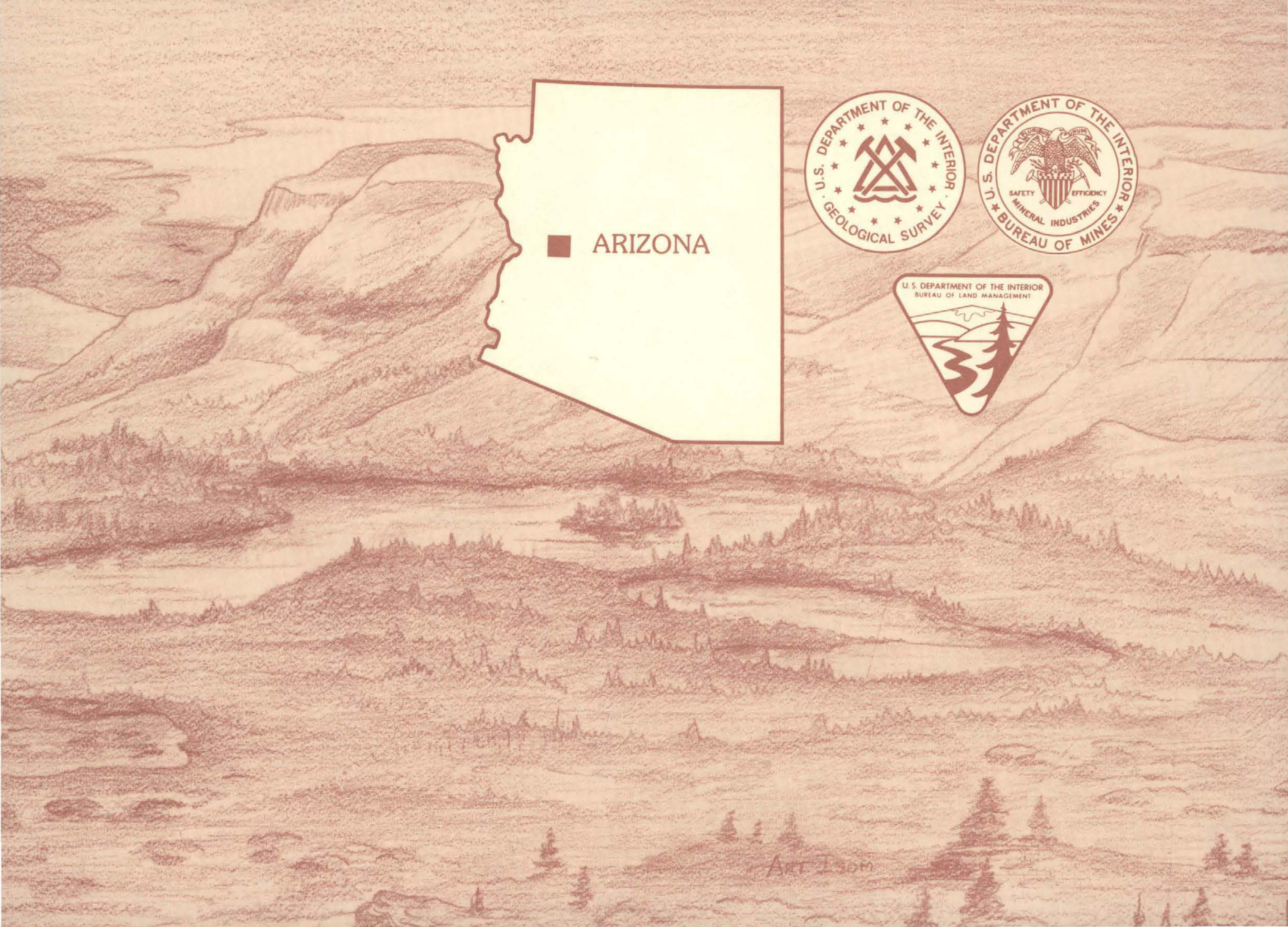
Mineral Resources of the Lower Burro Creek Wilderness Study Area, Mohave and Yavapai Counties, Arizona

U.S. GEOLOGICAL SURVEY BULLETIN 1701–B



Chapter B

Mineral Resources of the Lower Burro Creek Wilderness Study Area, Mohave and Yavapai Counties, Arizona

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U.S. GEOLOGICAL SURVEY BULLETIN 1701

MINERAL RESOURCES OF WILDERNESS STUDY AREAS:
WEST-CENTRAL ARIZONA AND PART OF SAN BERNARDINO COUNTY, CALIFORNIA

DEPARTMENT OF THE INTERIOR
DONALD PAUL HODEL, Secretary

U.S. GEOLOGICAL SURVEY
Dallas L. Peck, Director

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STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Area

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine 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 mineral survey of part of the Lower Burro Creek Wilderness Study Area (AZ-020-060), Mohave and Yavapai Counties, Arizona.

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Mineral Resources of the Lower Burro Creek Wilderness Study Area, Mohave and Yavapai Counties, Arizona

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SUMMARY

Abstract

The part of the Lower Burro Creek Wilderness Study Area (AZ-020-060) on which mineral surveys were requested encompasses approximately 21,700 acres at the south end of the Aquarius Mountains in west-central Arizona. In this report, any reference to the Lower Burro Wilderness Study Area refers to the original 21,660 acres and an additional 10 acres for which the Bureau of Land Management requested mineral surveys and is referred to as the study area. The U.S Bureau of Mines and the U.S. Geological Survey conducted geological, geophysical, and geochemical surveys during 1984 and 1985 to assess the mineral resources (known) and mineral resource potential (undiscovered) of the study area.

Inferred subeconomic mineral gold resources were identified at four mines and prospects in the southeastern part of the study area. Sedimentary rocks in the eastern part of the study area host inferred marginal reserves of bentonite and inferred subeconomic resources of magnesite. Undiscovered deposits of gold in the study area are likely to be of very small tonnage. The mineral resource potential for gold is low in three small areas in the eastern part of the study area. The mineral resource potential for gold, silver, copper, lead, and zinc is low in one area in the southern part of the study area. Anomalous concentrations of tin in stream sediment samples were probably derived from silicic volcanic rocks within the study area, therefore two areas are considered to have low mineral resource potential for tin. The mineral resource potential for magnesite in the area surrounding the inferred subeconomic magnesite resource is low. The eastern part of the study area has one area each of high, moderate, and low mineral resource potential for bentonite. The geothermal resource potential is considered to be low for the study area.

Character and Setting

The Lower Burro Creek Wilderness Study Area is located approximately 14 mi southeast of Wikieup and 10 mi west of Bagdad, Ariz. The southwest boundary of the study area adjoins Arizona Highway 93. Elevations range from 1,920 ft at Burro Creek beneath the bridge on Highway 93 to 3,820 ft on an unnamed peak in the northern part of the study area.

The study area lies in the structural transition zone between the Colorado Plateau and the Basin and Range physiographic province. Proterozoic (see appendix for geologic time chart) granitic and metamorphic rocks are extensively exposed in the region. Within the study area, Middle Proterozoic granites intrude schistose rocks of the Early Proterozoic Yavapai Series as well as an Early or Middle Proterozoic mafic-ultramafic complex. Fault-bounded basins within the Proterozoic basement locally contain thick accumulations of Tertiary volcanic and sedimentary rocks. Laramide (71 Ma) plutonic and Laramide(?) volcanic rocks are present near Bagdad, 10 mi east of the study area, however coeval magmatic activity has not been identified within the study area.

The study area is located near the southwest periphery of the Eureka mining district. Much of the production from that district has come from a Laramide-age porphyry copper deposit. Lesser production was from Proterozoic basement-hosted volcanogenic massive sulfide deposits, fault-controlled

