Geology of Gold in Southeastern Arizona

Greaterville ~1-2”

By Jan C. Rasmussen, Ph.D., R.G.

www.JanRasmussen.com

Gold photos from displays at the Arizona Mining and Mineral Museum, Phoenix, 2010

Jan Rasmussen, Ph.D.

February 17, 2018

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With Thanks to the gold prospectors group in Phoenix

Still active in 2018

Monday Crew at the Arizona Mining and Mineral Museum, Phoenix, 2010

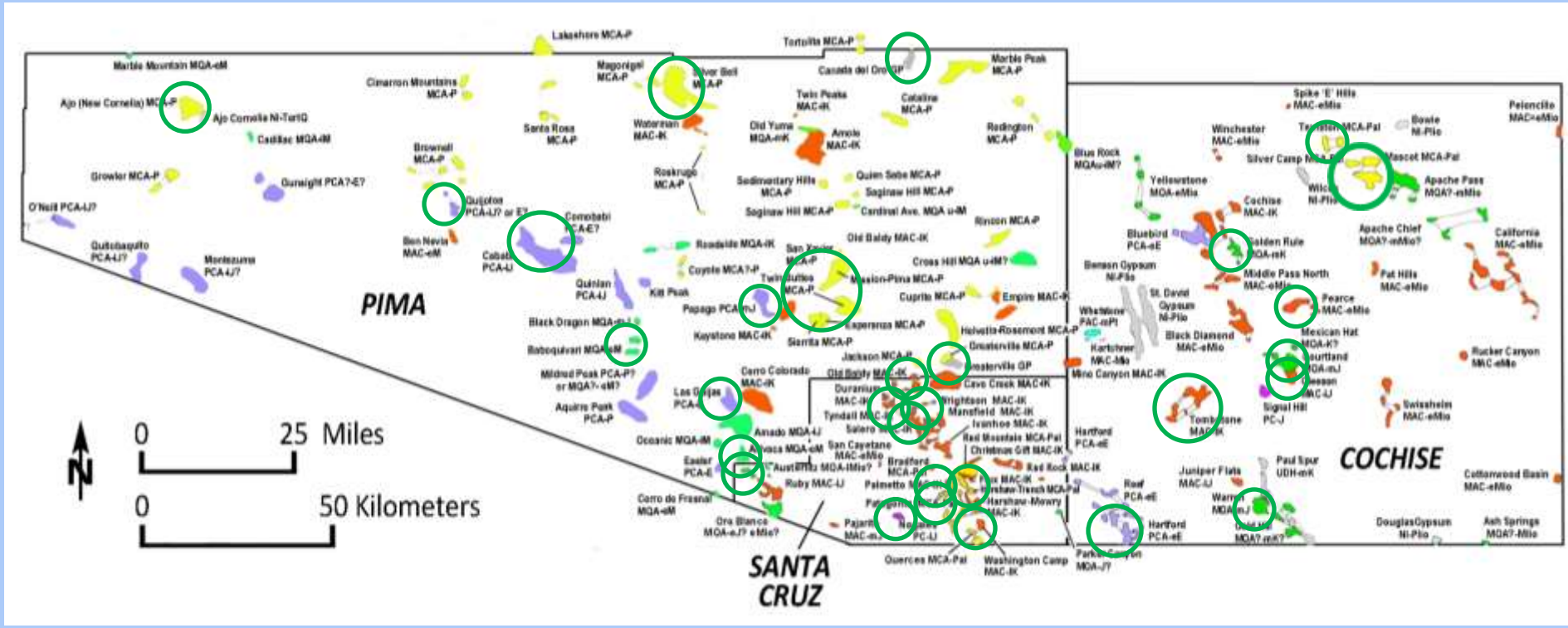
Safety Share

Dangers: Snakes, Scorpions, Cacti, Illegal Aliens, Drug Smugglers, Mine Owners who shoot trespassers

Check Land ownership – Make sure you are not trespassing on someone else's mining claim, Indian Reservation, or Military Gunnery Range

Gold Is Where You Find It

And Also Where Other People Have Found it



Mining districts in Cochise, Pima, and Santa Cruz counties with gold production, Placer gold specimens, Lode gold specimens, and production from copper or silver mines

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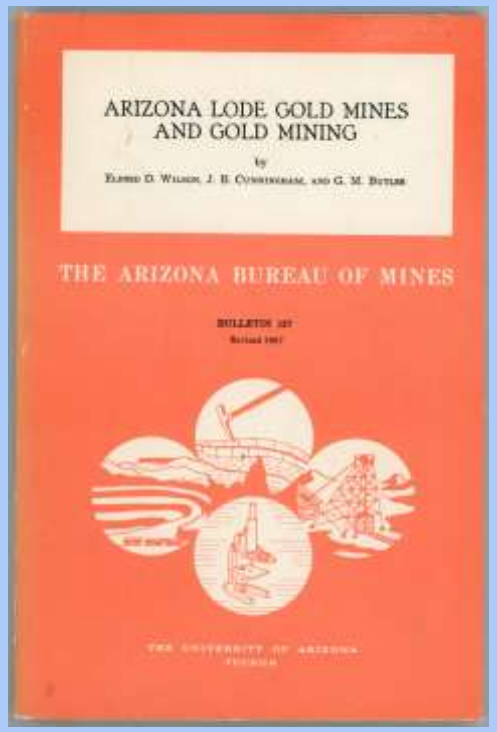
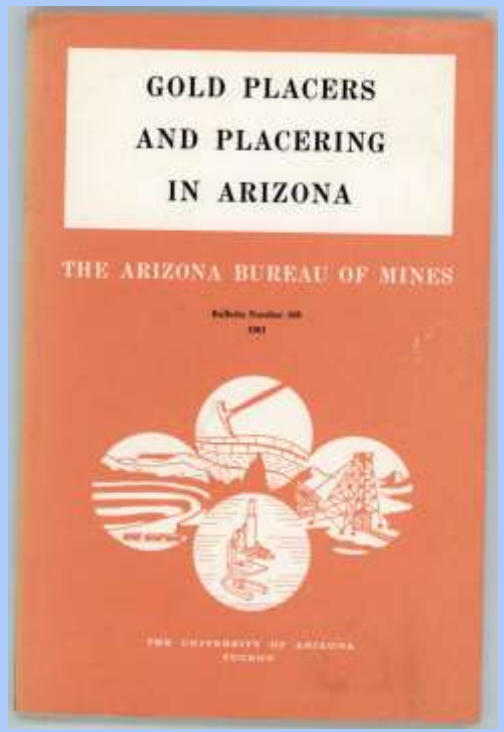
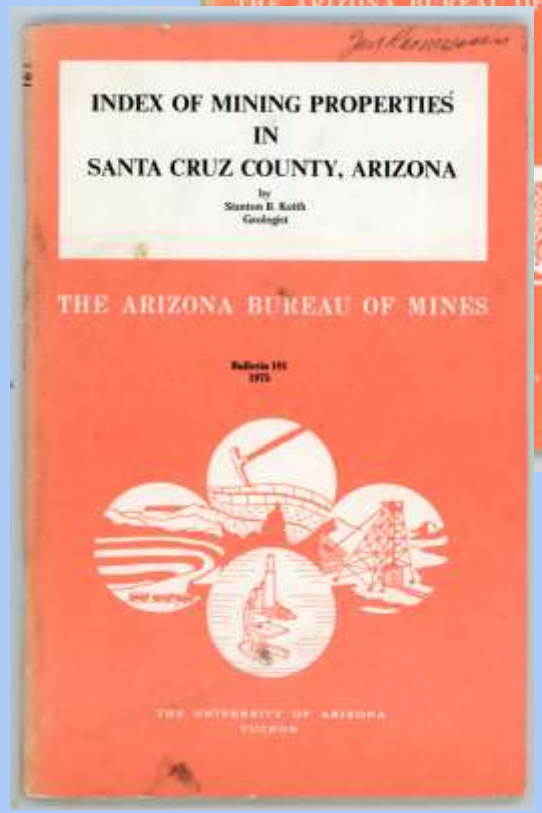
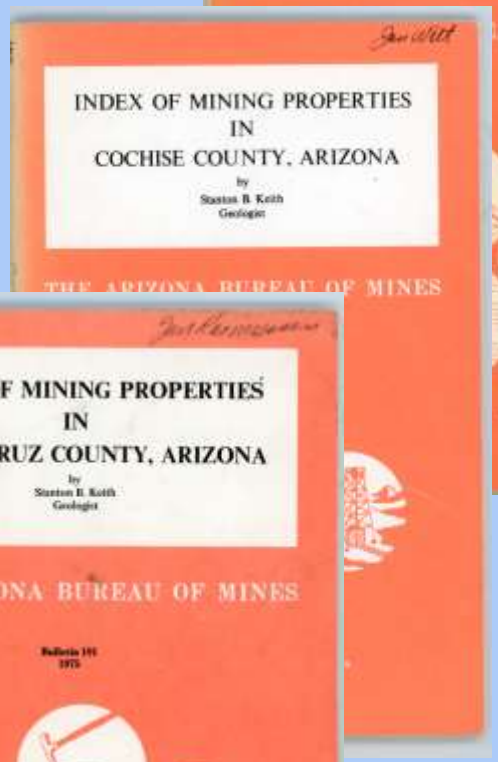
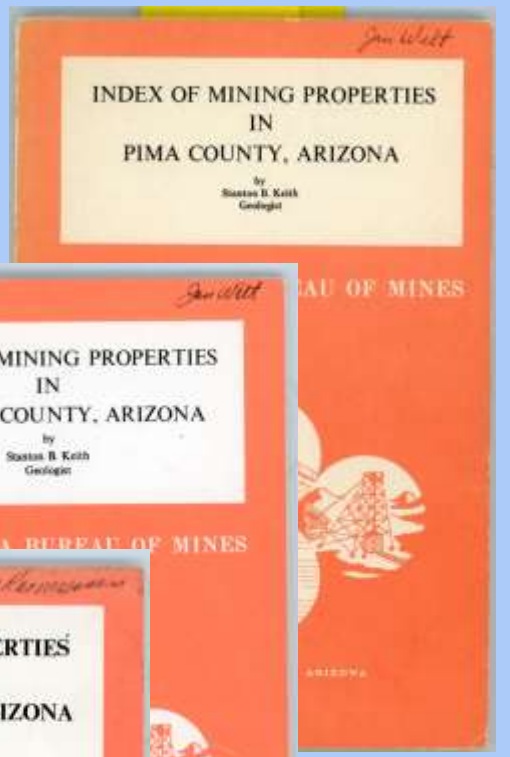
Information Sources











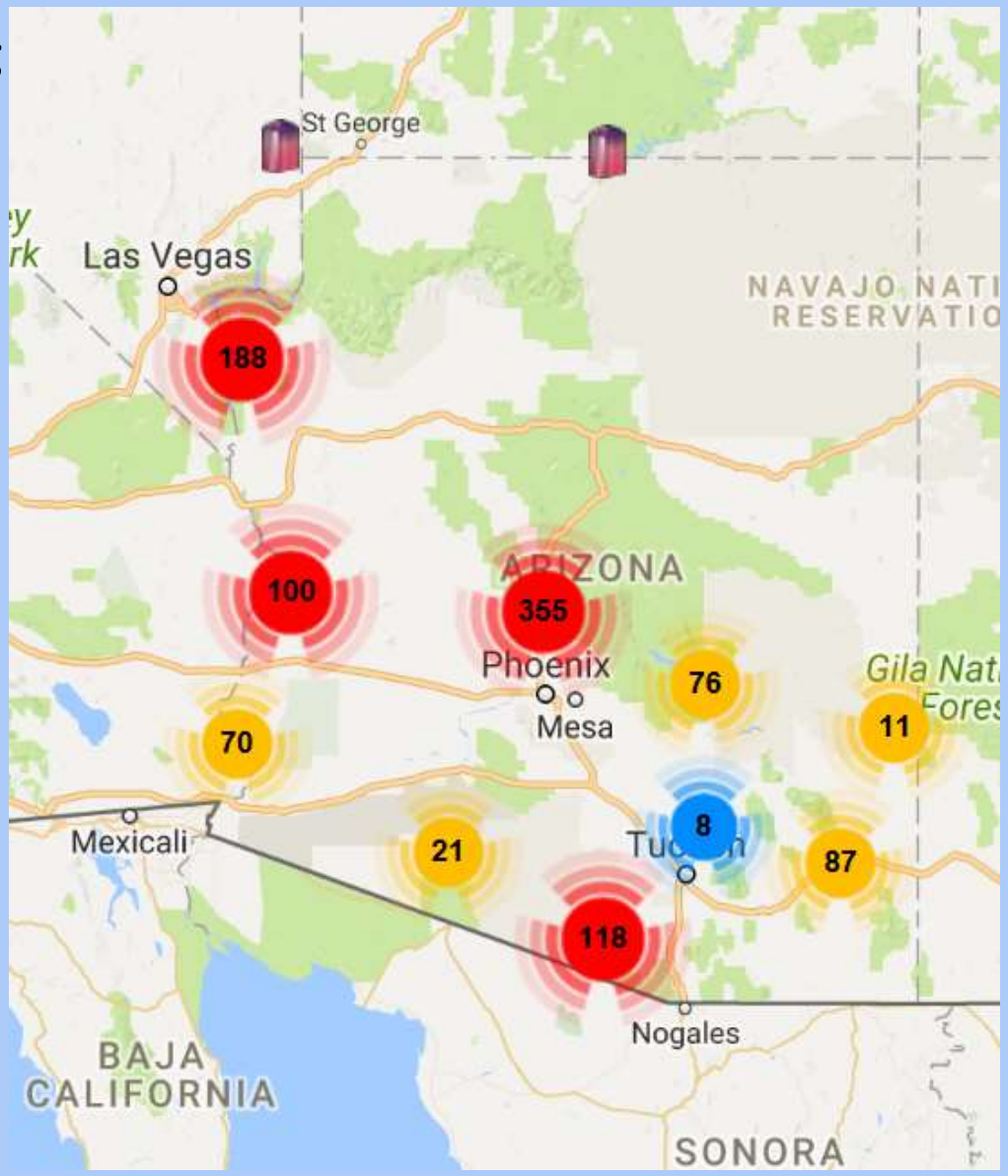
Arizona Geological Survey:

