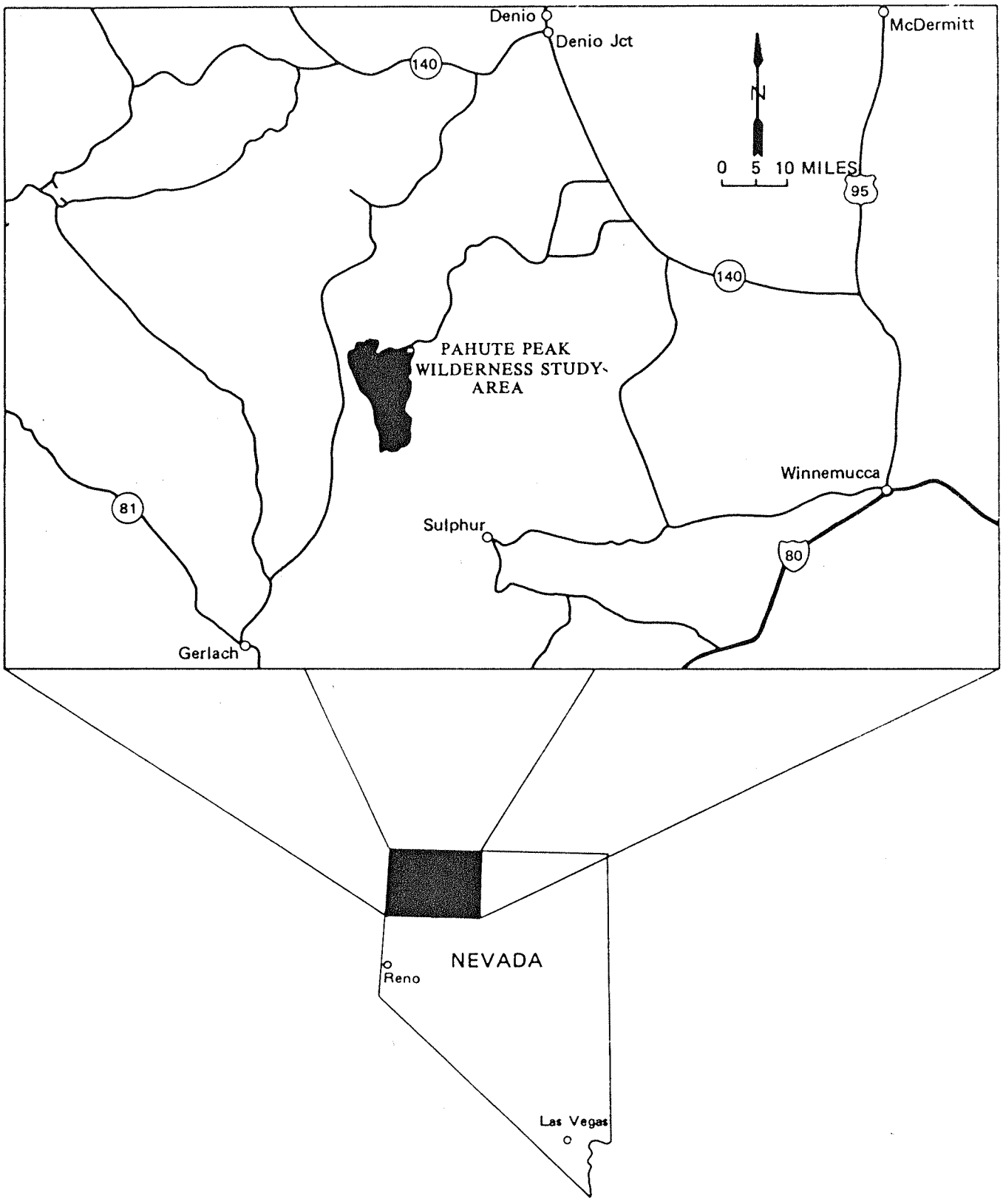

FIGURE 1. – Location of the Pahute Peak Wilderness Study Area (NB-020-621), NV

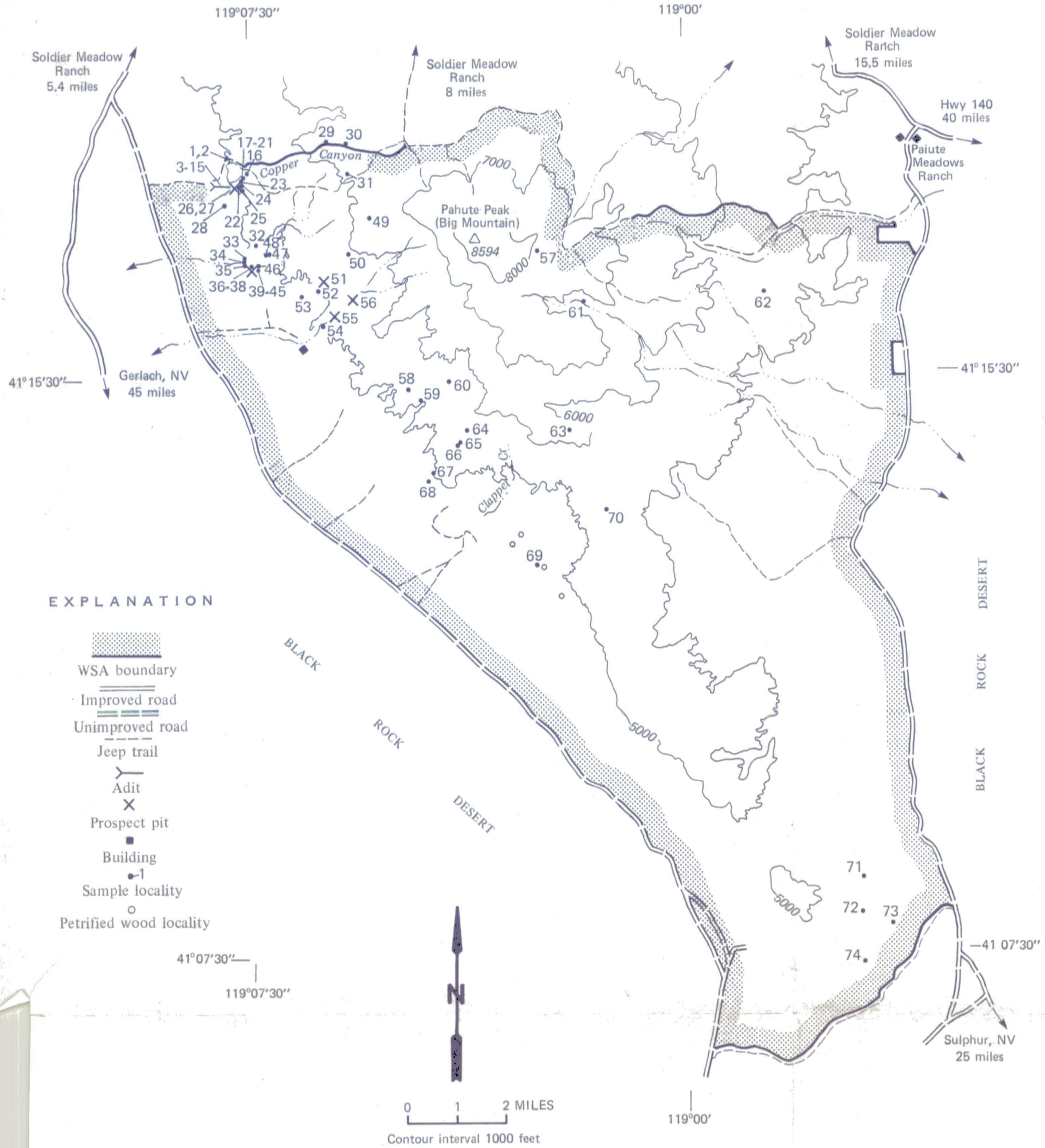

FIGURE 2. – Mines, prospects, and sample sites, in the Pahute Peak Wilderness Study Area (NV-020-621), NV

Previous Studies

Geology and mineral resources of Humboldt County and northwest Nevada are discussed by Willden (1964). Results of geochemical and geostatistical studies of the Winnemucca District are provided by Barringer Resources, Inc.(1982). The mining history of Humboldt County is summarized by Vanderburg (1938). The Cenozoic geology of the region was mapped by Noble (1970). Geology of Nevada was compiled by Stewart and Carlson (1978).

