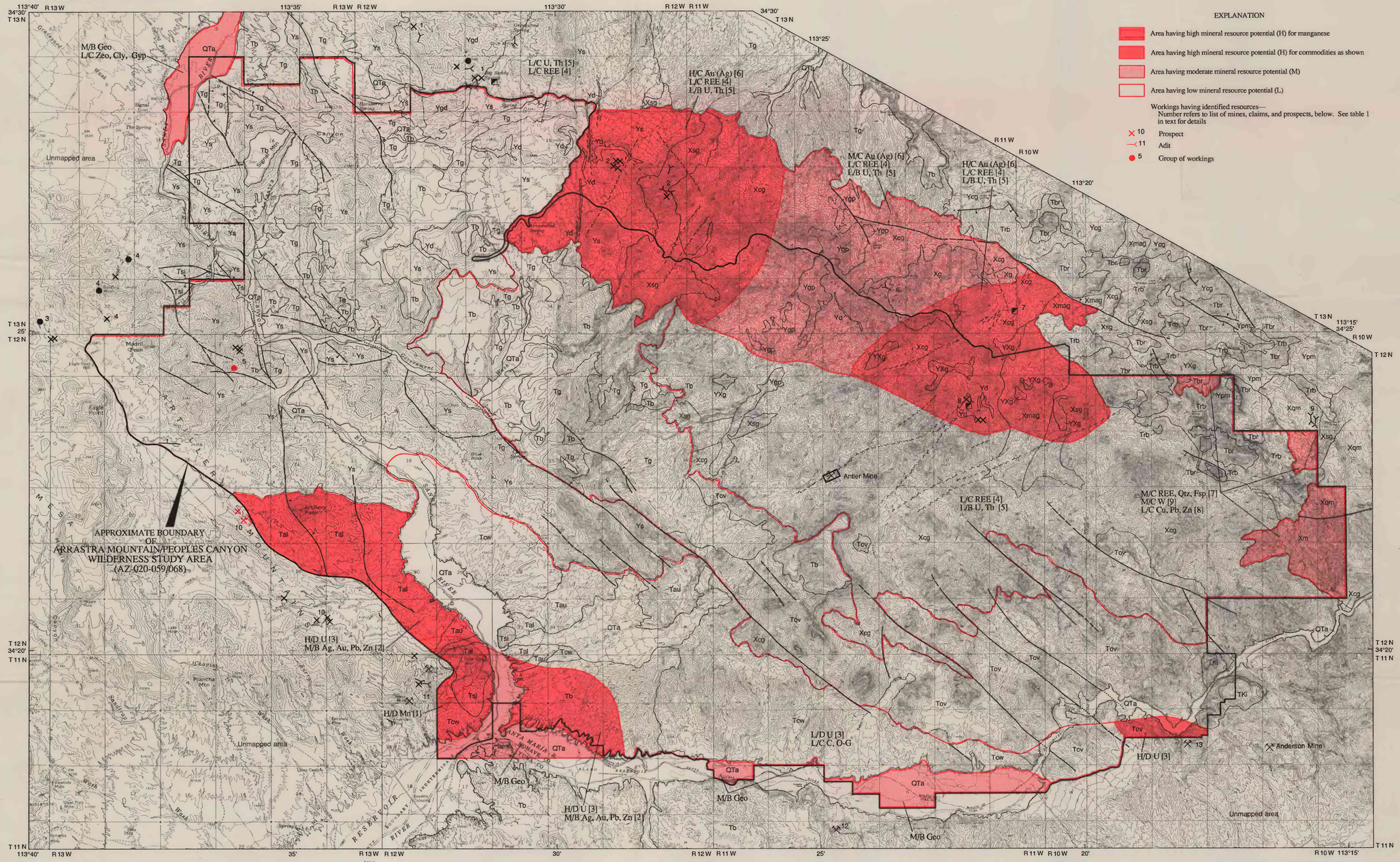
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

BULLETIN 1701-E
PLATE 1



Base from U.S. Geological Survey,
1:62,500: Artillery Peak, 1966; 1:24,000: Arrastra Mtn, Arrastra Mtn NE, Malpais Mesa SW, Palmerita Ranch, Thorn Peak, 1967
Universal Transverse Mercator projection
La Paz County created in 1983 from north part of Yuma County