AZGS Document Repository =
http://repository.azgs.az.gov
Bulletins 137=Lode Gold; 168=Placer Gold
Bulletins 187=Cochise; 189=Pima; 191=Santa Cruz
Production information=Bull. 194

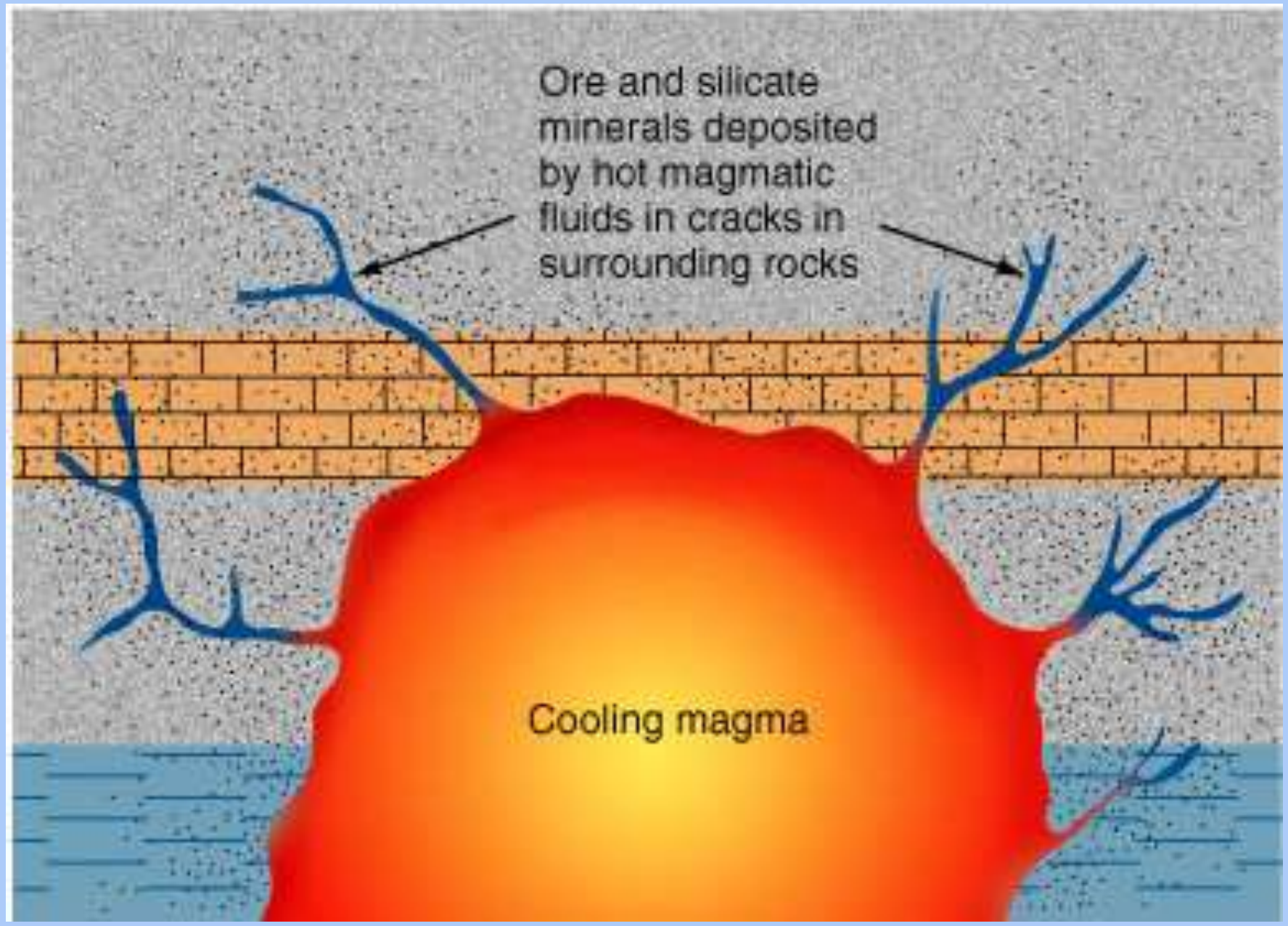
Information Sources - MinDat

MinDat.org = https://www.mindat.org

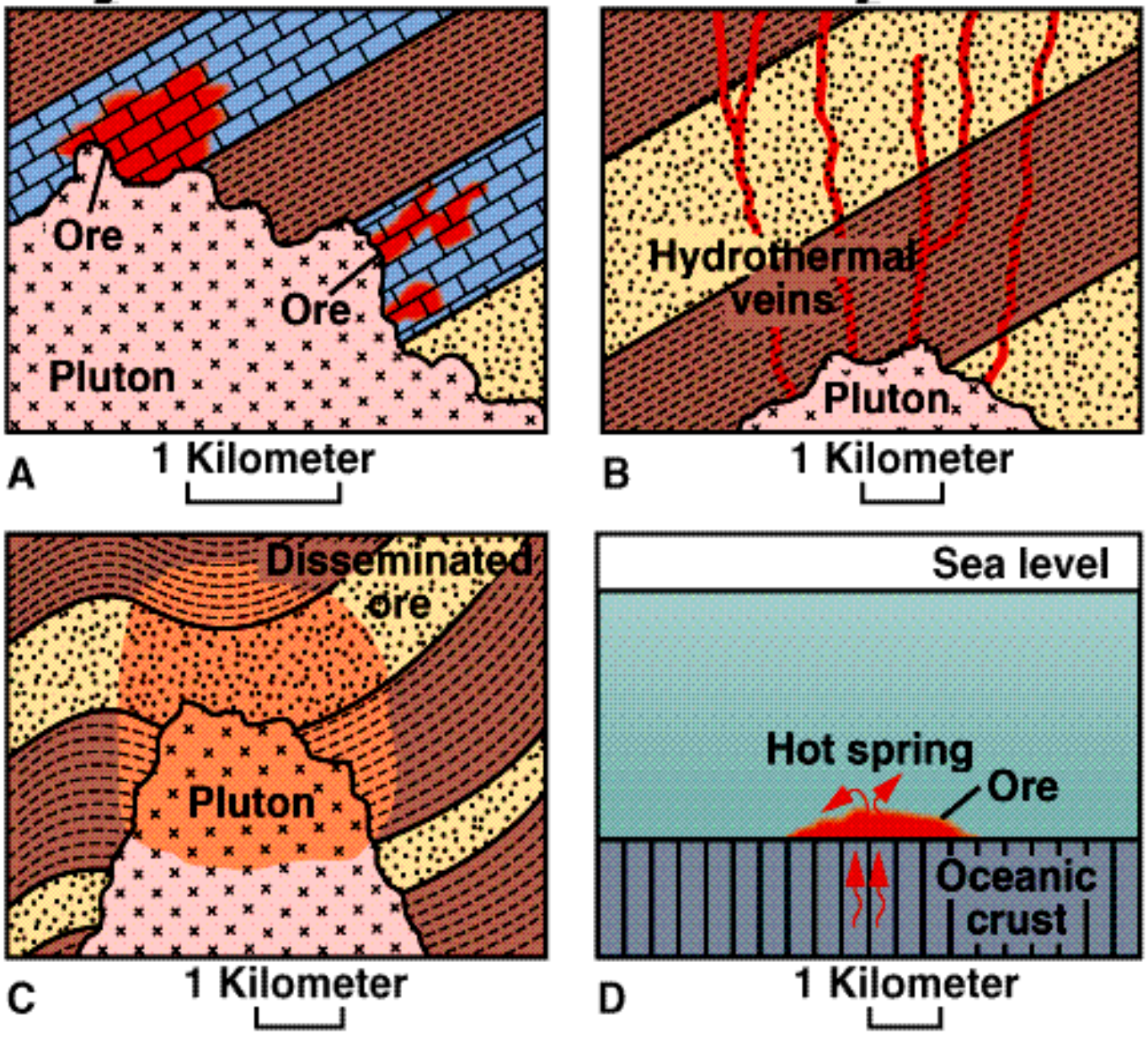
Santa Rita Mts
Greaterville District
ⓘ Argonaut placer group
ⓘ Arrastra Mine
Box Canyon
ⓘ Unnamed prospects
ⓘ Colchis placer group
Greaterville
ⓘ Buckhorn Mine (Wisconsin Mine)
ⓘ Greaterville placer deposits
ⓘ Boston Gulch
ⓘ Chispa Gulch
Empire Ranch area
ⓘ Colorado Gulch
ⓘ Succor Gulch (Sucker Gulch)
ⓘ Fulton Mine (Fulton claim)
ⓘ Graham Gulch
ⓘ Harshaw Gulch
ⓘ Unnamed prospects
ⓘ Hughes Gulch
ⓘ St. Louis Gulch
ⓘ St. Louis Mine (Morning Star Mine; Isabel)
ⓘ Yuba Mine (Inghram Mine)
ⓘ Kentucky Gulch
ⓘ Los Pozos Gulch
ⓘ Louisiana Gulch