Present Study

Pre-field investigation included library research for pertinent literature, a search of BLM and Humboldt County records for claim locations, and an examination of U.S. Bureau of Mines production records. Claim owners were contacted for additional information and for permission to examine and publish data on their properties. The Bureau's Mineral Industries Location System (MILS) was also queried for property locations within the area studied.

Field work included searching for and examining all mineral properties identified in the pre-field study. Ground and aerial reconnaissance of the entire WSA was conducted to locate unknown claims, prospects, or mineralized areas. All sites found were sampled and, if warranted, mapped. Anomalous zones within the Pahute Peak WSA as defined by the U.S. Bureau of Land Management (1983), were examined and sampled in an effort to determine the source of the indicated anomalies (fig. 3).

Depending on the character of the rock, all samples were analyzed for a particular suite of elements by inductively coupled plasma, atomic absorption, or other quantitative method. Detection limits for gold and silver were 0.007 and 0.3 ppm (parts per million), respectively. Detection limits for other elements varied with method but were generally below 30 ppm. Most samples were submitted for semi-quantitative spectrographic analysis for 40 elements 1/ to detect the presence of other elements. Select samples were analyzed petrographically for rock type, petrogenesis, alteration assemblages, and various other qualitative data.

ACKNOWLEDGEMENTS

Pre-field work was performed by Richard S. Gaps, a former employee of the U.S. Bureau of Mines. Field work was coordinated by R. S. Gaps

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1/ Aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, gallium, gold, iron, lanthanum, lead, lithium, magnesium, manganese, molybdenum, nickel, niobium, palladium, phosphorous, platinum, potassium, scandium, silicon, silver, sodium, strontium, tantalum, tellurium, tin, titanium, vanadium, yttrium, zinc, zirconium.

