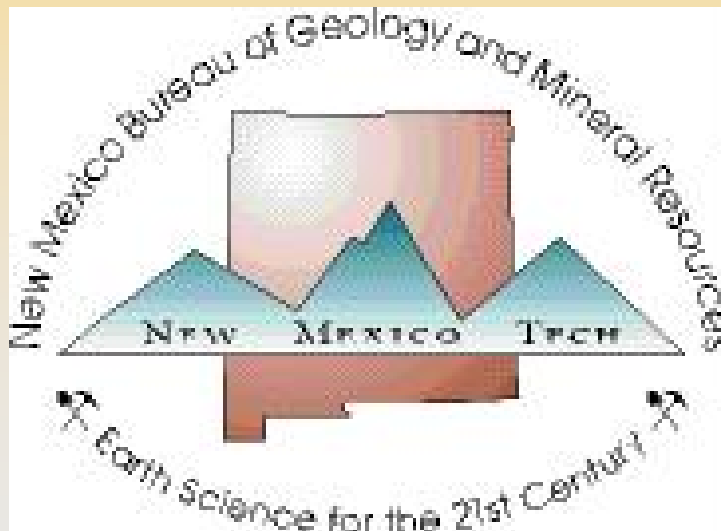


Gold in New Mexico

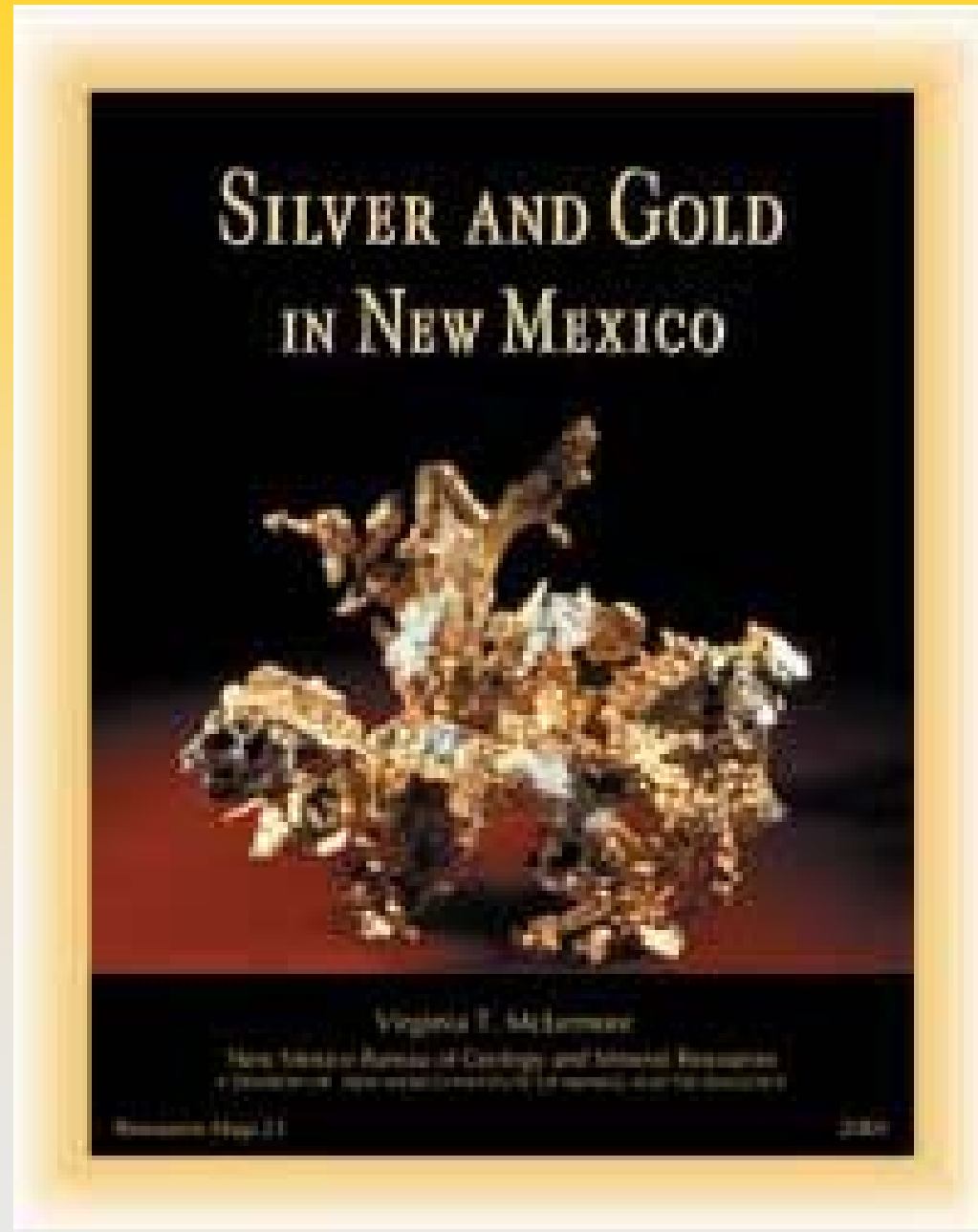
Virginia T. McLemore

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New Mexico Tech, Socorro, NM*



Publications

**RM-21—
Silver and
Gold in New
Mexico,
reprinted in
2010**





Placer gold deposits in New Mexico

by Virginia T. McLemore, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico 87801

Abstract

Thirty-six mining districts in New Mexico contain placer gold deposits. Production from these deposits began as early as 1828, resulting in the first gold rush in the western United States; however, minor production by Pueblo Indians and Spaniards probably occurred 200 or more years earlier. Most placer deposits were discovered by 1900, and almost all placer production occurred before 1902. It is estimated that 662,000 oz of gold were produced from New Mexico placer deposits between 1828 and 1991. The deposits typically are found in late Tertiary to Recent alluvial or eluvial deposits; alluvial fan deposits, bench or terrace deposits, river bars, stream concentrations, and residual placers that formed directly on top of lode deposits are known. New Mexico placer gold deposits are derived from Oligocene-Miocene Great Plains Margin deposits, Laramide vein deposits, and Proterozoic vein and replacement deposits in highly weathered and eroded terrains. The future potential will depend on discovery of large-volume, low-grade deposits. Also, new technologies minimizing water may stimulate activity because lack

deposits (Boyle, 1979, 1987): eluvial, alluvial, and aeolian. Eluvial deposits occur in weathered detritus at or near the outcrop of gold-bearing lode deposits. Alluvial deposits occur in the sands and gravels of streams, rivers, beaches, and deltas. Alluvial deposits are further subdivided into classes by Wells and Wootton (1932): hillside (valley slopes not in discrete channels), gulch or creek, bench or terrace, river-bar, gravel-plain, and buried placers. The aeolian deposits accumulate in windblown sand deposits and are relatively minor and unimportant. Most of the gold deposits in New Mexico are alluvial deposits, but some eluvial deposits are found in many districts. There are no known aeolian gold placer deposits in New Mexico.

This report presents a summary of continuing research on placer gold deposits in New Mexico. Johnson (1972) published one of the most comprehensive compilations of information on placer gold deposits in the state. This study updates the work by Johnson (1972) and North and McLemore (1986, 1988) and incorporates additional field observations and other data

deposits in New Mexico were discovered by 1900. Early production from placer deposits is poorly documented, and total production can only be estimated. It is estimated that 662,000 oz of gold have been produced from placer deposits throughout New Mexico from 1828 to 1991 (updated from Johnson, 1972). This production is insignificant compared to larger placers found in Alaska, California, New Zealand, and South America that contain millions of ounces of gold. Only four districts here have yielded more than 100,000 oz of placer gold production: Elizabethtown-Baldy, Hillsboro, Old Placers, and New Placers. Currently only one district is yielding some minor production (White Oaks) although small exploration activities and recreational gold panning are occurring in most areas of the state. ☐

Also in this issue

Oso Ridge Member (new),
Abo Formation,
Zuni Mountains

p. 26

Decision Makers Field Guides

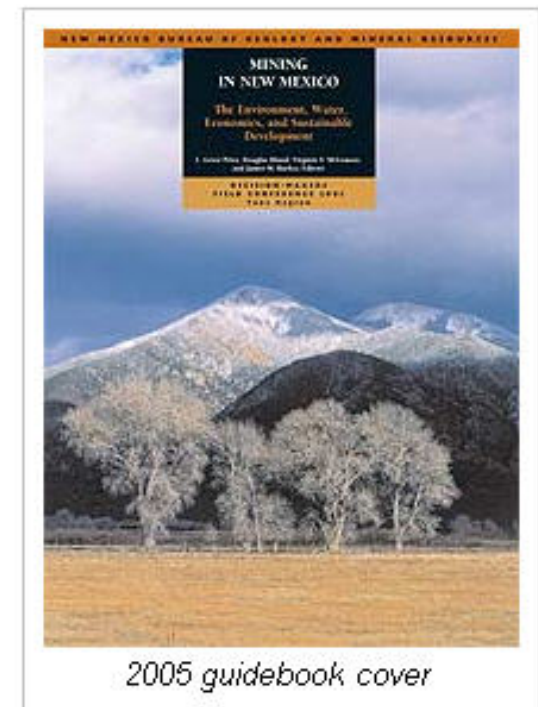
The New Mexico Bureau of Geology and Mineral Resources is joining with several state and local governmental agencies and organizations in conducting a series of field conferences for influential New Mexico decision makers. The purpose of these conferences is to present decision makers with the opportunity to learn first-hand about geological problems, opportunities, and potential solutions from some of the state's top experts, and to hear impartial (or at least balanced) opinions regarding current scientific knowledge about these matters.