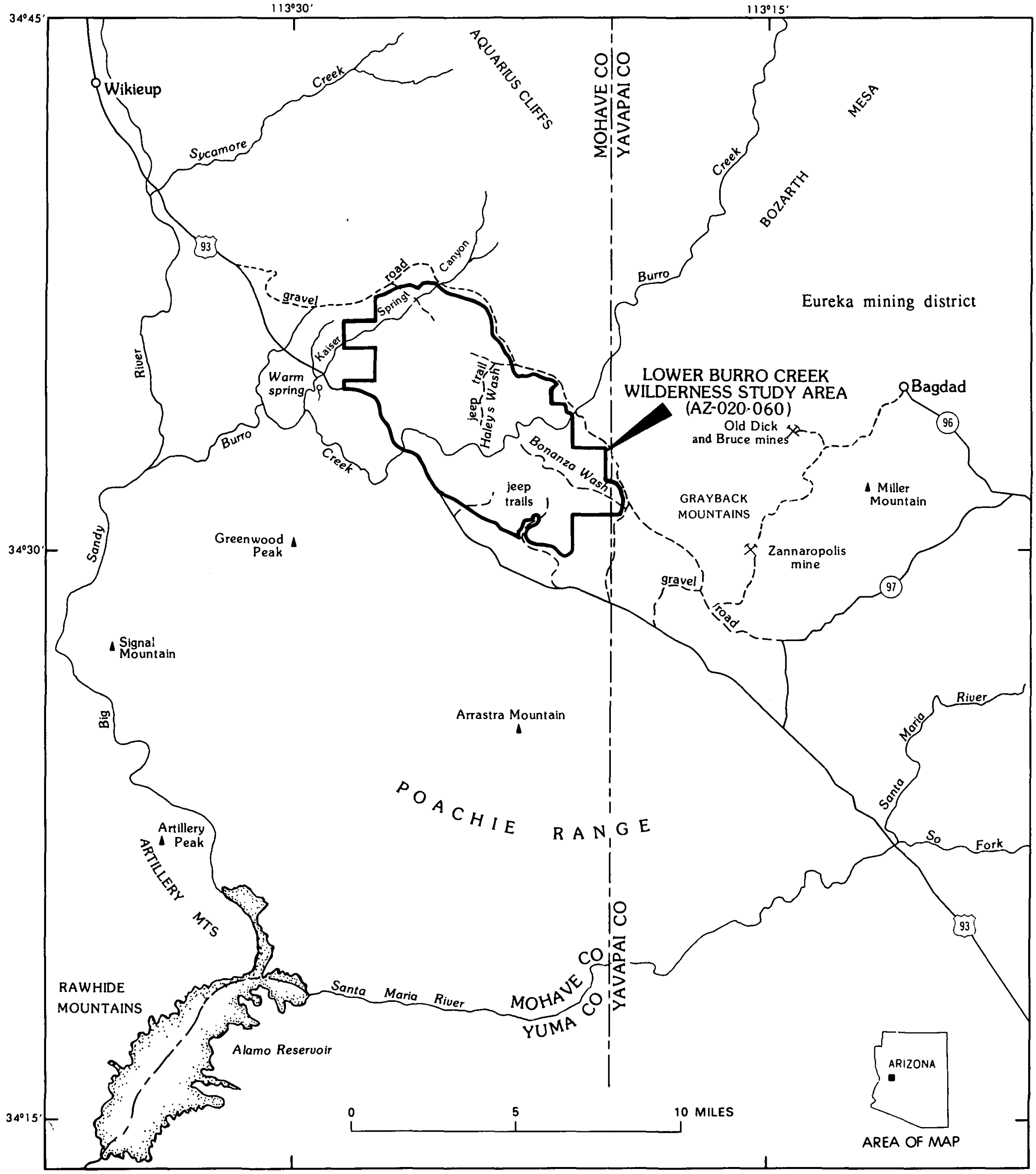

Figure 1. Index map showing location of Lower Burro Creek Wilderness Study Area, Mohave and Yavapai Counties, Arizona.

epithermal gold-, silver-, copper-, lead-, and zinc-bearing veins, and wolframite- and scheelite-bearing quartz veins and pegmatites. Tertiary zeolitized tuff within the district is mined locally for use as building material.

Gold mining began in the study area in the late 1800's and has occurred sporadically since. During the 1960's and 1970's, limited quantities of bentonite and magnesite were mined within and adjacent to the east boundary of the study area.

Identified Mineral Resources

Proterozoic rocks in the south half of the study area have been prospected extensively for lode gold deposits and the area for placer gold deposits. No production records are available for the mines and prospects within the area. Inferred subeconomic resources of gold were identified at the Golden Key mine, Granite State mine, and the Phoebe claims. The Golden Key mine has 350 short tons (st) averaging 0.15 oz gold/st and 5,700 st averaging 0.06 oz gold/st, the Granite State mine has 6,000 st averaging 0.05 oz gold/st, and the Phoebe claims have 5,500 st gold averaging 0.1 oz gold/st. Samples with similar gold values were collected at other prospects within the study area, however exposures were not sufficient to estimate the tonnage or grade of the deposits. In addition to gold, minor amounts of silver, copper, lead, zinc, and molybdenum are present in some prospects.

Bentonite is present in lacustrine sedimentary rocks that underlie the eastern part of the study area and extend eastward beyond the study area boundary. The bentonite having the most favorable chemical and physical characteristics and least overburden is found within and immediately east of the study area. Inferred marginal reserves of 600,000 st of bentonite are identified. The deposits of highest grade bentonite coincide with deposits of cryptocrystalline magnesite. Two million tons of inferred subeconomic magnesite resources of variable purity were identified within and east of the study area (loc. 14, fig. 2).

A thermal spring 2 mi southwest of the study area has a surface temperature of 37 °C and an estimated reservoir temperature of less than 115 °C (Goff, 1979). No geothermal activity is present within the study area.

Mineral Resource Potential

Gold and minor amounts of silver, copper, lead, and zinc are present at numerous mines and prospects located in the southeastern part of the study area. Geology and geochemistry indicate that these occurrences are fault-controlled hydrothermal deposits hosted by Proterozoic granitic and metamorphic rocks. Known deposits in the study area of this type have a very small tonnage and low or moderate grade. The potential for resources of gold in large-tonnage deposits is low in three areas within the study area and low for resources of gold, silver, copper, lead, and zinc, in one area.

Tin is present in anomalous concentrations in some stream-sediment samples from the study area. The tin is probably derived from Miocene fluorine-enriched rhyolite domes or associated pyroclastic deposits within the study area. The potential for resources of tin is considered to be low in two areas within the study area. Fluorine-enriched rhyolites may be associated with deposits of uranium, beryllium, lithium, molybdenum, and tungsten, however no evidence was found to indicate the presence of these deposits within the study area. Near Bagdad, uranium occurs in unusually high concentrations in accessory minerals within the Middle Proterozoic Lawler Peak Granite (Silver and others, 1984). A general aeroradiometric high over the granite in the southeast corner of the study area suggests that the same may be true there. Anomalous concentrations of uranium and thorium in stream-sediment samples from the study area are assumed to be the result of this high background rather than the result of resource-forming processes, therefore there is no potential for undiscovered resources of uranium or thorium in the study area.

Bentonite is interbedded with Tertiary lacustrine, basin-fill sediments in the eastern part of the study area. The thickest exposure of bentonite is present along the east boundary of the study area where resources of bentonite are identified. The potential for resources of bentonite is high in the area adjacent to the identified bentonite resource. In this area the lacustrine sediments are disrupted and repeated by faulting and slumping. Colluvium of basalt rubble covers most of the area and prevents the determination of the location or thickness of the bentonite. The potential for resources of bentonite is moderate in one area. Lacustrine rocks present near the center of the study area are dominantly composed of siltstones and silty mudstones but impure bentonite may be present locally. This area has low potential for bentonite resources in a deposit of white cryptocrystalline magnesite.

Additional resources of magnesite could be present within an area of slumped and colluvium-covered sediments adjacent to the known deposit. The potential for resources of magnesite is low in this area.

Zeolites, present as an alteration product of siliceous tuffs, are locally interbedded with the lacustrine sediments east of the study area. Lithic-rich silicic tuff overlies the lacustrine sediments in the study area. This tuff may be partially altered to zeolite minerals, locally, however the study area does not have resource potential for zeolites due to the high content of lithic detritus present in the tuff.

The geothermal resource potential is low for the study area. There is no potential for oil and gas resources in the study area.

INTRODUCTION

This mineral survey was requested by the U.S. Bureau of Land Managment and is a joint effort by the U.S. Geological Survey and the U.S. Bureau of Mines. The U.S. Bureau of Mines evaluates identified resources (known) at individual mines and known mineralized areas by collecting data on current and past mining activities and through field examination of mines, prospects, claims, and mineralized areas. Identified resources are classified according to the system described by U.S. Bureau of Mines and U.S. Geological Survey (1980). Studies by the U.S. Geological Survey are designed to provide a reasonable scientific basis for assessing the potential for mineral resources (undiscovered) by determining geologic units and structures, possible environments of mineral deposition, presence of geochemical and geophysical anomalies, and applicable ore-deposit models. Mineral assessment methodology and terminology as they apply