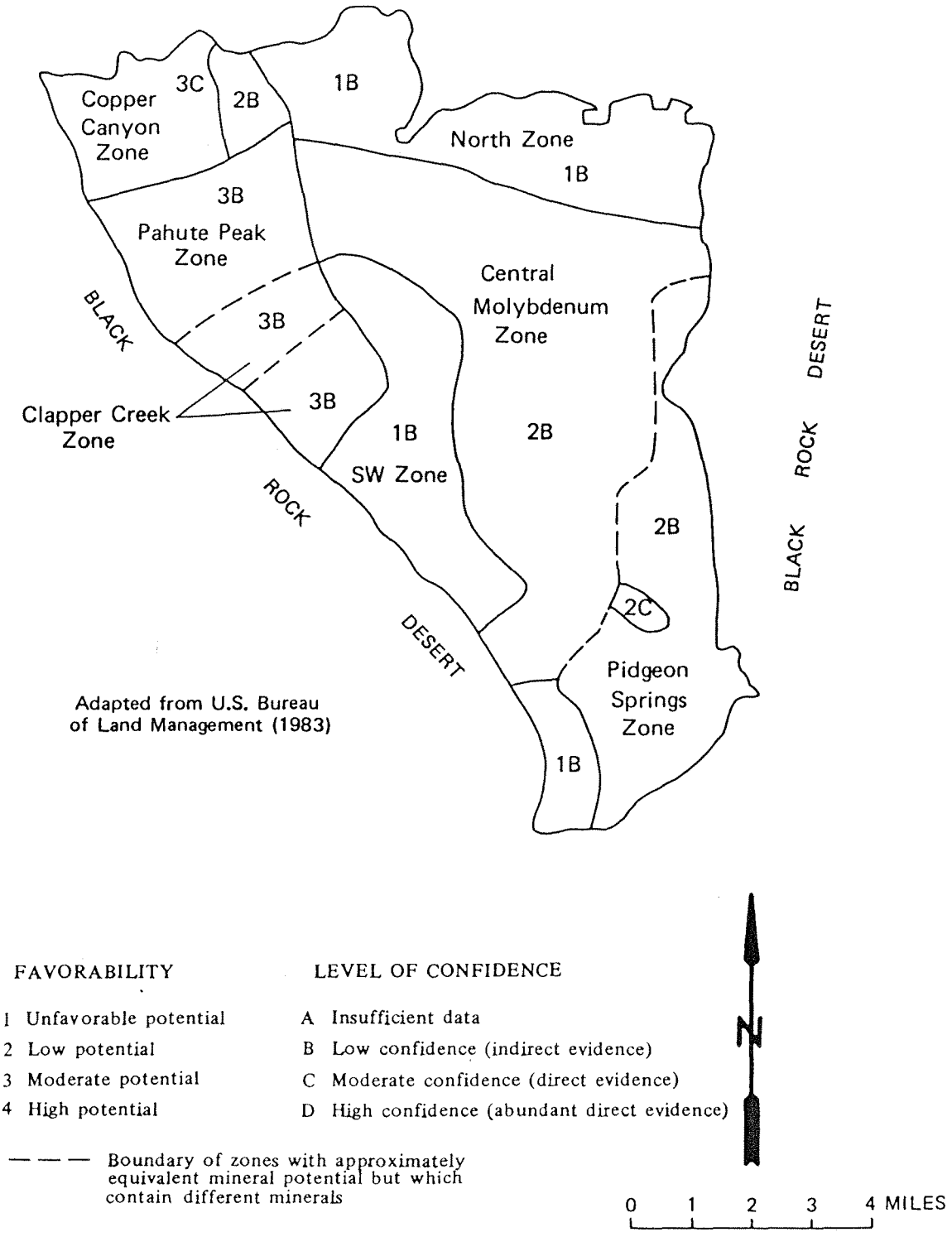

FIGURE 3. – Zones of anomalous character as defined by the BLM in the Pahute Peak Wilderness Study Area (NV-020-621), NV

and implemented with the assistance of Jerry Olson and Nicholas T. Zilka. Appreciation is extended to Mr. Willis Bland for allowing us to set up base camp at Paiute Meadows Ranch and for his assistance in many logistical matters. Victor Dunn of the BLM provided valuable information pertaining to the geologic and general mineral character of the WSA.

GEOLOGIC SETTING

The Pahute Peak WSA is within the Basin and Range physiographic province, which is characterized by northeast-trending, fault-bounded mountain ranges and valleys; the WSA is within an upthrown block (Fennaman, 1931). Most of the WSA is underlain by Tertiary volcanic rocks including Oligocene to Miocene basalt, dikes of dacite and andesite, air fall, ash flow, and reworked tuffs, including the Ashdown Tuff, and rhyolite domes, flows, and dikes (D.C. Noble, personal comm., 1984) and shallow intrusive rocks. In the northwest corner of the WSA Cretaceous granodiorite is in contact with pre-Cretaceous metasediments. This intrusive is thought to correlate with the Sierra Nevada and Idaho Batholiths (Smith and others, 1971, p. 2934). Most of the WSA south of Pahute Peak (Big Mountain) may be part of a large collapsed caldera (V. Dunn, personal comm., 1985).

A summary of the regional geologic history is adapted from Crewdson (1976, p. 21) as follows:

1. Late Paleozoic formation of volcanic and minor sedimentary rocks in a eugeosynclinal environment.

2. Regional Mesozoic(?) dynamo-thermal metamorphism.

3. Cretaceous emplacement of granodiorite intrusives and associated contact metamorphism.

4. Early Tertiary uplift and erosion exposing granodiorite and metavolcanic rocks and removing all Paleozoic rocks.

5. Mid-Tertiary deposition of volcanics.

6. Mid- to late Tertiary Basin and Range style faulting.

7. Quaternary deposition of lake sediments, alluvium, playa sediments, and dunes.

8. Recent minor faulting.

9. Holocene hot spring development, including Pinto Hot Springs to the northeast and Double Hot Springs to the southwest.

Ore deposits and mineralization within the region include massive sulfides, vein gold and silver deposition, and hot spring type mineralization. Recent precious metal exploration activity in the

Slumbering Hills northwest of Winnemucca, NV is associated with range front faulting.

Mineralization within the WSA was related primarily to: 1. contact metamorphism and associated skarn formations in Copper Canyon; 2. range front faulting and poosible hot spring type precious metal deposition along the western boundary; and 3. vein fluorite intrusion within both volcanic and intrusive rocks near the western range front south of Copper Canyon.