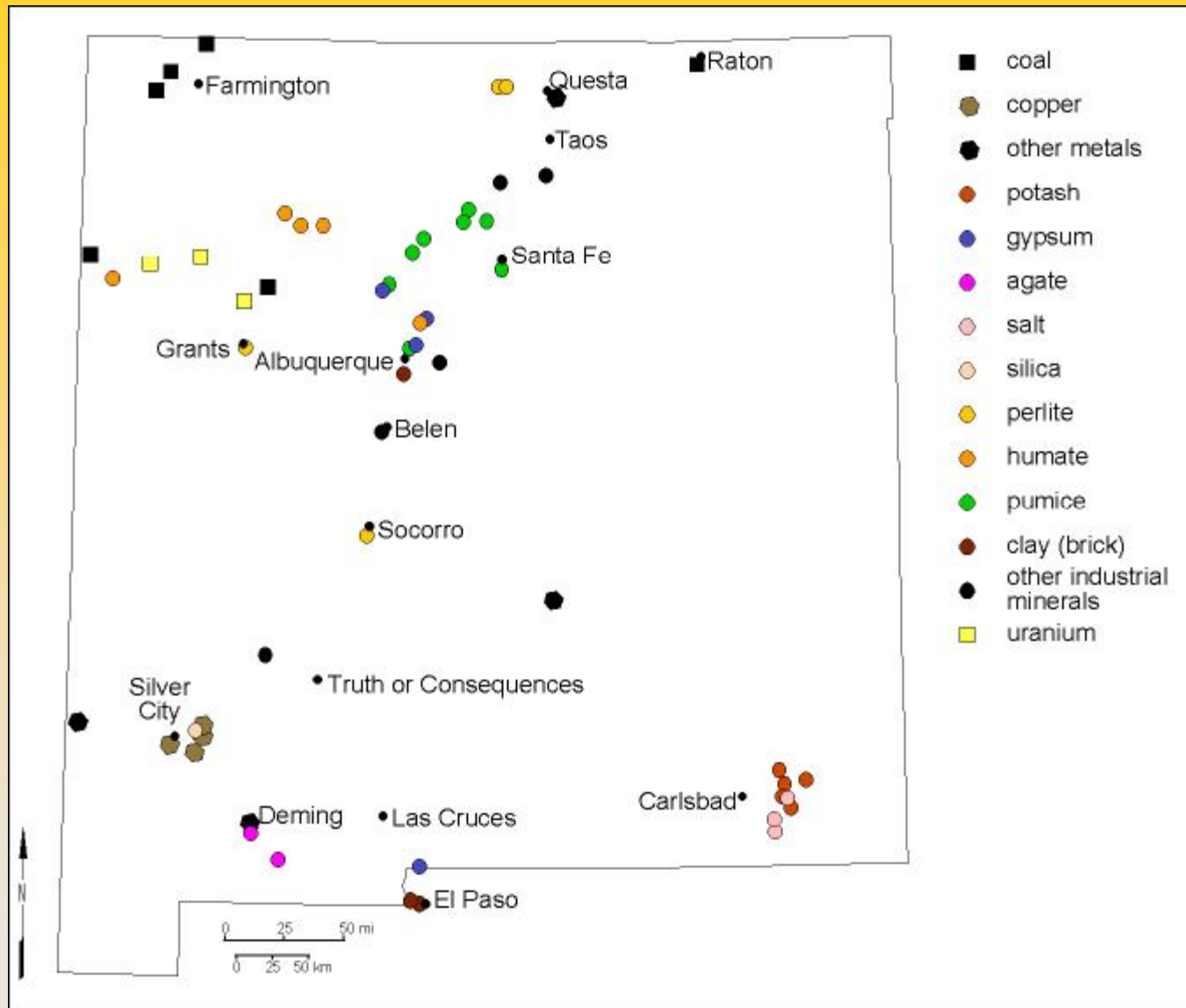
Mining in New Mexico—The Environment, Water, Economics, and Sustainable Development

Decision-Makers Field Guide 2005

Edited by L. Greer Price, Douglas Bland, Virginia T. McLemore, and James M. Barker

Mining has played a significant role in the history and development of New Mexico and continues to play an important role in the state's economic prosperity. The future of this industry will depend upon achieving a balance between our needs and desires, the changing economy, and our growing concern over environmental and social issues. This anthology of 30 articles is a timely look at some of those science and policy issues. 176 pages with tables, diagrams, maps, and color photographs throughout.





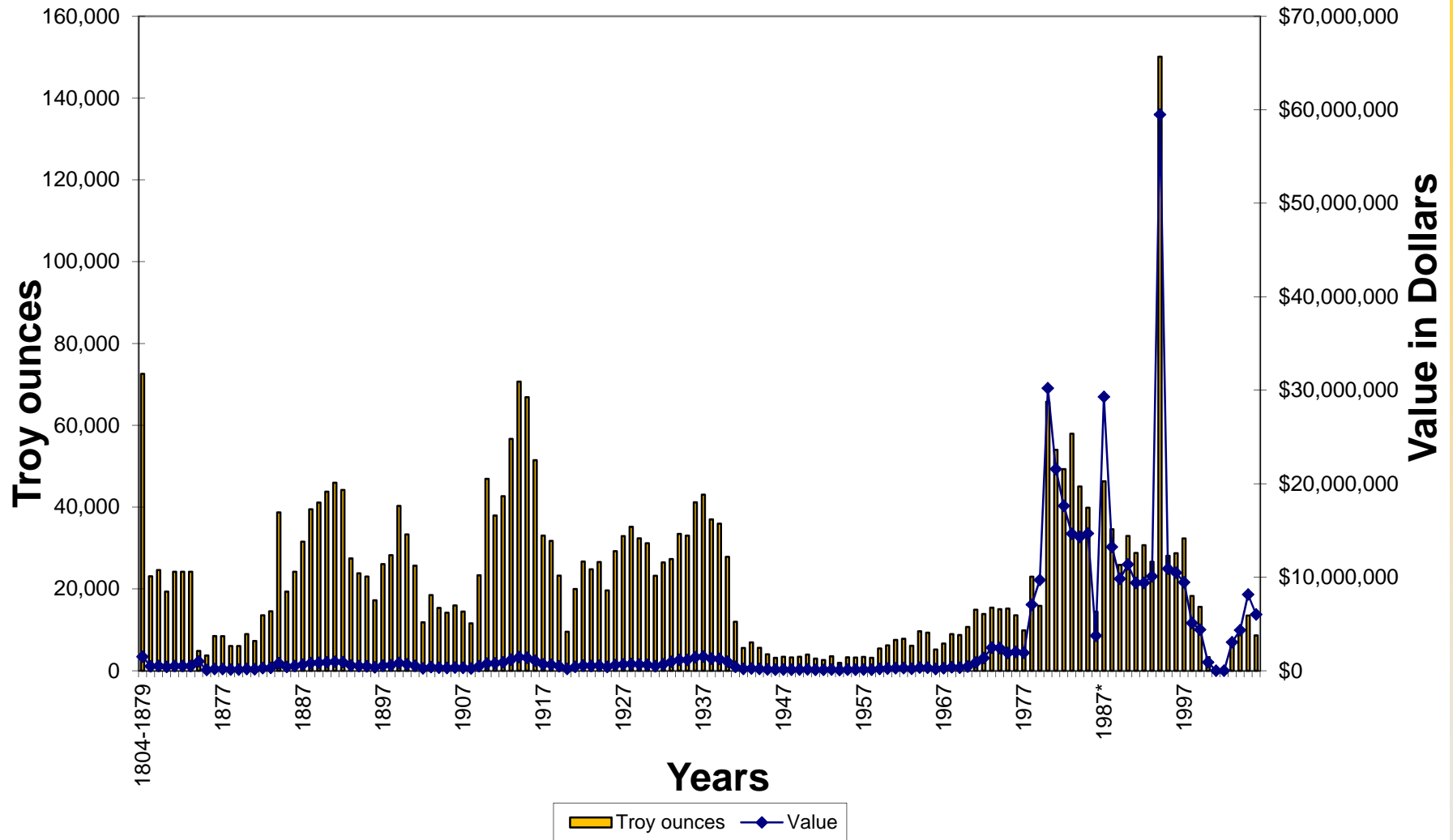
Active mines and exploration in New Mexico
2000-2013 (excluding aggregates)

PRODUCTION

Gold and silver production in
2004-2008, 2011-2012 as a
byproduct of copper production
from the Ivanhoe concentrator
(Freeport-McMoRan)

9th in gold production
10th in silver production

Gold Production 1804-2007



1804-2007 >3.2 million troy ounces Au worth >\$400.8 million

TABLE 3—Major gold-producing districts in New Mexico (updated from North and McLemore, 1986, 1988). *Major placer production (>50,000 oz), + no known placer deposits.

