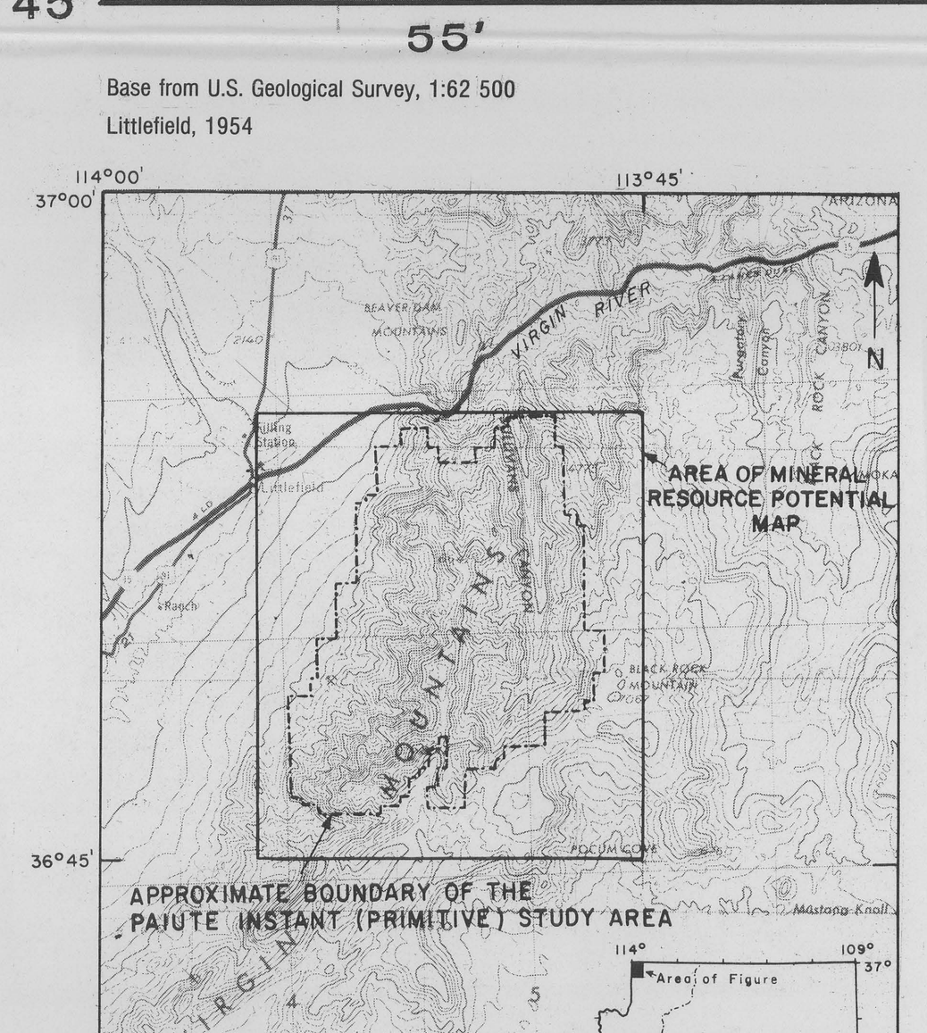
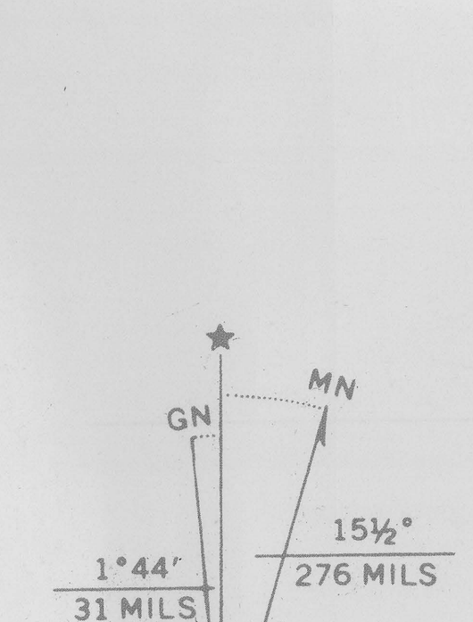
Base from U.S. Geological Survey, 1:62 500
Littlefield, 1954