MINING HISTORY

Prospecting in Humboldt County began by emigrants and prospectors travelling through the area on route to the California gold fields. The first account of a mineral discovery near the Black Rock Range is summarized by Vanderburg (1938, p. 9) as follows:

> In the summer of 1849, Allen Hardin, in the company of other emigrants, arrived almost destitute on the edge of the Black Rock Desert. Hardin, with two companions, had left the main party in search of game for food. This region is one of the barren and desolate sections in Nevada and the hunters found no game. However, on their return to camp they brought with them a piece of metal that weighed about 25 pounds, and they tried to get a member of the party to haul it to California for them. The party in question was short of oxen to haul his own property and he informed them that he would not pack it, even though it were pure gold. They were forced to leave the specimen beside the road, but before doing so they made a small button by melting a piece and molding it in the sand. Upon arriving in California the button was assayed and showed high values in silver. The rock that was left along side the road was found several months later by another party of emigrants and brought to Sacramento, where it was placed on exhibition in the leading bank at the time. In succeeding years numerous parties, numbering as high as 70 members in a single party, were organized by Hardin and others to search for the "lost mine", but these efforts were fruitless. Probably the metal found by Hardin was a specimen of hornsilver float from the Silver Camel mine near Sulphur.

Subsequent reports of the "discovery of the lost silver mine" resulted in the establishment of Hardin city and millsite, located about a mile southwest of the WSA. Surprisingly, no workings were found near the millsite, but parts of it are still standing today.

Mining has occurred in districts nearby and adjacent to the WSA, but only four propects were located inside (fig. 2). A millsite is reported to have been erected in Copper Canyon (U.S. Bureau of Land Management, 1983) but no production is recorded. Small scale exploration has occurred along the northwestern range front.

MINES, PROSPECTS, AND MINERALIZED AREAS

BLM mining records indicate four areas are under active or recent claim within or adjacent to the WSA; none of these are patented. Copper Canyon, just inside the northwest corner of the WSA, contains numerous underground and surface workings. The remaining three claim blocks, and one additional claim not identified in pre-field work, are somewhat clustered along the range front between 2 and 4 mi (miles) south of Copper Canyon (fig. 2); workings are limited to a few small pits. Other workings reported by the BLM near Clapper Creek were not observed during this study.

Copper Canyon

This zone is comprised of pre-Cretaceous metasedimentary calcareous rocks in contact with Cretaceous granodiorite and overlain by Oligocene volcanics of the South Willow Formation.

Numerous workings, including one 300-ft adit near the mouth of the canyon, and several smaller adits and pits at the mouth and within the canyon, expose small quartz veins and what appear to be poorly developed skarn zones (fig. 2, nos. 1-27). Of 28 samples, most gold values were below or near detection limits, copper ranged from 8 to 370 ppm, and no molybdenum, tin, or tungsten were detected. Most silver results were also below or near detection limits, but two samples within the canyon contained 16.6 and 15.2 ppm. Zinc, in four samples from shear and gossan zones ranged from 0.018% to 8.7% (percent). Zinc was also detected by semi-quantitative spectrography in three other samples ranging from 0.8% to 8.0%. Because zinc-bearing skarns are often found distal from the source (Meinert and others, 1980), results of this study may imply a source pluton not previously recognized within the area. Additional work would be needed to identify any associated resources. Results of all sample analyses are listed in table 1.

About 2 mi south of Copper Canyon, at the edge of the range front, a 20 to 30 ft wide fault zone, traceable for at least 1/4 mi, strikes N. 30° W. and dips 80° S (fig. 2 nos. 33-46). The zone is comprised of silicified volcanic and intrusive rocks with disseminated pyrite and crisscrossing iron-oxide-filled veinlets. Across an unnamed canyon, less than 1/4 mi to the south, another area of more pervasive argillic and silicic alteration, and similar lithology, occurs along the same trend. Three pits in this area expose heavily altered volcanics and gabbroic(?) rocks with visible primary sulfides (possibly chalcopyrite and arsenopyrite) and minor secondary copper minerals. Anomalous gold, silver, arsenic, and antimony values may be related to past range front faulting and associated hot spring activity and represent a large mineralized site. Additional work, including drilling, would be necessary to define resources. Results from all samples taken in both areas are listed in table 2 and the locations are shown on figure 2.