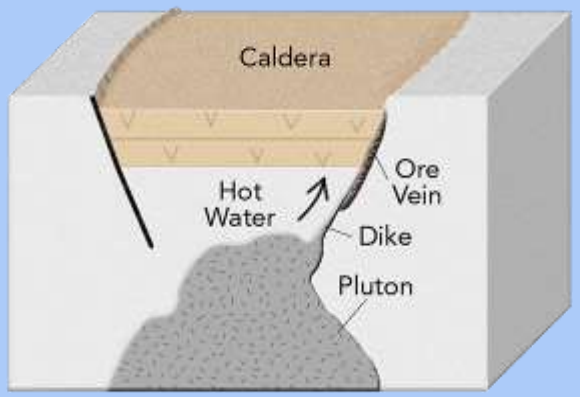
Hydrothermal deposits



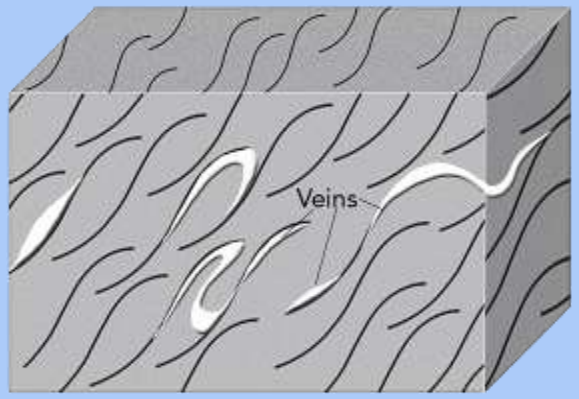
Hydrothermal Ore Deposits



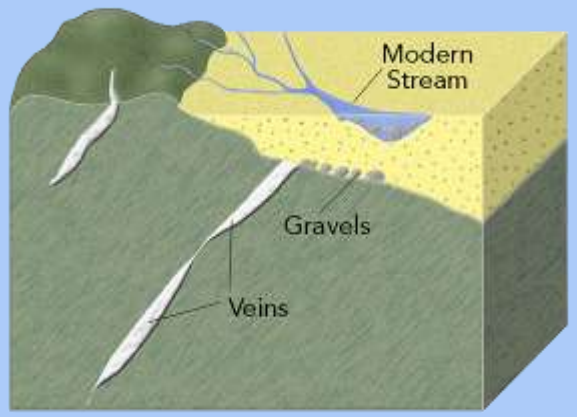
Gold- and Silver-rich Mineral Deposits



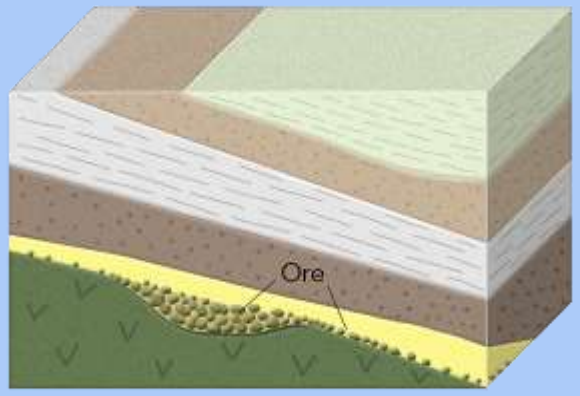
Veins from hot water



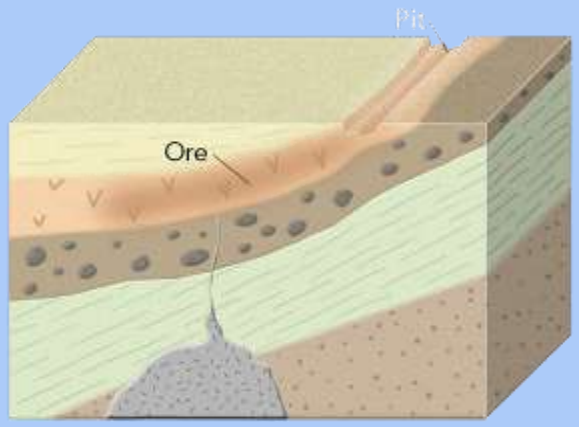
Veins in metamorphic rocks



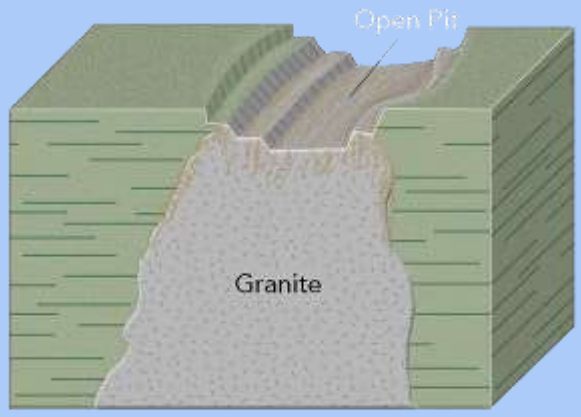
Gold in gravel



Gold-bearing conglomerates



Low-grade gold deposits

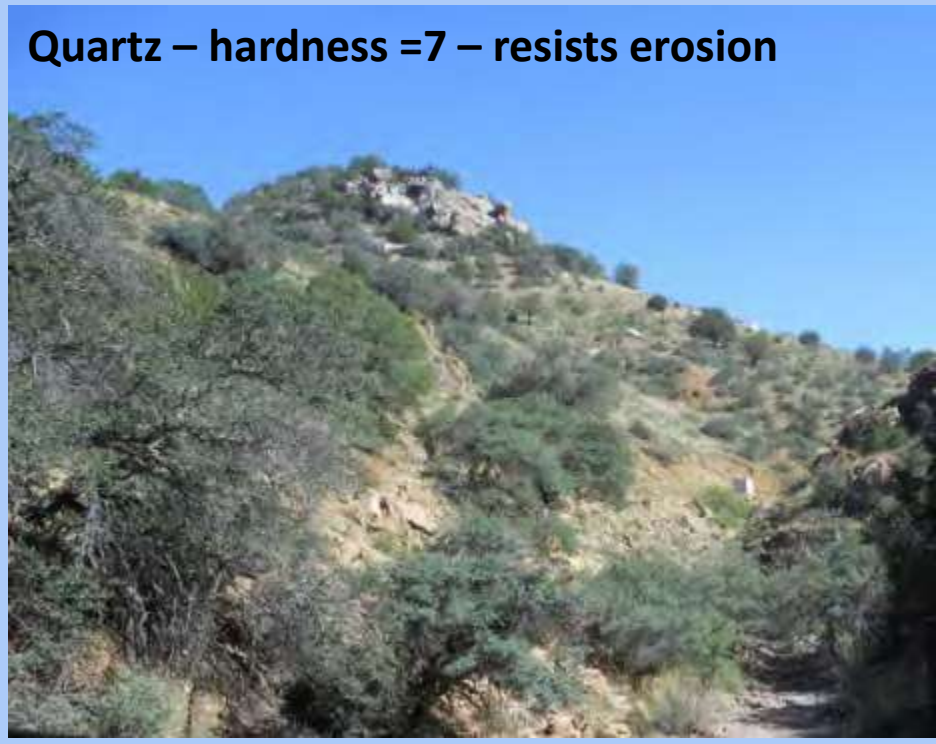


By-product gold

Gold in Quartz Veins

Courtland-Gleeson-Pearce – quartz vein

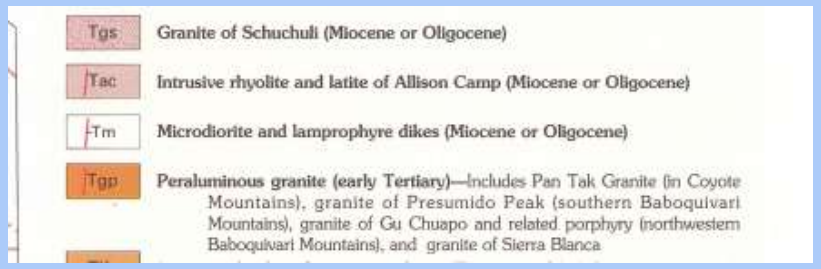
Visible Gold in drill core



Quartz – hardness =7 – resists erosion

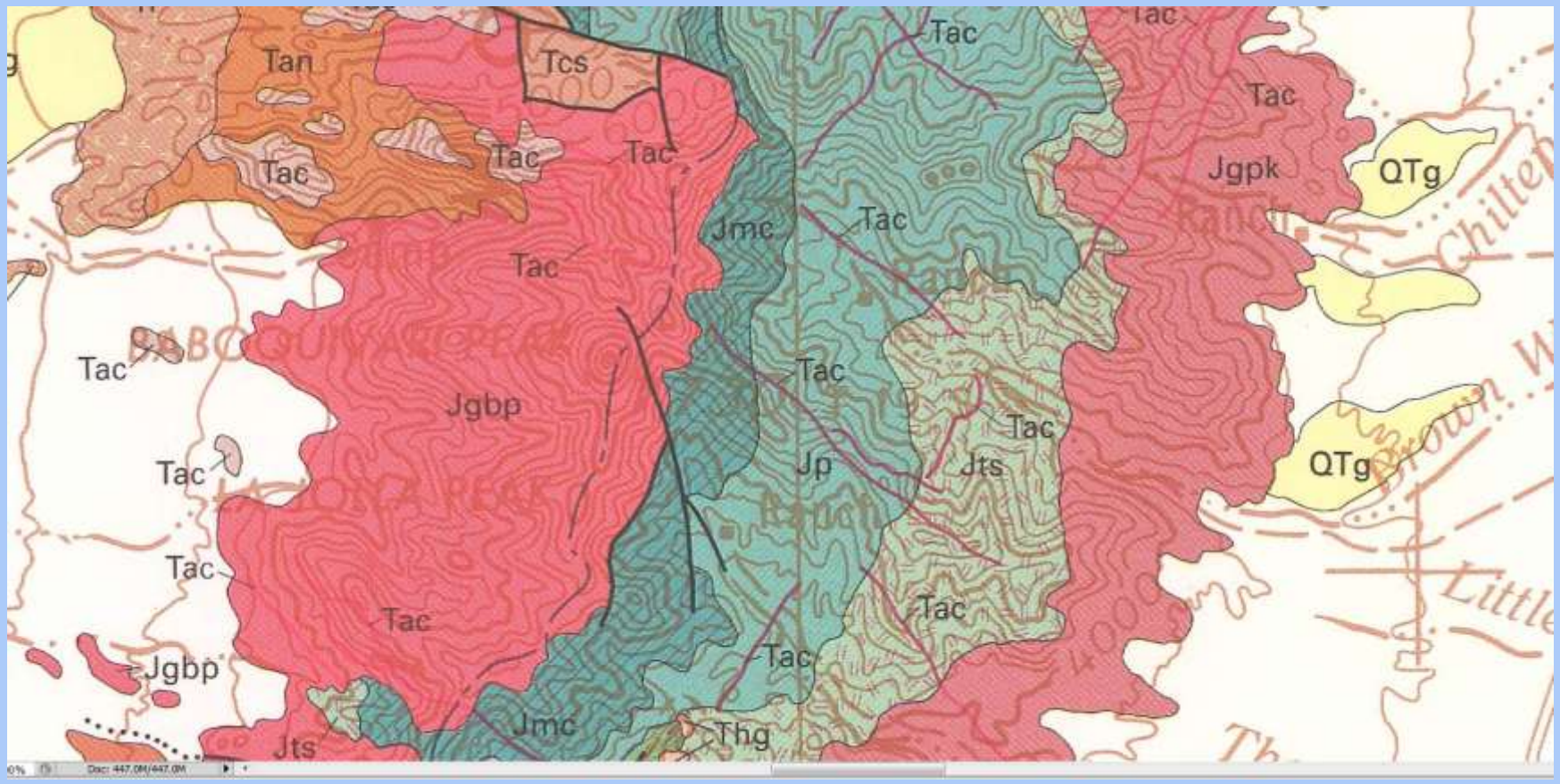
Billali Mine, New Mexico, Steeple Rock district

Dikes or Veins on Geologic Maps

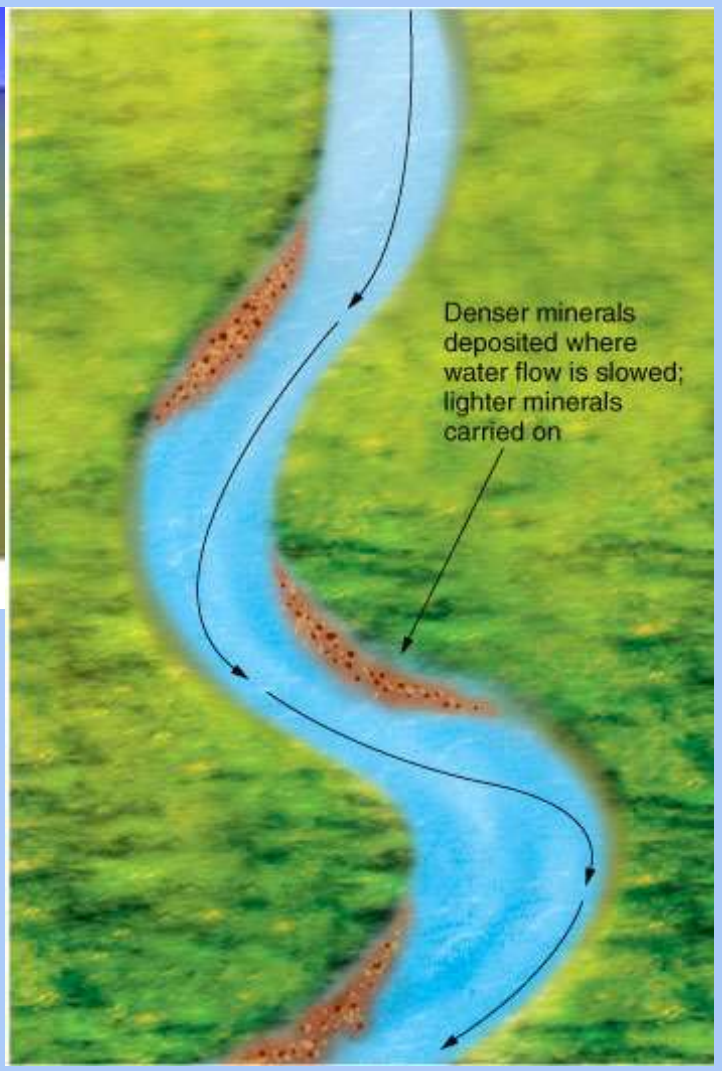


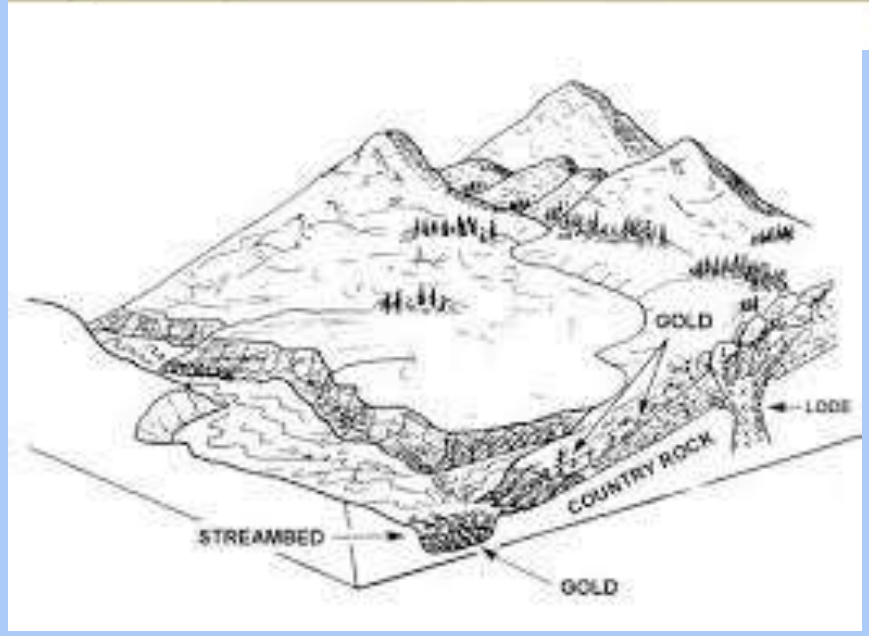
Look on the legend for quartz vein or dikes

Find veins, dikes, or mine symbols on geologic map



Placer Gold in old stream channels





Gold (heavy) is deposited wherever stream slowed down and could not carry the gravel , magnetite (black sand), or gold.

