

# **ORE GRADES FOR METALLIC MINERAL DISTRICTS OF ARIZONA**

by

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## Ore Grades for Metallic Mineral Districts of Arizona

This report provides average grades for all metallic mineral districts of Arizona. Metallic mineral districts were defined by Keith and others (1983a,b) as a means to classify mineral occurrences by virtue of their geologic and metallogenic characteristics, rather than the geographic parameters used in a traditional mining-district classification. The mineral districts are not intended to circumvent traditional mining districts, but rather to provide a more scientific and rational means of studying mineral occurrences and to determine the geologic interrelationships among mines, prospects, and discoveries.

Table 1 is a comprehensive table listing the tenor of Cu, Pb, Zn, Mo, Ag, and Au ore produced from all metallic mineral districts in Arizona with known production, except those districts in Apache and Navajo counties. The districts are listed alphabetically by county. Those mineral districts whose boundaries overlap two counties are listed in both counties, with the grades listed under each county representing ore produced from mines only in that county. The table does not include grades for Mn, U, V, and W production, because such information is not currently available. The data are compiled from Keith and others (1983b) and the U.S. Bureau of Mines mine production statistics database and are current as of 1981. The values for Cu, Pb, Zn, and Mo are in weight percent, whereas those for Ag and Au are in ounces per ton. Entries of  $<0.01$  and  $<0.001$  in the table indicate that there is production for that commodity, but the grade is insignificant, whereas 0.00 and 0.000 indicate there is no recorded production for that commodity.

Following the list of mineral districts for each county are two averages: county and district. County averages are **mean grades of all ore produced in the county**. They are calculated by summing the total amount of production for a given metallic commodity - in pounds or ounces - in each county, and dividing by the sum of total tonnage produced in each county. This value is a **weighted average** that is representative of the "richness" of each county. District averages are calculated by averaging the grades for each district in a county and are not weighted. Values of  $<0.01$  and  $<0.001$  are treated as 0.00 in calculating the district averages. This value represents the "**typical**" grade for a district in the county of interest.

It is interesting to note that the highest county averages for copper are found in Cochise, Yavapai, and La Paz counties; for lead in Graham and Santa Cruz counties; for zinc in Santa Cruz and Graham Counties, for molybdenum in Mohave and Pima counties; for silver in Santa Cruz county; and for gold in Yuma and Maricopa counties. Clearly this distribution of relative metallic wealth is a function of the various deposit types and geologic settings

in each county. Essentially, the highest county averages for all commodities, except molybdenum, occur in counties that lack large-tonnage, low-grade porphyry copper deposits. The averages document a lead-zinc-silver bias for mines in southeastern Arizona and a gold bias for those in western and central Arizona.

Metallogenesis in Arizona has been subdivided into ten different deposit types, they include:

- 1) Precambrian massive sulfide deposits
- 2) Precambrian veins
- 3) Jurassic veins
- 4) Jurassic porphyry copper deposits
- 5) Laramide veins
- 6) Laramide porphyry copper deposits
- 7) Early Tertiary veins
- 8) Middle Tertiary epithermal veins
- 9) Middle Tertiary microdiorite-related deposits
- 10) Middle Tertiary detachment-fault-related deposits

Table 2 is a compilation of the ore grades for these different deposit types in Arizona. The deposit-type determinations are from Keith and others (1983a,b) and Welty and others (1985). Mean grades of each deposit type and district mean and median grades for each deposit type are also listed. Mean grades of each deposit type are calculated in the same fashion as the county averages, that is, the total amount of a given commodity is divided by the total tonnage for each deposit type. The district mean grade is a standard arithmetic mean, whereas the district median grade is the middle grade value or the arithmetic mean of the two middle values of the grades arranged in an array. Values of  $<0.01$  and  $<0.001$  have been treated as 0.00 in the calculation of means and medians. The formulas used to calculate the median grades are taken from Spiegel (1961). When the values for the mean and median grades are in close agreement, the population of grades is normally distributed, and therefore, the average values are representative. When there is a wide discrepancy between these values, the population does not have a normal distribution, and hence the average values are less representative.

For most ore-deposit types, the calculated mean and median grades for these deposits are usually in close agreement. Notable exceptions include:

- 1) Precambrian massive sulfides and veins for copper and silver;
- 2) Laramide veins for silver;
- 3) Early Tertiary veins for copper and silver;
- 4) Middle Tertiary epithermal veins for precious-metals;
- 5) Middle Tertiary microdiorite-dike-related deposits for copper and precious metals; and
- 6) Middle Tertiary detachment-fault-related deposits for

silver.

Despite the diversity in some of the gold averages, Jurassic vein, early Tertiary vein, and middle Tertiary epithermal vein and microdiorite-dike-related deposits all have average gold grades in excess of 0.400 ounces per ton.

Figures 1 through 7 are ternary diagrams of deposit-type production normalized to gold for that deposit type. Production figures are taken from Keith and others (1983b). Individual mineral districts are plotted according to the value of their production in 1985 dollars (see Table 3 for exact metal prices used).

The data were normalized according to the following procedure:

$\Sigma$  = sum of all districts for each deposit type  
BM = Cu+Pb+Zn

$$\frac{\Sigma Au}{\Sigma BM} = f \qquad \frac{\Sigma Au}{\Sigma Ag} = g$$

f and g are normalization factors

$$BM \times f = BM' \text{ (for each district)}$$

$$Ag \times g = Ag' \text{ (for each district)}$$

Individual data points:

$$Cu+Pb+Zn = \frac{BM'}{BM'+Ag'+Au} (100)$$

$$Ag = \frac{Ag'}{BM'+Ag'+Au} (100)$$

$$Au = \frac{Au}{BM'+Ag'+Au} (100)$$

The normalization factors for each deposit type are listed in Table 4.

Figures 1 through 7 display the intra-deposit variation of the deposit types, and some inferences may be drawn from their examination. For Precambrian massive sulfide deposits, the large tonnage of the Verde mineral district so overwhelms other producers, that, in effect, Precambrian massive sulfide deposits are normalized to the production from this mineral district. The diagram reveals that those mineral districts in the western Precambrian volcanic belt (e.g. Hualapai and Old Dick) tend to be comparatively less precious-metal rich. Figure 3, the plot of Jurassic and Laramide vein deposits, shows nearly the same effect

of a single mammoth producer, in this case the Pioneer mineral district (Superior area). In this figure, mineral districts in Yavapai County (e.g. Mount Union, Ticonderoga, and Walker) tend to be gold-rich, whereas the Tombstone district in Cochise County is silver-rich. The Globe Hills district, a vein system adjacent to the Miami-Inspiration district is relatively depleted in precious-metals. Interestingly, the Miami-Inspiration porphyry copper district (fig. 4) is similarly depleted compared to other porphyry copper deposits. The Jurassic vein and porphyry copper deposits are both enriched in precious-metals relative to their Laramide counterparts (fig. 4). The Ajo district is the most gold-rich, large porphyry copper deposit, whereas the San Manuel district is the most silver-rich. Both the Pima and Silver Bell districts are gold-poor and silver-rich producers. Figure 5, representing the early Tertiary vein deposits, has too small a sample population to draw any meaningful conclusions, but this time period accounts for the greatest number of tungsten mineral districts in Arizona. Figure 6, the middle Tertiary epithermal vein and microdiorite-dike-related deposits, shows discrete clusters of mineral districts in each corner of the diagram with no hint of a continuum among districts rich in gold, silver, or base-metals. The middle Tertiary detachment-fault-related districts (fig. 7) exhibit a fundamental dichotomy between base-metal-rich (mostly copper) mineral districts (e.g. Planet and Clara) and those of greater precious-metal affinity (e.g. Cienega and Bullard).

Figures 8 through 12 are summary diagrams. For these figures, the individual mineral district production figures have been normalized to the total metallic production in Arizona. Again, each district is normalized on gold by the method described above; the normalization factors are given in table 4. Figure 8 is a plot of the mean grades of each deposit type. This diagram reveals that each deposit type plots as a discrete point, implying that each has a characteristic set of grades. It further can be seen that metallogenesis in Arizona is easily described by either gold-rich or gold-poor events. Precambrian veins, Jurassic veins and Tertiary metallogeny reveal an elevated gold content, whereas Precambrian massive sulfide deposits, Jurassic porphyry copper deposits, and Laramide metallogeny are nominally depleted in gold. Figure 9 demonstrates the effect that the porphyry copper deposits have on the relative positions of individual mineral districts. This effect is so pronounced that this diagram is essentially normalized to total porphyry copper deposit production.

Figures 10 through 12 are presented so that the individual metallogenic epochs may be seen more closely. Figure 10 shows the distribution of Precambrian mineral districts, both massive sulfide and vein deposits, normalized to state-wide production. The massive sulfide deposits show a trend from base-metal-rich toward subequal amounts of gold and silver production. The Precambrian vein deposits, although few in number, show a definite

gold bias. The Jurassic and Laramide vein and porphyry copper deposits (fig. 11) show the expected greater dominance of precious-metals in the vein systems, and the sense of continuum between the porphyry deposits and similarly aged vein deposits. Figure 12 displays the distribution of Tertiary mineral districts. Middle Tertiary epithermal vein deposits, even when normalized to state-wide production, evidence a pronounced clustering in both the gold-rich and silver-rich apices. The base-metal-rich deposits are also shown as a trend from the silver-rich apex toward the base-metal apex. Middle Tertiary microdiorite-dike-related deposits display a profound bias toward gold production, whereas detachment-fault-related deposits discreetly cluster in either the gold or base-metal apices. Perhaps the most intriguing trend is that of the early Tertiary vein deposits, which appear to closely mimic the distribution of middle Tertiary epithermal vein deposits, but with a slightly higher (up to 20%) base-metal component.

#### REFERENCES

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- Welty, J. W., Spencer, J. E., Allen, G. B., Reynolds, S. J., and Trapp, R. A., 1985, Geology and production of middle Tertiary mineral districts in Arizona: Arizona Bureau of Geology and Mineral Technology Open-File Report 85-1, 88 p.

TABLE 1. ORE GRADES OF METALLIC MINERAL DISTRICTS OF ARIZONA

COCHISE COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
APACHE PASS	0.01	2.37	0.00	0.00	1.011	0.916
BLUEBIRD	0.65	0.00	0.00	0.00	1.750	0.000
CALIFORNIA	0.55	13.56	1.93	0.00	4.485	0.003
COCHISE	0.57	<0.01	0.37	0.00	0.056	<0.001
GOLD HILL	0.00	0.00	0.00	0.00	0.081	0.949
GOLDEN RULE	<0.01	0.29	0.00	0.00	0.491	0.311
JUNIPER FLATS	0.81	1.01	0.00	0.00	4.479	0.592
MASCOT	2.26	0.77	0.02	0.00	4.201	0.132
MIDDLE PASS	1.26	0.20	4.37	<0.01	1.132	0.004
HARTFORD	1.13	10.98	4.76	0.00	7.503	0.051
MINE CANYON	1.72	0.00	0.00	0.00	0.576	0.007
PEARCE	<0.01	<0.01	<0.01	0.00	5.170	0.053
PELONCILLO	4.63	0.00	0.00	0.00	3.333	0.000
RUCKER CANYON	0.00	0.00	0.00	0.00	22.897	0.034
SILVER CAMP	<0.01	0.59	0.00	0.00	4.102	0.169
SWISSHELM	0.10	12.72	0.23	0.00	7.317	0.122
TEVISTON	0.18	1.16	0.00	0.00	1.641	0.821
TOMBSTONE	0.13	0.84	<0.01	0.00	10.861	0.045
TURQUOISE	3.21	0.37	0.05	0.00	1.329	0.027
WARREN	2.35	0.10	0.11	0.00	0.611	0.017
WHETSTONE	0.64	0.00	0.00	0.00	0.371	0.086
WINCHESTER	2.78	2.22	0.00	0.00	7.000	0.000
YELLOWSTONE	0.27	2.33	0.00	0.00	1.903	0.742
COUNTY AVERAGE	2.18	0.11	0.12	0.00	0.781	0.017
DISTRICT AVERAGE	1.01	2.15	0.51	0.00	4.013	0.221

COCONINO COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
FRANCIS	3.04	<0.01	0.00	0.00	0.354	0.008
GRANDVIEW	21.29	0.00	0.00	0.00	6.429	<0.001
HAVASU CANYON	4.37	10.51	0.70	0.00	3.991	0.000
ORPHAN	18.68	0.03	<0.01	0.00	6.612	0.006
PROSPECT CANTON	23.80	0.00	0.00	0.00	10.346	0.177
VALLE	20.39	0.00	0.00	0.00	0.613	0.000
WARM SPRINGS	6.52	<0.01	0.00	0.00	0.533	0.005
WHITE MESA	0.25	0.00	0.00	0.00	0.009	0.000
COUNTY AVERAGE	0.90	<0.01	<0.01	0.00	0.161	<0.001
DISTRICT AVERAGE	12.29	1.32	0.09	0.00	3.611	0.025