TABLE 1.--Sample results, Copper Canyon

[N, none detected; --, not analyzed]

Sample Map no.	Description	Gold (ppm)	Silver (ppm)	Copper (ppm)	Zinc (ppm)
1	Fine-grained, fractured, sheared monzo-diorite	N	N	--	--
2	do	N	N	--	--
3	Monzo-diorite with surface iron oxide staining	N	N	9	-- 1/
4	Shear zone in medium-grained monzo-diorite	0.068	N	58	-- 1/
5	do	.010	N	110	-- 1/
6	Iron-oxide filled fractures in monzo-diorite	.013	1.16	60	-- 1/
7	do	N	N	86	-- 1/
8	Dark gray monzo-diorite with 1 ft wide shear zone	N	N	50	-- 1/
9	Unaltered monzo-diorite	N	N	92	-- 1/
10	do	N	N	81	-- 1/
11	Monzo-diorite with disseminated pyrite	N	N	100	-- 1/
12	Gray, aphanitic, metasedimentary rock (?) with disseminated pyrite	N	N	160	-- 1/
13	Gray-green, fine-grained quartzite (?)	N	N	62	-- 1/

TABLE 1.--Sample results, Copper Canyon--Continued

Sample					
Map no.	Description	Gold (ppm)	Silver (ppm)	Copper (ppm)	Zinc (ppm)
14	Gray-green, fine-grained quartzite (?) with disseminated pyrite and garnet	N	N	50	-- 1/
15	Interfingered quartz and monzo-diorite	N	N	8	-- 1/
16	Silicified gossan pod	0.017	N	--	--
17	Gray, crystalline limestone	N	N	--	-- 1/
18	Fine-coarse breccia and gray fault gouge	N	N	100	3.9% 1/
19	Gray crystalline limestone	.008	0.35	--	* .8 1/
20	Gray-green fault gouge at limestone/granite contact	N	N	--	-- 1/
21	Limonite-filled shear zone (N. 60° W., 55° N.)	.042	1.019	--	-- 1/
22	Red, silicified breccia	.070	16.6	370	8.7% 1/
23	Red-brown brecciated gossan in gray crystalline limestone	.129	15.2	--	* 1.0% 1/
24	Iron-oxide stained pod in coarse limestone	.010	.42	--	--
25	Gossan shear zone (N. 35° W., 90°)	.061	.55	--	* 8.0% 1/
26	Iron-oxide filled shear zone (N. 20° E., 85° S.) in silicified limestone	N	.74	170	3.2% 1/

TABLE 1.--Sample results, Copper Canyon--Continued

Sample Map no.	Description	Gold (ppm)	Silver (ppm)	Copper (ppm)	Zinc (ppm)
27	Shear zone (N. 20° W., 90°) in silicified limestone---------	0.055	1.197	--	-- 1/
28	Quartzite with disseminate sulfides-------------------------	N	N	17	180

1/ Sample from working.
* Semi-quantitative spectrography.

No other workings or significant structures were found within the Copper Canyon zone. Of 28 samples taken elsewhere in the zone, those with detectable gold or silver are also listed in table 2 and the locations are shown on figure 2.

Pahute Peak

This zone is reported to have anomalous values of molybdenum and barium (U.S. Bureau of Land Management, 1983). Local lithology includes pre-Cretaceous metasedimentary rocks, Cretaceous intrusive rocks, Oligocene basalt and dacite of the South Willow Formation, and Miocene rhyolite.

Two pits expose a fluorite vein intruding volcanic and altered intrusive rocks on the north side of an unnamed canyon approximately 2-1/2 mi southeast of Copper Canyon (fig. 2, nos. 54-56). The vein is 2 to 4 ft wide, is traceable for about 300 ft, strikes east-west, and dips nearly vertical. One petrographic sample of vein material was described as massive fluorite with minor cryptocrystalline silica and minor opaque minerals. Two other samples (fig. 2, nos. 55 and 56) of vein material contained 20% and 10% fluorine (41.1% and 20.55% CaF_2). Because of the low indicated grade and lack of exposure no resources were calculated. At the upper end of the same canyon, in an area previously covered by six mining claims, one sample of charcoal(?) in volcanic tuffs contained 0.06% eU_3O_8 (Garside, 1973, p. 58). However, radiometric surveys with a gamma ray scintillometer provided no additional evidence of uranium mineralization in the area.