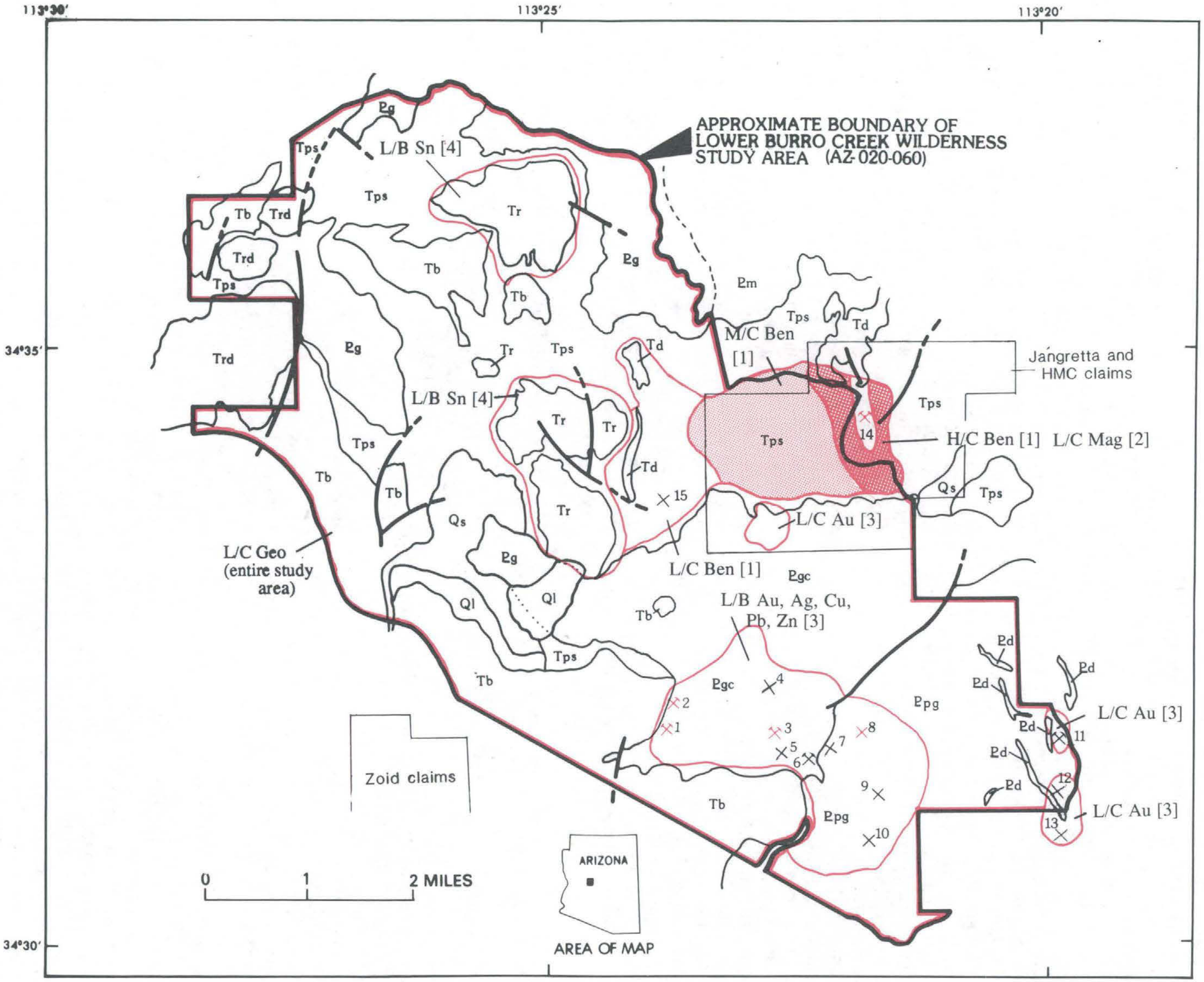

Figure 2. Mineral resource potential for the Lower Burro Creek Wilderness Study Area, Mohave and Yavapai Counties, Arizona.

EXPLANATION

Area with high resource potential

Area with moderate resource potential

Area with low resource potential

Mine with identified resource

Prospect with identified resource

See appendix for definition of levels of mineral resource potential and certainty of assessment and description of mines and prospects

Commodities

Au	Gold	Sn	Tin
Ag	Silver	Ben	Bentonite
Cu	Copper	Mag	Magnesite
Pb	Lead	Geo	Geothermal
Zn	Zinc		

[ ] Deposit types

1 Diagenetic alteration
2 Hot-spring alteration
3 Hydrothermal gold-bearing veins and fractures
4 Tin-bearing rhyolite

Description of map units

Qs	Alluvium (Quaternary)--Unconsolidated sand and gravel in modern stream channels. Includes talus
Ql	Landslide deposits (Quaternary)--Chaotic assemblages of volcanic and sedimentary rocks resulting from undercutting of Burro Creek
Trd	Rhyodacite (Miocene)--Variably porphyritic rhyodacite domes and associated flows on the west margin of the study area
Tb	Basalt (Miocene)--Mesa-forming basalt flows and minor agglomerates and tuffs
Tps	Pyroclastic and sedimentary deposits (Miocene)--Tuffs and fluvial and lacustrine tuffaceous sedimentary rocks
Tr	Rhyolite (Miocene)--Coalescing aphyric rhyolite domes contemporaneous with and partially overlying pyroclastic deposits
Td	Dolomite (Miocene)--Dolomite and minor interbedded lacustrine sediments
Pd	Diabase (Proterozoic)--Dikes and irregular intrusive bodies cutting granite
Pg	Granite (Proterozoic)--Weakly foliated to unfoliated, medium-grained muscovite-biotite granite. Near contact with Pm contains screens of metamorphic rock
Ppg	Porphyritic granite (Proterozoic)--Porphyritic medium-grained biotite-muscovite granite with orthoclase megacrysts .05 to 1 in. in length
Pgc	Gabbro complex (Proterozoic)--Gabbro, diorite, and minor hornblendite extensively intruded by orthoclase-porphyritic granite and granodiorite
Pm	Metamorphic rocks (Proterozoic)--Biotite and muscovite schist and quartz feldspar gniess, possibly correlative in part to Yavapai Series rocks near Bagdad. Locally includes tongues of granitic intrusive rocks

Contact--Dashed where approximate

Normal fault--Dashed where approximate

Mines and prospects

1	Golden Key mine	9	Unnamed
2	Golden Key mine--northern extension	10	Unnamed
3	Granite State mine	11	Golden Flow claims
4	Buckhorn and Endlog claims	12	Golden Flow claims
5	Buckhorn and Endlog claims	13	Unnamed
6	Key mine, Leverite claims	14	Jangretta and HMC claims
7	Leverite claims	15	Bentonia claim
8	Phoebe claims		

Correlation of map units

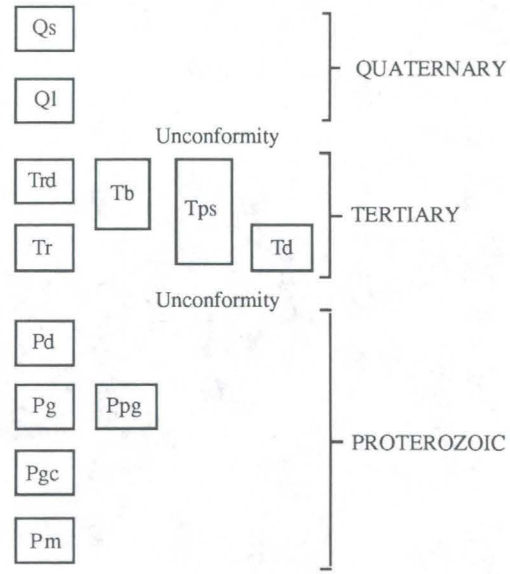

Figure 2. Continued.

to these surveys were discussed by Goudarzi (1984). See appendix for the definition of levels of mineral resource potential, certainty of assessment, and classification of identified resources.

Area Description

The Lower Burro Wilderness Study Area lies north of Arizona Highway 93 between Bagdad and Wikieup (fig. 1). The part of the area on which mineral surveys were requested encompasses approximately 21,700 acres near Burro Creek (fig. 1). The terrain is generally rugged; cliffs and steep canyons are common. Arizona Highway 93 bridges a spectacular 400-ft-deep gorge of Burro Creek west of the study area. Relief is moderate and elevation ranges from a high of 3,820 ft to a low of 1,960 ft. The climate is arid and vegetation consists of a mixture of Sonoran desert flora. Yucca, mesquite, and juniper are also quite common. Sycamore and cottonwood trees are found locally along major washes.

Access to the area is provided by a dirt road that originates from Arizona Highway 93 at Nothing, Ariz., follows the east and north boundaries of the study area and returns to the highway west of Kaiser Spring Canyon. Jeep trails along Bonanza Wash, Kaiser Spring Wash, and Haleys Wash provide access to the interior of the area. A jeep trail follows parts of the powerline transecting the northern part of the area. The Golden Key and Granite State mines are also reached by jeep trail.

Previous and Present Investigations

A geologic map of Mohave County was published by Wilson and Moore (1959). Anderson and others (1955) describe in detail the geology and ore deposits near Bagdad, Ariz., about 8 mi east of the study area. Moyer (1982) concluded that the aphyric rhyolites in the area fell into the class of unproductive topaz rhyolites (defined by Bikun and others, 1980) after completing a detailed study of the Tertiary volcanic rocks exposed in the Kaiser Spring quadrangle.

The U.S. Geological Survey conducted field investigations within the study area during 1984 and 1985. New geologic mapping was completed in areas lacking previous mapping and further detail was added to areas already mapped. Geochemical samples, including stream-sediment, pan-concentrate, mineralized and unmineralized rock samples, were collected throughout the area (D.E. Detra, unpub. data, 1986).