## GILA COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
BANNER	0.58	1.93	0.18	0.00	0.665	0.011
CHRISTMAS	0.70	0.00	0.00	0.00	0.082	0.002
DRIPPING SPRING	0.97	1.29	0.12	0.00	0.757	0.491
EL CAPITAN	1.02	0.38	0.00	0.00	19.176	0.026
GLOBE HILLS	4.27	0.01	<0.01	0.00	0.682	0.009
GREEN VALLEY	0.62	0.07	<0.01	0.00	0.699	0.169
MAZATZAL	2.79	0.17	0.00	0.00	39.865	0.258
MIAMI-INSPIRATION	0.69	<0.01	0.00	<0.01	0.012	<0.001
PINAL MOUNTAINS	0.94	0.66	0.08	0.00	9.584	0.050
PITTSBURG-TONTO	23.70	5.35	0.00	0.00	0.000	0.000
POLK	2.23	0.00	0.00	0.00	1.332	0.033
RICHMOND BASIN	0.74	0.50	0.00	0.00	59.435	0.015
ROOSEVELT	0.00	0.00	0.00	0.00	0.000	0.941
SALT RIVER	3.39	1.17	0.00	0.00	11.917	0.000
SIERRA ANCHA	0.70	0.00	0.00	0.00	5.732	0.006
SPRING CREEK	0.94	2.76	0.00	0.00	5.302	0.674
SUMMIT	15.28	0.00	0.00	0.00	0.264	0.002
COUNTY AVERAGE	0.75	<0.01	<0.01	<0.01	0.025	<0.001
DISTRICT AVERAGE	3.50	0.84	0.02	0.00	9.147	0.158

## GRAHAM COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
ARAVAIPA	0.33	6.06	4.90	0.00	1.240	0.015
CLARK	3.06	7.39	0.00	0.00	9.321	0.330
GILA RIVER	0.25	0.00	0.00	0.00	0.368	0.368
RATTLESNAKE	0.00	0.00	0.00	0.00	5.014	0.396
LONE STAR	2.24	0.09	0.00	0.00	0.178	0.016
SANCHEZ	10.22	0.00	0.00	0.00	0.050	0.000
SAN JUAN	5.38	0.00	0.00	0.00	0.019	<0.001
STANLEY	5.25	24.02	0.00	0.00	6.796	0.132
STARLIGHT	0.00	26.32	0.00	0.00	2.368	0.053
COUNTY AVERAGE	1.10	5.20	4.08	0.00	1.153	0.018
DISTRICT AVERAGE	2.97	7.10	0.54	0.00	2.262	0.146

## GREENLEE COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
ASH PEAK	<0.01	<0.01	0.00	0.00	6.656	0.026
COPPER MOUNTAIN	0.82	<0.01	<0.01	<0.01	0.035	<0.001
TWIN PEAKS	0.34	0.37	0.00	0.00	4.708	0.216
COUNTY AVERAGE	0.82	<0.01	<0.01	<0.01	0.040	<0.001
DISTRICT AVERAGE	0.39	0.12	0.00	0.00	3.800	0.081

LA PAZ COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
ALAMO	2.77	1.13	0.00	0.00	0.471	0.117
ALAMO SPRINGS	0.02	0.00	0.00	0.00	0.154	0.154
BOUSE	7.41	0.00	0.00	0.00	0.296	0.841
CIENEGA	4.49	0.00	0.00	0.00	0.084	0.629
CINNABAR	3.72	0.00	0.00	0.00	2.378	0.110
CLARA	4.69	0.00	0.00	0.00	0.035	<0.001
CUNNINGHAM PASS	8.77	0.02	0.00	0.00	0.297	0.463
ELLSWORTH	2.59	0.05	0.00	0.00	1.000	0.118
GRAND CENTRAL	0.00	0.00	0.00	0.00	0.200	0.800
HARCUVAR	2.86	0.00	0.00	0.00	0.217	0.278
HARQUAHALA	0.08	<0.01	0.00	0.00	0.350	0.124
LA CHOLLA	6.62	0.00	0.00	0.00	9.631	1.204
LA PAZ	0.07	0.01	0.00	0.00	0.095	0.217
LITTLE HARQUAHALA	0.02	0.05	0.00	0.00	0.566	0.901
MAMMON	5.17	0.00	0.00	0.00	0.169	0.071
MIDDLE CAMP	0.01	7.26	0.00	0.00	0.255	0.276
MIDWAY	2.20	0.00	0.00	0.00	0.164	0.210
MOON MOUNTAINS	0.00	0.00	0.00	0.00	2.667	0.333
NEW WATER	0.30	0.90	<0.01	0.00	34.294	0.022
NORTHERN PLOMOSA	2.31	0.17	0.00	0.00	0.977	0.677
PLANET	1.00	0.00	0.00	0.00	<0.001	<0.001
PLOMOSA PASS	4.40	0.00	0.00	0.00	0.585	0.018
PRIDE	0.03	0.00	0.00	0.00	0.158	2.053
SILVER	<0.01	1.19	<0.01	0.00	12.753	<0.001
SOUTHERN PLOMOSA	6.60	0.07	0.00	0.00	7.487	0.295
SWANSEA	2.43	0.00	0.00	0.00	0.061	<0.001
TRIGO MOUNTAINS	0.00	0.00	0.00	0.00	0.000	6.000
COUNTY AVERAGE	1.42	0.08	<0.01	0.00	0.921	0.093
DISTRICT AVERAGE	2.54	0.40	0.00	0.00	2.791	0.589

MARICOPA COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
AGUILA	1.17	2.75	0.00	0.00	1.090	0.397
BIG HORN	0.08	0.02	0.00	0.00	0.073	0.225
BLUE TANK	1.86	0.00	0.00	0.00	0.598	0.227
BRONCO CREEK	1.59	0.00	0.00	0.00	0.031	0.170
CAVE CREEK	0.56	<0.01	0.00	0.00	0.519	0.496
DUSHEY CANYON	0.08	0.00	0.00	0.00	0.236	0.403
GOLDFIELD	0.00	0.00	0.00	0.00	2.529	0.443
HARDLY ABLE	3.94	0.00	0.00	0.00	0.000	0.040
MAGAZINE	2.87	0.00	0.00	0.00	22.287	0.008
MAZATZAL MTNS.	0.11	0.96	0.00	0.00	1.213	0.311
McDOWELL MTNS.	1.20	0.00	0.00	0.00	5.689	0.056
NEW RIVER	1.92	0.00	0.00	0.00	0.417	0.014
OSBORNE	0.91	3.71	<0.01	0.00	2.316	0.144
PAINTED ROCK	6.69	14.39	0.00	0.00	4.511	0.047
PHOENIX MTNS.	0.10	0.00	0.00	0.00	0.067	0.700
PIKES PEAK	0.25	0.16	0.00	0.00	0.512	0.551
RED PICACHO	6.47	0.00	0.00	0.00	0.793	0.389
RELIEF	0.00	0.00	0.00	0.00	0.021	0.310
SAN DOMINGO	2.44	0.02	0.00	0.00	0.683	0.512
SALT RIVER MTNS.	0.09	0.00	0.00	0.00	0.327	0.459
SUNRISE	0.09	0.00	0.00	0.00	0.159	0.582
VULTURE	0.02	0.12	0.00	0.00	0.273	0.351
WEBB	3.71	0.38	0.00	0.00	0.485	0.137
WHITE PICACHO	0.00	0.00	0.00	0.00	1.000	2.000
WINIFRED	0.03	<0.01	0.00	0.00	0.093	0.231
COUNTY AVERAGE	0.18	0.31	<0.01	0.00	0.654	0.327
DISTRICT AVERAGE	1.45	0.90	0.00	0.00	1.837	0.368

MOHAVE COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
ARTILLERY	1.46	<0.01	0.00	0.00	1.323	0.018
BENTLEY	19.85	0.51	0.11	0.00	1.462	0.010
BORIANA	0.09	0.00	0.00	0.00	0.052	<0.001
BUCK MOUNTAINS	<0.01	0.55	0.00	0.00	0.409	0.341
CEDAR VALLEY	0.02	0.00	0.00	0.00	5.167	0.556
CHEMEHUEVIS	0.02	0.87	<0.01	0.00	1.807	0.628
CLEOPATRA	1.19	<0.01	0.00	0.00	0.580	0.088
COTTONWOOD	1.70	<0.01	0.00	0.00	0.447	0.201
DIAMOND JOE	0.54	0.36	<0.01	0.00	5.417	0.012
EL DORADO PASS	0.02	0.03	0.00	0.00	0.847	0.211
EMERALD ISLE	0.78	0.00	0.00	0.00	<0.001	<0.001
GOLD BASIN	<0.01	0.03	0.00	0.00	0.098	0.195
GOLD HILL	0.14	0.04	0.00	0.00	12.833	0.188
GREENWOOD	0.01	0.04	0.00	0.00	0.394	0.631
HACKBERRY	0.15	2.06	0.30	0.00	22.237	0.102
HACKS CANYON	4.56	0.00	0.00	0.00	2.151	0.002
HUALAPAI	3.49	0.28	3.52	0.00	0.616	0.004
KAABA	<0.01	0.71	0.00	0.00	0.193	0.217
LEAD PILL	0.96	13.96	0.00	0.00	1.535	0.365
LOST BASIN	3.10	0.00	0.00	0.00	0.789	0.276
MADRIL PEAK	2.36	0.00	0.00	0.00	0.000	1.077
MAYNARD	0.14	1.03	0.17	0.00	23.512	0.086
McCONNICO	<0.01	0.00	0.00	0.00	0.079	0.156
McCRACKEN	<0.01	0.88	0.01	0.00	4.038	<0.001
MINNESOTA	0.07	0.02	0.00	0.00	0.878	0.414
MUSIC MOUNTAIN	0.05	0.56	0.00	0.00	3.006	0.838
OATMAN	<0.01	<0.01	0.00	0.00	0.296	0.501
OWENS	0.11	3.95	<0.01	0.00	13.038	0.133
PILGRIM	0.00	0.00	0.00	0.00	0.258	0.170
PINE PEAK	0.02	0.32	0.42	0.00	0.466	0.039
RAWHIDE	0.75	18.37	1.62	0.00	11.475	0.054
SILVERADO	1.29	15.41	0.00	0.00	40.969	0.000
TOPOCK	1.88	0.00	0.00	0.00	1.444	1.099
UNION PASS	0.00	0.00	0.00	0.00	0.475	0.163
VIRGINIA	<0.01	<0.01	0.00	0.00	0.232	0.232
WALLAPAI	0.37	0.04	0.07	0.03	0.125	0.002
WHITE HILLS	<0.01	0.02	0.00	0.00	3.119	0.017
WILLOW BEACH	0.00	0.00	0.00	0.00	0.667	2.000
YELLOW JACKET	0.31	0.02	7.11	0.00	1.802	0.037
COUNTY AVERAGE	0.36	0.04	0.07	0.03	0.145	0.024
DISTRICT AVERAGE	1.16	1.54	0.34	<0.01	4.211	0.284

PIMA COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
AJO	0.70	0.00	0.00	<0.01	0.046	0.004
AMADO	0.32	2.76	0.34	0.00	9.685	0.537
AMOLE	1.31	1.73	0.04	0.00	0.932	0.044
ARIVACA	0.49	1.71	0.01	0.00	5.505	0.208
AGUIRRE PEAK	1.11	0.00	0.00	0.00	2.000	0.037
BABOQUIVARI	0.01	<0.01	0.00	0.00	2.322	0.194
BEN NEVIS	0.46	0.04	0.00	0.00	450.202	0.761
BROWNELL	1.59	0.25	0.00	0.00	5.591	0.003
CABABI	1.23	2.27	0.02	0.00	10.326	0.426
CATALINA	4.15	<0.01	0.00	0.00	0.464	<0.001
CERRO COLORADO	0.22	0.42	0.00	0.00	67.956	0.141
CERRO DE FRESNAL	0.11	0.00	0.00	0.00	15.868	0.647
CIMARRON MTNS.	2.05	4.30	0.00	0.00	4.200	0.375
COMOBABI	8.25	0.00	0.00	0.00	38.739	0.000
COYOTE	8.62	0.00	0.00	0.00	1.550	0.023
CUPRITE	4.75	1.97	0.02	0.00	1.706	0.010
EASTER	0.00	0.00	0.00	0.00	1.500	3.000
EMPIRE	0.66	19.24	0.44	0.05	6.237	0.029
GREATERVILLE	1.07	18.38	0.30	0.00	9.630	0.180
GROWLER	2.86	9.28	0.00	0.00	4.512	0.024
GUNSIGHT	0.03	0.41	<0.01	0.00	20.951	0.013
HELVETIA	4.28	0.04	0.13	<0.01	0.846	0.003
JACKSON	9.06	0.00	0.00	0.00	4.845	0.005
KEYSTONE	0.17	1.29	0.10	0.00	3.392	0.698
LAS GUIJAS	0.17	0.00	0.00	0.00	0.205	0.022
MAGONIGAL	2.49	0.00	0.00	0.00	0.019	0.000
MARBLE PEAK	2.32	0.03	0.01	0.00	0.754	0.002
MILDRED PEAK	1.98	0.10	0.00	0.00	6.301	0.185
MINE CANYON	1.21	0.00	0.00	0.00	0.650	0.000
MONTEZUMA	8.39	0.65	0.00	0.00	8.397	0.017
OCEANIC	<0.01	0.01	0.00	0.00	0.270	0.403
PAPAGO	0.41	7.41	<0.01	0.00	5.050	0.025
PIMA	0.45	<0.01	<0.01	0.02	0.058	<0.001
QUIEN SABE	0.80	<0.01	0.00	0.00	0.161	0.001
QUIJOTOA	0.63	0.28	0.00	0.00	3.118	0.280
QUINLAN	0.00	62.00	0.00	0.00	30.000	0.000
REDINGTON	6.36	0.00	0.00	0.00	1.495	0.000
RINCON	3.28	0.19	0.00	0.00	2.411	0.570
ROADSIDE	0.00	0.00	0.00	0.00	0.444	0.815
ROSEMONT	3.87	0.04	0.00	0.00	0.800	0.001
ROSKRUGE	1.71	0.00	0.00	0.00	28.599	0.007
SAGINAW HILL	1.14	1.52	3.40	0.00	2.414	0.057
SANTA ROSA	4.84	1.44	0.00	0.00	5.706	0.249
SEDIMENTARY HILLS	2.63	0.00	0.00	0.00	5.500	0.000
SILVER BELL	0.71	<0.01	0.02	<0.01	0.065	<0.001
WATERMAN	3.04	1.88	1.36	0.00	3.781	0.003
COUNTY AVERAGE	0.55	<0.01	<0.01	0.01	0.056	0.001
DISTRICT AVERAGE	2.13	3.10	0.14	<0.01	17.208	0.222