By-product Gold

Porphyry Copper Mines, Lead-Zinc-Silver Mines

Lavender Pit at Bisbee (Warren district)
Largest Gold Producer in Arizona (to 1981)

Porphyry Copper Mines

Early production of copper had gold and silver as a by-product of smelting. Current copper leaching does not recover the gold or silver or other metals.

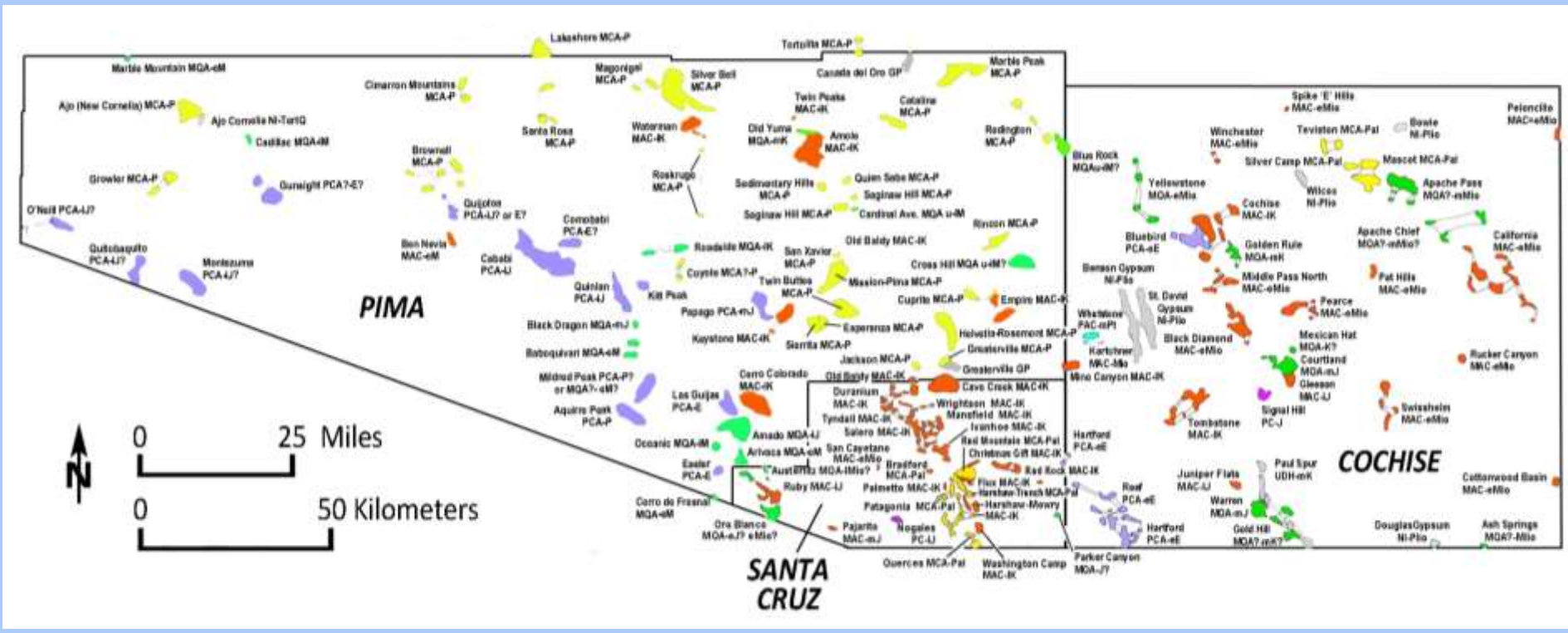
Jan C. Rasmussen, Ph.D., R.G.

Laramide porphyry copper (65-55 Ma)

Orogeny	Orogenic Phase	Age (Ma)	Age (period)	Arizona Magmatism	Alkalinity	Resources	Mining districts
Laramide	Middle (Morenci)	65-55	Cretaceous-Tertiary	granodiorite - quartz monzonite porphyry stocks, NE to ENE-striking dike swarms	Metaluminous Calc-alkalic	large disseminated porphyry Cu systems, local skarns & veins, fringing Zn-Pb-Ag	Ajo, Ray, Christmas, San Manuel, Mineral Park, Pima, Bagdad, Silver Bell, Globe-Miami, Morenci, Superior

Ray shovel, haul truck
Dave Briggs photos

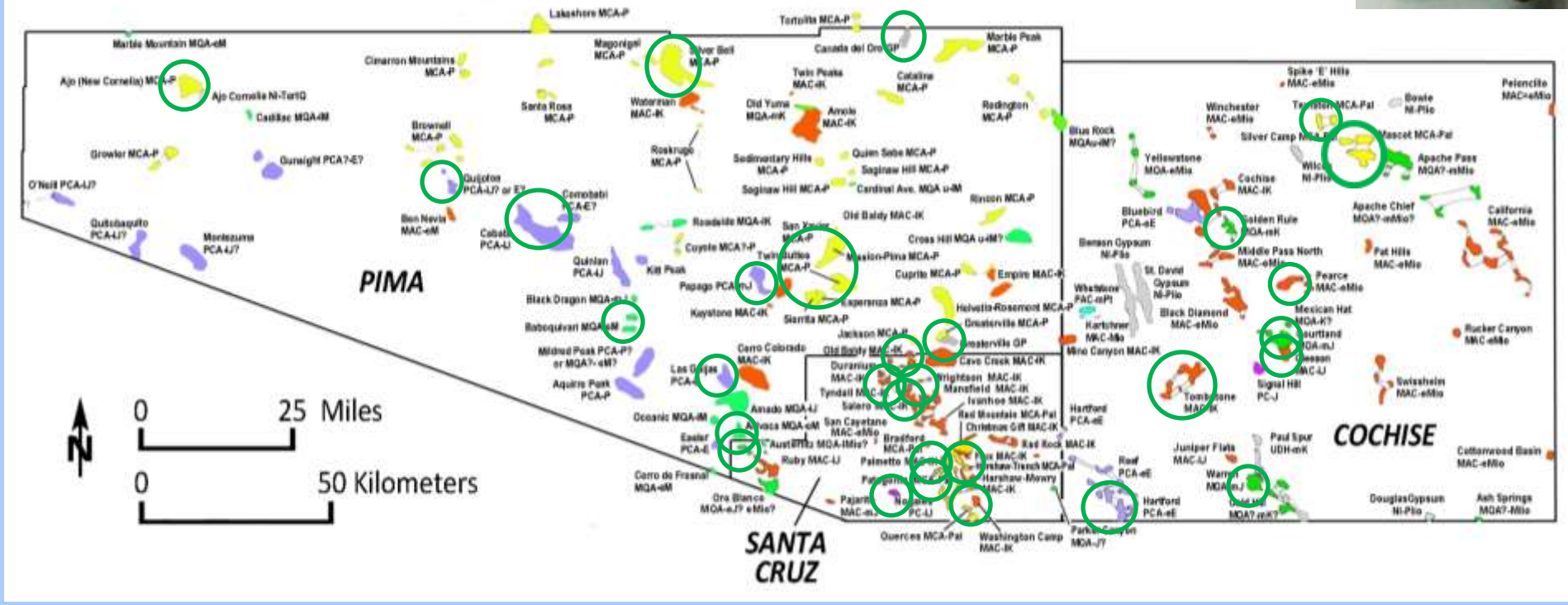
Mining Districts in most mountain ranges in Cochise, Pima, and Santa Cruz Counties



Mining district maps for 4th edition of Mineralogy of Arizona (in progress for publication in early 2020)

Jan Rasmussen, Ph.D. **February 17, 2018** **www.janrasmussen.com**

Gold In Cochise, Pima, and Santa Cruz Counties



Mining Districts with Gold Production (usually as by-product), and Placer gold or Lode gold specimens

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February 17, 2018

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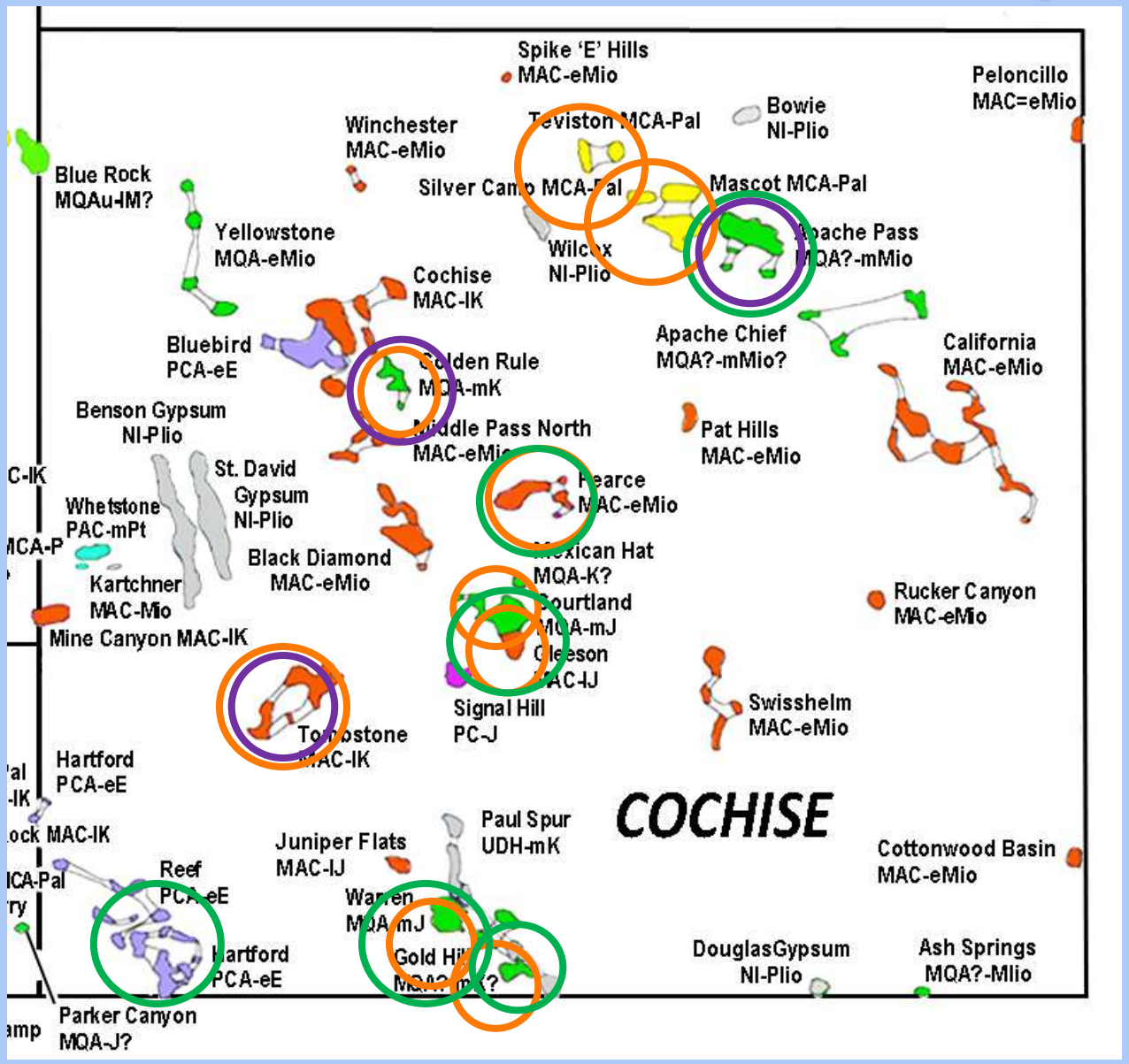
Gold in Cochise County