UTM GRID AND 1954 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

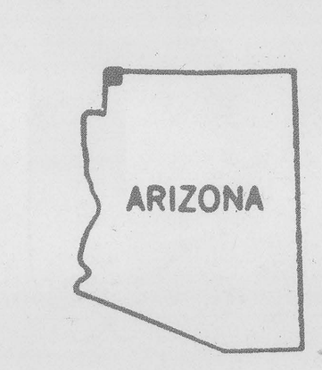
1 ½ 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 80 FEET
DOTTED LINES REPRESENT 40-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Mineral resource data compiled in 1979-80.
Geology from Villalobos (1980a)



AREA OF MAP

EXPLANATION FOR MINERAL RESOURCE MAP

+² Known mineral occurrence--Includes mines, prospects, and other workings; number corresponds to number in table 1

● Iron oxide-stained area--Area containing secondary iron oxide mineralization resulting from weathering and oxidation of iron-bearing sulfide minerals

LOW-POTENTIAL MINERAL RESOURCE AREAS

All resource areas and mineral occurrences shown on map are low-potential areas determined from interpretation of geologic and geochemical data and investigation of mines and prospects and associated mineral deposits of the study area[1].

AREA

(1) Pegmatites with beryllium-bearing minerals and dumortierite (aluminum-silicate mineral)

Criteria used to define area:

a. Known dumortierite occurrence (loc. 4)
b. Anomalous beryllium traces detected in sediment sample[2]; sediments derived from pegmatite and gneiss
c. Pegmatite rock samples show beryllium traces
d. Pegmatites traced from aerial photographs and traversed on ground

(2) Tungsten-bearing veins and manganese deposits

Criteria used to define area:

a. Known scheelite (tungsten-bearing mineral) occurrence (loc. 6)
b. Tungsten detected in rock samples
c. Favorable rock type for tungsten-bearing minerals that consists of quartz and feldspar pegmatites
d. Known manganese deposits (locs. 5, 7)
e. High manganese concentrations in rock samples
f. Observed manganese oxide on outcrops

(3) Breccia-pipe copper, silver, and arsenic deposit

Criteria used to define area:

a. Known copper mineral (azurite, malachite) occurrences (locs. 10, 11)
b. High arsenic and copper concentration in rock samples; detection of silver in rock samples
c. Observed surface alteration (fractured red beds)
d. Fractured and faulted bedrock

(4) Disseminated and fracture-filling lead, silver, and zinc deposit

Criteria used to define area:

a. Known lead mineral (galena) occurrence (loc. 9)
b. High lead and silver in dry stream-sediment sample, sediments derived from faulted limestone
c. High lead, silver, and zinc concentrations detected in rock samples
d. Observed surface alteration near fault zone
e. Fault contact between limestone units

(5) High base-metal content in carbonate rocks

Criteria used to define area:

a. Anomalous and high concentrations of copper and lead in sediment samples; high values for arsenic, molybdenum, nickel, silver, and zinc in sediments samples
b. Contiguous drainage areas underlain by carbonate rocks
c. Area where rock units are extensively folded and faulted; faults have produced zones of brecciation and some recrystallization

(6) High arsenic, copper, lead, silver, and zinc content in carbonate and clastic sedimentary rocks

Criteria used to define area:

a. Anomalous concentrations of arsenic, copper, lead, silver, and zinc in the magnetic fraction of sediment sample
b. Drainage area underlain by faulted limestone, sandstone, and siltstone

(7) Sandstone and siltstone red beds with interbedded, discontinuous gypsiferous strata containing barium

Criteria used to define area:

a. Observed outcrops of gypsiferous strata interbedded with clastic strata
b. Contact of limestone with sandstone or siltstone
c. Anomalous and high barium values in sediment samples derived from sedimentary rocks
d. Known gypsum occurrences in similar deposits outside the primitive area

(8) Sandstone and siltstone red beds with interbedded gypsum strata containing barium

Criteria used to define area:

a. Observed gypsum beds
b. Limestone-red bed contact
c. Anomalous and high barium in sediment samples derived from sedimentary rocks

[1]Sources of data used for defining resource areas are: Hamm (1980), mines and prospects; Villalobos (1980a), geology; Villalobos (1980b), geochemistry.