Investigations by the U.S. Bureau of Mines included a search of mining records and field examination and sampling of all mines and prospects within the area. Based on results of that work, mineralized areas were appraised and resources were determined when sufficient exposures were present (Schreiner, 1985).

Acknowledgments

T.H. Eyde of GSA Resources, Cortaro, Ariz., provided geologic, historical and other data pertinent to the bentonite and magnesite deposits within the Lower Burro Creek Wilderness Study Area. C.S. Thompson, manager, R.T. Vanderbilt Company, Inc., Norwalk, Conn., and M.R. McGath, manager, NL Chemicals, Inc., Newberry Springs, Calif., provided analyses of a bentonite sample.

APPRAISAL OF IDENTIFIED RESOURCES

By Russell Schreiner
U.S. Bureau of Mines

Published and unpublished literature relating to the Lower Burro Creek Wilderness Study Area was searched to obtain pertinent information concerning mineral occurrences and mining activity. Mining claim information and land status plats were acquired from the Bureau of Land Management (BLM) State Office, Phoenix, Ariz. Prospects and mineralized areas in and within 1 mi of the boundary were mapped by compass-and-tape method and sampled. Two hundred and fifty-three channel, chip, and grab samples were taken.

All samples were fire assayed for gold and silver. Inductively coupled plasma-atomic emission spectroscopy (ICP-AES) or atomic absorption spectrophotometry was used to analyze for copper, lead, molybdenum, and zinc. Inductively coupled plasma-atomic emission spectroscopy and wet chemical methods were used to analyze for elements in the bentonite and magnesite samples. Bentonite and magnesite samples were analyzed by X-ray diffraction to identify and characterize all minerals present. At least one sample from each prospect was analyzed for 40 elements by semiquantitative optical emission spectroscopy to determine the presence of unsuspected elements.

Standard physical property tests used in the oil, steel, and foundry industries were performed on bentonite samples by the U.S. Bureau of Mines Research Center, Tuscaloosa, Ala. Tests included viscosity and filtration to determine potential for use as drilling mud, plate water absorption to indicate potential for pelletizing or agglomeration capacity of fine iron ores to be processed by blast furnaces, and compressive tests to indicate potential for use as a binder for molding. Additional testing of physical properties on a sample of clay was performed by NL Chemicals Inc., Newberry Springs, Calif., and R.T. Vanderbilt Company Inc., Norwalk, Conn., to determine if the clays are suitable for non-conventional uses.

Tonnage and grade were calculated for deposits with adequate exposures and sample data. Sample values were averaged and weighted with respect to sample length. Projection of the mineralized zone beyond the sampling sites was assumed to be one half the exposed length when no other data were available.

All analytical data are available for public inspection at the U.S. Bureau of Mines, Intermountain Field Operations Center, Denver Federal Center, Denver, CO, 80225.

Mining History

The Lower Burro Creek Wilderness Study Area is located along the southwestern periphery of the

Eureka mining district. Most of the activity in the mining district has focused on porphyry copper and massive sulfide deposits at Bagdad, approximately 8 mi east of the study area. In the study area, intermittent mining activity has occurred from the late 1800's to the present. No recent gold mining activity has taken place and no production records were found. Lode and placer claims located for gold are found in the southern part of the study area.

The Jangretta, HMC, and Bentonia claims cover bentonite and magnesite deposits in the eastern part of the study area. GSA Resources is currently evaluating the bentonite deposit and in 1983-1984 parts of the deposit were drilled. Bentonite was mined (approximately 5,000 to 10,000 st) in the 1960's and 1970's and used for water impedance in the Patagonia Lake dam, Santa Cruz County, Ariz., and as a binder for cattle feed. Magnesite was mined on a small scale and used as a brightening additive in swimming pool plaster (T.H. Eyde, GSA Resources, Cortaro, Ariz., oral commun., 1985).

Concretions containing purple agate are collected for lapidary purposes from the bentonite and magnesite deposits (John Gutierrez, BLM, Kingman, Ariz., oral commun., 1984).

Five millsite claims, including the remains of a small mill, are located at the junction of Burro Creek and Bonanza Wash. The mill was built in the 1940's to process tungsten ore from the Zannaropolis mine, 4 mi east of the study area.

The Zoid claim block, staked for uranium in 1980, is located 0.25 to 2 mi south of the study area. The claims cover a helium anomaly (a common product of the radioactive decay of uranium) in a basin containing Tertiary sedimentary and volcanic rocks. The basin is adjacent to highly radioactive granitic rocks at Greenwood Peak, a few miles to the southwest. Two holes were drilled for uranium by Union Carbide Corp. approximately 2,400 ft and 2,600 ft deep in Tertiary sedimentary and volcanic rocks (one hole penetrated granitic gneiss basement rocks). No mineralized rock was encountered (Ernst Kendall, Union Carbide Corp., Grand Junction, Colo., oral commun., 1984).

Oil and gas leases cover the southern part of the study area (Schreiner, 1985), but there had been no drilling as of August 1984.

Appraisal of Sites Examined

Mines and prospects in the study area are located on occurrences and deposits of gold, silver, copper, lead, and zinc in igneous and metamorphic rocks and bentonite, magnesite, and agate in lacustrine rocks.

Gold Mines and Prospects

Gold mines and prospects are located on faults in granite and gneiss in the southern part of the study area. The faults contain gold and minor amounts of silver, copper, lead, molybdenum, and zinc (Schreiner, 1985; table 1). Inferred subeconomic gold resources were identified at the Golden Key mine, Granite State mine, and Phoebe claims. On the Golden Flow claims, sample results suggest that a resource may exist but grade and tonnage could not be calculated because of insufficient data due to inadequate exposure. Mines and prospects are shown on figure 2 and described in the appendix.

Bentonite Prospects

Deposits of bentonite, magnesite, and occurrences of agate are present in a section of faulted and slightly folded Tertiary tuffaceous lacustrine rocks along Burro Creek in the eastern part of the study area. Bentonite and magnesite were mined on a small scale along the east boundary of the study area. The occurrences and deposits are currently covered by the Jangretta and HMC claim groups. Additional clay and magnesite deposits are exposed along Burro Creek, east of the study area.

Bentonite is exposed for 60 ft in a partial section below a tuff. The bentonite section in descending order consists of brown, beige, brown, and green beds. The section dips slightly to the southwest.

Bentonite in the study area was identified by chemical and X-ray diffraction analyses as high-magnesium trioctahedral smectites (saponite-type clays) containing various types and amounts of impurities (Schreiner, 1985, tables 3, 4). The beige clay is the purest and has the greatest economic potential. Seven sites contained partial exposures of the beige clay bed (Schreiner, 1985). The bed is found about 25 ft below the tuff and appears to be continuous in the area sampled. The beige clay bed is white on weathered surfaces, and the top of the bed, where exposed, is dolomitic and siliceous, resulting in the formation of a boxwork texture.

Standard physical property tests for bentonite used by oil, steel, and foundry industries, which consumed 70 percent of the domestic output of bentonite in 1984 (U.S. Bureau of Mines, 1985, p. 34), were performed on four samples of beige clay, one sample of brown clay, and one sample of green clay (Schreiner, 1985, table 5). The results of these tests are compared with runs of commercially acceptable clays or standards, a western standard (sodium bentonite), and a southern standard (calcium bentonite). The physical properties of the clays from the study area are far below those of the acceptable standards. The one exception is the green clay that has a dry-compression strength (70.5 pounds per square inch) similar to the western standard and exceeds the southern standard, indicating that it could possibly be used as a binder for molding, but further testing would be required by the individual foundry for acceptability. Beneficiation to make the clays acceptable would incur additional costs, reducing the likelihood to producing an economically competitive product.

Though the clays in the study area may not be readily suitable for major uses, the crude clays could be used locally for water impedance in reservoirs, ponds, and ditches. The beige clay, because of its high brightness, white color when dry, and purity, has potential for use in the higher priced, specialty-clay thickener or stabilizer products and in paints, greases, cosmetics, and pharmaceuticals. Strict quality standards call for beneficiation of clays used as raw material for these products. A sample of the beige clay was sent to R.T. Vanderbilt Company, Inc., Norwalk, Conn., and NL Chemicals, Inc., Newberry Springs, Calif., for additional physical property tests (Schreiner, 1985, table 4). The companies reported that the sample consisted of a low-swelling magnesium smectite and minor dolomite having a low viscosity and lack of colloidal stability. R.T. Vanderbilt Company, Inc., reported that the clay has commercial potential as a raw material for making thickener or stabilizer products with relatively unsophisticated treatment. NL Chemicals reported that because of the low swelling property it would be unsuitable for their use.