Production

Placer

Lode



Gold in Cochise County

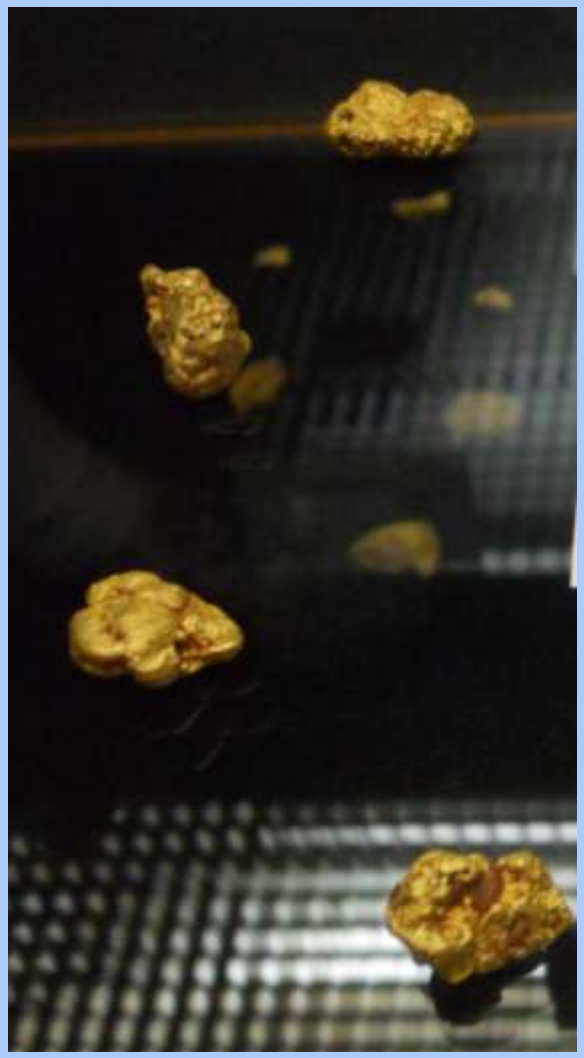
Placer	Lode	Production
Dos Cabeza Mts.-Teviston	Dos Cabeza Mts.	Mascot
Huachuca Mts.		
Bisbee (Gold Gulch)		Bisbee (Warren)
Gleeson		Gleeson
		Courtland
Pearce		Pearce
	Golden Rule	
	Tombstone	Tombstone

Placer Gold in Dos Cabeza Mts.

Teviston - Dos Cabezas/ Silver Camp – Derived from northern foot of Dos Cabezas Mountains in granite and dike rocks in pediment
Small quantities from dry placering in gulches – coarser near mountains, fine-grained away from mountains

Placer and Lode Gold in Teviston

Teviston - Dos Cabezas Mts.



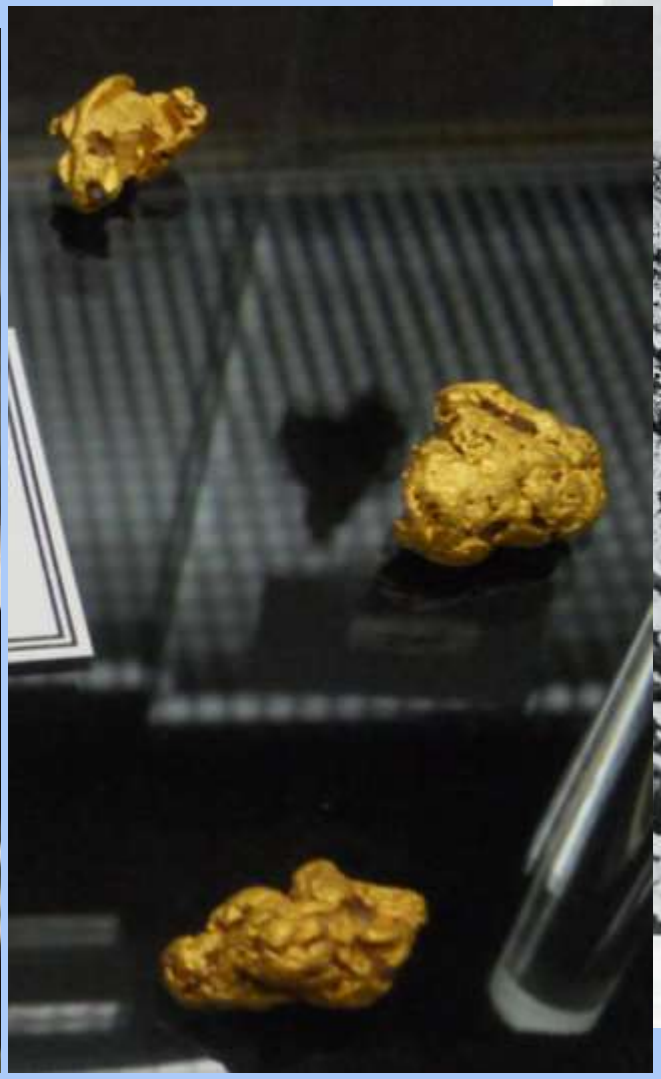


Plate X.—Gold Gulch Mining Company operations, Teviston district, in June, 1933.

Placer Gold in Cochise County

Huachuca Placers

Ash Canyon. SE Huachuca Mts, SW of Hereford

Placer gravels for 3 mi. elev. 6500-5000 ft at bedrock, flakes to rounded nuggets ¼ in in diameter

Gold Gulch Placer Bisbee area

4 mi SE of Bisbee derived from Glance Congl. Concentrated in sand and gravel of present arroyo not economic

Gleeson Placers

1 ¾ mi E of post office. Thin mantle of gravel and soil on gullied pediment of limestone; at base of soil, small speck to nuggets. Associated with black sand, hematite, oxidized copper, native silver, galena, oxidized lead minerals

Pearce Placer

E and W margins of Pearce Hill, derived by weathering of quartz veing in Pearce Hill. In Mn-stained sugary quartz with cerargyrite, embolite, and free gold.

Gold Production in Cochise County

District	type of gold	Period	Age (Million Years)	Au oz to 1981
Courtland	by-product	Middle Jurassic	150	18,200
Gleeson	by-product	Late Cretaceous	75	Included above
Gold Gulch/ Gold Hill	by-product	Middle Cretaceous ?	100 ?	1,600
Golden Rule	by-product	Middle Cretaceous	100	10,400
Pearce	by-product	Early Miocene	22	81,000
Silver Camp	by-product	Paleocene	65	600
Tombstone	by-product	Late Cretaceous	75	131,600
Warren (Bisbee)	by-product	Middle Jurassic	190	2,700,000
Huachuca/ Hartford	lode	Early Eocene	50	400
Mascot	lode	Paleocene	65	13,400
Teviston	placer	Paleocene	65	740

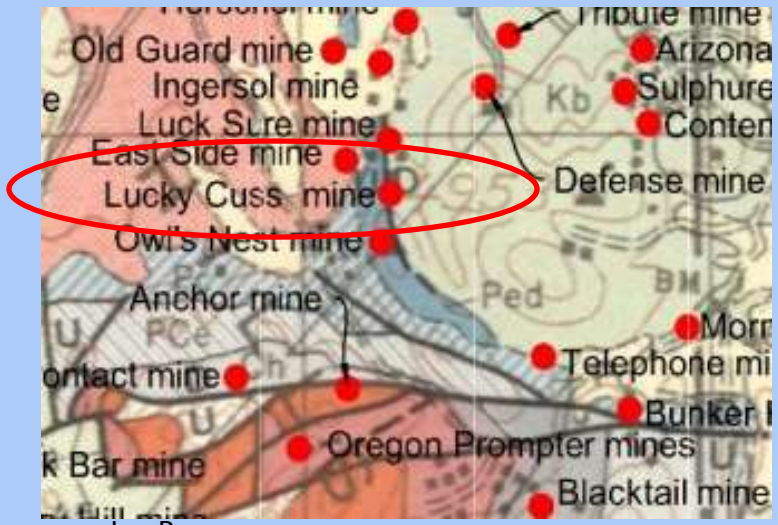
By-Product Gold in Cochise County

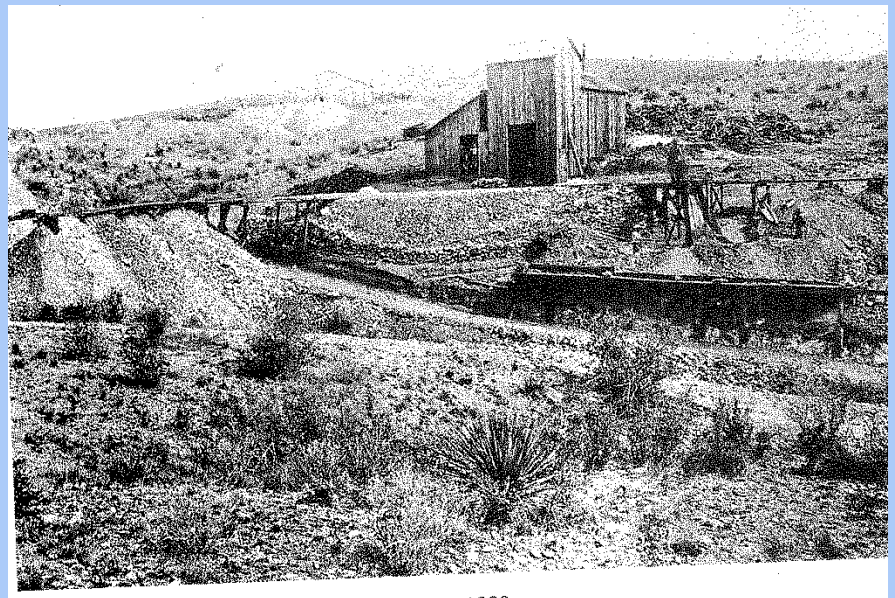
Tombstone – MAC-lK 131,600 oz to 1981

Tombstone Hills (Google Earth)

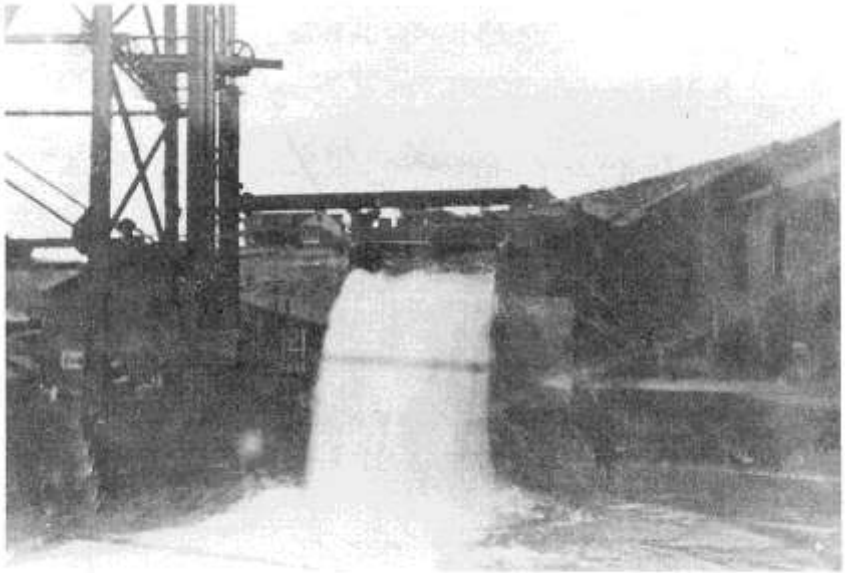
Lucky Cuss Mine, Tombstone

After the first silver strike, Schieffelin found two more rich silver claims, which he registered as the "Lucky Cuss" and the "Toughnut." Word spread that silver had been discovered, and other prospectors began to search the area. Before long, more mines began to open, including the Grand Central, the Charleston, and the Contention Mines, and a mining camp was born named after Ed's first claim—Tombstone. (Don Taylor.)