[2]Some of the geochemical data from dry stream-sediment samples were evaluated statistically to determine the geometric mean, geometric deviation, and threshold values for the elements listed below. Anomalous values are defined as equal to or above the threshold; high values are below the threshold but above one geometric deviation above the metric mean. A statistical evaluation was not attempted for rock samples; high deviations from average amounts were considered anomalous. Anomalous and high geochemical sample values used for this report are:

Arsenic--High values are 500 ppm or greater for sediment samples; 1,500 ppm or greater for rock samples

Barium--Anomalous values are 7,000 ppm or greater, high values are 1,500 ppm or greater for sediment samples

Beryllium--Anomalous values are 15 to 30 ppm in rock samples; 20 ppm in sediment samples

Copper--Anomalous values are 500 ppm or greater and high values are in the 200 to 300 ppm range for sediment samples; high values are 150 to 20,000 ppm for rock samples

Lead--Anomalous values are 500 ppm or greater and high values are 300 ppm and above in sediment samples; high value is 100 ppm for rock samples

Manganese--High value is 5,000 ppm in rock samples

Molybdenum--High values are 100 to 150 ppm in sediment samples

Nickel--High values are 700 ppm in sediment samples

Silver--Any detectable is considered anomalous (0.5 ppm or greater for rock samples, 1 ppm or greater for sediment samples)

Tungsten--Anomalous value is 50 ppm in rock samples

Zinc--High values are 300 ppm and greater in sediment samples

CORRELATION OF MAP UNITS

Unit	Age
Qal	QUATERNARY
Qls	QUATERNARY(?)
UNCONFORMITY	
QTb, QTc	QUATERNARY(?) AND TERTIARY
UNCONFORMITY	
Ꞧc / Ꞧcs	TRIASSIC
UNCONFORMITY	
Ꞧm	TRIASSIC
UNCONFORMITY	
Pkt, Pr	PERMIAN
PPc	PERMIAN AND PENNSYLVANIAN
Mr	MISSISSIPPIAN
DO€c	DEVONIAN, ORDOVICIAN(?), AND CAMBRIAN
€bt	CAMBRIAN
UNCONFORMITY	
p€gn, p€gr	PRECAMBRIAN

DESCRIPTION OF MAP UNITS

Qal ALLUVIAL DEPOSITS (Quaternary)

Qls LANDSLIDE DEPOSITS (Quaternary?)

QTb BASALT (Quaternary? and Tertiary)

QTc CONGLOMERATE (Quaternary? and Tertiary)

Ꞧc CHINLE FORMATION (Triassic)--Interbedded claystone, siltstone, and sandstone

Ꞧcs Shinarump Member--Sandstone and conglomerate

Ꞧm MOENKOPI FORMATION (Triassic)--Siltstone and sandstone red beds, minor limestone, and gypsiferous beds

Pkt KAIBAB LIMESTONE AND TOROWEAP FORMATION, UNDIVIDED (Permian)--Limestone and gypsiferous red beds

Pr RED BEDS (Permian)--Sandstone and siltstone

PPc CARBONATE ROCKS (Permian and Pennsylvanian)--Predominately carbonate rock with interbedded sandstone (Pakoon Limestone of McNair (1951) and Callville Limestone)

Mr REDWALL LIMESTONE (Mississippian)--Limestone and chert

DO€c CARBONATE ROCKS, UNDIFFERENTIATED (Devonian, Ordovician?, and Cambrian)--Limestone, dolomite, sandstone, siltstone, breccia, and conglomerate

€bt BRIGHT ANGEL SHALE AND TAPEATS SANDSTONE (Cambrian)

p€gn GNEISS AND SCHIST (Precambrian)
p€gr GRANITE AND PEGMATITE (Precambrian)