District	County	Estimated gold production (oz)	Type of deposits
+ Santa Rita	Grant	>475,000	porphyry copper
*Elizabethtown-Baldy	Colfax	471,400	Great Plains Margin, placer
*Old Placers	Santa Fe	450,000	Great Plains Margin, placer
+ Mogollon	Catron	365,000	volcanic-epithermal
*Hillsboro	Sierra	270,000	Laramide vein, placer
Lordsburg	Hidalgo	266,600	Laramide vein, minor placer
Willow Creek	San Miguel	179,000	Proterozoic massive sulfide, minor placer
White Oaks	Lincoln	163,500	Great Plains Margin, placer
+ Steeple Rock	Grant	151,000	volcanic-epithermal
*Pinos Altos	Grant	150,000	Laramide vein, carbonate-hosted, placer

Types of Gold Deposits in New Mexico

Types of Gold Deposits in New Mexico

- **Placer gold**
- **Volcanic-epithermal**
- Copper-silver (\pm uranium) vein
- **Great Plains Margin**
- Rio Grande Rift
- Carbonate-hosted lead-zinc (copper-silver) replacement
- Carbonate-hosted silver (manganese, lead) replacement
- Laramide copper and lead/zinc skarn
- Laramide vein
- Laramide porphyry-copper (molybdenum, gold)
- Sedimentary-copper
- Vein and replacement deposits in Proterozoic rocks
- Proterozoic massive-sulfide deposits

Placer Gold Deposits in New Mexico

Placer deposits

- Placer is from Spanish meaning alluvial sand
- Any natural accumulation or concentration of a material in unconsolidated sediments of a stream, beach, or residual deposit
- Four conditions must occur
 - Source terrain must crop out
 - Source must be weathered
 - Gold is eroded, transported and concentrated
 - Deposit must be preserved from erosion

Types of placer deposits

- Alluvial
 - the sands and gravels of streams, rivers, beaches and deltas
- Aeolian
 - windblown sand deposits and are relatively minor
- Eluvial (hill-slope) or residual
 - weathered detritus directly over or near the outcrops of the lode deposits

Alluvial deposits

- Hill-side placers on valley slopes that are partly sorted by running water but not in distinct channels
- Gulch or creek placers that are shallow placers in or adjacent to the beds of small streams
- Bench or terrace placers, consisting of old stream gravels partly removed by later streams that have cut into the original bedrock

Alluvial deposits--cont

- River-bar placers that occur in river bars and in gravel flats adjacent to larger streams of small gradient
- Gravel-plain placers formed in flood plains, deltas and alluvial fans
- Buried placers that have been buried by a later accumulation of sediments or by surface flows of igneous rock
- Beach placer deposits

Gold Placer Deposits in New Mexico

- Important source of gold in NM prior to 1902
- Placer production in NM after 1902 has been minor
- Most placer gold deposits discovered in NM by 1900
- ~662,000 oz of gold produced 1828 to 1991
- No recorded placer production since 1991

Major placer gold deposits in NM

- >100,000 oz gold
 - Elizabethtown/Baldy
 - Hillsboro
 - Old Placers
 - New Placers
- Generally occur in alluvial fan deposits, bench or terrace gravel deposits, river-bars, and stream deposits or as residual placers formed directly on top of lode deposits

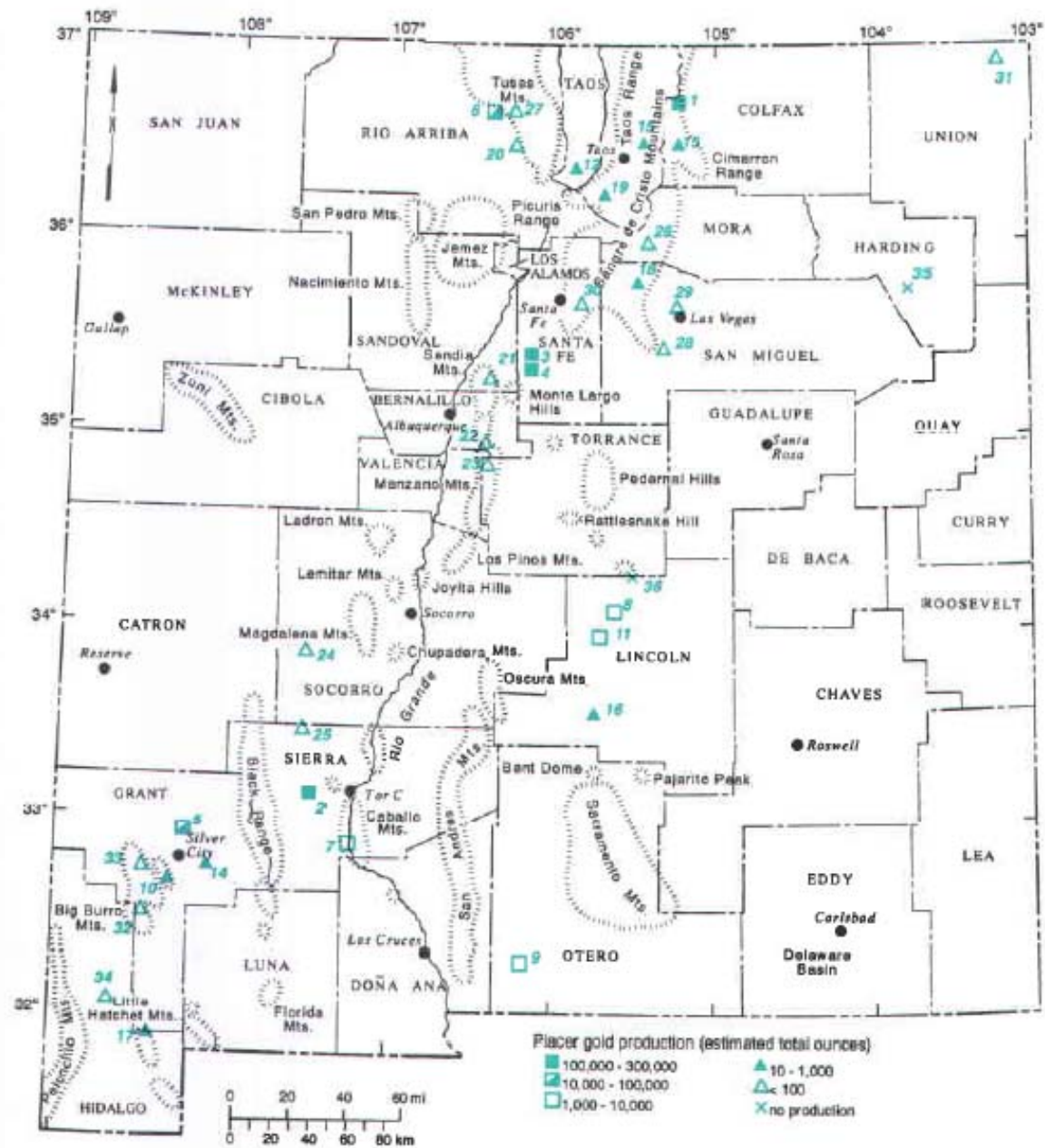


FIGURE 1—Placer gold deposits in New Mexico. Number refers to Table 1.

TABLE 1—Placer production from New Mexico (modified from Johnson, 1972; North and McLemore, 1988). Map Fig. 1.

Map no.	District	County	Year of discovery	Estimated prior to 1902 (oz)	Recorded 1902–1991 (oz)	Total estimated placer production (oz)	Total estimated lode production (oz)
1	Elizabethtown-Baldy	Colfax	1866	225,000	25,167	251,000	220,400
2	Hillsboro	Sierra	1877	104,000	15,559	120,000	45,000
3	Old Placers	Santa Fe	1828	100,000	1,558	>102,000	98,000
4	New Placers	Santa Fe	1839	96,759	3,011	>100,000	17,000
5	Pinos Altos	Grant	1860	38,842	5,995	50,000	100,000
6	Hopewell	Rio Arriba	1880	15,000	121	16,000	8,000
7	Pittsburg	Sierra	1901	none	7,089	8,000	0
8	Jicarilla	Lincoln	1850	4,500	3,020	8,000	8,000
9	Orogrande	Otero	1899	400	1,546	>2,000	14,500
10	White Signal and Malone	Grant	1884	some	366	1,700	12,000
11	White Oaks	Lincoln	1879	unknown	885	1,000	162,000
12	Rio Grande valley	Taos	1600	unknown	16	<1,000	0
13	Cimarroncito	Colfax	1898	some	none	<1,000	0
14	Bayard	Grant	1900	some	128	<1,000	24,000
15	Red River (Rio Hondo)	Taos	1826	unknown	120	<500	365
16	Nogal	Lincoln	1865	some	134	200	14,800
17	Sylvanite	Hidalgo	1908	none	109	<200	2,400
18	Willow Creek	San Miguel	1883	unknown	none	100	179,000
19	Picuris	Taos	1908	unknown	65	100	15
20	Rio Chama	Rio Arriba	1848	unknown	some	<100	0

TABLE 2—Location of placer gold deposits in New Mexico (from Johnson, 1972, and other references listed in Table 1) and age of adjacent lode gold deposits (from North and McLemore, 1986, 1988; McLemore, in press).