GSA Resources, in a joint venture with an undisclosed major clay producer, is currently evaluating the beige clay. In 1983 and 1984, GSA Resources drilled 22 holes in the deposit within and near the east boundary of the study area. Results indicate that the beige clay is 3 to 20 ft thick and locally contains variable amounts of impurities. The clay with the best color, colloidal properties, and lowest arsenic levels is present both inside and outside the east boundary of the study area. The best clay is located adjacent to masses of magnesite, chalcedony, and dolomite of varying thickness that appear to be located along faults. Alteration of tuffaceous rocks to these high magnesium smectites was apparently the result of deposition in a lacustrine environment and later introduction of hydrothermal solutions from hot springs (T.H. Eyde, GSA Resources, oral commun., 1984).

Although the beige clay appears to be present over a large part of the study area, the least amount of overburden is near the east boundary of the study area. Considering a 60-ft limit of overburden that could be stripped by open-pit mining methods (T.H. Eyde, oral commun., 1985), the clay in this locality, having a minimum thickness of 5 ft, could be mined over an area 3,000 by 500 ft, estimated from outcrop locations and topography. Using a tonnage factor of 13 ft^3/st, an inferred marginal reserve of approximately 600,000 st of clay is identified.

Magnesite Prospects

White cryptocrystalline magnesite is present as 10- to 40-ft-thick mound-like masses within the clays near the east boundary of the study area (fig. 2, loc. 14). Samples contained as much as 90 percent magnesite and had chalcedony, dolomite, calcite, and saponite-type clay impurities (Schreiner, 1985, table 6). The amount of impurities present in samples appears to be highly variable. An estimated 2 million st of inferred subeconomic magnesite resources of various grades were identified and could be mined using open-pit mining methods. Calculations were made assuming that the magnesite is continuous over an area of 2,000 by 500 ft, averages 20 ft thick, and has a tonnage factor of 10 ft^3/st. Additional deposits of magnesite are exposed along Burro Creek east of the study area.

Currently, no market exists for the crude magnesite, except for possible local use as an additive to increase the brightness of materials, such as plaster. The material would have to be processed by heavy media separation to remove the impurities and dead burned or calcined to produce a commercially acceptable product. Basic, Inc., is mining and processing ore at Gabbs, Nev., at grades as low as 85 percent magnesite, which is comparable to some of the material in the study area. Basic, Inc., had estimated 10 million st of magnesite in the Burro Creek area but the overall grade was considered too low to warrant development (Ty Jepsen, oral commun., 1984). Currently, low demand for magnesium compounds would make development in the study area unlikely.

Agate Prospects

Purple agate is reported (J. Gutierrez, BLM, oral commun., April, 1985) to be present in concretions within lacustrine rocks in the study area, although none was noted by USBM personnel. The agate is used in making cabochons for jewelry. Three small pits, approximately 1 mi north of the study area, contained pockets of black, red, and white chalcedony in a siliceous dolomite. Some of the chalcedony contains inclusions forming crude dendritic patterns.

Geothermal

No geothermal leases were present in or near the study area as of March 1984, but a thermal spring (surface temperature 37 $^{\circ}C$) is located at Warm Spring, approximately 2 mi southwest of the study area. A geothermal reservoir of moderate temperature (estimated at less than 115 $^{\circ}C$ from chemical geothermometry) exists at Warm Spring (Goff, 1979).

Oil and Gas

Most of the study area acreage has been leased for oil and gas but no drilling had occurred as of April 1984 (John Gutierrez, BLM, Kingman, Ariz., oral commun., 1984).

Conclusions

Gold and minor amounts of silver and copper, lead, zinc, and molybdenum metals are present in small deposits along faults in the Proterozoic igneous and metamorphic rocks in the Lower Burro Creek Wilderness Study Area. Inferred subeconomic gold resources are identified at the Golden Key mine (350 st averaging 0.15 oz gold/st and 5,700 st averaging 0.06 oz gold/st), the Granite State mine (6,000 st averaging 0.05 oz gold/st), and the Phoebe claims (5,500 st averaging 0.1 oz gold/st). Other similar deposits within the study area lacked sufficient exposures, which prevented detailed mapping and sampling and resource calculations. Narrow, moderately to steeply dipping fault-controlled deposits such as these would be amenable primarily to underground mining methods. At an average 1984 gold price of $365.00 per oz, these deposits would be subeconomic.

High-magnesium bentonite is present in the eastern part of the study area in lacustrine sedimentary rocks. The beige clay (inferred marginal reserve of approximately 600,000 st) has the greatest commercial value and is amenable to open-pit mining methods. With beneficiation, this clay could be used as a raw material for making thickener or stabilizer products.

White cryptocrystalline magnesite is present in the eastern part of the study area also in lacustrine sedimentary deposits. An estimated 2 million st of inferred subeconomic magnesite resources of various grades were identified and are amenable to open-pit mining. Some of the magnesite is of similar grade to a deposit currently being mined in Nevada. Low demand for magnesium compounds makes near-term development unlikely.

Purple agate is present in concretions in the lacustrine deposits in the eastern part of the study area. The agate is used for lapidary purposes.

A thermal spring is located approximately 2 mi southwest of the study area at Warm Spring. A geothermal reservoir of moderate temperature exists there which could be used for limited local use.

No oil and gas resources are known to exist in the study area.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

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U.S. Geological Survey

Geology

The Lower Burro Creek Wilderness Study Area is located in the structural transition zone between the Colorado Plateau and the Basin and Range physiographic province. Within the study area upper Tertiary volcanic and sedimentary rocks lie directly on Proterozoic basement rocks that have a complex deformational and intrusive history.

Proterozoic metamorphic rocks on the north side of the study area consist of a heterogenous mixture of predominantly biotite and quartz-muscovite schist that is vertically foliated and extensively intruded by equigranular to seriate granite. The schist may be correlative with part of the Yavapai Series recognized by Anderson and others (1955) near Bagdad, Ariz. Metavolcanic rocks comprise much of the Yavapai Series at Bagdad and host massive sulfide deposits at the Old Dick and Bruce mines. The metavolcanic component of the Yavapai present at Bagdad is absent in the study area.

A complex of hornblende gabbro, hornblendite, orthoclase augen gneiss, and minor selvages of mica schist underlies much of the central and southern parts of the study area. The age of the complex is not known; however it is intruded by monzogranite porphyry assumed to be lithologically correlative with the Middle Proterozoic Lawler Peak granite. Ludwig and Silver (1977) have determined an age of 1420 Ma for the Lawler Peak Granite. (Shafiqullah and others (1980) considered a 577 Ma K-Ar age on biotite from the granite near Nothing, Ariz., to be partially reset.) Pegmatites that intrude both the gabbro complex and the later granite, probably represent the last stage in the crystallization of the granite. Numerous generally northwest-trending dikes and irregular masses of diabase intrude the granite. The diabase has not been dated but may be similar in age to Late Proterozoic diabase elsewhere in Arizona.

A Laramide granitic intrusion at Bagdad, Ariz., hosts a porphyry copper deposit and may have provided the heat source for the redistribution and deposition of epithermal gold, silver, copper, lead, and zinc within the surrounding Proterozoic basement rocks (Anderson and others, 1955). A tuff exposed in the Grayback Mountains (fig. 1) was assumed by Anderson and others (1955) to represent coeval Laramide volcanic activity. No evidence for Laramide magmatic activity has been found within the study area.

The early and middle Tertiary was primarily a period of erosion. During the Oligocene and Miocene, normal faulting produced extensive basin development in the region. Thick accumulations of lacustrine and fluvial basin-fill sediments were faulted, tilted, and buried by a second period of basin development in the late Tertiary. The earlier basin fill hosts a uranium deposit at the Anderson mine 20 mi south of the study area. These organic-rich sediments were deposited under marsh-like conditions and provide a reducing environment for the accumulation of uranium.

The lacustrine sedimentary rocks within the study area are generally composed of flat-lying sandy mudstone, tuffaceous mudstone, claystone, and tuff overlying arkosic sandstone, siltstone, and conglomerate. A thin oncolitic dolomite bed is extensively silicified and hydrothermally altered to magnesite near the east boundary of the study area. Tuffs intercalated with the sedimentary rocks are altered to bentonite. This unit is lithologicaly similar to the Big Sandy Formation exposed near Wikieup.

Bimodal volcanism occurred within the study area between 8 and 12 Ma and has been discussed in detail by Moyer (1982). Aphyric rhyolite domes and associated tuffs are characterized by a moderately enriched fluorine content; lithophysal garnet is present locally. A second series of silicic eruptions produced domes and flows of biotite-, hornblende-, and feldspar-phyric rhyodacite. These eruptions were roughly coeval with the eruption of mesa-forming basalt flows that covered much of the area. Subsequent faulting and erosion has produced the present topography.