PINAL COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
ANTELOPE	9.70	0.00	0.00	0.00	0.481	0.017
BUNKER HILL	2.82	0.61	0.00	0.43	0.538	0.003
BURNEY	0.90	2.47	0.89	0.00	1.717	0.011
CASA GRANDE	0.52	<0.01	<0.01	0.00	0.037	<0.001
COPPER BUTTE	2.94	<0.01	0.00	0.00	0.030	<0.001
COTTONWOOD	1.11	0.62	0.00	0.00	7.305	0.294
CRESCENT	14.83	0.00	0.00	0.00	23.500	0.167
DRIPPING SPRING	3.90	0.02	0.00	0.00	0.856	0.001
DURHAM-SUIZO	1.57	0.00	0.00	0.00	0.259	0.009
ESTRELLA	4.13	0.00	0.00	0.00	2.000	0.273
GOLDFIELD	0.03	0.00	0.00	0.00	0.168	0.223
GRAND PRIZE	0.12	0.00	0.00	0.00	0.815	0.478
GREENBACK	0.13	0.00	0.00	0.00	3.808	0.129
LAKESHORE	0.79	<0.01	0.00	0.00	0.001	<0.001
LITTLE HILLS	0.34	<0.01	0.00	0.00	0.019	<0.001
MAMMON	0.05	0.00	0.00	0.00	0.163	1.425
MAMMOTH	0.10	1.25	0.82	0.04	0.313	0.066
MARTINEZ CANYON	0.19	4.94	<0.01	0.00	6.982	0.002
MINERAL BUTTE	3.04	0.17	0.00	0.00	0.236	0.011
MINERAL CREEK	0.90	<0.01	<0.01	<0.01	0.027	<0.001
MINERAL HILL	0.14	0.07	<0.01	0.00	12.724	0.010
MINERAL MOUNTAIN	0.49	6.51	0.94	0.00	0.844	0.085
NORTH STAR	1.39	0.00	0.00	0.00	0.255	0.005
ORACLE	0.27	3.08	0.00	0.00	16.085	0.415
OWL HEAD	1.27	0.00	0.00	0.00	5.039	0.025
PICACHO	0.97	0.00	0.00	0.00	0.540	0.177
PINAL GRANDE	10.29	0.27	0.13	0.00	0.174	0.014
PIONEER	4.47	<0.01	0.15	0.00	1.543	0.027
POSTON BUTTE	1.06	0.00	0.00	0.00	0.030	0.000
RANDOLPH	0.41	3.66	0.00	0.00	13.492	0.096
RED HILLS	4.88	0.00	0.00	0.00	0.000	0.000
RIPSEY	0.60	0.02	0.00	0.00	18.925	0.190
RIVERSIDE	3.73	<0.01	0.00	0.00	0.929	0.059
SADDLE MOUNTAIN	1.96	0.03	<0.01	0.00	1.500	0.008
SAN MANUEL	0.61	0.00	0.00	<0.01	0.024	0.001
SILVER REEF	0.07	0.08	0.00	0.00	10.554	0.006
SLATE	<0.01	0.02	0.00	0.00	0.470	0.003
SUMMIT	6.87	0.06	0.00	0.00	4.265	0.010
SUPERSTITION MTNS.	0.56	0.00	0.00	0.00	0.775	0.307
TABLE MOUNTAIN	8.00	0.00	0.00	0.00	<0.001	0.193
VEKOL	0.38	0.05	0.05	0.00	10.022	0.005
WOOD CAMP CANYON	1.09	0.00	0.00	0.00	2.941	0.002
WOOLEY	2.88	0.00	0.00	0.00	1.051	0.011
COUNTY AVERAGE	0.86	0.01	0.01	<0.01	0.085	0.002
DISTRICT AVERAGE	2.34	0.56	0.07	0.01	3.522	0.111

SANTA CRUZ COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
BRADFORD	9.70	0.94	0.00	0.00	3.643	0.000
CAVE CREEK	0.86	<0.01	0.00	0.00	4.145	0.008
IVANHOE	1.97	8.37	0.00	0.00	24.541	0.060
MANSFIELD	1.94	13.38	0.00	0.00	12.738	0.264
NOGALES	1.22	3.33	1.08	0.00	5.332	0.248
ORO BLANCO	0.23	0.39	0.00	0.00	5.333	0.444
PAJARITO	0.16	5.10	0.01	0.00	15.730	0.055
PARKER CANYON	0.22	0.46	0.00	0.00	1.887	0.679
PATAGONIA	6.27	3.44	<0.01	0.00	7.769	0.109
QUERCES	7.30	0.00	0.00	0.00	0.742	0.023
RED MOUNTAIN	0.20	5.40	5.13	0.00	5.407	0.015
RED ROCK	1.89	2.13	0.29	0.00	5.548	0.006
RUBY	0.22	3.28	2.75	0.00	4.900	0.043
SALERO	1.48	11.48	0.40	0.00	10.411	0.268
THUNDER MOUNTAIN	4.21	0.08	<0.01	0.00	0.356	0.003
TYNDALL	0.20	17.87	8.24	0.00	5.767	0.004
WASHINGTON CAMP	2.89	3.35	6.51	0.00	5.225	0.016
WRIGHTSON	4.54	4.08	2.47	0.00	5.900	0.020
YELLOW JACKET	0.03	0.00	0.00	0.00	1.578	1.252
COUNTY AVERAGE	0.95	4.33	4.42	0.00	5.035	0.027
DISTRICT AVERAGE	2.52	4.59	1.49	0.00	6.758	0.171

YAVAPAI COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
AGUA FRIA	3.64	<0.01	<0.01	0.00	0.314	0.006
ASH CREEK	0.94	0.00	0.00	0.00	5.326	0.697
BATTLE FLAT	0.39	0.25	0.09	0.00	33.032	0.032
BIG BUG	0.12	1.87	4.93	0.00	2.694	0.074
BLACK CANYON	0.05	0.68	0.04	0.00	3.584	0.124
BLACK HILLS	3.66	0.07	<0.01	0.00	2.489	0.005
BLACK ROCK	0.61	0.10	0.00	0.00	2.283	0.259
BLOODY BASIN	3.00	0.00	0.00	0.00	2.000	0.000
BLUE TANK	7.18	0.24	0.00	0.00	1.812	0.211
BULLARD	1.77	0.00	0.00	0.00	0.347	0.210
CAMP WOOD	0.00	0.00	0.00	0.00	9.333	0.333
CASTLE CREEK	2.66	0.89	0.00	0.00	3.137	0.475
CHERRY CREEK	0.29	0.06	0.17	0.00	3.882	0.478
COPPER BASIN	2.75	0.07	0.20	0.00	0.138	0.002
CROSBY	0.09	0.04	0.00	0.00	0.441	0.515
EUREKA	0.64	<0.01	<0.01	<0.01	0.046	<0.001
FINCH	6.34	0.00	0.00	0.00	5.193	0.333
FRENCH GULCH	0.02	<0.01	0.00	0.00	0.125	0.228
GROOM CREEK	0.56	0.03	0.06	0.00	5.671	0.271
HASSAYAMPA	0.65	2.13	1.27	0.00	6.380	0.522
HUMBUG	0.93	0.67	0.00	0.00	1.662	0.375
KAY	5.79	0.26	0.00	0.00	1.070	0.058

KIRKLAND	0.04	0.05	0.00	0.00	0.317	0.525
LANE MOUNTAIN	0.00	0.00	0.00	0.00	72.000	0.048
LITTLE COPPER CRK.	1.82	0.46	0.05	0.00	10.536	0.316
MARTINEZ	<0.01	<0.01	0.00	0.00	0.375	0.348
MAYER	3.22	0.00	0.00	0.00	1.249	0.042
MINERAL POINT	0.11	0.02	0.00	0.00	0.756	0.522
MINNEHAHA	0.08	0.51	0.00	0.00	1.535	0.402
MOUNT UNION	0.77	1.35	0.32	0.00	3.924	0.703
OLD DICK	3.16	0.09	9.13	0.00	0.387	0.002
PECK	0.05	0.72	0.00	0.00	88.789	0.005
PINE FLAT	0.87	0.00	0.00	0.00	26.872	0.846
PRESCOTT	1.53	0.00	0.00	0.00	0.758	0.615
RED PICACHO	0.62	0.01	0.00	0.00	0.817	0.574
RICH HILL	<0.01	0.06	0.00	0.00	0.257	0.270
RICHINBAR	0.01	0.01	0.00	0.00	0.045	0.150
SHEA	1.88	0.00	0.00	0.00	32.902	0.137
SILVER MOUNTAIN	0.78	0.70	0.00	0.00	1.823	1.112
SQUAW CREEK	0.76	2.12	<0.01	0.24	6.539	0.041
THUMB BUTTE	0.15	0.17	0.00	0.00	0.271	0.394
TICONDEROGA	0.38	0.49	<0.01	0.00	4.668	0.557
TIGER	0.28	0.15	0.61	0.00	4.102	0.553
TIP TOP	0.02	0.05	0.00	0.00	67.348	0.347
TURKEY CREEK	0.09	2.55	<0.01	0.00	5.487	0.080
TUSCUMBIA	1.05	0.32	0.00	0.00	9.038	0.747
VERDE	5.01	<0.01	0.14	0.00	1.584	0.044
WAGONER	0.94	2.72	0.00	0.00	0.692	0.667
WALKER	0.92	1.04	0.12	0.00	4.045	0.296
WALNUT GROVE	0.32	4.71	0.27	0.00	5.259	0.111
WHITE PICACHO	0.90	8.23	0.00	0.00	11.547	0.116
YARBER WASH	0.02	0.00	0.00	0.00	0.131	0.298
ZONIA	0.27	<0.01	0.00	0.00	<0.001	<0.001
COUNTY AVERAGE	1.67	0.08	0.33	<0.01	0.590	0.022
DISTRICT AVERAGE	1.29	0.64	0.33	<0.01	8.585	0.303

YUMA COUNTY

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
CASTLE DOME	0.02	3.76	<0.01	0.00	1.652	0.019
FORTUNA	<0.01	0.00	0.00	0.00	0.095	0.856
FRISCO	2.01	0.00	0.00	0.00	1.438	0.278
KOFA	<0.01	<0.01	0.00	0.00	0.116	0.314
LAGUNA	0.01	0.00	0.00	0.00	0.140	0.342
LA POSA	0.43	0.00	0.00	0.00	0.319	0.901
MIDDLE MOUNTAINS	0.07	59.84	0.00	0.00	35.950	0.000
MOHAWK	0.74	3.66	0.00	0.00	91.686	0.000
NEVERSWEAT	3.09	9.82	0.00	0.00	6.421	0.538
SHEEP TANKS	<0.01	0.00	0.00	0.00	1.959	0.359
TANK MOUNTAINS	0.00	0.00	0.00	0.00	0.080	0.520
YUMA	0.00	0.00	0.00	0.00	0.019	0.197
COUNTY AVERAGE	<0.01	0.63	<0.01	0.00	0.377	0.357
DISTRICT AVERAGE	0.53	6.42	0.00	0.00	11.656	0.360



TABLE 2. ORE GRADES BY DEPOSIT TYPE

## PRECAMBRIAN MASSIVE-SULFIDE DEPOSITS

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
AGUA FRIA	3.64	<0.01	<0.01	0.00	0.314	0.006
BIG BUG	0.12	1.87	4.93	0.00	2.694	0.074
BRONCO CREEK	1.59	0.00	0.00	0.00	0.031	0.170
HUALAPAI	3.49	0.28	3.52	0.00	0.616	0.004
KAY	5.79	0.26	0.00	0.00	1.070	0.058
MAYER	3.22	0.00	0.00	0.00	1.249	0.042
OLD DICK	3.16	0.09	9.13	0.00	0.387	0.002
PITTSBURG-TONTO	23.70	5.35	0.00	0.00	0.000	0.000
VERDE	5.01	<0.01	0.14	0.00	1.584	0.044
DEPOSIT-TYPE MEAN GRADE (weighted mean):						
	4.21	0.26	1.12	0.00	1.674	0.046
DISTRICT AVERAGE GRADES:						
MEAN	5.52	0.87	1.97	0.00	0.883	0.044
MEDIAN	3.49	0.87	1.97	0.00	0.616	0.042