No other workings or significant structures were found in the remainder of the zone. Of 25 samples taken at selected sites, four (Nos. 54, 58, 59, and 60) contained 0.04, 0.219, 0.024, 0.11 ppm gold, and two samples (Nos. 59 and 60) contained 1.75, and 2.13 ppm silver respectively. Sample locations are shown on figure 2.

Clapper Creek

The rocks in this zone include pre-Cretaceous metasediments, Oligocene tuffs, Miocene rhyolite and olivine basalt, and dacite dikes of the South Willow Formation. A 5-ft adit and numerous small pits are reported by the BLM to occur at an andesite-quartzite contact, but these workings were not found during this study. Of 15 samples taken elsewhere in the zone, five samples (fig. 2, nos. 64 through 68) taken along a ridge 1 mi northwest of Clapper Creek, from what appear to be silicified rhyolite dome structures, had from 0.4 to 0.89 ppm silver.

Others

The remaining four zones include: 1. the Central Molybdenum zone, comprised of Oligocene-Miocene rhyolite, sediments, and tuffs, including the Ashdown Tuff, and shallow intrusive rocks; 2. the Pidgeon Springs zone, underlain predominantly by basalt correlated with the Steens Basalt and moderate amounts of Miocene(?) tuff; 3. a zone in the southwest

TABLE 2.--Sample results, Copper Canyon Zone

[N, none detected; --, not analyzed]

Sample Map no.	Description	Gold (ppm)	Silver (ppm)	Arsenic (ppm)	Antimony (ppm)	Copper (ppm)
29	Brecciated, vesicular basalt	0.10	N	--	--	230
30	Brown, silicified (?) volcanic	.10	N	--	--	--
31	Gray-purple, flow-banded rhyolite	.012	N	--	--	--
32	Biotite diorite, slightly weathered	.012	N	--	--	--
33	Gray-buff, silicified fault zone with iron oxide veinlets	N	N	44	N	120
34	Gray-brown fault breccia with 10%-20% quartz	.055	0.78	76	N	60 2/
35	Gray-buff, silicified volcanic tuff	.242	.987	4.3%	7.8	210
36	Gray-green, silicified, argillized volcanic (?) rock	1.66	1.62	--	--	-- 1,2/
37	do	1.56	.60	17%	28.5	-- 1,2/
38	Milky quartz with secondary copper and iron-oxide stain	1.11	.50	1060	4.1	-- 1,2,3/
39	Gray-green, silicified, argillized volcanic (?)	.528	.74	2.1%	3.0	110 2/
40	do	N	.68	68	N	240 2/
41	Gray, silicified mafic intrusive with surface copper oxide	N	1.18	58	N	1000

TABLE 2.--Sample results, Copper Canyon Zone--Continued

Sample Map no.	Description	Gold (ppm)	Silver (ppm)	Arsenic (ppm)	Antimony (ppm)	Copper (ppm)
42	Gray-green, silicified, argillized volcanic with primary sulfides	2.793	0.86	10.6%	33	200 2/
43	Silicified volcanic breccia with primary sulfides (arsenopyrite?)	N	.971	440	N	330
44	Gray-buff, silicified volcanic (?)	N	N	85	N	N
45	Gray, silicified, argillized volcanic with primary sulfides	1.277	.56	11.7%	13	270 2/
46	White-buff, bleached, medium-grained intrusive	N	.462	--	--	-- 1,2/
47	Medium-grained, equigranular diorite	.015	N	--	--	--
48	Red-brown-yellow quartzite with sulfide odor	.015	N	--	--	--
49	Lavender, slightly vuggy rhyolite	.011	N	--	--	--
50	Devitrified obsidian in tuff	N	3.38	--	--	-- 2/
51	Ash fall tuff and basalt	.007	2.53	--	--	-- 2/
52	Fracture zone (N. 65° W., 90°) in rhyolitic tuff	.007	.64	--	--	N 2/
53	Limonitic breccia in tuff	.020	2.28	--	--	N 2/

1/ Range Front Fault zone.
2/ Sample from working.
3/ Not seen in place.

corner of the WSA comprised of Tertiary volcanic rocks; and 4. a zone along the northern border also predominantly underlain by Tertiary volcanics. No workings or significant structures were found in any of these areas. Analyses of selected samples with detectable gold or silver and possibly warranting additional investigation are listed in table 3 and the locations are shown on figure 2. No other elements were detected in significant amounts.