Contact - Dashed where approximately located or inferred

Fault - Dashed where inferred; dotted where concealed

Anticline

Strike and dip of beds

30 Inclined

80 Overturned

Strike and dip of foliation

50 Inclined

Vertical

Approximate boundary of Paiute Primitive Study Area

Explanatory pamphlet accompanies map

MINERAL RESOURCE POTENTIAL

The oil and gas potential and the surficial radioactive mineral resource potential is apparently nil or at best very low for the Paiute Instant (Primitive) Study Area. Favorable oil- and gas-producing structures are not recognized in the study area; oil and gas leases overlap the south end, but drilling has not been attempted. During the 1950's, the U.S. Atomic Energy Commission conducted an aerial survey that located a radioactive anomaly near the northeast corner of the study area. A surface reconnaissance with a geiger counter was conducted by the U.S. Bureau of Mines, and radiation levels above background were not detected. All rock and sediment samples were tested with a scintillometer, and none of the readings was above background radiation.

The area is not valuable for coal, oil shale, sodium and potassium compounds, phosphate, or geothermal resources. Combustible minerals such as coal and oil shale are not known to occur within the study area. Sodium and potassium compounds do not occur in the evaporite deposits located within the study area. Phosphate resources do not occur within the area. Geothermal activity is nil; none of the springs visited was above diurnal temperatures.

The Paiute Instant (Primitive) Study Area includes several low-potential mineral resource areas, which are shown on the mineral potential map. Low-potential mineral resources include the metals and nonmetals described below.

METALS

Copper

Copper occurs chiefly as two genetic types of deposits--breccia-pipe and hydrothermal occurrences--and is found at five known locations (locs. 1, 2, 8, 10, and 11), the most significant being copper mineralization consisting of fracture filling and intergranular growths of malachite and azurite at location 11. In areas 5 and 6, copper was detected in dry stream-sediment samples; copper mineral deposits are not known in these areas but are suspected to occur here. Mines and prospects at known locations reflect small-scale operations that consisted of the digging of shallow pits and shafts and the driving of short adits; all workings are presently inactive. Production probably has been insignificant or nil. Chemical analyses indicate that the copper content in selected grab samples of rock is relatively low. The surface expression of these occurrences suggests the potential size of any mineralization to be small. Nonetheless, a low potential for copper is assigned to areas 3, 5, and 6.

Lead

Lead occurs as disseminated galena in fractured and brecciated limestone at location 9. Lead was also detected in sediments from drainages within areas 4, 5, and 6. Lead mineralization is not known in areas 5 and 6, but minor mineralization is suspected. The inactive workings at location 9 include a caved shaft, a trench, and a pit. Production from this area appears to have been small. The lead-mineralized area at the surface of location 9 is small and limited to about 6 acres (2.5 hectares). Low potential for lead is assigned to areas 4, 5, and 6.

Tungsten

Tungsten was detected in selected rock samples of quartz and feldspar pegmatites in Precambrian banded gneiss. Pegmatite samples from locations 3 and 6 contain small inclusions of scheelite. The workings at location 3 consist of a long side-slope dozer cut; at location 6, scheelite-bearing rock was collected from a trench. Chemical analyses of the most intensely mineralized samples from both prospects show small amounts of tungsten and thus do not suggest high grade. There has not been any production from either of the now inactive prospects. Pegmatites that may have tungsten-bearing minerals are included in low-potential mineral resource area 2.

Manganese

Manganese occurs as secondary oxidation coatings and intergrowths of pyrolusite on metamorphic rocks. These manganese-oxide shows have been prospected at locations 5 and 7. The workings consist of several small shallow pits that are now abandoned. Because the prospect pits are small, we suspect that there has not been any production from them. Manganese-oxide outcrops delineate a small, extremely low-potential resource area (area 2) covering about 40 acres (16 hectares).