## PRECAMBRIAN VEIN DEPOSITS

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
CHERRY CREEK	0.29	0.06	0.17	0.00	3.882	0.478
COTTONWOOD	0.25	0.01	0.00	0.00	0.277	0.776
FINCH	6.34	0.00	0.00	0.00	5.193	0.333
GREEN VALLEY	0.62	0.07	<0.01	0.00	0.699	0.169
MINERAL POINT	0.11	0.02	0.00	0.00	0.756	0.522
POLK	2.23	0.00	0.00	0.00	1.332	0.033
PRESCOTT	1.53	0.00	0.00	0.00	0.758	0.615
RICHINBAR	0.01	0.01	0.00	0.00	0.045	0.150
SPRING CREEK	0.94	2.76	0.00	0.00	5.302	0.674
THUMB BUTTE	0.15	0.17	0.00	0.00	0.271	0.394
YARBER WASH	0.02	0.00	0.00	0.00	0.131	0.298
DEPOSIT-TYPE MEAN GRADE (weighted mean):						
	0.13	0.02	0.00	0.00	0.324	0.186
DISTRICT AVERAGE GRADES:						
MEAN	1.14	0.28	0.02	0.00	1.695	0.404
MEDIAN	0.29	0.28	0.02	0.00	0.756	0.394

JURASSIC VEIN DEPOSITS

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
JUNIPER FLATS	0.81	1.01	0.00	0.00	4.479	0.592
NOGALES	1.22	3.33	1.08	0.00	5.332	0.248
DEPOSIT-TYPE MEAN GRADE (weighted mean):						
	0.65	0.09	0.97	0.00	4.706	0.529
DISTRICT AVERAGE GRADES:						
MEAN	1.02	2.17	0.54	0.00	4.906	0.420
MEDIAN	1.02	2.17	0.54	0.00	4.906	0.420

JURASSIC PORPHYRY COPPER DEPOSITS

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
TURQUOISE	3.21	0.37	0.05	0.00	1.329	0.027
WARREN	2.35	0.10	0.11	0.00	0.611	0.017
DEPOSIT-TYPE MEAN GRADE (weighted mean):						
	2.36	0.01	0.11	0.00	0.615	0.017
DISTRICT AVERAGE GRADES:						
MEAN	2.78	0.24	0.08	0.00	0.970	0.022
MEDIAN	2.78	0.24	0.08	0.00	0.970	0.022

LARAMIDE VEIN DEPOSITS

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
AMOLE	1.31	1.73	0.04	0.00	0.932	0.044
BATTLE FLAT	0.39	0.25	0.09	0.00	33.032	0.032
CERRO COLORADO	0.22	0.42	0.00	0.00	67.956	0.141
CIMARRON MTNS.	2.05	4.30	0.00	0.00	4.200	0.375
EL CAPITAN	1.02	0.38	0.00	0.00	19.176	0.026
EMPIRE	0.66	19.24	0.44	0.05	6.237	0.029
GLOBE HILLS	4.27	0.01	<0.01	0.00	0.682	0.009
GOLD HILL	0.00	0.00	0.00	0.00	0.081	0.949
GOLDEN RULE	<0.01	0.29	0.00	0.00	0.491	0.311
GRAND PRIZE	0.12	0.00	0.00	0.00	0.815	0.478
GREATERVILLE	1.07	18.38	0.30	0.00	9.630	0.180
HACKBERRY	0.15	2.06	0.30	0.00	22.237	0.102
HASSAYAMPA	0.65	2.13	1.27	0.00	6.380	0.522
HUMBUG	0.93	0.67	0.00	0.00	1.662	0.375
IVANHOE	1.97	8.37	0.00	0.00	24.541	0.060
KEYSTONE	0.17	1.29	0.10	0.00	3.392	0.698
LANE MOUNTAIN	0.00	0.00	0.00	0.00	72.000	0.048
MAGONIGAL	2.49	0.00	0.00	0.00	0.019	0.000
MANSFIELD	1.94	13.38	0.00	0.00	12.738	0.264
MAYNARD	0.14	1.03	0.17	0.00	23.512	0.086
MINE CANYON-PIMA	1.21	0.00	0.00	0.00	0.650	0.000
MINE CANYON-COCH	1.72	0.00	0.00	0.00	0.576	0.007
MOUNT UNION	0.77	1.35	0.32	0.00	3.924	0.703
MUSIC MOUNTAIN	0.05	0.56	0.00	0.00	3.006	0.838
PAJARITO	0.16	5.10	0.01	0.00	15.730	0.055
PARKER CANYON	0.22	0.46	0.00	0.00	1.887	0.679
PINAL MOUNTAINS	0.94	0.66	0.08	0.00	9.584	0.050
PIONEER	4.47	<0.01	0.15	0.00	1.543	0.027
RED ROCK	1.89	2.13	0.29	0.00	5.548	0.006
RICHMOND BASIN	0.74	0.50	0.00	0.00	59.435	0.015
RIPSEY	0.60	0.02	0.00	0.00	18.925	0.190
RIVERSIDE	3.73	<0.01	0.00	0.00	0.929	0.059
RUBY	0.22	3.28	2.75	0.00	4.900	0.043
SALERO	1.48	11.48	0.40	0.00	10.411	0.268
SILVERADO	1.29	15.41	0.00	0.00	40.969	0.000
TICONDEROGA	0.38	0.49	<0.01	0.00	4.668	0.557
TIP TOP	0.02	0.05	0.00	0.00	67.348	0.347
TOMBSTONE	0.13	0.84	<0.01	0.00	10.861	0.045
TYNDALL	0.20	17.87	8.24	0.00	5.767	0.004
WALKER	0.92	1.04	0.12	0.00	4.045	0.296
WATERMAN	3.04	1.88	1.36	0.00	3.781	0.003
WRIGHTSON	4.54	4.08	2.47	0.00	5.900	0.020

DEPOSIT-TYPE MEAN GRADE (weighted mean):

	3.94	0.11	0.11	<0.01	2.052	0.030
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DISTRICT AVERAGE GRADES:

MEAN	1.15	3.36	0.45	<0.01	14.050	0.213
MEDIAN	1.11	3.36	0.45	----	5.658	0.213

LARAMIDE PORPHYRY COPPER DEPOSITS

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
AJO	0.70	0.00	0.00	<0.01	0.046	0.004
BANNER	0.58	1.93	0.18	0.00	0.665	0.011
BRADFORD	9.70	0.94	0.00	0.00	3.643	0.000
BROWNELL	1.59	0.25	0.00	0.00	5.591	0.003
BUNKER HILL	2.82	0.61	0.00	0.43	0.538	0.003
CASA GRANDE	0.52	<0.01	<0.01	0.00	0.037	<0.001
CATALINA	4.15	<0.01	0.00	0.00	0.464	<0.001
CHRISTMAS	0.70	0.00	0.00	0.00	0.082	0.002
COPPER BASIN	2.75	0.07	0.20	0.00	0.138	0.002
COPPER MOUNTAIN	0.82	<0.01	<0.01	<0.01	0.035	<0.001
COTTONWOOD	1.11	0.62	0.00	0.00	7.305	0.294
COYOTE	8.62	0.00	0.00	0.00	1.550	0.023
CUPRITE	4.75	1.97	0.02	0.00	1.706	0.010
DRIPPING SPRING	0.97	1.29	0.12	0.00	0.757	0.491
EUREKA	0.64	<0.01	<0.01	<0.01	0.046	<0.001
HELVETIA	4.28	0.04	0.13	<0.01	0.846	0.003
JACKSON	9.06	0.00	0.00	0.00	4.845	0.005
LAKESHORE	0.79	<0.01	0.00	0.00	0.001	<0.001
LITTLE COPPER CRK.	1.82	0.46	0.05	0.00	10.536	0.316
LITTLE HILLS	0.34	<0.01	0.00	0.00	0.019	<0.001
LONE STAR	2.24	0.09	0.00	0.00	0.178	0.016
MARBLE PEAK	2.32	0.03	0.01	0.00	0.754	0.002
MASCOT	2.26	0.77	0.02	0.00	4.201	0.132
MIAMI-INSPIRATION	0.69	<0.01	0.00	<0.01	0.012	<0.001
MINERAL BUTTE	3.04	0.17	0.00	0.00	0.236	0.011
MINERAL CREEK	0.90	<0.01	<0.01	<0.01	0.027	<0.001
PATAGONIA	6.27	3.44	<0.01	0.00	7.769	0.109
PIMA	0.45	<0.01	<0.01	0.02	0.058	<0.001
PINAL GRANDE	10.29	0.27	0.13	0.00	0.174	0.014
PINE FLAT	0.87	0.00	0.00	0.00	26.872	0.846
POSTON BUTTE	1.06	0.00	0.00	0.00	0.030	0.000
QUERCES	7.30	0.00	0.00	0.00	0.742	0.023
QUIEN SABE	0.80	<0.01	0.00	0.00	0.161	0.001
RED MOUNTAIN	0.20	5.40	5.13	0.00	5.407	0.015
REDINGTON	6.36	0.00	0.00	0.00	1.495	0.000
ROSEMONT	3.87	0.04	0.00	0.00	0.800	0.001
ROSKRUGE	1.71	0.00	0.00	0.00	28.599	0.007
SADDLE MOUNTAIN	1.96	0.03	<0.01	0.00	1.500	0.008
SAGINAW HILL	1.14	1.52	3.40	0.00	2.414	0.057
SAN JUAN	5.38	0.00	0.00	0.00	0.019	<0.001
SAN MANUEL	0.61	0.00	0.00	<0.01	0.024	0.001
SANCHEZ	10.22	0.00	0.00	0.00	0.050	0.000
SANTA ROSA	4.84	1.44	0.00	0.00	5.706	0.249
SEDIMENTARY HILLS	2.63	0.00	0.00	0.00	5.500	0.000
SILVER BELL	0.71	<0.01	0.02	<0.01	0.065	<0.001
SILVER CAMP	<0.01	0.59	0.00	0.00	4.102	0.169
SUMMIT	15.28	0.00	0.00	0.00	0.264	0.002
THUNDER MOUNTAIN	4.21	0.08	<0.01	0.00	0.356	0.003
TIGER	0.28	0.15	0.61	0.00	4.102	0.553
WALLAPAI	0.37	0.04	0.07	0.03	0.125	0.002
WASHINGTON CAMP	2.89	3.35	6.51	0.00	5.225	0.016

DEPOSIT-TYPE MEAN GRADE (weighted grade):

0.57      0.005      0.006      0.01      0.040      0.001

DISTRICT AVERAGE GRADES:

MEAN	3.10	0.50	0.33	0.01	2.859	0.067
MEDIAN	3.09	0.47	0.32	----	2.892	0.083

EARLY TERTIARY VEIN DEPOSITS

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
CABABI	1.23	2.27	0.02	0.00	10.326	0.426
COMOBABI	8.25	0.00	0.00	0.00	38.739	0.000
FORTUNA	<0.01	0.00	0.00	0.00	0.095	0.856
FRISCO	2.01	0.00	0.00	0.00	1.438	0.278
HARTFORD	1.13	10.98	4.76	0.00	7.503	0.051
LA POSA	0.43	0.00	0.00	0.00	0.319	0.901
MILDRED PEAK	1.98	0.10	0.00	0.00	6.301	0.185
MONTEZUMA	8.39	0.65	0.00	0.00	8.397	0.017
PAPAGO	0.41	7.41	<0.01	0.00	5.050	0.025
PELONCILLO	4.63	0.00	0.00	0.00	3.333	0.000
QUIJOTOA	0.63	0.28	0.00	0.00	3.118	0.280

DEPOSIT-TYPE MEAN GRADE (weighted mean):

0.24      0.61      0.20      0.00      1.979      0.750

DISTRICT AVERAGE GRADES:

MEAN	2.64	1.97	0.43	0.00	7.693	0.274
MEDIAN	1.23	1.97	0.43	0.00	5.050	0.276

MID-TERTIARY EPITHERMAL VEIN DEPOSITS

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
ARAVAIPA	0.33	6.06	4.90	0.00	1.240	0.015
ARTILLERY PEAK	1.46	<0.01	0.00	0.00	1.323	0.018
ASH PEAK	<0.01	<0.01	0.00	0.00	6.656	0.026
BABOQUIVARI	0.01	<0.01	0.00	0.00	2.322	0.194
BEN NEVIS	0.46	0.04	0.00	0.00	450.202	0.761
BLACK CANYON	0.05	0.68	0.04	0.00	3.584	0.124
CALIFORNIA	0.55	13.56	1.93	0.00	4.485	0.003
CASTLE DOME	0.02	3.76	<0.01	0.00	1.652	0.019
EL DORADO PASS	0.02	0.03	0.00	0.00	0.847	0.211
GOLDFIELD	0.00	0.00	0.00	0.00	2.529	0.443
KOFA	<0.01	0.00	0.00	0.00	0.116	0.314
MARTINEZ CANYON	0.19	4.94	<0.01	0.00	6.982	0.002
MIDDLE PASS	1.26	0.20	4.37	<0.01	1.132	0.004
MINERAL HILL	0.14	0.07	<0.01	0.00	12.724	0.010
MINERAL MOUNTAIN	0.49	6.51	0.94	0.00	0.844	0.085
MINNESOTA	0.07	0.02	0.00	0.00	0.878	0.414
NEW WATER	0.30	0.90	<0.01	0.00	34.294	0.022
OATMAN	<0.01	<0.01	0.00	0.00	0.296	0.501
PEARCE	<0.01	<0.01	<0.01	0.00	5.170	0.053
PECK	0.05	0.72	0.00	0.00	88.789	0.005
RANDOLPH	0.41	3.66	0.00	0.00	13.492	0.096
RATTLESNAKE	0.00	0.00	0.00	0.00	5.014	0.396
RUCKER CANYON	0.00	0.00	0.00	0.00	22.897	0.034
SILVER REEF	0.07	0.08	0.00	0.00	10.554	0.006
STANLEY	5.25	24.02	0.00	0.00	6.796	0.132
SUPERSTITION MTNS.	0.56	0.00	0.00	0.00	0.775	0.307
TWIN PEAKS	0.34	0.37	0.00	0.00	4.708	0.216
VIRGINIA	<0.01	<0.01	0.00	0.00	0.232	0.232
WHITE HILLS	<0.01	0.02	0.00	0.00	3.119	0.017
YELLOW JACKET-PINL	0.03	0.00	0.00	0.00	1.578	1.252
YELLOW JACKET-MOHA	0.31	0.02	7.11	0.00	1.802	0.037

DEPOSIT-TYPE MEAN GRADE (weighted mean):

	0.12	1.28	0.78	<0.01	3.478	0.416
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DISTRICT AVERAGE GRADES:

MEAN	0.40	2.12	0.62	<0.01	22.485	0.192
MEDIAN	0.42	2.21	0.62	----	3.119	0.085

MID-TERTIARY MICRODIORITE-DIKE-RELATED DEPOSITS

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
BIG HORN*	0.08	0.02	0.00	0.00	0.073	0.225
CUNNINGHAM PASS	8.77	0.02	0.00	0.00	0.297	0.463
ELLSWORTH	2.59	0.05	0.00	0.00	1.000	0.118
HARCUVAR	2.86	0.00	0.00	0.00	0.217	0.278
HARQUAHALA	0.08	<0.01	0.00	0.00	0.350	0.124
LA CHOLLA	6.62	0.00	0.00	0.00	9.631	1.204
LITTLE HARQUAHALA	0.02	0.05	0.00	0.00	0.566	0.901
MARTINEZ	<0.01	<0.01	0.00	0.00	0.375	0.348
RICH HILL	<0.01	0.06	0.00	0.00	0.257	0.270
SALT RIVER MTNS.	0.09	0.00	0.00	0.00	0.327	0.459
SOUTHERN PLOMOSA	6.60	0.07	0.00	0.00	7.487	0.295

DEPOSIT-TYPE MEAN GRADE (weighted mean):

	0.08	0.03	0.00	0.00	0.408	0.406
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DISTRICT AVERAGE GRADES:

MEAN	3.08	0.03	0.00	0.00	1.871	0.426
MEDIAN	2.52	0.02	0.00	0.00	0.350	0.295

\*Recent work indicates that mineral deposits in the Big Horn district represents multiple episodes and styles of mineralization, most of which is middle Tertiary. For this report, we have followed the deposit-type classification of Welty and others (1985).

MID-TERTIARY DETACHMENT-FAULT-RELATED DEPOSITS

DISTRICT	Cu	Pb	Zn	Mo	Ag	Au
ALAMO	2.77	1.13	0.00	0.00	0.471	0.117
BULLARD	1.77	0.00	0.00	0.00	0.347	0.210
CIENEGA	4.49	0.00	0.00	0.00	0.084	0.629
CLARA	4.69	0.00	0.00	0.00	0.035	<0.001
CLEOPATRA	1.19	<0.01	0.00	0.00	0.580	0.088
MAMMON	5.17	0.00	0.00	0.00	0.169	0.071
MIDWAY	2.20	0.00	0.00	0.00	0.164	0.210
MOON MOUNTAINS	0.00	0.00	0.00	0.00	2.667	0.333
NORTHERN PLOMOSA	2.31	0.17	0.00	0.00	0.977	0.677
OWENS	0.11	3.95	<0.01	0.00	13.038	0.133
PLANET	1.00	0.00	0.00	0.00	<0.001	<0.001
RAWHIDE	0.75	18.37	1.62	0.00	11.475	0.054
RINCON	3.28	0.19	0.00	0.00	2.411	0.570
SWANSEA	2.43	0.00	0.00	0.00	0.061	<0.001

DEPOSIT-TYPE MEAN GRADE (weighted mean):

	1.60	0.01	<0.01	0.00	0.044	0.012
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DISTRICT AVERAGE GRADES:

MEAN	2.30	1.70	0.12	0.00	2.320	0.221
MEDIAN	2.26	1.70	0.12	0.00	0.526	0.221

TABLE 3. March, 1985 Metal Prices\*

GOLD:	\$315/oz
SILVER:	\$6.30/oz
COPPER:	\$0.69/lb
LEAD:	\$0.20/lb
ZINC:	\$0.45/lb

\*Prices from June, 1985 Engineering & Mining Journal

TABLE 4. Normalization Factors

<u>DEPOSIT TYPE</u>	<u>f</u>	<u>g</u>
pC MASSIVE SULFIDES	0.0004	0.0276
pC VEIN DEPOSITS	0.0629	0.5745
J VEIN DEPOSITS	0.0004	0.0147
J PORPHYRY DEPOSITS	0.00006	0.0200
KT VEIN DEPOSITS	0.0004	0.0147
KT PORPHYRY DEPOSITS	0.00006	0.0200
eT VEIN DEPOSITS	0.0311	0.3792
mT EPITHERMAL VEINS	0.0096	0.1197
mT MICRODIORITE-DIKE	0.0096	0.1197
mT DETACHMENT-FAULT	0.0004	0.2649
STATE-WIDE	0.0002	0.0291



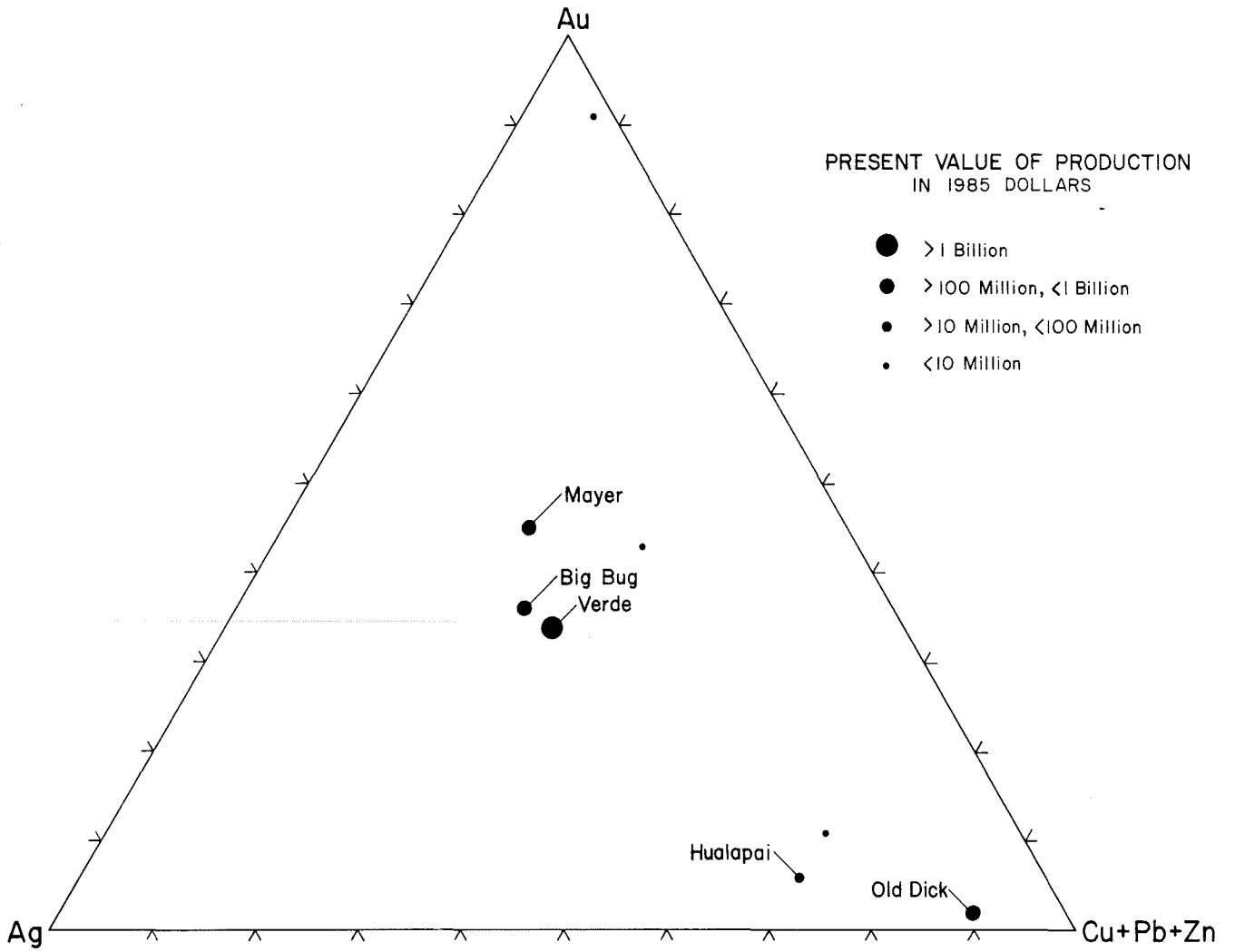


Figure 1. Ternary diagram of base- and precious-metal production of Precambrian massive sulfide deposits.

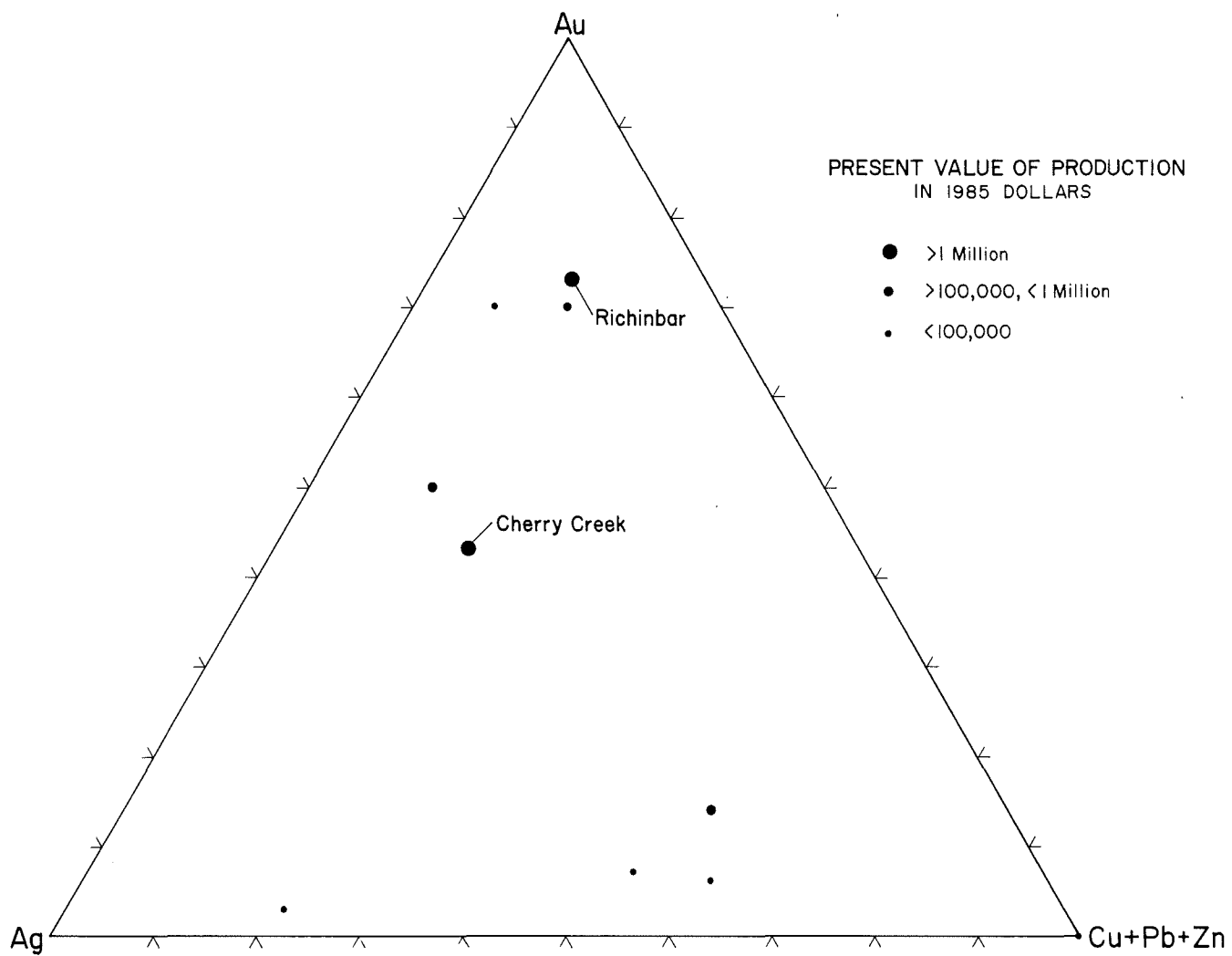


Figure 2. Ternary diagram of base- and precious-metal production of Precambrian vein deposits.