SCALE 1:62 500

1 ½ 0 1 2 3 4 5 MILES
1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVALS 20, 40, AND 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

APPROXIMATE MEAN DECLINATION, 1989

AREA OF MAP

Geology modified from Bryant (1988), Wilson and others (1969), and unpublished mapping by J.K. Otton, 1976-1982, and Floyd Gray and R.J. Miller, 1986-1988

EXPLANATION

- Area having high mineral resource potential (H) for manganese
- Area having high mineral resource potential (H) for commodities as shown
- Area having moderate mineral resource potential (M)
- Area having low mineral resource potential (L)

Workings having identified resources—Number refers to list of mines, claims, and prospects, below. See table 1 in text for details

- 10 Prospect
- 11 Adit
- 5 Group of workings

CORRELATION OF MAP UNITS

QTa, Tb, Tsi, Tcw, Tau, Tal, Tov	Tg, Tbr, Trb	QUATERNARY
		Miocene — TERTIARY
		Miocene and (or) Oligocene — TERTIARY
Unconformity		
TKi		TERTIARY OR CRETACEOUS
Yd, Ygp, Ys, Ygd, Ycg, Ypm, YXg, Xg, Xqm, Xcg, Xsg, Xm, Xmag		MIDDLE PROTEROZOIC; MIDDLE AND (OR) EARLY PROTEROZOIC; EARLY PROTEROZOIC

DESCRIPTION OF MAP UNITS

QTa Alluvium (Quaternary and Tertiary)—Conglomerate, sandy conglomerate, sand, and silt along modern drainages. Includes high-standing terrace deposits along modern drainages; also includes calcareous conglomerate, sandy conglomerate, and sand associated with earlier stage of modern drainage, deposited significantly higher than active alluvium

Tb Basalt and conglomerate (Miocene)—Vesicular olivine basalt and underlying sandstone, sandy conglomerate, and conglomerate; forms mesas in western part of map area

Tg Gravel (Miocene)—Calcareous sandy conglomerate fining upward into poorly sorted sandstone and sandy siltstone; includes interbedded alkaline basalt flows near base of section. Prominent unit exposed along bluffs that flank Date Creek; locally includes granite boulders as much as several meters in diameter in matrix of sand and fine-grained conglomerate

Tbr Biotite rhyodacite (Miocene)—Medium- to light-gray and lavender porphyritic biotite-bearing dacitic flows and plugs. Contains phenocrysts of sanidine and scattered quartz

Trb Rhyodacite breccia (Miocene)—Coarse, light-gray dacitic rubble underlying major flow units

Tsi Silicic intrusive rocks (Miocene)—Rhyolitic to dacitic volcanic necks and shallow intrusive rocks in western part of map area

Tcw Chapin Wash Formation (Miocene)—Calcareous boulder conglomerate, sandy conglomerate, and conglomeratic sandstone. Includes poorly sorted sandstone, siltstone, mudstone, and limestone deposited in alluvial fan and lake setting. Alkaline basalt and basaltic andesite interlayered with sandstone near base of section. Distinctive greenish-gray conglomeratic sandstone at base of section

Artillery Formation (Miocene and (or) Oligocene)—Divided into:

Tau Upper part—Monolithologic breccia composed dominantly of dark greenish-gray, undifferentiated metavolcanic rocks deposited as debris flows and disordered debris avalanches. Contains reddish-brown sandy conglomerate derived predominantly from metavolcanic breccia beds but also including clasts of phyllite, schist, quartzofeldspathic gneiss, metaquartzite, and marble. Also contains sandy conglomerate of volcanic clasts, sandstone, lacustrine siltstone, and limestone. Minor basaltic andesite flows interbedded with clastic rocks. Manganese enrichment prominent in parts of section. Age based on potassium-argon (K-Ar) age of 23.0±0.7 Ma from upper part of unit

Tal Lower part—Andesitic to rhyolitic agglomerate, flows, conglomerate, conglomeratic sandstone, and local lacustrine sandstone. Also includes basaltic andesite interbedded with clastic rocks. Unit extensively enriched in manganese oxides in western part of map area