Zinc

Zinc was detected in stream sediments derived from metamorphic rocks mineralized with pyrite and chalcopyrite at location 2. At location 9, zinc occurs in fractured limestone with veinlets of galena. In mineral resource areas 5 and 6, zinc concentrations were detected in sediment samples; mineral occurrences are not known in areas 5 and 6, but mineralization is suspected. At location 2, the abandoned workings consist of a caved adit, some small pits, and a bench cut; a shaft and two pits are located at location 9. The prospect at location 2 was probably worked for the silver-bearing pyrite deposits. At location 9, mining activity centered on the lead-, silver-, and zinc-bearing minerals. Production from location 2 is not known, but judging from the condition and size of the workings, production was small. Production from location 9 has been limited to a 10-ton (9.1-mt)-assay shipment (P. Lamoreaux, oral commun., 1979). Mineralization was not observed in areas 5 and 6, but high values for zinc and other associated elements suggest that minor undiscovered mineral occurrences may exist in these areas, which are therefore assigned a low potential.

Silver

Silver was detected at several known hydrothermal mineral occurrences (locs. 2 and 9) and breccia pipes (locs. 10 and 11). Pyrite and chalcopyrite occur at location 2, and galena at location 9; silver is probably concentrated in these sulfide deposits. Malachite and azurite minerals in area 3 also contain small amounts of silver. All the workings at these locations (locs. 2, 9, 10, and 11) are inactive. The adits and pits are small-scale operations, and production, if any, could not have been significant. Silver was detected in sediment samples collected from drainages in areas 5 and 6. Mineralization is not known in these areas; however, silver traces and associated elements may indicate undiscovered mineral occurrences.

Molybdenum and nickel

Molybdenum and nickel occurrences were not previously known to occur in the study area. However, concentrations of molybdenum and nickel were detected in sediment samples collected from contiguous drainages in area 5. In area 4, molybdenum was detected in a sediment sample. No workings are associated with the occurrences. High molybdenum concentrations and occurrences of other associated elements suggest that undiscovered mineral occurrences may occur in area 5.

NONMETALS

Aluminum-silicate and beryllium

Dumortierite, an aluminium-silicate mineral, occurs in a pegmatite that has been prospected at location 4. Area 1 outlines pegmatites that may also contain dumortierite. Production from the prospect at location 4 is not know; the prospect is now filled in and abandoned. No other occurrences of dumortierite are known in the region. Pegmatite is a favorable rock type for beryllium-bearing minerals. Area 1 outlines an area of pegmatite and gneiss where anomalous beryllium was detected in rock and sediment samples. Beryllium-bearing minerals are not known to occur in the study area, but traces in rock samples indicate that beryllium minerals probably occur in the pegmatites.

Arsenic

Anomalous and high arsenic concentrations were detected in the study area. Arsenic is associated with breccia pipes in area 3, which includes several known copper occurrences (locs. 10 and 11), and at location 8; arsenic was detected in sediment samples from contiguous drainages in area 5 and in area 6. The arsenic occurrences are associated with anomalous and high concentrations of several base metals. Mineral deposits have not been discovered in these areas, but the detection of arsenic and other associated elements suggests that these areas contain undiscovered mineral deposits.

Gypsum- and barium-bearing strata

Gypsum occurs in low-potential areas 7 and 8. These occurrences consist of discontinuous gypsum beds of varying thickness, some as much as 1 ft (30 cm) thick. Anomalous and high barium values were detected in contiguous drainages underlain by gypsum-bearing strata. Barium is probably concentrated in the gypsiferous strata. There is no evidence that the deposits have been worked. The gypsum and barium occurrences are situated in a highly inaccessible and rugged area far from population centers. The overall gypsum tonnage would have to be great to be profitable; although areas 7 and 8 are large, the actual content of high-quality gypsum is probably not substantial.

Gem minerals

Several gemstone claims for garnet and yellow quartz are located within the study area. Garnet is abundant and widely distributed throughout the Precambrian metamorphic rocks. The garnets observed are fractured and of poor gem quality. Yellow quartz is not abundant but may occur anywhere in the crystalline rocks. A resource area for gemstones is not shown on the map. Virtually all of the Virgin Mountains are underlain by Precambrian crystalline rocks that have very low potential for gemstones.

Sand, gravel, and limestone

The study area contains large quantities of sand, gravel, and limestone. Sand and gravel are deposited chiefly in alluvial fans and ephemeral stream channels. Limestone units occur in the northern and eastern parts of the study area. These deposits are far from major markets and in highly inaccessible areas, and these factors make the economic potential of these resources low.