Five sites containing zeolite-bearing rock were sampled within the WSA. Two samples contained only 9.0% clinoptilolite, and are not considered important for zeolite minerals.

PETRIFIED WOOD

Petrified wood was found at four separate locations, approximately 1 mi south of Clapper Creek. Amounts range from scattered float to one partially buried log estimated to be 50 ft long and 3 ft in diameter. The area is underlain by Tertiary volcanics of the South Willow Formation.

According to two Spokane, WA, rock and gem dealers, raw product petrified wood wholesale prices range from $0.10 to $0.25 per lb (pound). Small finished products usually sell for $2.00 to $4.00 per lb, but large polished rounds up to 12 in. (inches) in diameter can sell for $50.00. Because the areas are essentially inaccessible by vehicle, the larger log segments would be extremely difficult to excavate. The smaller broken pieces may be of limited commercial or recreational interest.

GEOTHERMAL

Most of the southern half of the WSA is favorable for geothermal resources based on the proximity of the Double Hot Springs Known Geothermal Resource Area adjacent to the southern boundary. According to the U.S. Geological Survey, reservoir temperatures range from 125°C to 145°C and "....hold high potential for industrial processing applications" (Bureau of Land Management, 1983, p.293). No hot springs or geothermal leases occur within the WSA.

APPRAISAL OF MINERAL RESOURCES

No resources were identified within or adjacent to the WSA. However, one or more mineralized sites, predominantly in the northwest corner of the WSA, warrant additional investigation for resource definition. Surface manifestations of zinc skarn mineralization in Copper Canyon are poorly developed, but these occurrences are sometimes associated with more extensive mineralization at depth (fig. 2, nos. 1-27). Additional work is required to delineate possible resources. A fault controlled linear zone 1/4 to 1 mi in length along the range front south of Copper Canyon (fig. 2, nos. 33-46) contains anomalous amounts of gold, silver and arsenic. Because this setting is similar to other range front mineralized sites with demonstrated ore

TABLE 3.--Sample results, other zones

[N, none detected; --, not analyzed]

Sample Map no.	Description	Gold (ppm)	Silver (ppm)	Arsenic (ppm)	Antimony (ppm)	Molybdenum (ppm)
57	Gray-purple, silicified rhyolite with reddish banding--	N	1.19	2.0	N	N
61	Gray-maroon, vesicular rhyolite----------	N	.43	--	--	7.0
62	Silicified, rhyolite breccia----------	.012	N	--	--	N
63	Red-gray, slightly silicified volcanic rock; minor brecciation----------	.011	2.53	--	--	10.0
69	Gray-buff, lithic tuff with iron-oxide fracture-filling	N	.42	--	--	N
70	Gray-buff, lithic tuff----------	N	.38	--	--	N
71	Silicified andesite (?) between tuff and basalt--------	0.217	N	8.0	N	--
72	Buff, fine-grained volcanic rock with minor manganese oxide----------	N	.84	4.0	N	--
73	Brown, silicified, vesicular basalt----------	N	.57	10.0	N	3.0
74	Buff-yellow, bleached, vesicular volcanic rock---------	N	.34	2.0	N	--

deposits within the region it should be further investigated. The geologic setting in an unnamed canyon south of Copper Canyon (fig. 2, nos. 54-56) is characteristic of molybdenum deposits, but due to current (1985) prices and low demand, it is unlikely that this site will be explored in the near future. Individual gold and silver occurrences defined within the anomalous zones may be significant and warrant further attention. Petrified wood in small quantities is available near Clapper Creek for recreational or limited commercial collecting.

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