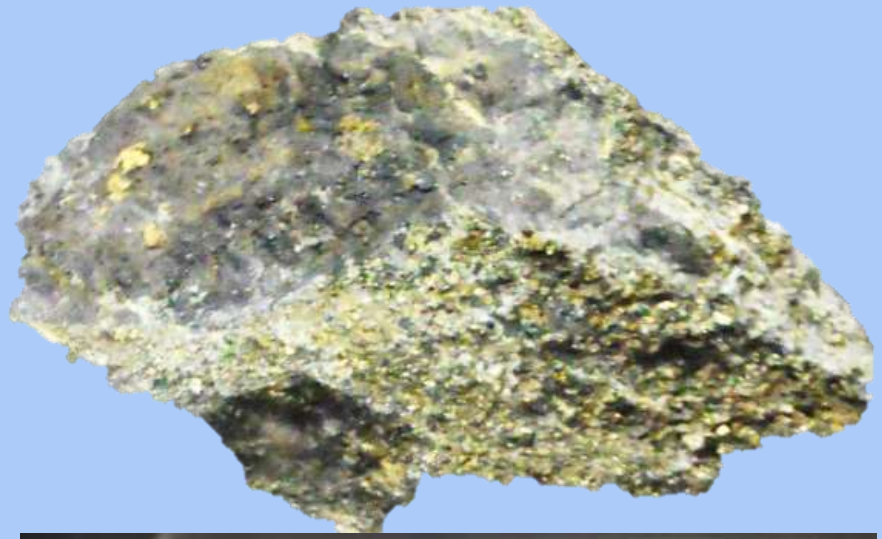
Lucky Cuss Mine, 1880.
Macia-Devere Collection

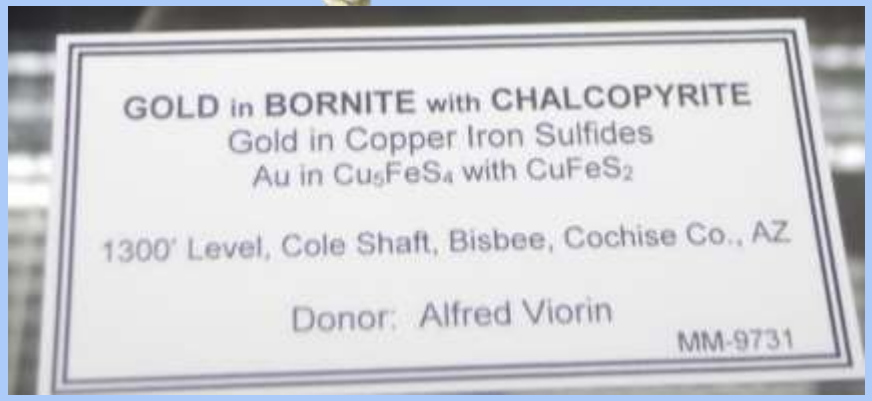


Water discharge from the Boom Shaft; 4,000,000 gallons per day, 1908.
Macia-Devere Collection

By-Product Gold in Bisbee

- Bisbee – Metaluminous Quartz Alkalic - middle Jurassic (~150 Ma)
- 2,700,000 oz to 1981
- Largest Gold Producer in Arizona





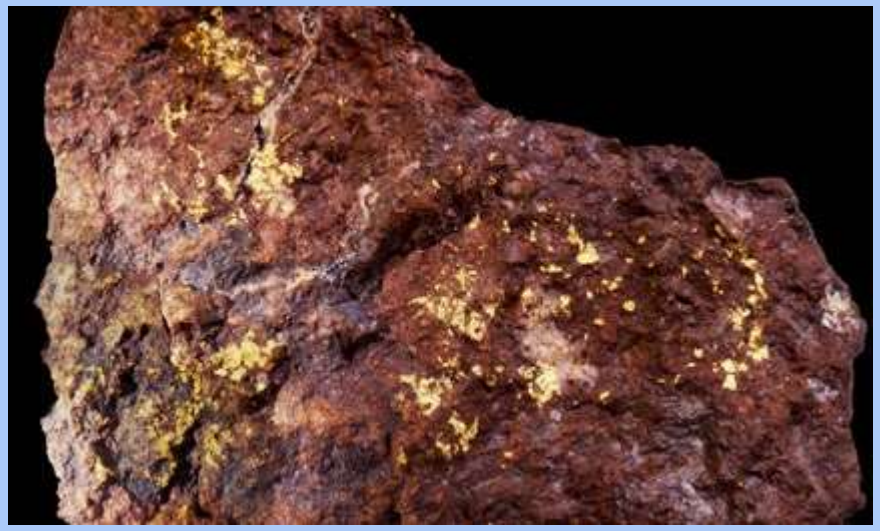
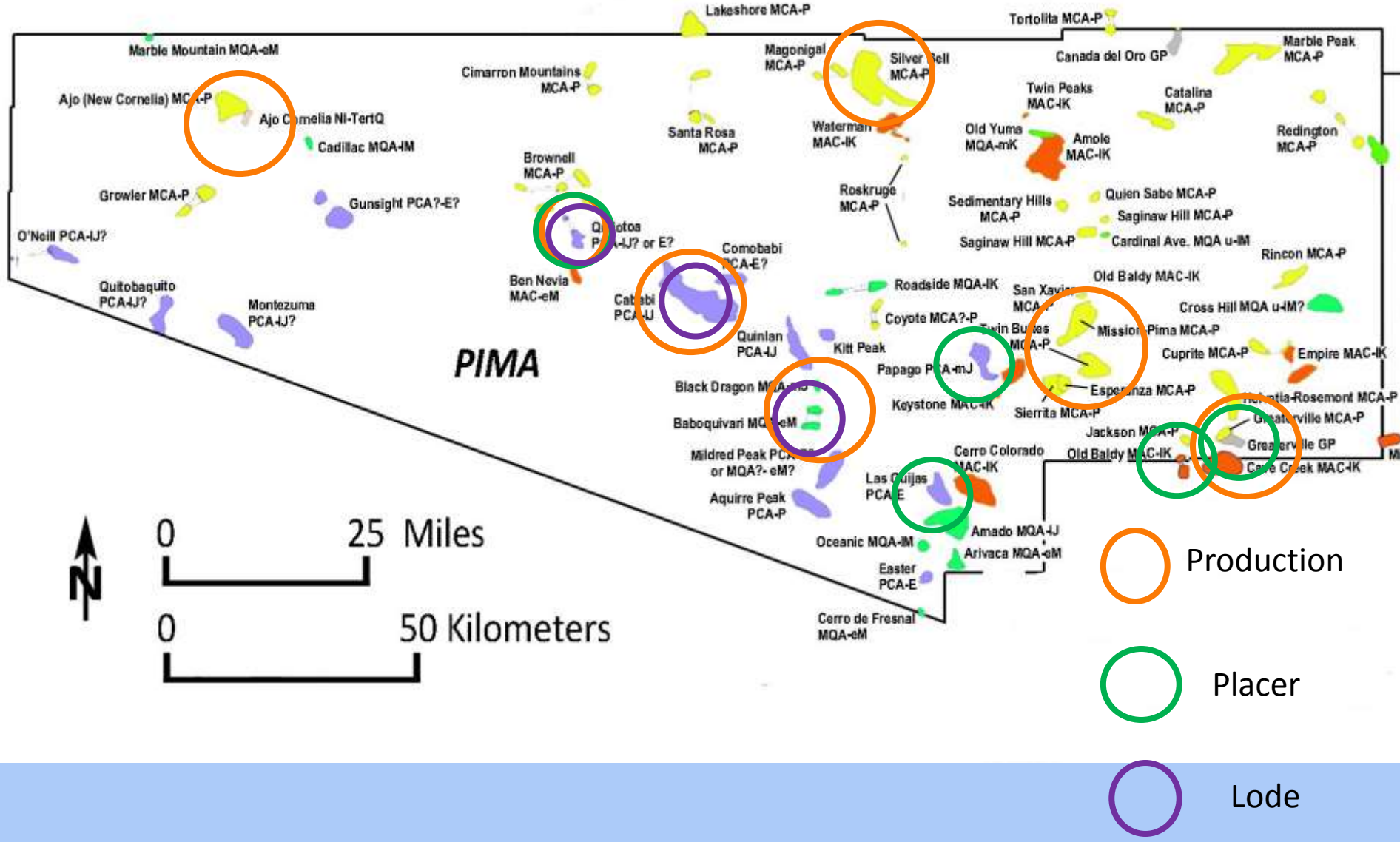


Photo from Dick Graeme: gold, as massive material in a hematite-rich silica breccia. Shattuck mine. specimen 10.3 cm. U.S. Museum of Natural History collection. Richard Graeme III photo.

Gold in Pima County



Gold Production in Pima County

Placer	Lode	By-Product	Production (Au ounces)
Greaterville		Greaterville	324
Canada del Oro/Old Hat, Marble Peak			260
Quijotoa	Quijotoa	Quijotoa	1,450
Las Guijas – Arivaca			520
Baboquivari	Baboquivari	Baboquivari	11,300
Cababi	Cababi		3,000
Old Baldy			1
Papago (Sierrita Mts.)			115
		Ajo	1,562,000
		Pima	20,222
		Silver Bell	2,000

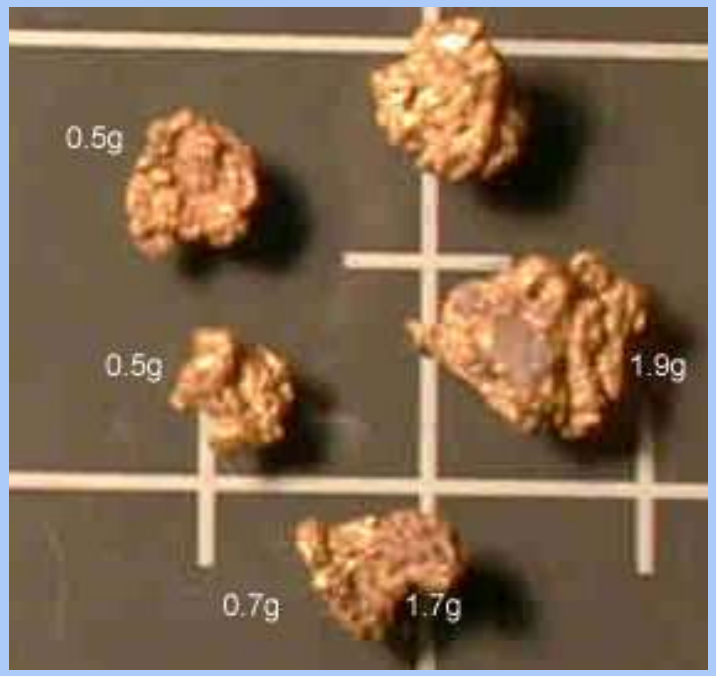
Placer Gold in Canada del Oro

Canada del Oro ? – Santa Catalina Mountains

Gold in quartz
Santa Catalina Mts.

Placer Gold in Papago district

Sierrita Mountains – Papago district



Placer Gold in Arivaca (Las Guijas)

Las Guijas or Arivaca

Pits or shallow shafts sunk to bedrock and a few inches of richer material is gathered and treated in dry-washers or rockers after rains

San Luis Canyon midway between Arivaca and Buenos Aires placers on inter-arroyo benches of dissected pediment of sedimentary and volcanic rocks. Gold as fairly coarse, angular fragments. Gold-bearing veins were original source of placers; NE side of mountains along Las Guijas Creek. Gulches around Arivaca. Duzrano, Pisquero, Yaqui, and Sangose are most noted gulches

Mesa gravels contain gold scattered through maximum thickness of 15 to 20 ft. Highest values at bedrock or at clay-cemented false bedrock. Gold rather finely divided.

Placer Gold at Greaterville – Santa Rita Mountains

Greaterville – MCA-P - 324 oz to 1981

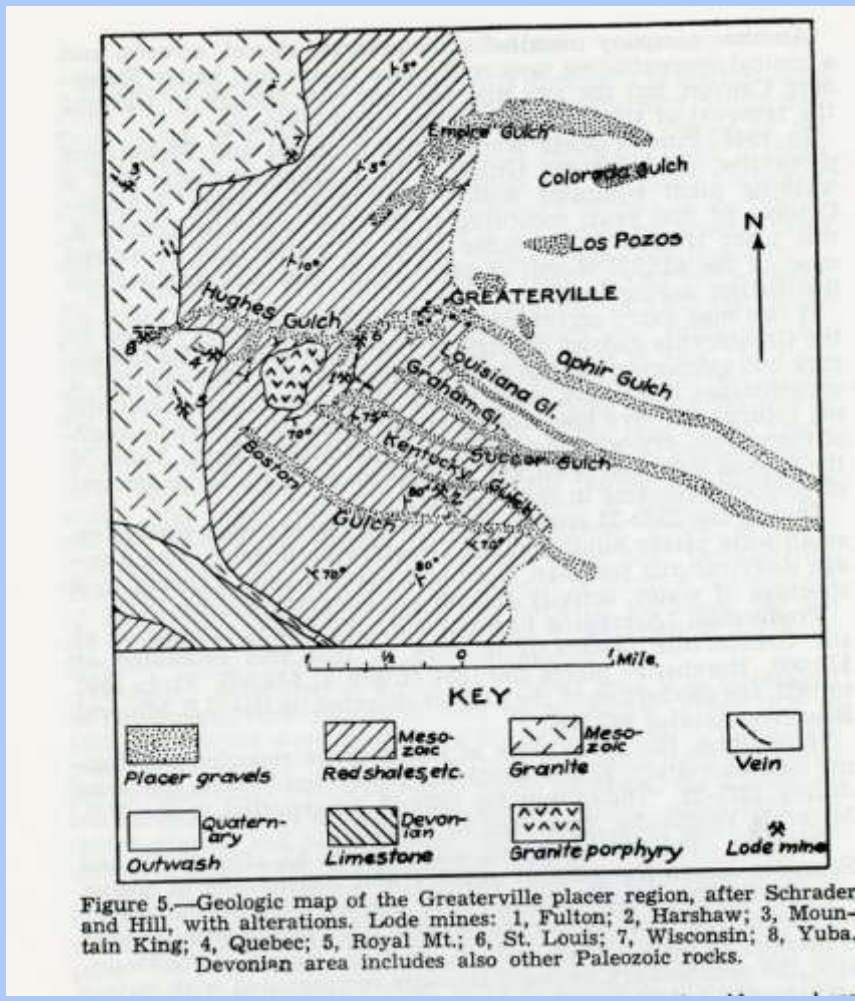


Figure 5.—Geologic map of the Greaterville placer region, after Schrader and Hill, with alterations. Lode mines: 1, Fulton; 2, Harshaw; 3, Mountain King; 4, Quebec; 5, Royal Mt.; 6, St. Louis; 7, Wisconsin; 8, Yuba. Devonian area includes also other Paleozoic rocks.