Geophysical Studies

The Lower Burro Creek Wilderness Study Area is covered by regional gravity surveys (Lysonski and others, 1980a, b; Aiken and others, 1981) and magnetic surveys (Sauck and Sumner, 1970; Western Geophysical Company of America, 1979) having sufficient resolution to define anomalies of several square kilometers in area or larger. Contours of complete (terrain corrected) Bouguer gravity anomalies are defined by about 15 observation points, most of them within a few kilometers of the study area. Contours of total-intensity magnetic anomalies are defined by three traverses flown 9,000 ft above sea level and eight traverses flown 400 ft above the terrain.

Two gravity features have regional significance: (1) a broad 6-mGal low that trends southeast over the western two-thirds of the study area and is associated with low-density tuffaceous and lacustrine sedimentary rocks, rhyolites, and alluvium of Tertiary and Quaternary age; and (2) a narrower 4-mGal high trending northward over the eastern third of the study area that is largely associated with higher density Precambrian gabbroic rocks. Although the mapped gabbroic rocks trend northeastward toward the gabbro near Bagdad, Ariz., they are inferred to extend in the subsurface on a more northerly trend toward the exposed Precambrian terrane north of the study area.

Magnetic anomalies over the study area are generally characterized by low amplitudes and low gradients. The trends of three regional highs extend into the study area. At the northwest corner of the study area, one magnetic high appears to be associated in part with Precambrian intermediate plutonic rocks; however, the main part of this high appears to be associated with Precambrian gneiss west of the study area. Cutting southwestward across part of the northwest third of the study area, another high is associated with Precambrian intermediate plutonic rocks and Tertiary tuffaceous sedimentary rocks and rhyolite; it is inferred that the more highly magnetic Precambrian rocks underlie the volcanic sequences. The main part of this high also appears to be associated with Precambrian gneiss north and northeast of the study area. At the southeast corner of the study area, a north-trending nose is associated with Precambrian intermediate plutonic rocks immediately southeast of the gabbro complex (fig. 2). Precambrian gneiss is not associated with this high.

The magnetic data, like the gravity data, indicate that the body of mapped gabbro within the study area does not extend continuously in the subsurface to the highly magnetic gabbroic body at the west margin of the Bagdad mining district (see Vacquier and others, 1963, p. 31-34 and plates 8 and 9). Instead, the gabbroic rocks within the study area are unexpectedly associated with a broad magnetic low trending northeastward to a region just west of the gabbro near Bagdad, Ariz. This weak magnetic depression probably indicates that the gabbro is relatively nonmagnetic. However, it is possible that the feature is caused by reversed total magnetization of the gabbro but only if the body also becomes progressively less dense northeast of the study area boundary (to accommodate the absence of a continuous gravity high). The mesa-forming basalts within and outside the study area have little influence on the anomaly map, presumably because they are relatively thin.

Because a large number of local occurrences of Tertiary intrusive rocks in the Basin and Range province of Arizona are associated with the flanks of regional magnetic highs, the possibility exists that the magnetic highs (noses) in the study area are caused primarily by Tertiary intermediate plutonic rocks, rather than Precambrian ones. If Tertiary plutonism is indicated by the anomaly, this magnetic feature could directly or indirectly point to mineralization associated with metamorphic core complexes (Crittenden and others, 1980; Coney and Reynolds, 1980) and Tertiary detachment faults (Spencer and Welty, 1986). However, apart from this possibility of hidden Tertiary intrusive rocks, the available regional geophysical data do not delineate terranes of increased mineral potential.

Geochemical Studies

Methods

Geochemical sampling was conducted within the study area by the U.S. Geological Survey during 1984. Stream-sediment, nonmagnetic heavy-mineral concentrate, and rock samples were collected at 48, 48, and 40 sites, respectively. These samples were analyzed for 31 elements by a six-step semi-quantitative spectrographic method described by Grimes and Marranzino (1968). In addition, the concentration of uranium and thorium in stream sediment samples was determined by delayed neutron counting (Millard and Keaton, 1981). Gold was analyzed in selected heavy-mineral concentrate samples by the atomic absorption method of Thompson and others (1968). Rock sample analyses were supplemented by the determination of arsenic, bismuth, cadmium, antimony, and zinc by an atomic absorption method (Viets, 1978).

The level at which the concentration of an element was considered anomalous was determined by inspection of histograms, percentiles, and enrichment relative to crustal abundance. Frequently, these anomalies reflect known mining activity, but in some instances may indicate areas of undisclosed or previously unrecognized mineralization.

Results and Interpretation

Epithermal quartz veins containing variable amounts of gold and minor silver were mined or prospected in the southeast part of the study area. These deposits contain minor or trace amounts of lead, zinc, copper, molybdenum, arsenic, antimony, and bismuth. The epithermal veins are localized along faults cutting Proterozoic granitic and metamorphic rocks. Anomalous concentrations of metallic and nonmetallic elements in heavy-mineral concentrate samples collected within the Proterozoic terrain indicate additional epithermal veins may be present. In particular, anomalous concentrations of silver, barium, bismuth, molybdenum, and tungsten were noted in a heavy mineral-concentrate sample collected from the drainage north of the Granite State and Key mines.

Anomalous concentrations of tin (greater than 2,000 ppm) were detected in four concentrate samples collected from drainages underlain in part by Miocene aphyric rhyolite domes or associated tuffs and sedimentary rocks in the northern and central parts of the study area. Two of the tin anomalies were not associated with anomalies of other elements. A third sample contained only minor bismuth and the fourth contained anomalous concentrations of barium, zinc, and thorium in addition to the tin.

Anomalous concentrations of uranium and thorium are present in most stream sediment and heavy mineral concentrates derived from the Proterozoic basement rocks within the study area. These anomalies may represent elevated background values for the Proterozoic granitic rocks.

Mineral Resource Assessment

Geologic studies, geochemical sampling, and an examination of mines and prospects indicate that diverse mineral and energy resources may be present within the Lower Burro Creek Wilderness Study Area.

Gold-, silver-, copper-, lead-, and zinc-bearing hydrothermal veins are hosted by Proterozoic granitic and metamorphic rocks in the study area. Three areas within the eastern part of the study area are assigned a low resource potential for gold (certainty level C). Gold, silver, copper, lead, and zinc have low resource potential in one area (certainty level B). The hydrothermal veins are restricted to faults cutting Proterozoic rocks however the age of mineralization is unknown. Mineralization consists of silica and calcite veins and stringers restricted to zones along faults. Wallrock alteration is generally minor with argillic alteration of feldspar in the host rock limited to within a few feet of the fault. Gold and minor silver is accompanied by sporadic concentrations of galena, anglesite, malachite, chrysocola, and sphalerite. Geochemical analyses indicate minor variable amounts of molybdenum, antimony, and arsenic are also present locally in the veins, however the study area is not considered to have resource potential for these commodities. Some aspects of these deposits are similar to characteristics of other gold-bearing vein systems. Uncertainty as to the age of the deposits or probable origin of the mineralizing fluids prevent making direct analogies with established deposit models. The tonnage of identified gold resources within the study area is smaller than the smallest tonnages of deposits used in compiling grade/tonnage models for typical hydrothermal vein systems (Cox and Singer, 1986).

The flourine-enriched "topaz rhyolites" within the study area may host tin mineralization of the type described by Huspeni and others (1984), in which cassiterite-bearing veins form in the host rhyolite near the contact with overlying units. Deposits of this type are typically of very low grade and small tonnage. The resource potential for tin in two areas within the study area is low with certainty of B.

Uranium and thorium are found in unusually high quantities in disseminated trace minerals within the Lawler Peak Granite (Silver and others, 1984) near Bagdad. Uranium and thorium concentrations in sediment samples derived from the Proterozoic granitic plutons within the study area are consistently high. These high uranium and thorium values probably indicate background levels for these elements rather than the results of ore forming processes. Lacustrine sedimentary rocks in the basal part of the Big Sandy Formation exposed north of Wikieup may provide a favorable environment for uranium mineralization. Correlative sedimentary rocks in the study area lack evidence of paludal conditions and have a generally low-gamma ray signature. There is no resource potential for uranium and thorium within the study area.

Bentonite is present within a sequence of lacustrine sedimentary rocks underlying the eastern part of the study area. Most of the bentonite was probably derived by diagenetic alteration from silicic tuffs deposited in a saline, alkaline lake environment. Dolomite, interbedded with the bentonites, is extensively silicified. The silica may have been introduced during the alteration of the tuffs or by hot spring hydrothermal fluids. The lower part of this dolomite bed has been hydrothermally altered to a high purity bentonite type clay. Identified resources of this clay are located along the eastern boundary of the study area. The dolomite horizon extends into the east central part of the study area however the distribution and intensity of the clay alteration is not well known due to extensive colluvial basalt cover, and slumping and faulting of sedimentary units. The lacustrine sediments thin westward within the study area as a result of westward shallowing of the basin in which they were deposited. The mineral resource potential for bentonite is high (certainty level C) in one area adjacent to the area of inferred marginal reserves bentonite; and moderate (certainty level C) in one area in the east central part of the study area. The potential is considered to be moderate due to thinning of the host dolomite horizon, increasing distance from the probable source of hydrothermal fluids, and thinning of bentonite beds derived from the alteration of tuffs.