District	Approximate location of placer gold deposits		Approximate age of lode gold deposits
Elizabethtown-Baldy	T27N R16-18E	Moreno River valley, flanks of Baldy Mountain, Ute and Ponil Creeks	Oligocene-Miocene
Hillsboro	T15-16S R6-7W	Animas Hills, Dutch Gulch, Rio Percha	Laramide
Old Placers	T12-13N R7-8E	Ortiz Mountains, Cunningham Canyon, Dolores Gulch, Arroyo Viejo	Oligocene-Miocene
New Placers	T12N R2E	San Pedro Mountains, Tuerto Creek	Oligocene-Miocene
Pinos Altos	T16-17S R13-14W	Bear Creek, Rich Gulch, Whiskey Gulch, Santo Domingo Gulch, near Mountain Keg mine	Laramide
Hopewell	T28-29N R6-7E	Tusas Mountains, Placer Creek (Eureka Creek)	Proterozoic
Pittsburg	T14,16,17S R4W	Trujillo Gulch, Apache Canyon, Union Gulch, Palomas Gap	Proterozoic
Jicarilla	T5S R12E	Ancho, Warner, Spring, and Rico Gulches	Oligocene-Miocene
Orogrande	T22S R8E	Jarilla Mountains	Laramide
White Signal, Malone	T20S R16, 14W	Gold Gulch, Gold Lake	Laramide
White Oaks	T6S R11E	Baxter and White Oaks Gulches	Oligocene-Miocene
Rio Grande valley	—	Red River to Cabresto Creek	unknown
Cimarroncito	T26N R18E	Urraca Creek	Oligocene-Miocene
Bayard	T17-18S R12-13W	drainages near Bayard	Laramide
Red River	T28-29N R14-15E, T26-27N R13E	Bitter Creek, Comanche Creek, Placer Creek, Red River, Gold Hill, Lucero Creek, Arroyo Hondo	Precambrian, mid-Tertiary

Gold Panning





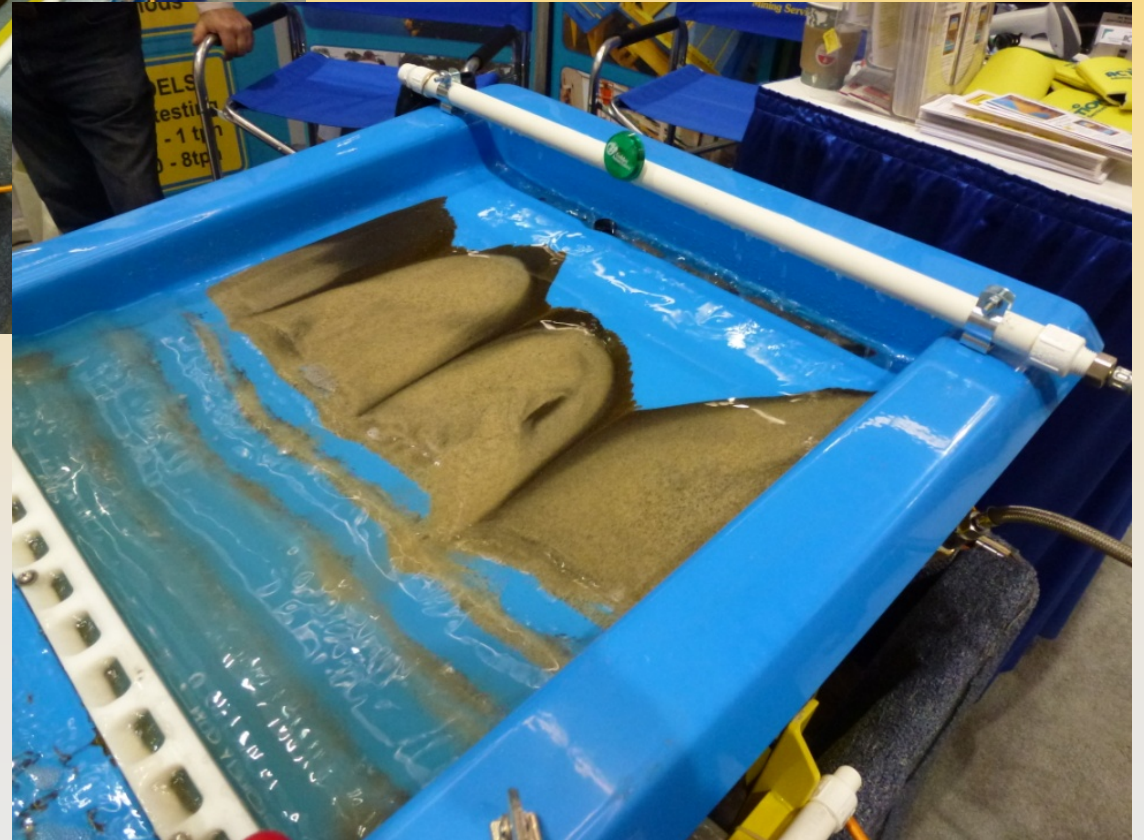
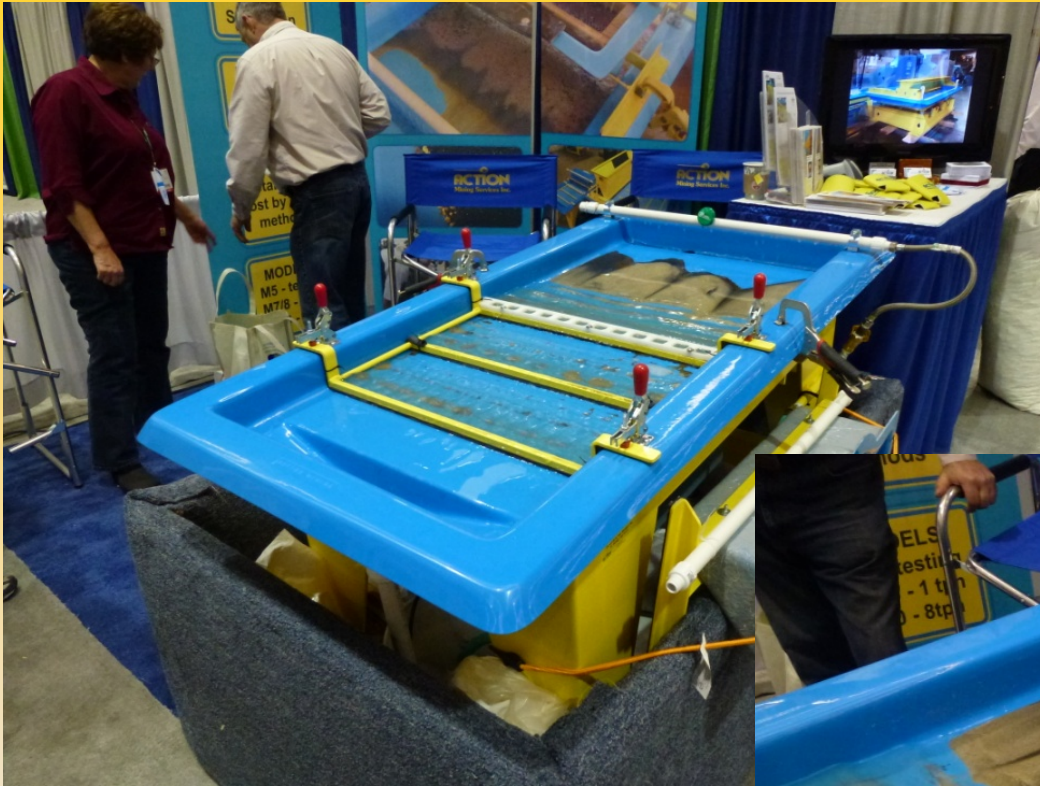