From AZGS Bull. Placer Gold in Arizona

Placer Gold at Greaterville

Greaterville – MCA-P 324 oz to 1981
Greaterville production 1875-1880;
Productive gulches = Kentucky, Boston, Harshaw, Sucker, Graham, Louisiana, Hughes, Ophir, and Empire Gulches, Nigger and St. Louis gulches, Los Pozos Gulch, Colorado Gulch, Chispa Gulch.
Hydraulic operations - with clay, so dry washing not very practicable;
Gold-bearing quartz vein source;
Upturned, irregularly eroded ridges of underlying sedimentary beds form natural riffles; small gravel < 1inch;
coarse gold; angular with quartz some galena, some iron-stained
Derived from Quartz veins – lode mines of Yuba (Inghram), St. Louis, Quebec, etc. that have free gold

Placer Gold at Greaterville

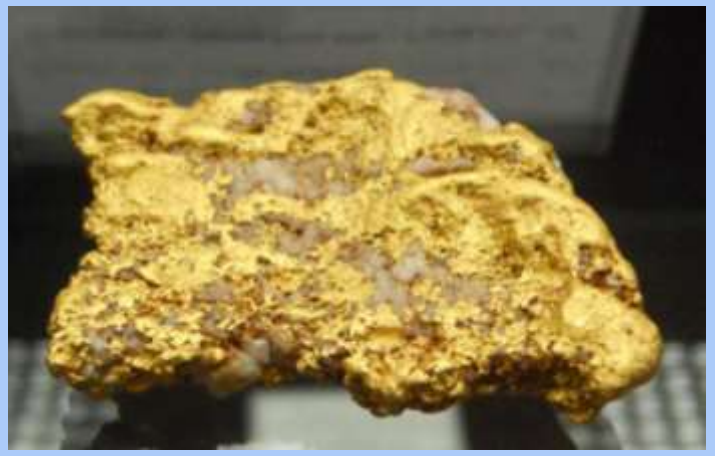
Greaterville – MCA-P 324 oz to 1981

Placer Gold at Greaterville

Greaterville – MCA-P 324 oz to 1981

Placer Gold at Greaterville

Greaterville – MCA-P 324 oz to 1981



Gold at Greaterville

Greaterville – MCA-P 324 oz to 1981

Other Gold Placers in Pima County

Old Baldy Placers

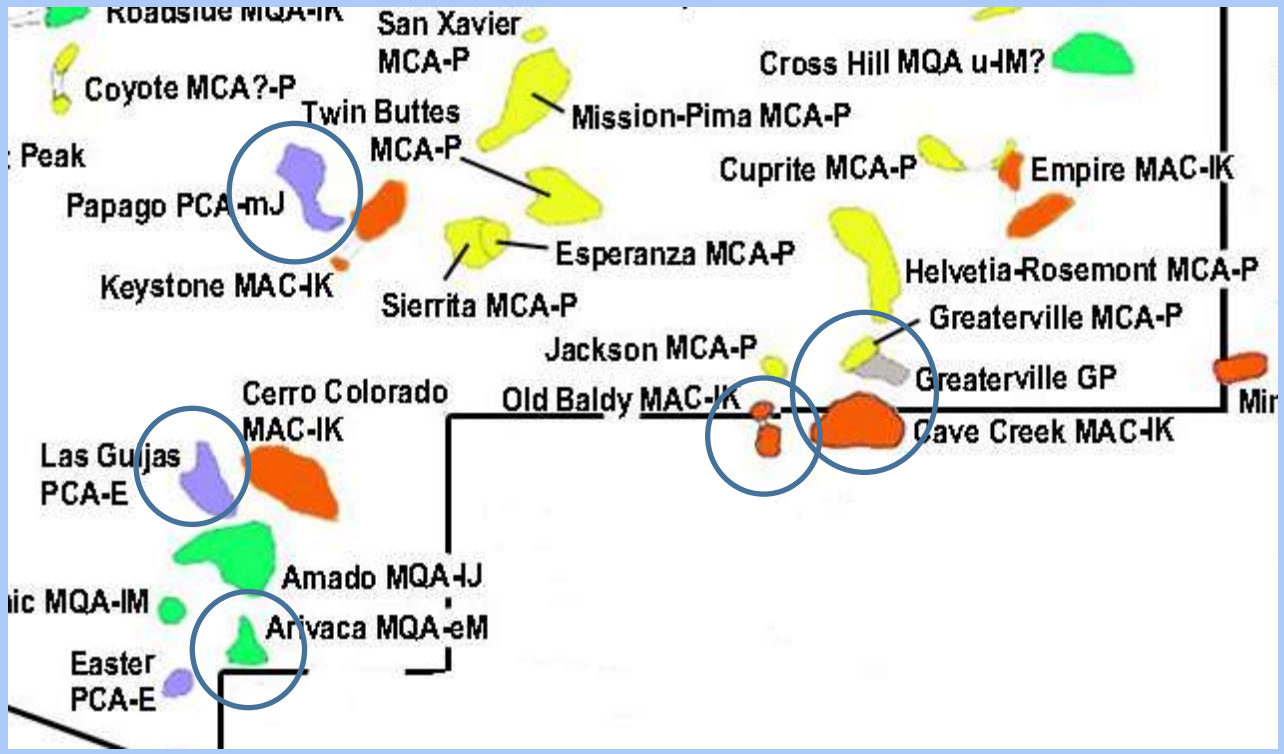
NW base of Santa Rita Mts in vicinity of Madera Canyon. Gravels contain colors of gold.

Sierrite (Papago, Armagosa)

Along Ash Creek on Sunshine-Sunrise group of claims and in Pascola Canyon – small area

Armagosa Placers (included in Pima District)

Gold placers occur along upper course of Armargosa Arroyo in the Tinaja Hills 6 mi. W of Continental. Minor dry washing in gravels of tributaries to arroyo. A little gold in thin soil and hillside detritus



Gold in Pima County

District	type of gold	Geologic period	age in Ma	Au oz to 1981
Ajo (New Cornelia)	by-product	Paleocene	65	1,562,000
Old Hat (Marble Peak, Catalina	by-product	Paleocene	62	260
Pima	by-product	Paleocene	65	20,222
Silver Bell	by-product	Paleocene	65	2,000
Arivaca	lode	early Miocene	25	520
Baboquivari/ Allison Camp	lode	early Miocene	25	11,300
Cababi	lode	late Jurassic	150	3,000
Papago (Sierrita)	lode	middle Jurassic	190	115
Canada del Oro	placer	?	?	
Greaterville	placer	Paleocene	65	32,400
Las Guijas	placer	Eocene	50	<100
Old Baldy/ Jackson	placer	Paleocene	65	1
Quijotoa	placer	late Jurassic or Eocene	150 or 50	1,450

By-Product Gold in Pima County

Ajo district MCA-P 1,562,000 oz

Silver Bell district MCA-P 2,000 to 1981

Pima district MCA-P 20,000 oz to 1981

Mission Mine

Jan Rasmussen, Ph.D.

February 17, 2018

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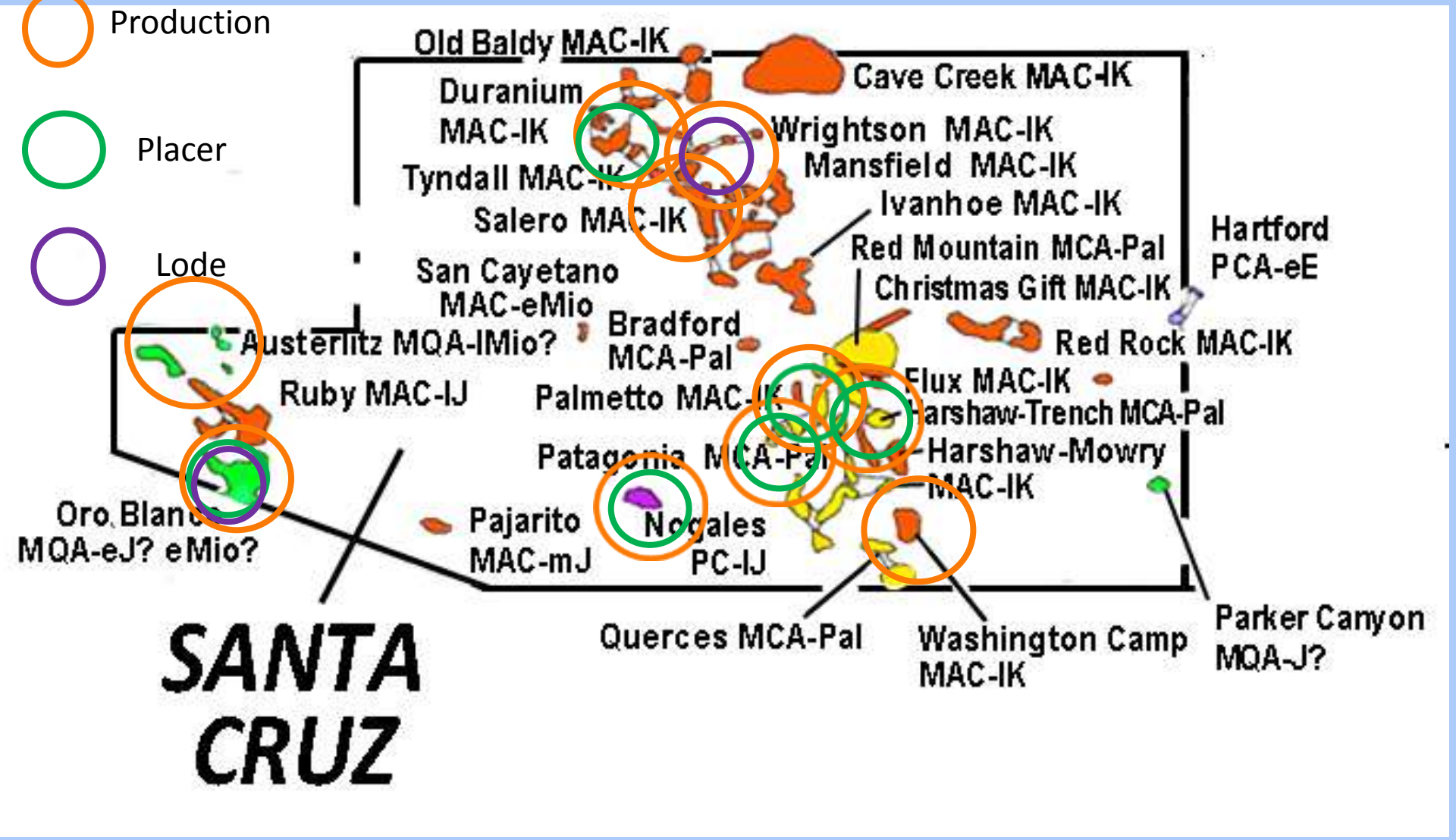
Gold in Santa Cruz County