Tov Older volcanic and sedimentary rocks (Miocene and (or) Oligocene)—Andesitic to dacitic agglomerates and flows, flow-banded rhyolite, welded ash-flow tuff, rhyolitic volcanic breccia, and lithic tuffs; lowermost part of unit consists of arkose

TKi Intrusive rocks (Tertiary or Cretaceous)—Fine- to medium-grained, gray, porphyritic granite and minor diorite

Yd Diabase (Middle Proterozoic)—Fine-grained, black to greenish-black diabase; weathers brown to brownish black. Commonly sheared and partially altered to chlorite and epidote

Ygp Porphyritic granite (Middle Proterozoic)—Porphyritic biotite quartz monzonite and granite containing K-feldspars as much as 1.5 cm in diameter in fine- to medium-grained matrix

Ys Signal Granite (Middle Proterozoic)—Light-pinkish-gray to light-gray, very coarse grained monzonitic granite. Includes biotite granite to hornblende granodiorite and minor mafic phases. Also includes granodiorite to quartz diorite that lacks large K-feldspars. Age based on uranium-lead (U-Pb) ages of 1,410±3 and 1,409.6±2.5 Ma

Ygd Mafic granodiorite (Middle Proterozoic)—Fine- to medium-grained, locally porphyritic hornblende-biotite and augite-hornblende-biotite granodiorite and diorite; has granophyric texture in matrix. Contains small hornblende-plagioclase pegmatite dikes and large microcline-quartz pegmatite dikes as thick as 30 ft. Roughly equivalent in age to unit Ys

Ycg Coarse-grained granite (Middle Proterozoic)—Biotite quartz monzonite, granite, and granodiorite containing K-feldspar crystals as long as 6 cm. Unit is equigranular to porphyritic

Ypm Porphyritic quartz monzonite (Middle Proterozoic)—Light-pink to pinkish-gray to light-gray porphyritic quartz monzonite containing coarse K-feldspar phenocrysts in faintly foliated biotite-quartz-feldspar matrix

YXg Granite (Middle and (or) Early Proterozoic)—Fine- to medium-grained biotite granite, quartz monzonite, and minor granodiorite. Cuts Early Proterozoic rocks

Xg Granite (Early Proterozoic)—Fine- to medium-grained leucocratic granite and pegmatite

Xqm Quartz monzonite (Early Proterozoic)—Muscovite-biotite quartz monzonite and granodiorite. U-Pb data on zircon define an age of 1,683±14 Ma

Xcg Coarse-grained granite (Early Proterozoic)—Hornblende-biotite and biotite quartz monzonite, granodiorite, granite, and monzonite. Unit contains K-feldspar megacrysts commonly 1 to 2 cm in diameter

Xsg Schist and gneiss (Early Proterozoic)—Muscovite-biotite schist and gneiss. Contains some sillimanite-rich layers and amphibole-rich layers. Includes minor quartzite

Xm Metamorphic rocks (Early Proterozoic)—Mixed metamorphic rocks, mainly schist and gneiss

Xmag Mafic gneiss and schist (Early Proterozoic)—Dark-greenish-gray to black, fine-grained biotite-hornblende-plagioclase schist and gneiss, plagioclase-porphyroblast gneiss, and minor migmatite

Contact—Dashed where approximate, dotted where concealed

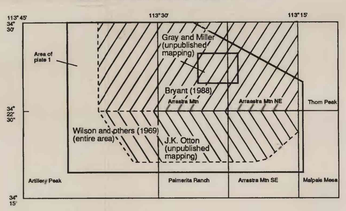
Fault—Dashed where approximate or inferred, dotted where concealed; bar and ball on downthrown side