Sluice box

<http://en.wikipedia.org/wiki/File:Goldwaschrinne.jpg>



Shaking table

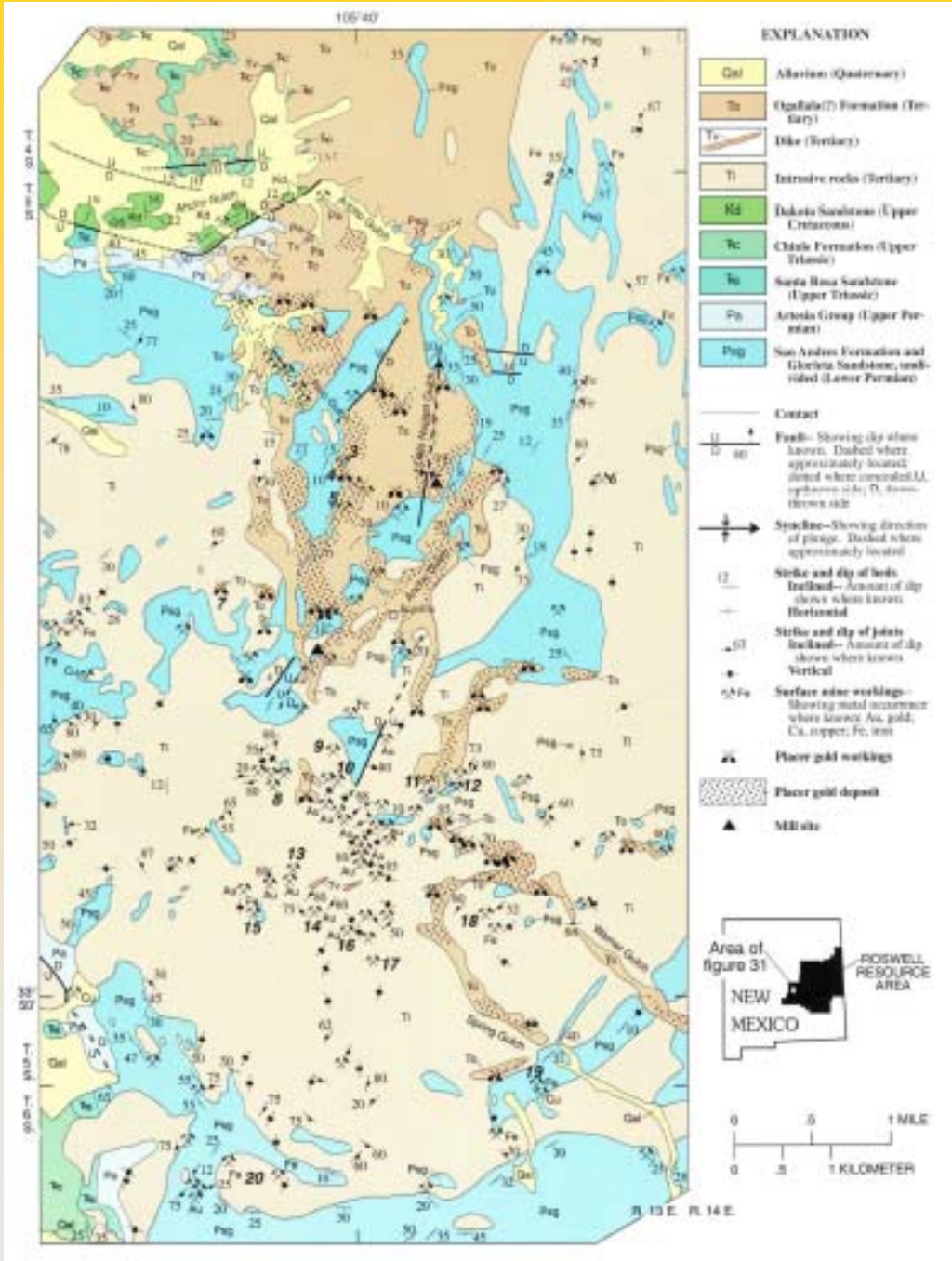
Jicarilla district

Production

- 800 oz placer Au
- 800 oz lode Au
- 38,000 oz Ag
- 4.2 mill lbs Cu
- 3000 lbs Pb
- 8000 tons Fe ore
- Possible Spanish production

Types of Deposits

- Placer
- Au-bearing quartz veins
- Fe skarn/replacement and vein deposits



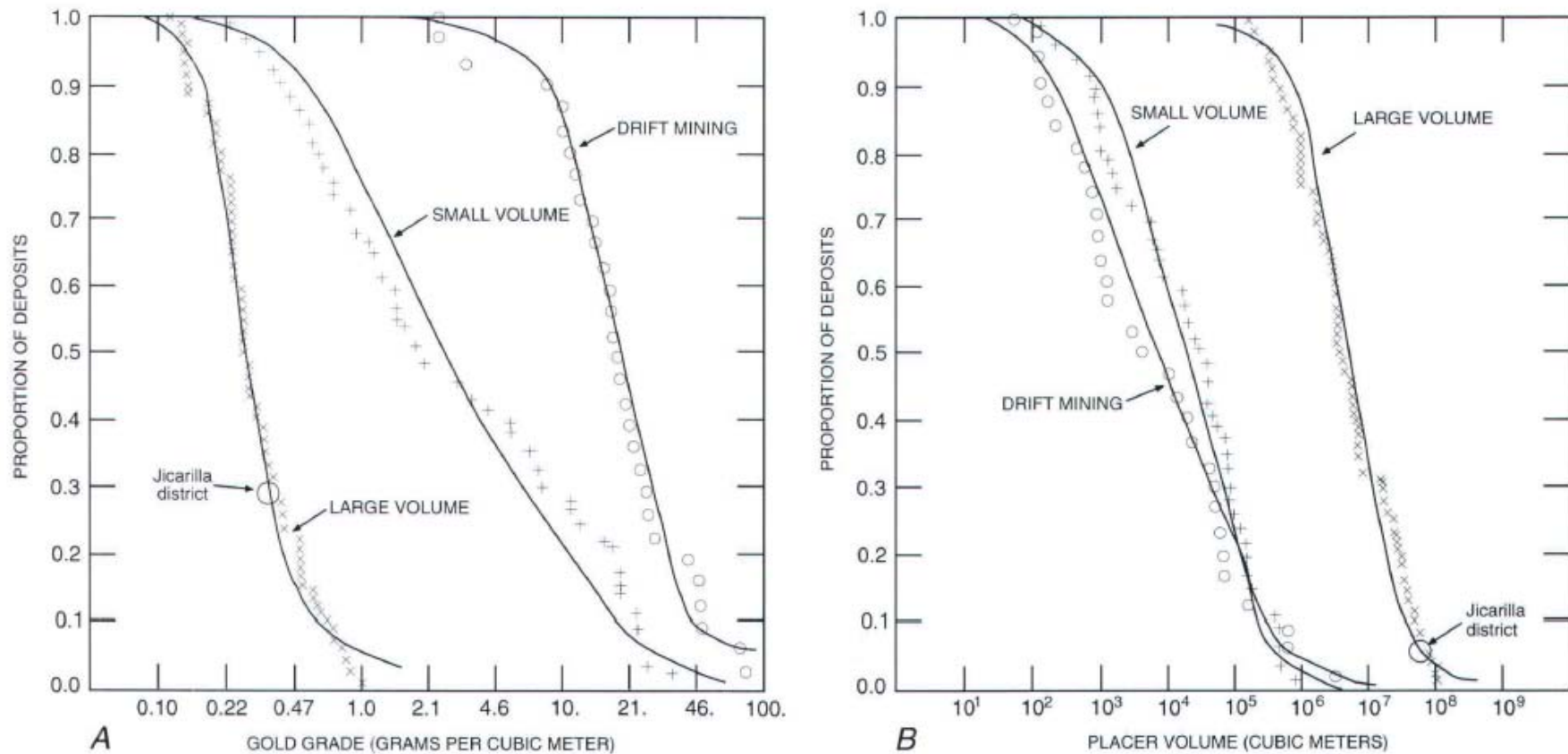


Figure 32. Estimates of *A*, gold grade and *B*, placer volume for placer gold deposits in the Jicarilla district, New Mexico, in comparison with grade and volume model for world-wide placer gold deposits (modified from Bliss and others, 1987). Plots labeled small volume, large volume, and drift mining represent world-wide placer gold deposits. [1 gram per cubic meter=0.026 ounce per cubic yard; 1 cubic meter=1.307 cubic yards.]

Volcanic-epithermal vein deposits

New Gold Mine

- Santa Fe Gold is developing the Summit mine in the Steeple Rock district and plans to begin production this year
- The ore will be milled at Lordsburg

Summit gold mine

In 2009, Santa Fe Gold opened the Summit mine in the Steeple Rock district

The ore is milled at Lordsburg







0 10 20 30 40 50 60 70 80 mm

Mineralium Deposita

SGA



0 10 20 30 40 50 60 70 80 mm



Mineralium Deposita
SGA
Society for Geology
Applied to Mineral Deposits

0 1 2 Inch

Breccia ore



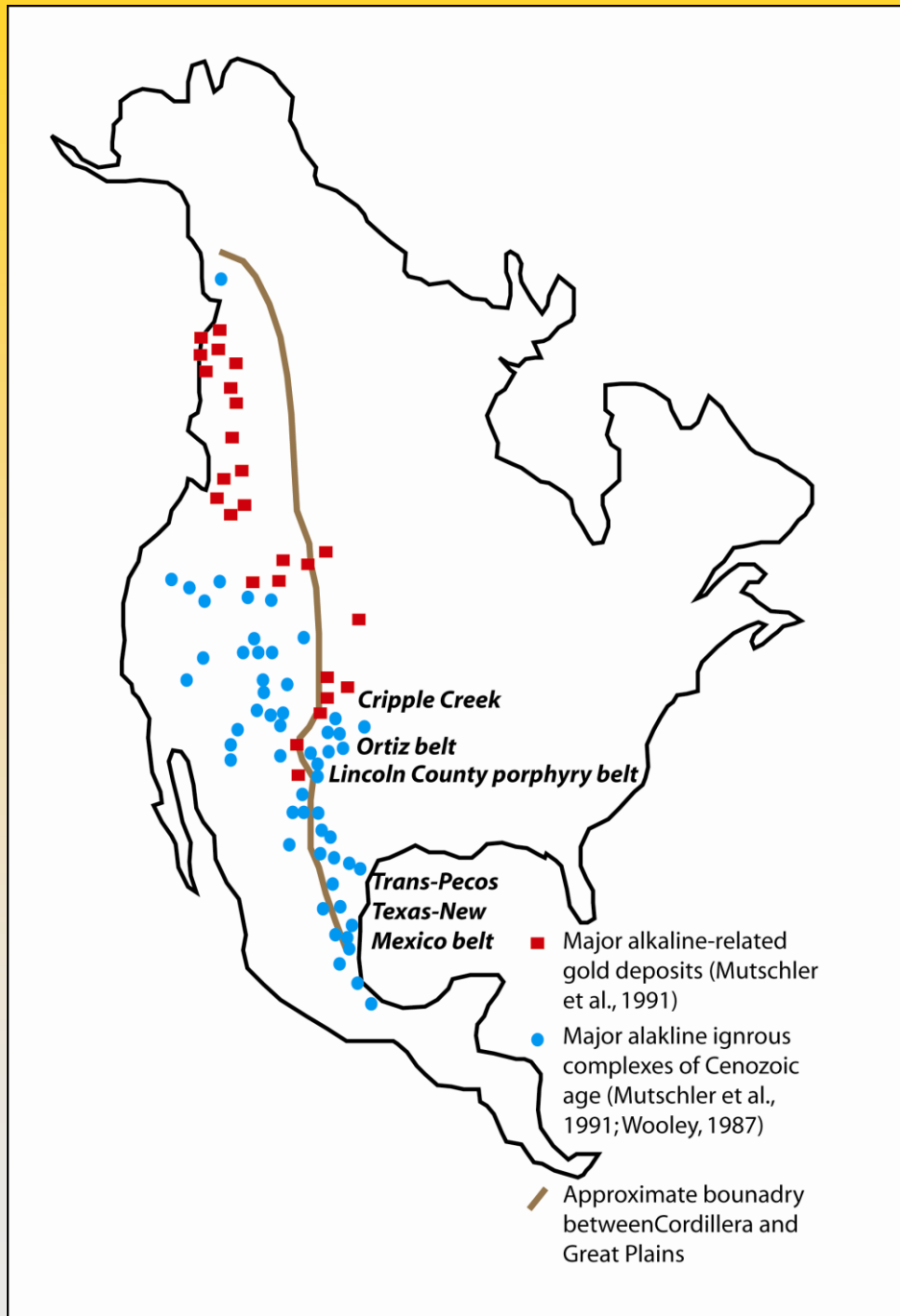
**GREAT PLAINS MARGIN (ALKALIC-
RELATED) GOLD DEPOSITS
or NORTH AMERICAN ALKALINE
GOLD BELT**