Table 1.--Mining and mineralized areas, commodities, and reserve assessments in the Paiute Instant Study Area, Mohave County, Arizona

Map No.	Name	Commodity	Production and development	Reserve assessment*
1	Hedrick Canyon shaft and prospects.	Copper........	Production unknown; four shafts in relative proximity. Largest, more than 100 ft (30 m) deep.	Copper was detected in amounts ranging from 84 to 720 ppm (samples 2463-2717). No foreseeable economic potential.
2	Hancock Canyon adit and prospects.	Silver and gold(?).	Production unknown; caved adit and 12 ft (3.7 m) trench.	Pyrite and magnetite visible. Traces of gold and silver (samples 2721-2724). No substantial quantities of economic minerals detected.
3	Hancock Canyon prospect.	Tungsten......	Production unknown; sidehill cut.	Very localized scheelite in a quartz and feldspar vein averaging about 6 in. (15 cm) wide. No tungsten detected in random sampling (samples 2725, 2726)
4	Dumortierite prospect.	Dumortierite..	No production; prospect pit.	Occurs as vein 2.5 ft (0.8 m) wide in pegmatite. Unknown extent (sample 2769).
5	Mount Bangs manganese prospects.	Manganese.....	No production; small pits.	Discontinuous occurrences as rock surface coatings.
6	Temple View prospect, Mount Bangs.	Tungsten......	No production (one shipment to Pioche, Nev., for assay); trench 20 ft (6.1 m) long.	Assay results show tungsten quantities less than 0.03 percent (samples 2730, 2731).
7	Manganese prospect (caved adit?), Mount Bangs.	Manganese(?)..	Production unknown; sidehill trench 40 ft (12 m) long.	Manganese visible as occasional rock surface coating. No other potentially economic minerals detected (samples 2732, 2733).
8	South-end breccia-pipe shaft	Copper........	Production unknown; one shaft of undetermined depth with caved connecting adit.	Localized breccia-pipe extending to unknown depth. Sample from stockpile contained 5.4 percent
9	Goddess workings 0.5 mi (0.8 km) south of study area.	Silver, lead, zinc.	10 tons (9.1 metric tons) (P. Lamoreaux, oral commun. 1979). Shaft, caved at a depth of approx. 10 ft (3 m). Trench (caved adit?), 40 ft (12.2 m) long. Pit approx. 250 yd^3 (190 m^3) of excavated material.	Limestone/calcite karst zone. Local mineralization as open-space fracture filling. Assay results from the shaft indicate 0.5-2.9 oz/ton silver, 1.5-2.2 percent lead, and 2.7-7.2 percent zinc. At the pit, assay results indicate 0.53 percent lead, and 0.19-3.7 percent zinc. Negligible amounts of economic minerals were detected at the trench (samples 2737-2758).
10	Sullivans Canyon upper adit.	Copper........	Production unknown; 100-ft (30-m) adit.	Malachite and azurite along fracture surfaces; 0.61 percent copper, trace silver, 0.31 percent arsenic (sample 2772).
11	Sullivans Canyon lower adit	Do.	Production unknown; 14-ft (4-m) adit.	Breccia-pipe copper deposit. Malachite and azurite along fracture surfaces; 1.0-2.3 percent copper, 0.1-0.2 oz/ton silver, 0.43-0.51 percent arsenic (samples 2773, 2774).

*Sample numbers refer to rock samples collected and analyzed by the U.S. Bureau of Mines. Element concentrations were determined by standard spectrographic and fire assay techniques.

Mineral Surveys
Related to Bureau of Land Management
Instant Study Areas

In accordance with the provisions of the Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976), the Geological Survey and the Bureau of Mines have conducted mineral surveys on certain areas, which formally had been identified as "natural" and "primitive" areas prior to November 1, 1975. This report discusses the results of a mineral survey of the Paiute Instant (Primitive) Study Area, Mohave County, Arizona.

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MAP SHOWING MINERAL RESOURCE POTENTIAL OF THE PAIUTE INSTANT (PRIMITIVE) STUDY AREA, MOHAVE COUNTY, ARIZONA

By

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U.S. Geological Survey U.S. Bureau of Mines

1981