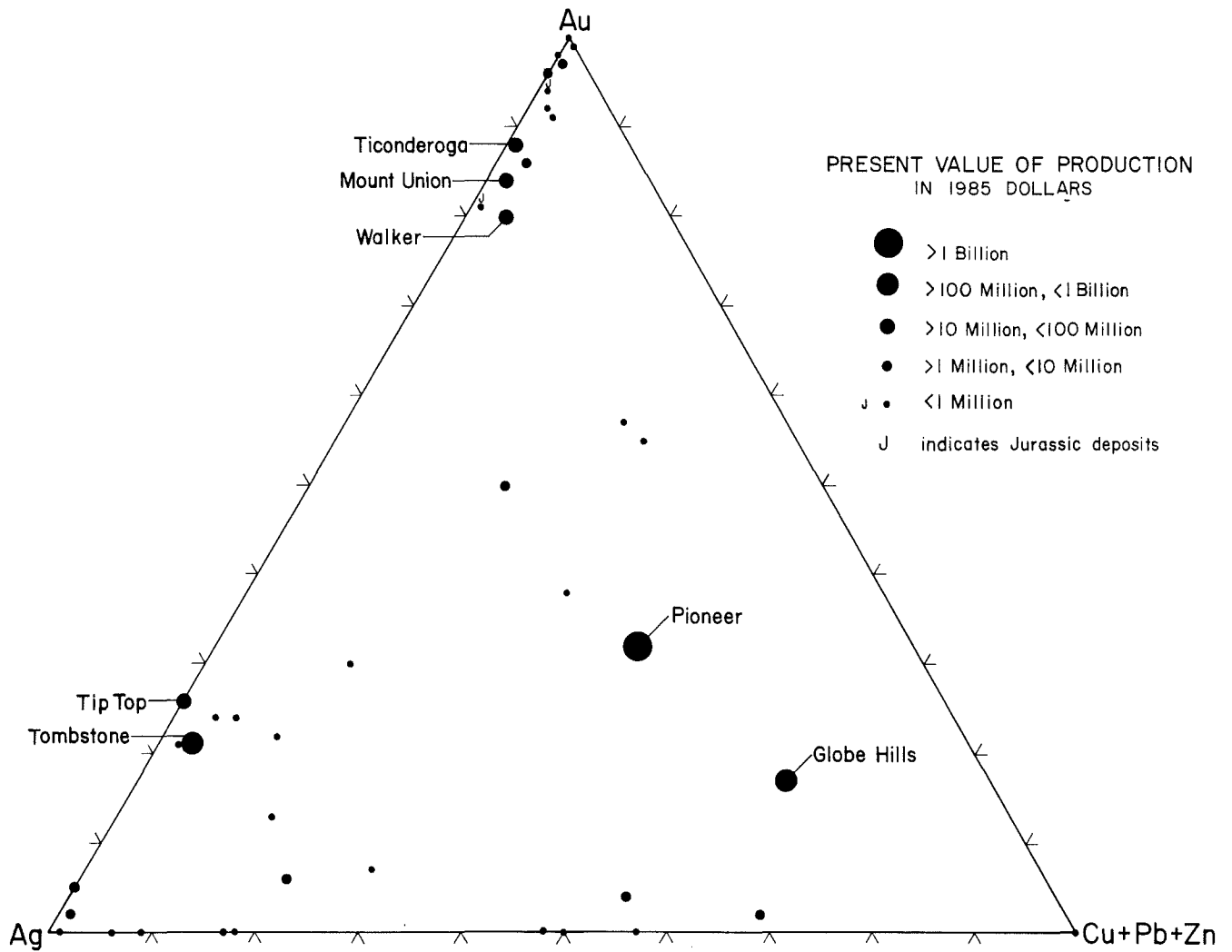


Figure 3. Ternary diagram of base- and precious-metal production of Jurassic and Laramide vein deposits.

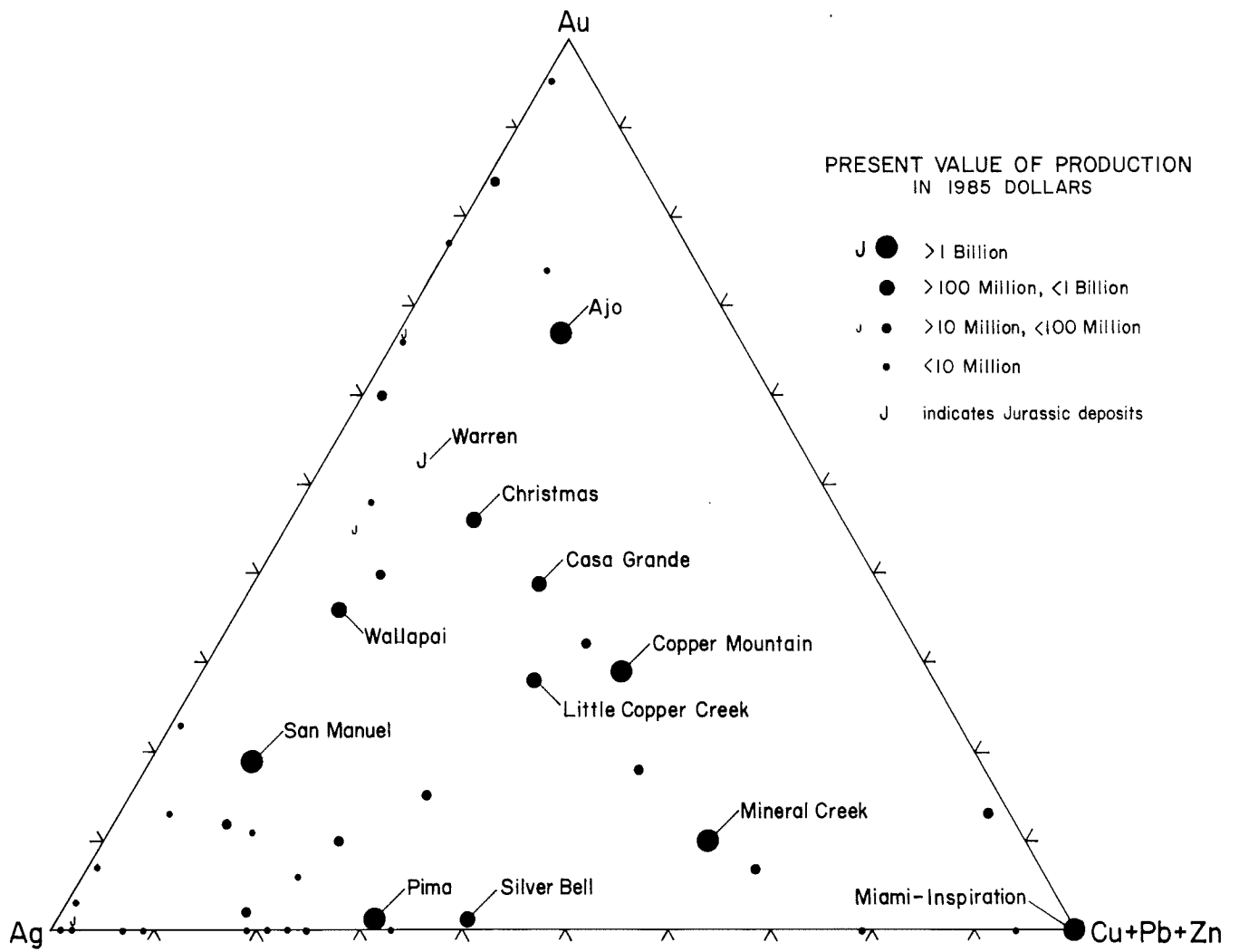


Figure 4. Ternary diagram of base- and precious-metal production of Jurassic and Laramide porphyry copper deposits.

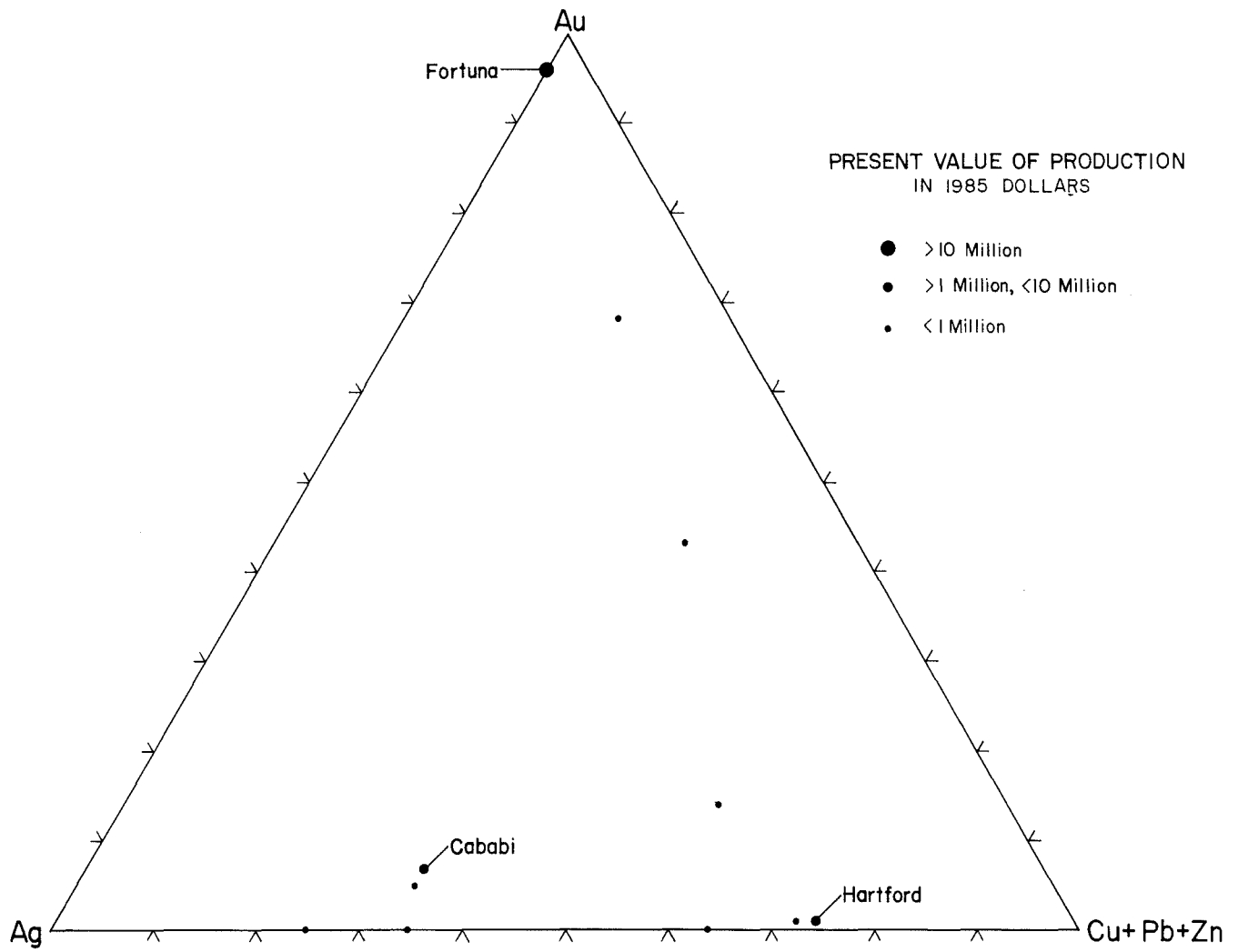


Figure 5. Ternary diagram of base- and precious metal production of early Tertiary vein deposits.