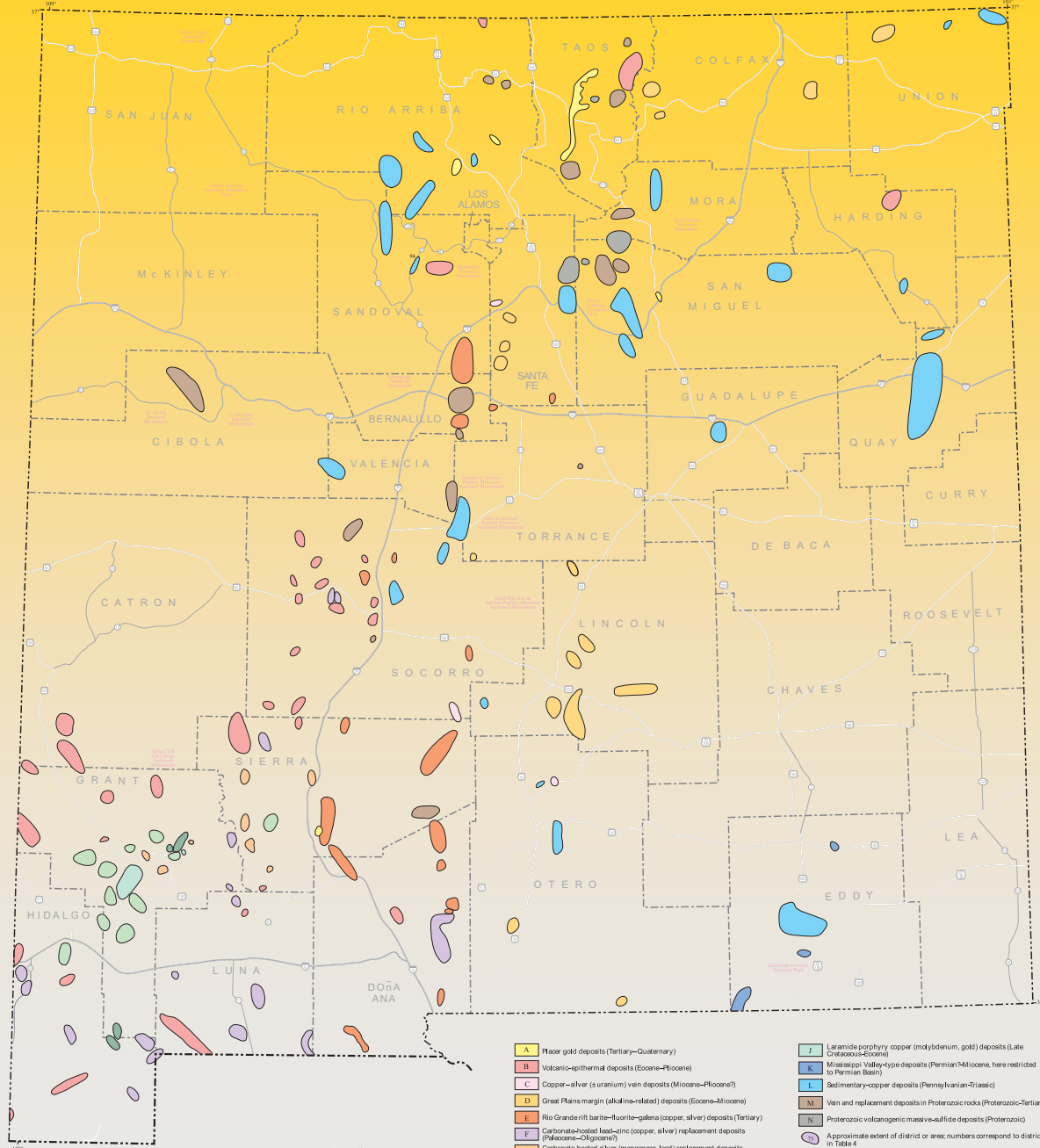
Great Plains Margin (Alkaline-related) Gold Deposits

- Part of a regional belt of similar deposits that extends northward into Canada and southward into Mexico
- Gold vein, skarn, breccia pipe, porphyry, placer that are associated with alkaline rocks
- Associated with Fe, Mo, F, W, U, Th, REE (rare earth elements), Nb

Alkaline igneous rocks

- High total alkalis ($\text{Na}_2\text{O} + \text{K}_2\text{O}\%$)





Gold districts in NM

- A** Placer gold deposits (Tertiary-Quaternary)
 - B** Volcanic-epithermal deposits (Eocene-Pliocene)
 - C** Copper-silver (± uranium) vein deposits (Miocene-Pliocene?)
 - D** Great Plains margin (alkaline-related) deposits (Eocene-Miocene)
 - E** Rio Grande rift barite-fluorite-galena (copper, silver) deposits (Tertiary)
 - F** Carbonate-hosted lead-zinc (copper, silver) replacement deposits (Palaeocene-Oligocene?)
 - G** Carbonate-hosted silver (manganese, lead) replacement deposits (Palaeocene-Oligocene?)
 - H** Laramide to mid-Tertiary lead-zinc and copper skarn deposits (Late Cretaceous-Eocene)
 - I** Polymetallic vein deposits (Late Cretaceous-Eocene)
 - J** Laramide porphyry copper (molybdenum, gold) deposits (Late Cretaceous-Eocene)
 - K** Mississippian Valley-type deposits (Permian-Miocene, here restricted to Permian Basin)
 - L** Sedimentary-copper deposits (Pennsylvanian-Triassic)
 - M** Vein and replacement deposits in Proterozoic rocks (Proterozoic-Tertiary)
 - N** Proterozoic volcanogenic massive-sulfide deposits (Proterozoic)
- Approximate extent of district or area; numbers correspond to districts in Table 4
- Caldera boundary; ages shown in millions of years (Ma). (New Mexico Geological Society, 1981; McIntosh & Bryan, 2000; McIntosh et al., 1991)
- National parks and monuments