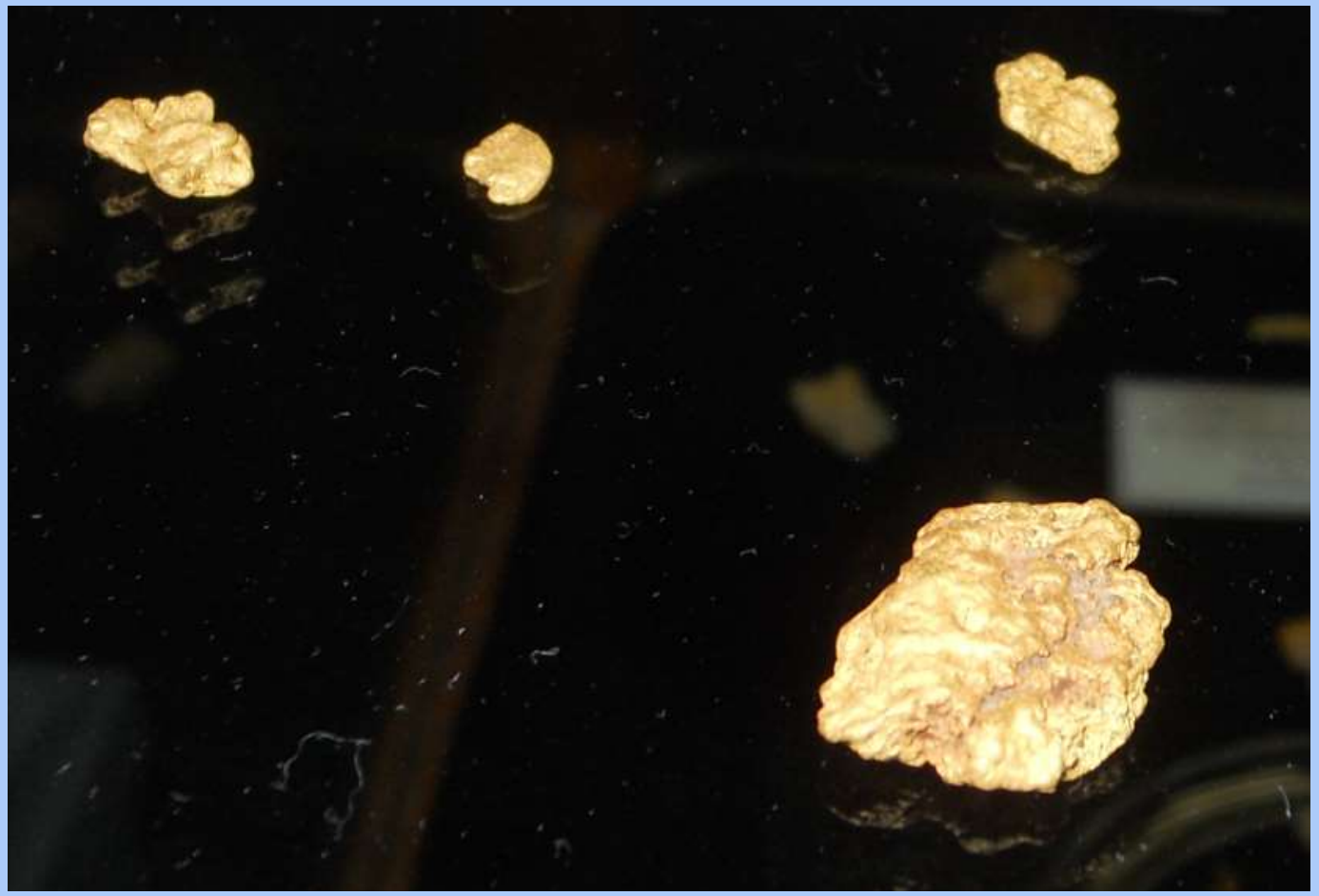
Gold in Santa Cruz County

Placer	Lode	By-product	Production (Au oz)
Oro Blanco	Oro Blanco	Oro Blanco	4,000
		Ruby	37,000
Patagonia/Mowry		Patagonia	670
Harshaw		Harshaw	1,850
Tyndall		Tyndall	200
Nogales		Nogales	400
Palmetto		Palmetto	19,400
	Wrightson	Wrightston	12
		Austerlitz	2,700
		Salero	5,000
		Washington Camp	8,900

Placer Gold in Santa Cruz County

Oro Blanco district MQA-eJ 4,000 to 37,000 oz to 1981

Oro Blanco Placers
Gold in California or Oro Blanco Viejo Gulch near mouth of Warsaw Creek – gold too fine
From gold-bearing quartz veins and stringers in gulches that come from mineralized areas.



Other Placer Gold in Santa Cruz County

Patagonia or Mowry Placers

In Mowry Wash and its tributaries, Quajolote Flat SW of Mowry etc.

Harshaw Placers

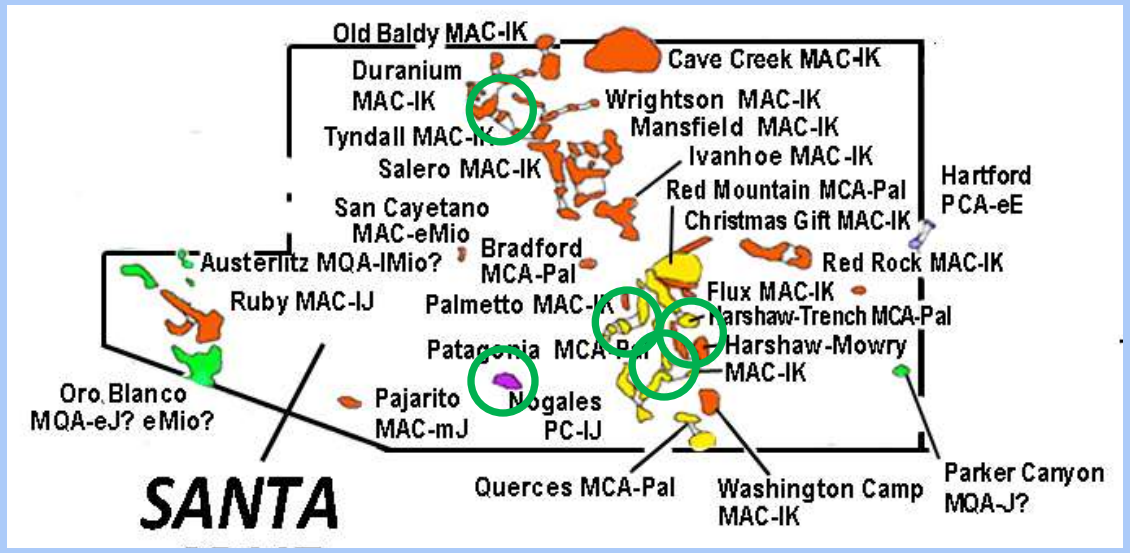
2 Mi SW of Patagonia between Sonoita Creek on the NW and Alum Canyon on the SW. Placer gold in Quaternary gravels underlying the mesa-like area

Tyndall Placers

Some placer gold produced 12-14 mi SW of Salero and 1 mi S of Mt. Allen at the SW base of Grosvenor Hills and adjoining ground in open basin-headed canyon that is tributary to Ash Canyon

Nogales Placers

NE part of Nogales district on Guebabi Canyon. Gold placers in Quaternary gravels

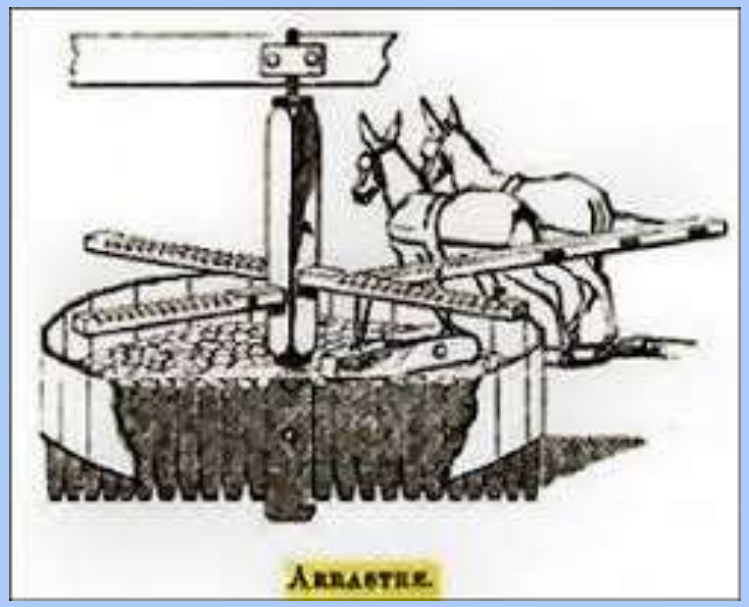


Lode Gold in Santa Cruz County

Oro Blanco and Ruby district MQA-eJ 4,000 plus 37,000 oz to 1981

Oro Blanco vein -1873; Yellow Jacket, Ostrich, etc. later; ore treated in arrastres. Montana, Warsaw, Old Glory, Ragnarole, Golden Eagle, St. Patrick, Tres Amigos, San Juan, Franklin, Cleveland, Oro, Nil Desperandum, Last Chance deposits. Margarita Mine. Austerlitz

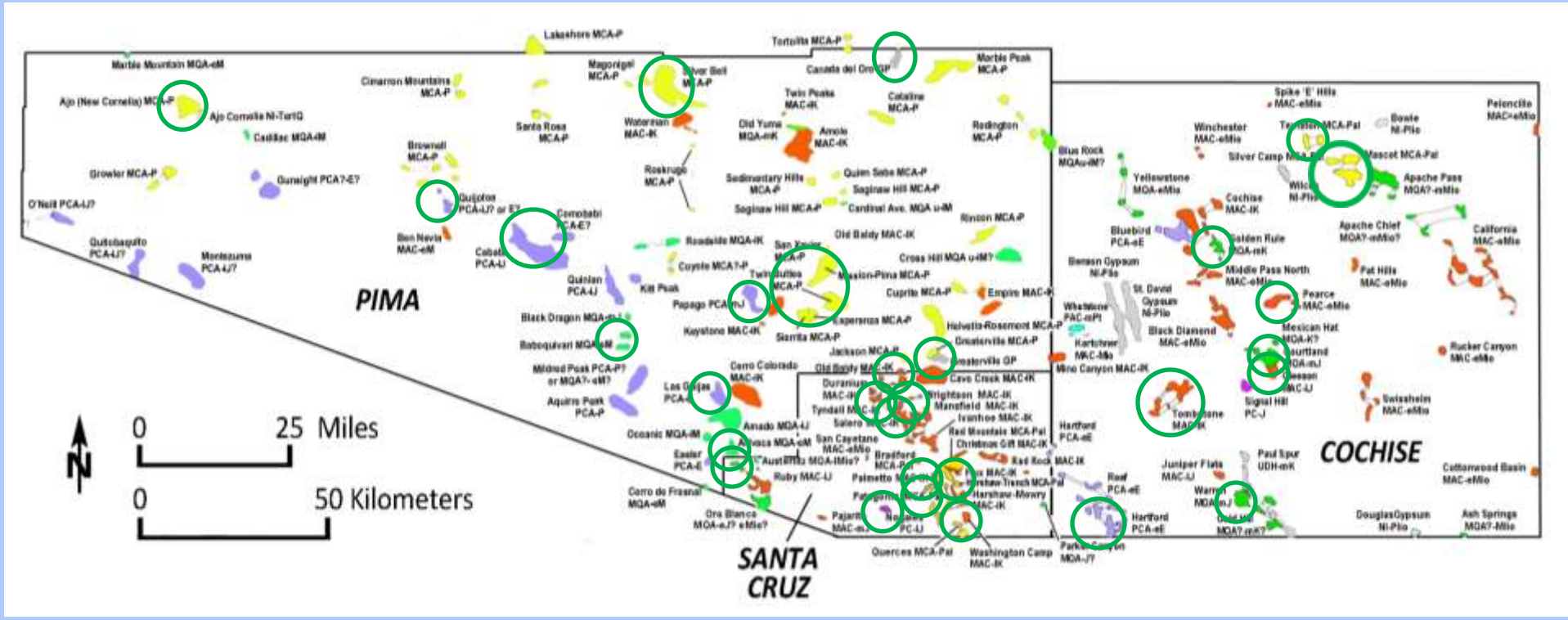
Arkosic ss, qtzt, cgl, sh some volc. Rest on altered, grayish diorite. Intruded by dikes of basic to acid composition. Gold occurs as medium fine-grained to coarse particles. Mineralized shear zones.



Gold in Santa Cruz County

District	type of gold	Geologic period	age in Ma	Au oz to 1981
Austerlitz	lode	late Jurassic	190	2,700
Oro Blanco	lode	late Jurassic	190	37,000
Harshaw	by-product	Paleocene	65	1,850
Nogales	by-product	late Jurassic	190	400
Palmetto	by-product	late Cretaceous	75	19,400
Patagonia	by-product	Paleocene	65	670
Salero	by-product	late Cretaceous	75	5,000
Tyndall	by-product	late Cretaceous	75	200
Washington Camp	by-product	late Cretaceous	75	8,900
Wrightson	by-product	late Cretaceous	75	12

Good Luck, Have Fun, and Stay Safe



Production, Placer gold, or Lode gold specimens