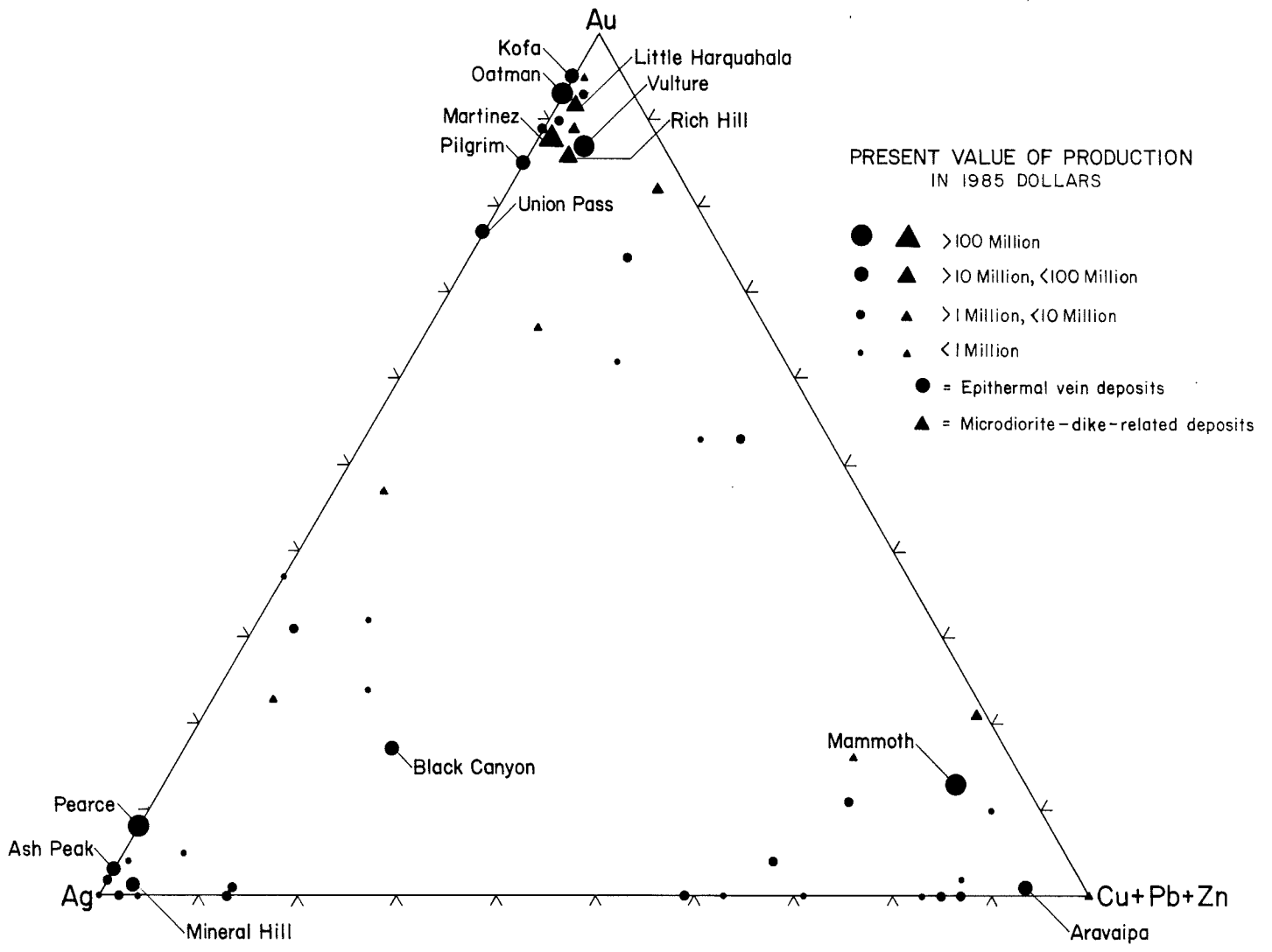


Figure 6. Ternary diagram of base- and precious-metal production of Middle Tertiary epithermal vein and microdiorite-dike-related deposits.

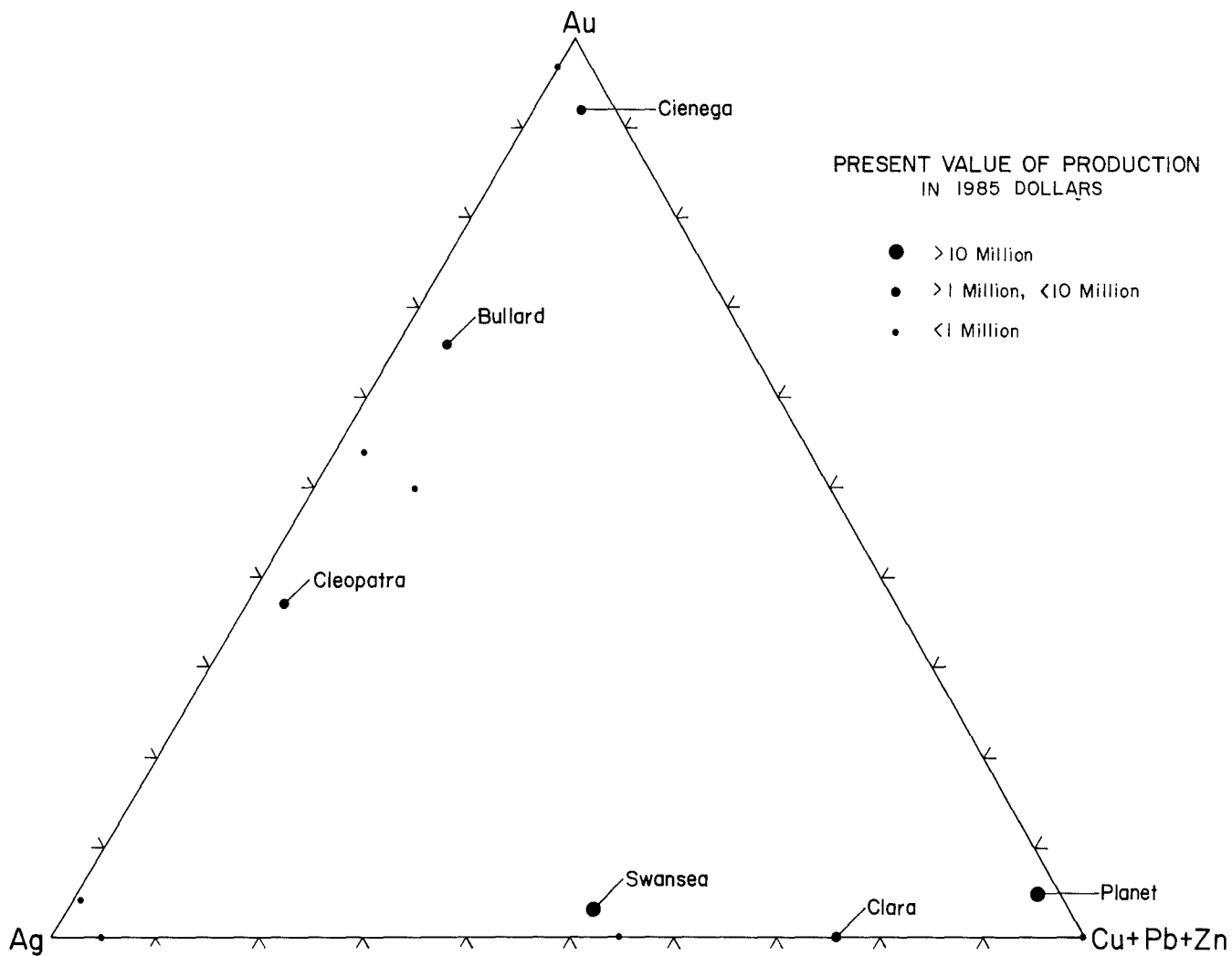


Figure 7. Ternary diagram of base- and precious-metal production of Middle Tertiary detachment-fault-related deposits.

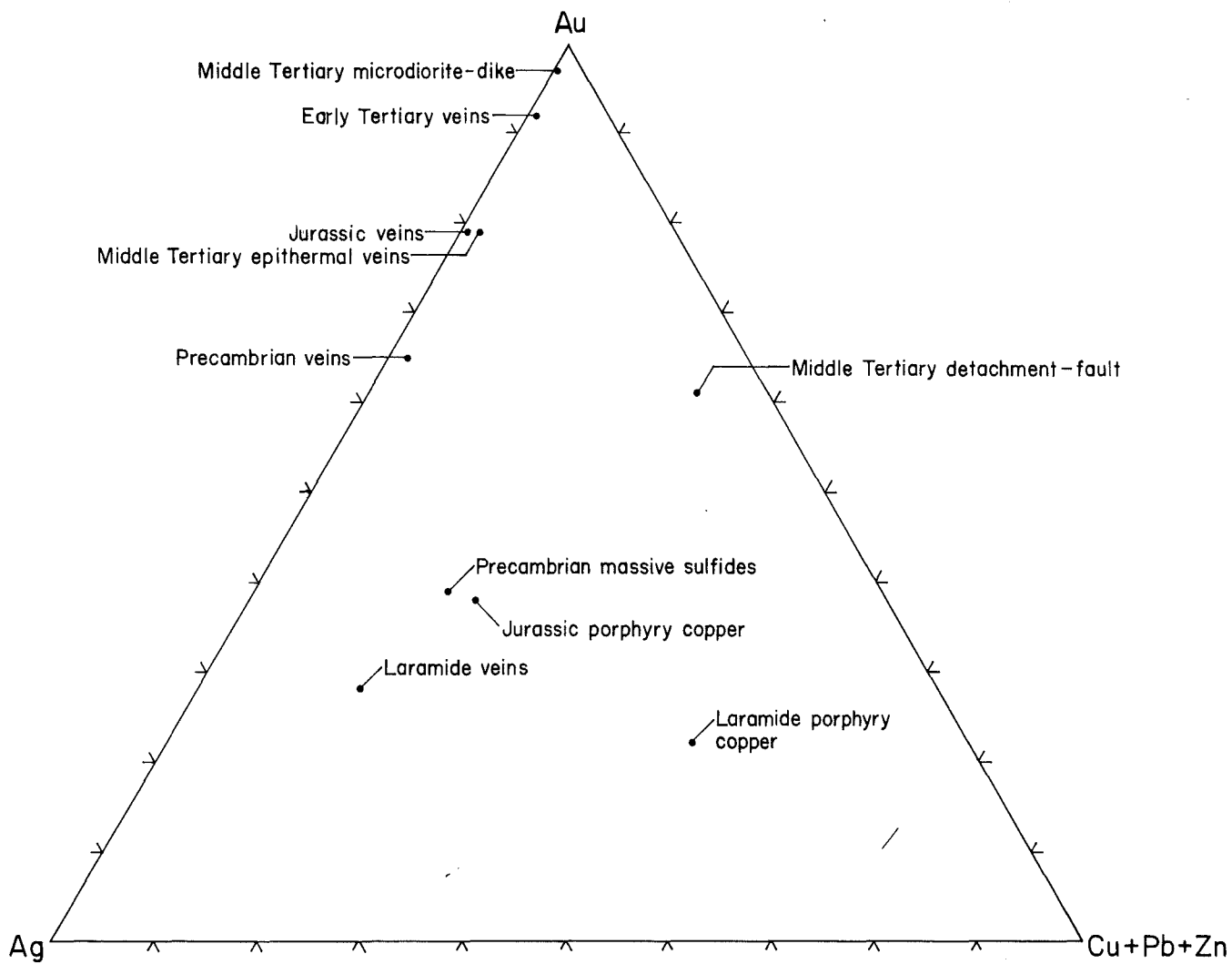


Figure 8. Ternary diagram of mean base- and precious-metal grades of different deposit types.



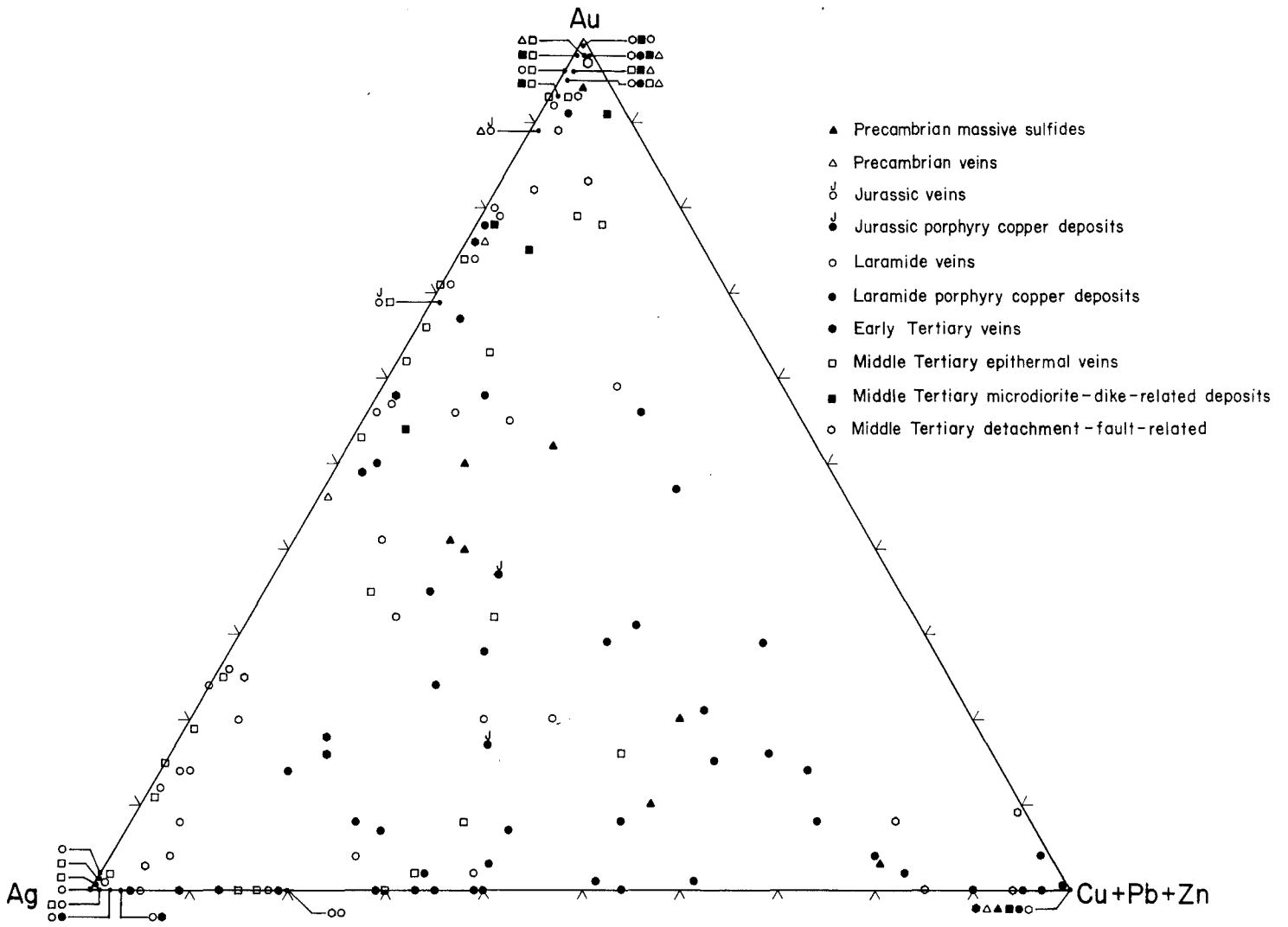


Figure 9. Ternary diagram of base- and precious-metal production of mineral districts by deposit type.