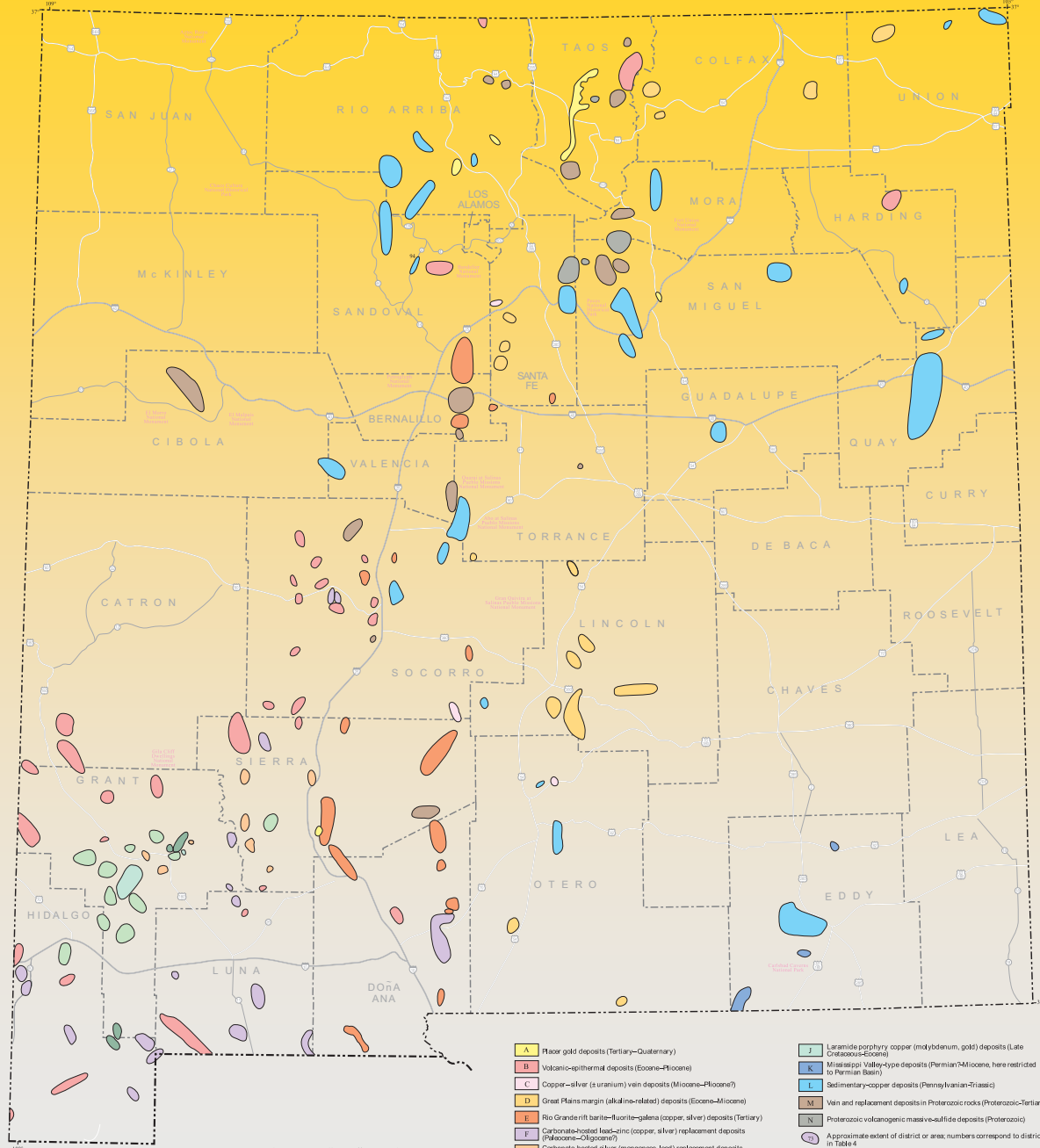


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Lordsburg	Hidalgo	266,600	Laramide vein, minor placer
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+ Steeple Rock	Grant	151,000	volcanic-epithermal
*Pinos Altos	Grant	150,000	Laramide vein, carbonate-hosted, placer

New Mexico Deposits

- Elizabethtown-Baldy district
 - 471,400 oz Au produced
- Old Placers district
 - 450,000 oz produced
- New Placers district
- Jicarilla district
- White Oakes district
- Nogal-Bonito district
- Orogrande district
 - 305,000 metric tons of ore grading 1.7 ppm Au
- Great Western deposit – 3.275 million metric tons of ore containing less than 2 ppm Au
- Vera Cruz deposit – 188,590 metric tons of ore grading 4.8 ppm Au
- Carache Canyon breccia deposit—4.5 million metric tons of ore grading 3.2 ppm Au
- Lukas Canyon—5.4 million metric tons of ore grading 1 ppm Au



Gold districts in NM

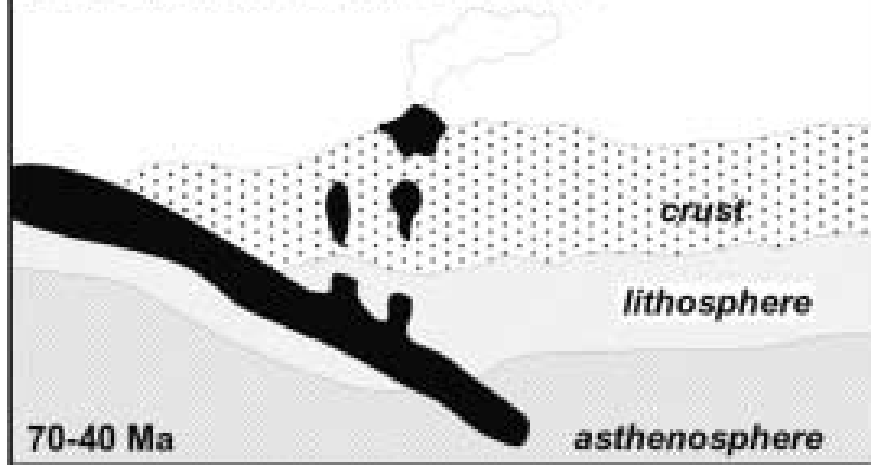
- A** Placer gold deposits (Tertiary-Quaternary)
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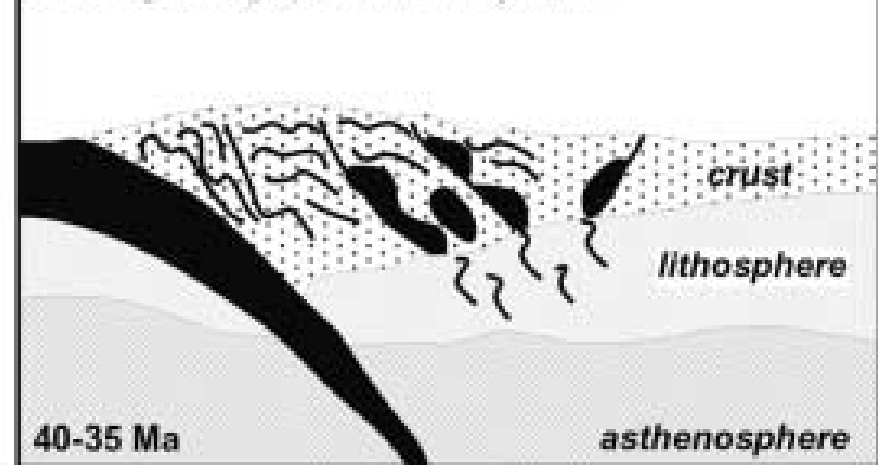
Types of deposits

- Polymetallic epithermal to mesothermal veins
- Gold-bearing breccia deposits and quartz veins
- Copper-gold and/or gold porphyries
- Iron skarns and replacements
- Copper, lead-zinc, and gold skarns or carbonate-hosted replacements,
- Gold placers
- Th-u-ree-fluorite epithermal veins and breccias