The mineral resource potential for bentonite is low (certainty level C) for one area in the vicinity of Haleys Wash. Dolomite, where it is exposed, is thin and lacks evidence of clay alteration. The purity of bentonite in this area is likely to be low due to detrital material washed in from the margin of the basin.

Also located along the east boundary of the study area, and coincident with the bentonite, is a deposit of magnesite. This deposit was probably formed by hydrothermal replacement of dolomite due to fault-controlled hot spring activity. Exposures of unaltered dolomite west of the known deposit provide evidence that the magnesite alteration was not widespread within the lacustrine rocks. The mineral resource potential for magnesite adjacent to identified magnesite resources is low with certainty C.

Zeolite beds in the Big Sandy Formation near Wikieup have been quarried for local use as building stone (Janders, 1978). Zeolitized tuff horizons may be present within the lacustrine sediments in the eastern part of the study area. The purity of known occurrences is very low. The study area is not considered to have resource potential for zeolites.

A low-temperature geothermal reservoir exists at Warm Springs 2 mi south of the study area. The reservoir may be suitable for small scale development (Goff, 1979; Witcher and others, 1982). No thermal springs are known within the wilderness study area and the geothermal resource potential is low with a certainty level of C.

Much of the study area has been leased for oil and gas exploration. The Proterozoic granitic and metamorphic rocks that underlie most of the wilderness study area are unfavorable for oil and gas accumulation (Ryder, 1983). Intense Tertiary volcanic activity in the study area makes the accumulation of oil and gas resources unlikely. There is no oil and gas resource potential within the study area.

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APPENDIXES

DEFINITION OF LEVELS OF MINERAL RESOURCE POTENTIAL AND CERTAINTY OF ASSESSMENT

LOW mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics define a geologic environment in which the existence of resources is permissive. This broad category embraces areas with dispersed but insignificantly mineralized rock as well as areas with few or no indications of having been mineralized.

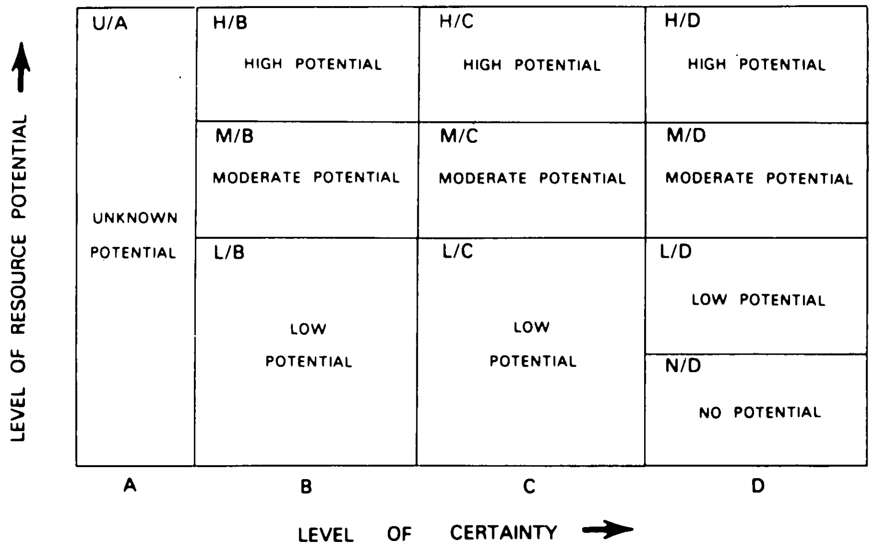
MODERATE mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate reasonable likelihood of resource accumulation, and (or) where an application of mineral-deposit models indicates favorable ground for the specified type(s) of deposits.

HIGH mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurence, where interpretations of data indicate a high degree of likelihood for resource accumulation, where data supports mineral-deposit models indicating presence of resources, and where evidence indicates that mineral concentration has taken place. Assignment of high resource potential to an area requires some positive knowledge that mineral-forming processes have been active in at least part of the area.

UNKNOWN mineral resource potential is assigned to areas where information is inadequate to assign low, moderate, or high levels of resource potential.

NO mineral resource potential is a category reserved for a specific type of resource in a well-defined area.

Levels of Certainty



A. Available information is not adequate for determination of the level of mineral resource potential.
B. Available information suggests the level of mineral resource potential.
C. Available information gives a good indication of the level of mineral resource potential.
D. Available information clearly defines the level of mineral resource potential.

Abstracted with minor modifications from:

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RESOURCE/RESERVE CLASSIFICATION

	IDENTIFIED RESOURCES			UNDISCOVERED RESOURCES	
	Demonstrated		Inferred	Probability Range	
	Measured	Indicated		Hypothetical	Speculative
ECONOMIC	Reserves		Inferred Reserves		
MARGINALLY ECONOMIC	Marginal Reserves		Inferred Marginal Reserves		
SUB-ECONOMIC	Demonstrated Subeconomic Resources		Inferred Subeconomic Resources		

Major elements of mineral resource classification, excluding reserve base and inferred reserve base. Modified from U.S. Bureau of Mines and U.S. Geological Survey, 1980, Principles of a resource/reserve classification for minerals: U.S. Geological Survey Circular 831, p. 5.

GEOLOGIC TIME CHART

Terms and boundary ages used by the U.S. Geological Survey in this report

EON	ERA	PERIOD		EPOCH	AGE ESTIMATES OF BOUNDARIES (in Ma)
Phanerozoic	Cenozoic	Quaternary		Holocene	0.010
				Pleistocene	1.7
		Tertiary	Neogene Subperiod	Pliocene	5
				Miocene	24
			Paleogene Subperiod	Oligocene	38
				Eocene	55
				Paleocene	66
	Mesozoic	Cretaceous		Late	96
				Early	138
		Jurassic		Late Middle Early	205
		Triassic		Late Middle Early	~240
	Paleozoic	Permian		Late Early	290
		Carboniferous Periods	Pennsylvanian	Late Middle Early	~330
			Mississippian	Late Early	360
		Devonian		Late Middle Early	410
		Silurian		Late Middle Early	435
		Ordovician		Late Middle Early	500
		Cambrian		Late Middle Early	~570[1]
Proterozoic	Late Proterozoic				900
	Middle Proterozoic				1600
	Early Proterozoic				2500
Archean	Late Archean				3000
	Middle Archean				3400
	Early Archean				(3800?)
pre-Archean[2]					4550

[1]Rocks older than 570 Ma also called Precambrian, a time term without specific rank.

[2]Informal time term without specific rank.

TABLE 1. *Summary of mines and prospects in and adjacent to the Lower Burro Creek Wilderness Study Area*

Map No. (fig. 2)	Property name	Summary	Sample data
1	Golden Key mine	Mine workings consist of three adits (upper, middle, and lower), five shafts, and several pits and trenches along a fault, striking N. 25° E. and dipping 60° NW. in gneiss and granite. The 2.5-ft-thick fault is traceable for 2,000 ft. It consists of brecciated wallrock, clay gouge, sporadic quartz stringers and pods, and traces of magnetite and chrysocolla.	Sixty-eight samples were taken from workings. Twenty samples contained 0.01 to 1 oz gold/short ton (st) and averaged 0.12 oz gold/st. An 80-ft-long section in the middle adit contains an inferred subeconomic resource of 350 st averaging 0.15 oz gold/st (assuming a width of 20 ft, an average thickness of 2.6 ft, and a tonnage factor of 12 ft^3/st).
2	Golden Key mine-northern extension	A 180-ft-long adit, two shafts, and three pits are located on a fault striking east, dipping 50° N., and traceable for 400 ft in gneiss. The fault zone averages 3.7 ft in thickness; consists of brecciated wallrock, clay gouge, quartz pods, minor white and brown calcite, and exhibits hematite-limonite staining.	Eleven of 13 chip samples taken along fault contained 0.01 to 0.28 oz gold/st. A select grab sample contained 0.52 oz gold/st. An inferred subeconomic resource of 5,700 st averaging 0.06 oz gold/st was calculated (assuming a width of 94 ft, a length of 198 ft, an average thickness of 3.7 ft, and a tonnage factor of 12 ft^3/st).
3	Granite State mine	Consists of three inclined shafts on a fault striking N. 30° W., dipping 30° to 50° NE., and traceable for 220 ft in granite. Fault zone averages 2.5 ft thick; consists of brecciated wallrock, clay gouge, and hematite-limonite staining. Brecciated quartz veinlets coated by minor amounts of malachite and chrysocolla were observed in two areas.	Eighteen of 19 samples taken along fault contained 0.01 to 0.29 oz gold/st. An inferred subeconomic resource of 6,000 st averaging 0.05 oz gold/st was identified and was calculated (assuming a 240 ft length, a 120 ft width, an average thickness of 2.5 ft, and a tonnage factor of 12 ft^3/st).
		Three additional small groups of workings are within 200 ft of Granite State mine (Schreiner, 1985; fig. 5). A shaft, pits, and trenches are located on faults striking approximately N. 20°-30° E. in gneiss. Fault zones consist of sheared wallrock, clay gouge, and quartz veinlets. Chrysocolla and minor amounts of malachite observed with quartz in shaft.	Five of eight chip samples taken on faults contained gold values ranging form 0.01 to 0.3 oz/st. A select grab sample from the shaft dump contained 0.12 oz gold/st. Resources were not calculated because of insufficient data due to inadequate exposures at these prospects.
4	Buckhorn and Endlog claims	Six prospects consisting of a 22-ft adit, two trenches, and three pits are located on faults, fractures, and pegmatite pods in gneiss and granite.	Seven samples were collected. Four chip samples contained 0.04 to 0.17 tr oz gold/st. Six chip samples contained 0.1 to 0.6 tr oz silver/st and base metal content less than 0.01 percent. A select grab sample contained 0.73 tr oz gold/st, 0.5 tr oz silver/st, and base metal content less than 0.1 percent.
5	Buckhorn and Endlog claims	Caved shaft and seven pits are located on faults having quartz veinlets. Chalcopyrite, chalcocite, chrysocolla, and hematite-limonite staining found in quartz at some sampling sites.	Eight samples were collected. Two chip samples contained 0.01 and 1.19 tr oz gold/st, and base metal content less than 0.3 percent. Three select grab samples contained as much as 0.24 tr oz gold/st, 2.3 tr oz silver/st, 5.3 percent copper, 2.5 percent lead, and 0.11 percent molybdenum.