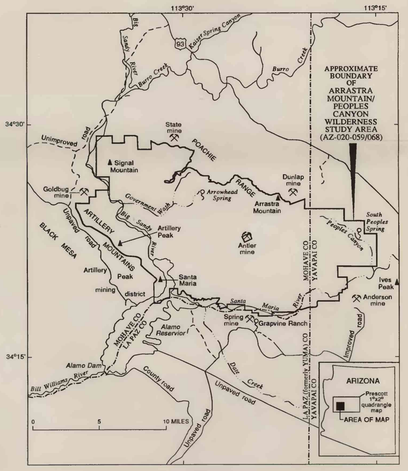
Shear zone

Mines, claims, and prospects—Number refers to list to the left and to table 1 in text. Symbols may represent more than one working. Data for Antler mine are confidential by request of owner

- 12 Mine
- 7 Shaft
- 6 Adit
- 9 Trench
- 10 Prospect pit
- 4 More than one working

INDEX TO TOPOGRAPHIC AND GEOLOGIC MAPPING





INDEX MAP

DEFINITION OF LEVELS OF MINERAL RESOURCE POTENTIAL AND CERTAINTY OF ASSESSMENT

LEVELS OF RESOURCE POTENTIAL

- H **HIGH** 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 a high degree of likelihood for resource accumulation, where data support 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.
- M **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 for resource accumulation, and (or) where an application of mineral-deposit models indicates favorable ground for the specified type(s) of deposits.
- L **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 little or no indication of having been mineralized.
- N **NO** mineral resource potential is a category reserved for a specific type of resource in a well-defined area.
- U **UNKNOWN** mineral resource potential is assigned to areas where information is inadequate to assign a low, moderate, or high level of resource potential.

LEVELS OF CERTAINTY

- A Available information is not adequate for determination of the level of mineral resource potential.
- B Available information only 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.

LEVEL OF RESOURCE POTENTIAL \ LEVEL OF CERTAINTY	A	B	C	D
UNKNOWN POTENTIAL	U/A	H/B HIGH POTENTIAL	H/C HIGH POTENTIAL	H/D HIGH POTENTIAL
		M/B MODERATE POTENTIAL	M/C MODERATE POTENTIAL	M/D MODERATE POTENTIAL
		L/B LOW POTENTIAL	L/C LOW POTENTIAL	L/D LOW POTENTIAL
				N/D NO POTENTIAL

Abstracted with minor modifications from:

Taylor, R.B., and Steven, T.A., 1983, Definition of mineral resource potential: Economic Geology, v. 78, no. 4, p. 1268-1270.
Taylor, R.B., Stoneman, R.J., and Marsh, S.P., 1984, An assessment of the mineral resource potential of the San Isabel National Forest, south-central Colorado: U.S. Geological Survey Bulletin 1638, p. 45-62.
Goudarzi, G.H., compiler, 1984, Guide to preparation of mineral survey reports on public lands: U.S. Geological Survey Open-File Report 84-0787, p. 7, 8.

Mines, claims, and prospects

[Numbered workings described in table 1 of text. Asterisk indicates site outside study area]

1 *Anderson mine
Antler mine
2 *State mine and Greenwood Spring area
3 *Unnamed prospect
4 *Goldbug mine
5 Unnamed prospects
6 *Unnamed prospect
7 *Dunlap mine
8 Button claims group
9 Unnamed prospect
10 *Masterson claims group
11 *Santa Maria area
12 *Spring mine
13 Unnamed prospect

Commodities

Ag Silver
(Ag) Minor silver
Au Gold
C Coal
Cly Clay
Cu Copper
Geo Geothermal energy
Gyp Gypsum
Fsp Feldspar
Mn Manganese
O-G Oil and gas
Pb Lead
Qtz Quartz
REE Rare-earth elements
Th Thorium
U Uranium
W Tungsten
Zeo Zeolite minerals
Zn Zinc

Deposit types

[1] Epithermal manganese
[2] Polymetallic epithermal veins
[3] Lacustrine uranium
[4] Disseminated rare-earth elements
[5] Disseminated uranium and thorium
[6] Shear- or fault-controlled, disseminated gold
[7] Pegmatite
[8] Volcanogenic massive sulfides
[9] Vein tungsten

MINERAL RESOURCE POTENTIAL AND GEOLOGIC MAP OF THE ARRASTRA MOUNTAIN/PEOPLES CANYON WILDERNESS STUDY AREA, LA PAZ, MOHAVE, AND YAVAPAI COUNTIES, ARIZONA