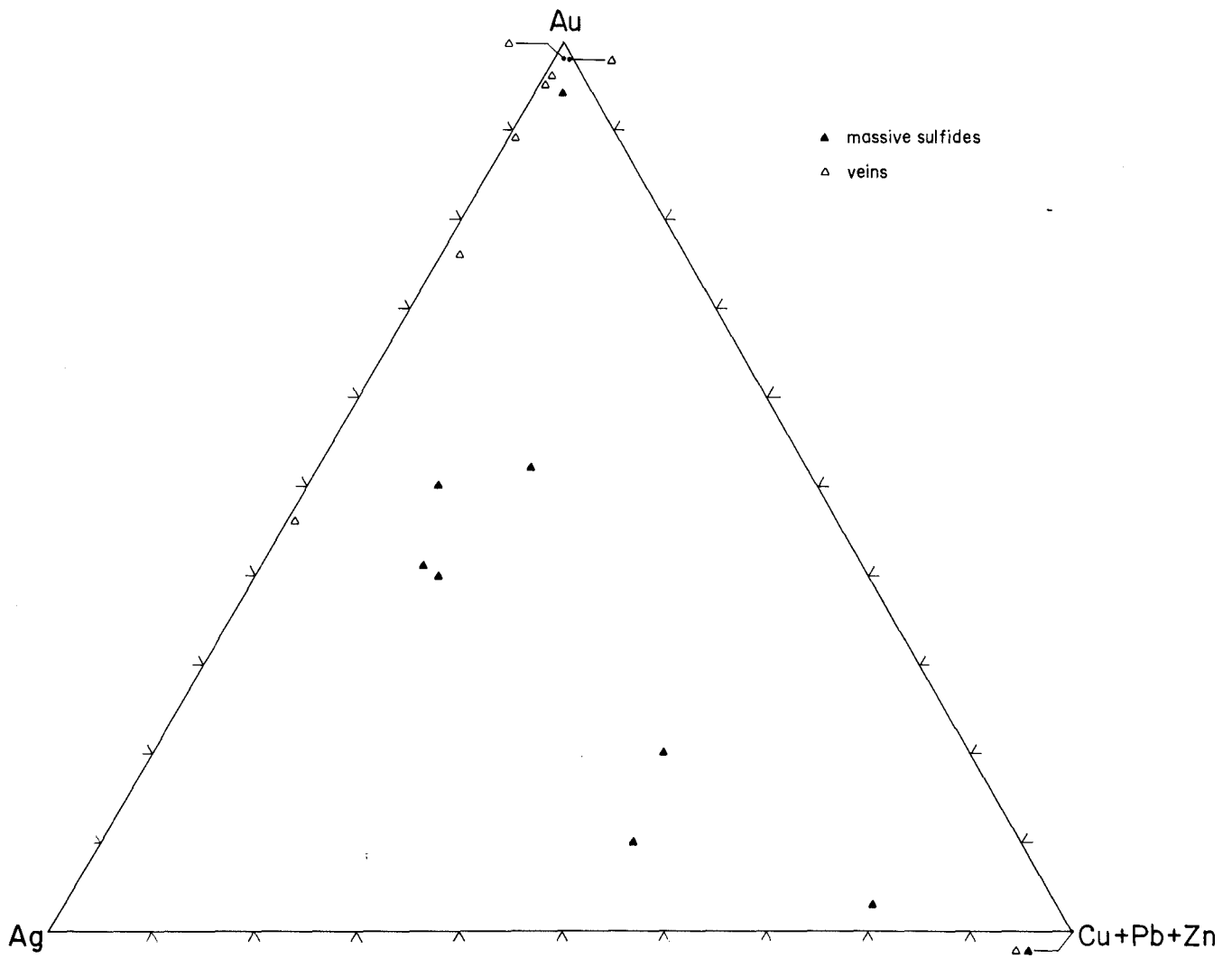


Figure 10. Ternary diagram of base- and precious-metal of Precambrian mineral districts by deposit type.

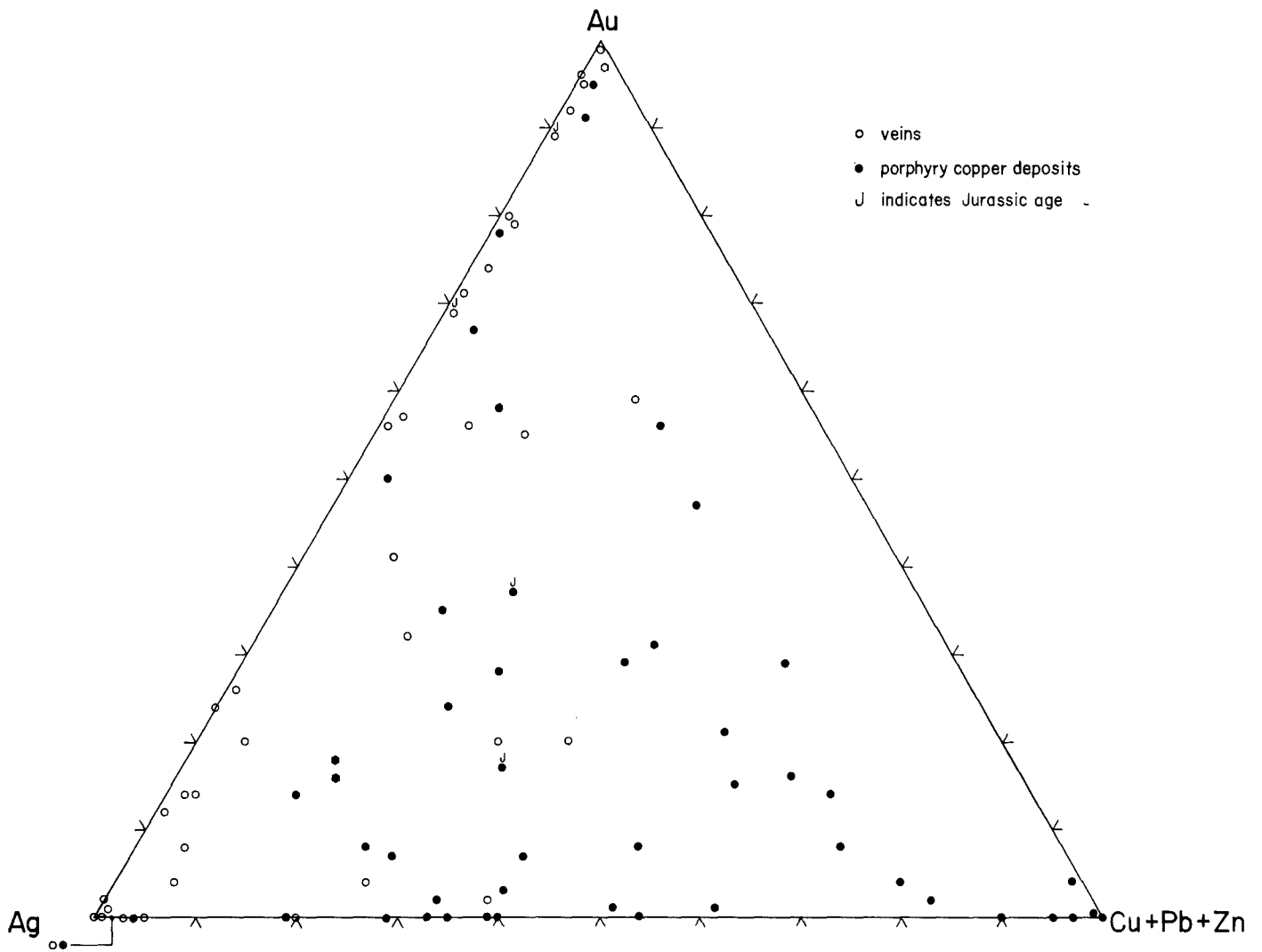


Figure II. Ternary diagram of base- and precious-metal production of Jurassic and Laramide mineral districts by deposit type.

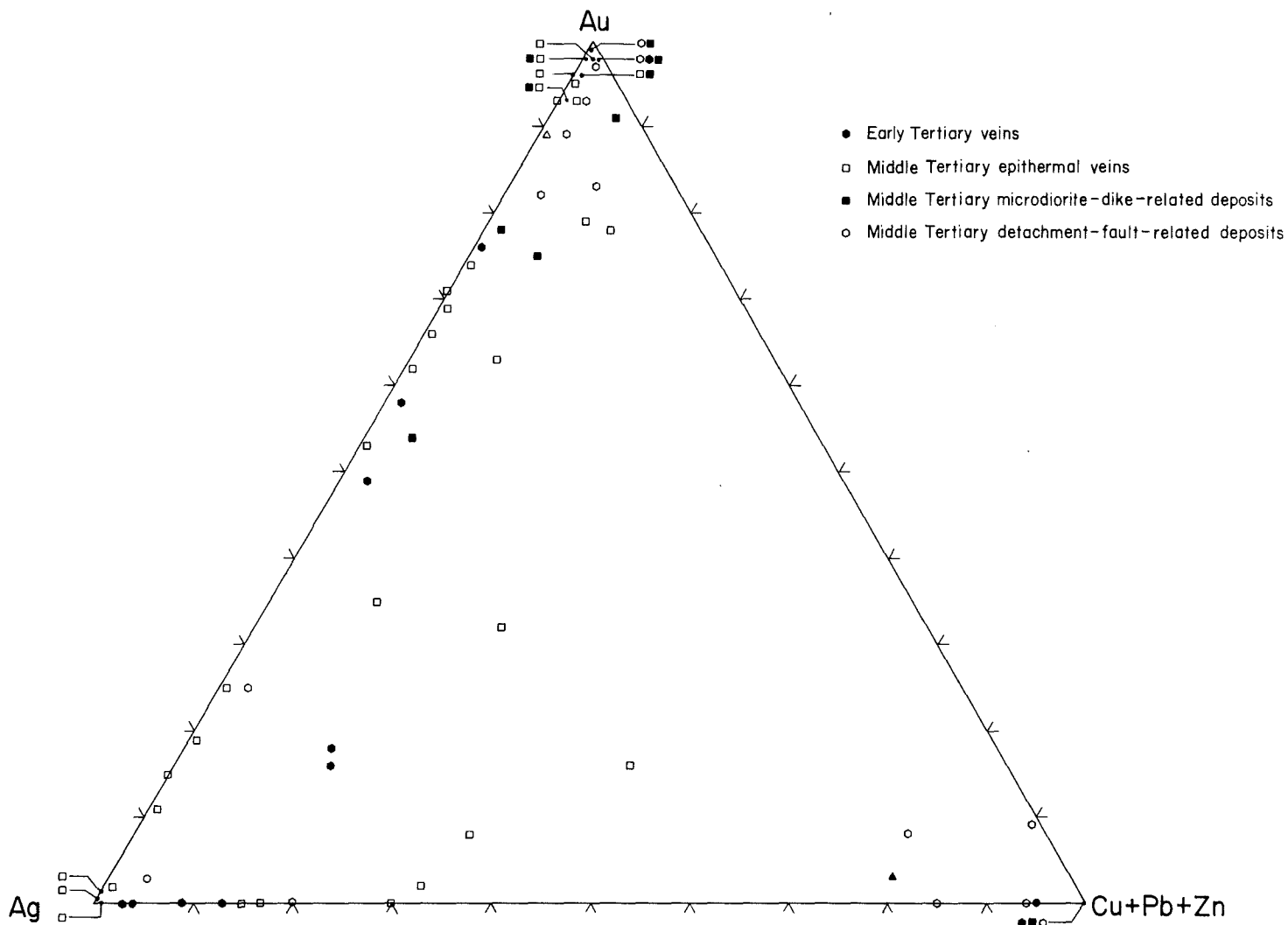


Figure 12. Ternary diagram of base- and precious-metal production of Tertiary mineral districts by deposit type.