TABLE 1. *Summary of mines and prospects in and adjacent to the Lower Burro Creek Wilderness Study Area*—Continued

Map No. (fig. 2)	Property name	Summary	Sample data
6	Key mine, Leverite claims	Mine consists of a 35-ft-long adit, 15-ft-deep shaft and a 75-ft-deep inclined winze. Bottom of the winze was not accessible to USBM personnel. Workings follow thin faults and fractures in granite; sporadic hematite-stained pods and vuggy quartz a few ft in diameter are present along fractures; four of these pods are located over a distance of 50 ft in the winze.	Seven samples were collected. Four chip samples contained 0.02 to 0.63 tr oz gold/st. Two contained 0.02 tr oz silver/st. Two dump samples contained 0.16 and 0.12 tr oz gold/st.
	Leverite claims	Inclined caved shaft at least 65 ft deep, vertical caved shaft at least 50 ft deep, and three pits are located in granite. No mineralized rock found in place but pieces of hematite-stained granite and vuggy quartz were found on dumps.	Five samples were collected. Dump samples contained 0.08 and 0.16 tr oz gold/st in random grabs and 0.20 oz gold/st in a select grab. A chip sample contained 0.1 tr oz silver/st.
	Leverite claims	A 40-ft-long adit, and a 20-ft-long adit that connects to a caved shaft are present along fractures with sporadic limonite-stained pods in granite.	Six samples were collected. Three chip samples contained 0.01 to 0.24 tr oz gold/st. A select grab sample contained 0.44 tr oz gold/st, and less than 0.012 percent base metal content.
	Leverite claims	A 7-ft-long adit on a fault and two trenches are located on fractures in granite.	Four samples were collected. Three chip samples contained 0.02, 0.16, and 1.01 tr oz gold/st and base metal content less than 0.027 percent. A select grab contained 0.05 tr oz gold/st, 0.4 tr oz silver/st, 0.023 percent copper, 2.29 percent lead, and 0.019 percent zinc.
7	Leverite claims	A 40-ft-long inclined shaft and a pit are located on a fault with quartz veining in granite. Galena and chalcopyrite found in a select grab sample of quartz pieces from dump.	Four samples were collected. Three chip samples contained 0.04 to 0.13 tr oz gold/st, 0.1 to 0.2 tr oz silver/st, and less than 0.144 percent base metal content. A select grab sample contained 0.13 tr oz gold/st, 0.5 tr oz silver/st, and as much as 4.3 percent.
8	Phoebe claims	Prospect consists of an adit, a tunnel, two shafts, trenches, and pits. These workings are located on a fault striking N. 50° E. and dipping 50° NW. and traceable for 240 ft in granite. Fault zone averages 2.3 ft thick and consists of brecciated wallrock, clay gouge, and sporadic quartz veinlets. Chrysocolla and anglesite are present locally.	Seven of 10 samples taken along fault contained from 0.01 to 0.38 oz gold/st and averaged 0.1 oz gold/st. An inferred subeconomic resource of 5,500 st averaging 0.1 oz gold/st was identified and was calculated using a 240 ft length, as assumed 120 ft width, a 2.3 ft average thickness, and a tonnage factor of 12 ft^3/st.
9	Unnamed	A 17-ft-deep inclined shaft, three pits, and a trench are located over a distance of 100 ft along a fault containing quartz veinlets in granite.	Four samples were collected. Three contained 0.01 to 0.19 tr oz gold/st. Four contained 0.1 to 0.2 tr oz silver/st and as much as 1.18 percent base metal content.
10	Unnamed	A shaft over 50 ft deep that was not accessible to U.S. Bureau of Mines USBM personnel and a series of pits and trenches are located over a distance of 180 ft on a fault containing quartz veinlets. Galena and malachite are present locally.	Four samples were collected. Three contained 0.04 to 0.22 tr oz gold/st and 0.1 to 0.4 tr oz silver/st. Base metal content as much as 1.45 percent.

TABLE 1. *Summary of mines and prospects in and adjacent to the Lower Burro Creek Wilderness Study Area—Continued*

Map No. (fig. 2)	Property name	Summary	Sample data
11	Golden Flow claims	Golden Flow claims are located on east boundary of study area in sec. 29, T. 14 N., R. 10 W. Workings generally are located along sheared contacts between granite and diabase dikes. Some clay gouge and quartz veinlets are present along contact. Workings are clustered into two groups, a northern and southern. Northern group consists of two adits, an inclined shaft, pits and trenches (Schreiner, 1985, fig. 7) along the granite-diabase contact zone, which strikes N. 5° W., dips 30° E., and averages 1.6 ft in thickness for a distance of 1,000 ft.	Nine samples contained from 0.01 to 0.75 oz gold/st (Schreiner, 1985, table 1). Eleven samples taken along contact averaged 0.20 oz gold/st. Because of inadequate exposures, data were not sufficient for calculation of resources.
12	Golden Flow claims	Southern group of workings consists of an inclined shaft, an adit, and a series of pits and trenches (Schreiner, 1985, fig. 8) along granite-diabase contact zone, which strikes N. 30° W., dips 40° NE., and averages 1.2 ft in thickness over a distance of 1,450 ft.	Fourteen chip samples taken along contact contained 0.03 to 0.52 oz gold/st and averaged 0.14 oz gold/st (Schreiner, 1985, table 1). Eight chip samples were taken along other faults and fractures in diabase and granite; three contained 0.01, 0.03, and 0.09 oz gold/st. A select grab sample contained 0.36 oz gold/st. Data were not sufficient for resource calculation.
	Unnamed	A trench is located on on fractures and a pit is located on a fault in granite.	Three samples were collected. One contained 0.01 tr oz gold/st. Two contained 0.2 and 0.3 tr oz gold/st.
13	Unnamed	A flooded shaft, a 7-ft-long adit, three pits, and a trench are located on a fault over a distance of 245 ft in granite. Fault zone consists of brecciated wallrock and clay gouge. A pit is present approximately 200 ft away on a fault containing quartz veinlets in granite.	Eight samples were collected. Three of seven samples collected at the main prospect contained 0.01 tr oz gold/st. Two contained 0.1 tr oz gold/st. One contained 0.04 tr oz gold/st, two contained 0.1 tr oz silver/st. Base metal less than 0.1 percent. One sample contained 0.04 tr oz gold/st.
14	Jangretta and HMC claims	Deposits of bentonite, magnesite, and occurrences of agate are located in a section of slightly folded Tertiary tuffaceous lacustrine rocks along Burro Creek. Bentonite and magnesite have been mined on a small scale along east boundary of study area	Considering a 60 ft limit of overburden that could be stripped by open pit mining methods (Ted Eyde, oral commun., April 1985), clay in this locality, having a minimum thickness of 5 ft, could be mined over an area 3,000 by 500 ft, estimated from outcrop locations and topography. Using a tonnage factor of 13 ft^3/st, an inferred resource of approximately 600,000 st of clay was identified. An estimated 2 million st of magnesite of various grades would be amenable to open pit mining methods. Calculations were made assuming that magnesite is continuous over an area of 2,000 by 500 ft, averages 20 ft thick and has a tonnage factor of 10 ft^3/st.
15	Bentonia claim	Deposits of bentonite in Tertiary lacustrine rocks near Haleys Wash	

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