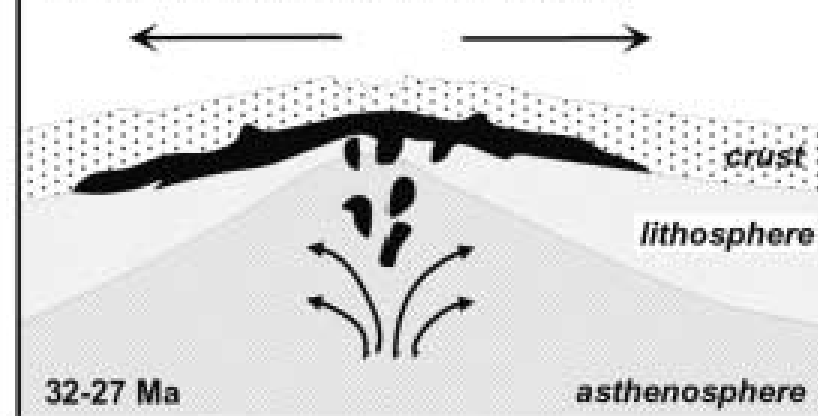
A. Arc plutonism and volcanism



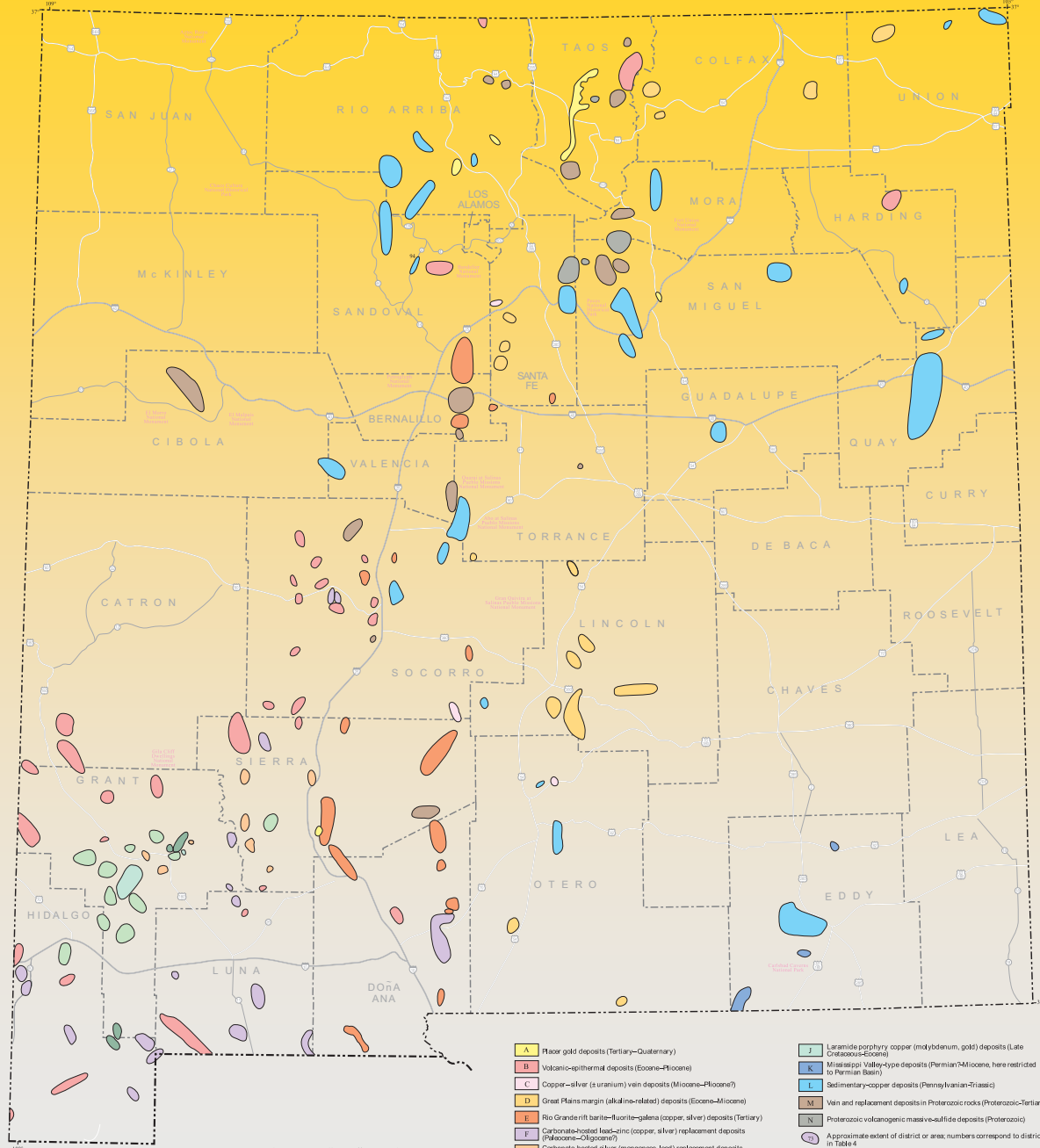
B. Steepening of subducting slab



C. Initiation of extension and rifting



White Oaks district



- A** Placer gold deposits (Tertiary-Quaternary)
 - B** Volcanic-epithermal deposits (Eocene-Pliocene)
 - C** Copper-silver (± uranium) vein deposits (Miocene-Pliocene?)
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Gold districts in NM







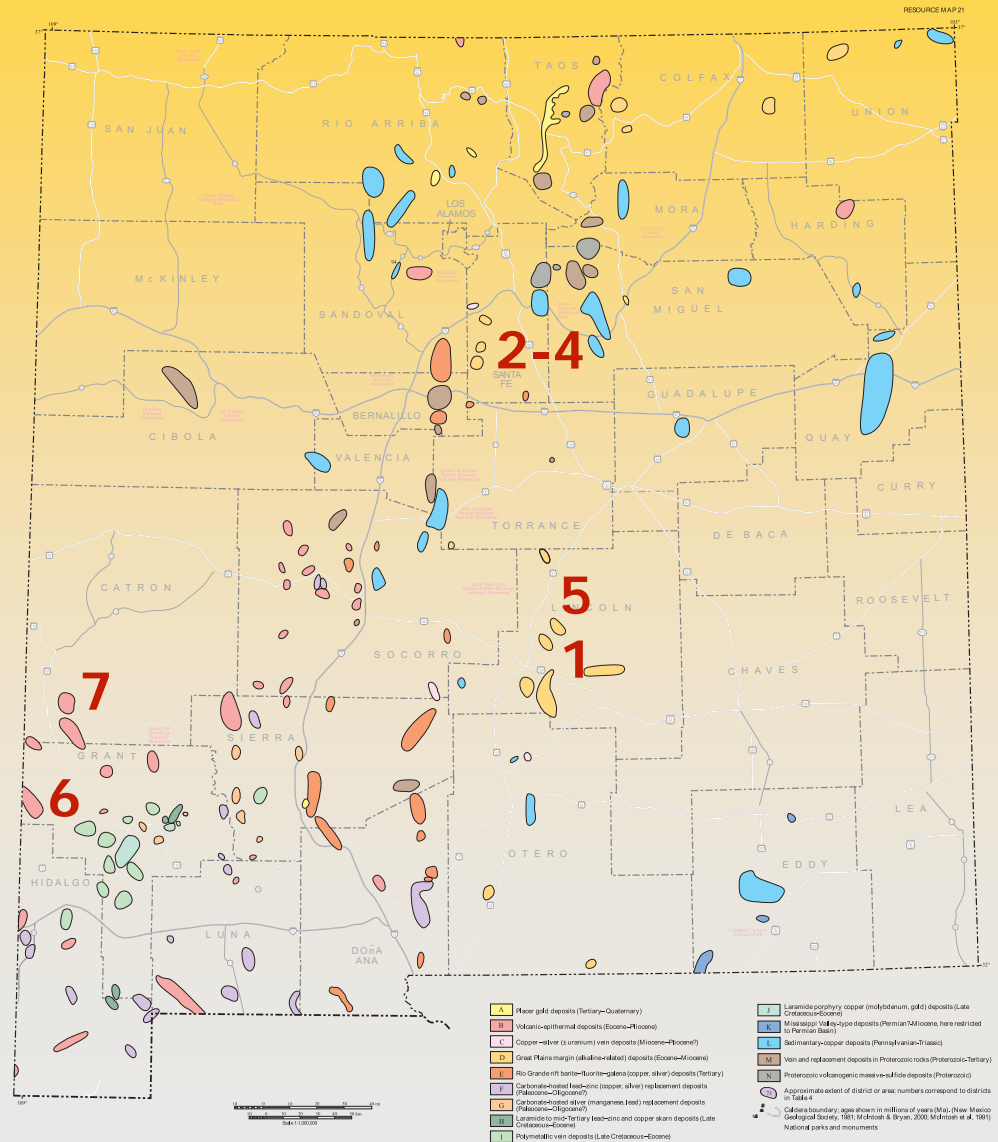


Potential for Gold in New Mexico

1. Vera Cruz, Lincoln Co

Gold and Silver

2. Carache Canyon, Santa Fe Co
3. Lukas Canyon, Santa Fe Co
4. San Lazarus, Santa Fe Co
5. Jicarilla Au placers
6. Steeple Rock district
7. Mogollon



New Discovery

- Entrée Gold Inc. completed drilling in the Lordsburg district and has announced the discovery of a copper porphyry deposit

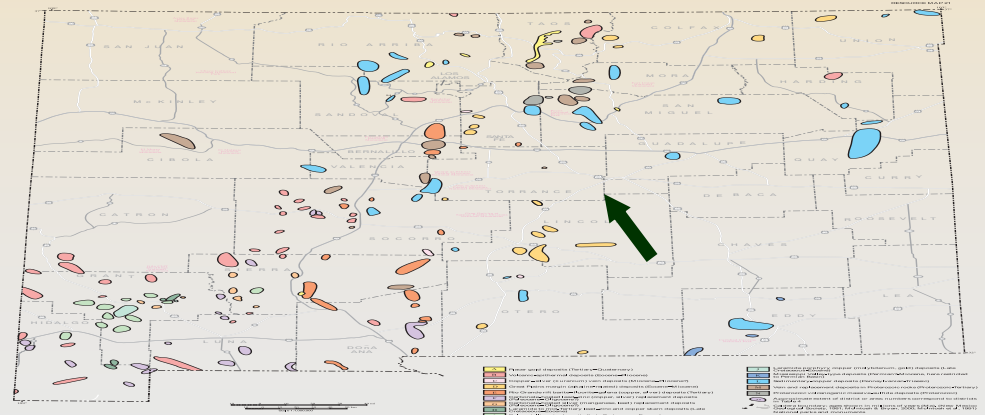
Table 1: Summary of mineralized intervals from 2008 drill program.

Hole ID	From (m)	To (m)	Interval (m)	Cu (%)	Au (g/t)
EG-L-08-002	156.0	466.0	310.0	0.14	0.08
Including	182.0	211.3	29.3	0.21	0.12
Including	240.0	254.0	14.0	0.33	0.26

<http://www.newswire.ca/en/releases/archive/January2009/15/c8081.html>

Iron ore from the Capitan Mts

- Produced 250,000 mill tons Fe ore 1963-1988
- El Capitan Precious Metals Corp. claims a resource of 141,000 tons ore of 0.041 opt Au
- Drilling permit approved by MMD 11/26/07, but rejected by the USFS requesting additional work



ACKNOWLEDGEMENTS

- New Mexico Energy, Minerals and Natural Resource Department
- Company annual reports
- Personal visits to mines
- Historical production statistics from US Bureau of Mines, US Geological Survey, NM Energy, Minerals and Natural Resource Department (NM MMD), company annual reports

VISIT OUR WEB PAGE

<http://geoinfo.nmt.edu/>

The screenshot shows a Netscape browser window displaying the NMBGMR Home Page. The browser's address bar shows the URL <http://geoinfo.nmt.edu/>. The page features a navigation menu on the left with items such as Staff, Research, Laboratories, Publications, Maps, Data Archive, Natural Resources, Environment, Geologic Tour, Education, Museum, and Search. The main content area includes the New Mexico Bureau of Geology & Mineral Resources logo, a banner image of a desert landscape, and the text: "The New Mexico Bureau of Geology & Mineral Resources A Division of New Mexico Tech". Below this, there is a navigation bar with links for General Information, Meetings & Upcoming Events, New & Cool, and Links. The central text reads: "A non-regulatory research and public service agency that serves as the geological survey for the State of New Mexico". A colorful geological map is displayed below the text. At the bottom of the main content area, there is a "contact us" link and a search box labeled "Search Geoinfo". The browser's status bar at the bottom shows "Document: Done" and the system tray includes the Start button, taskbar, and system clock showing 11:04 AM.

More Information

- Mines and Minerals Division

<http://www.emnrd.state.nm.us/MMD/index.htm>

- Virginia McLemore web page

<http://geoinfo.nmt.edu/staff/mclemore/home.html>

- New Mexico Bureau of Geology and Mineral Resources

<http://geoinfo.nmt.edu/>