The Geology and Mining History of Mining Districts in Grant County, New Mexico

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ACKNOWLEDGEMENTS

- New Mexico Energy, Minerals and Natural Resource Department
- Company annual reports
- Personal visits to mines
- Students at NM Tech
- New Mexico Mining Association
Outline

• Importance of minerals
• Copper in Grant County
• Gold in Grant County
• Summary
Historic photos are from the NMBGMR photo archive

Recent photos by myself
Silver City

• Silver City is the only New Mexico community still operating under its original territorial charter
• Historic document signed February 17, 1878
• Silver City was founded about 1870, shortly after silver was discovered at Chloride Flat by Captain John M. Bullard
• This area has a rich mining, ranching history as well as prehistoric cultures
• Ultimately became the center of commerce for the area
IMPORTANCE OF MINERALS

- NM has some of the oldest mining areas in the United States
- Native Americans mined turquoise from Cerrillos Hills, Tyrone and Santa Rita districts more than 500 yrs before the Spanish settled in the 1600s
- One of the earliest gold rushes in the West was in the Ortiz Mountains (Old Placers district) in 1828, 21 yrs before the California Gold Rush in 1849

One of the turquoise mines in the Cerrillos Hills district
Importance of minerals

- Mining of minerals began with prehistoric man who wanted to improve their way of life.
- Ancient cultures often settled time after time around areas that provided raw materials.
- 300,000-100,000 years ago mining of flint in N France and S England.
- Throughout history, wars were fought over natural resources.
Important Cultural Eras

- Stone Age (prior to 4000 B.C.)
- Bronze Age (4000 to 5000 B.C.)
- Iron Age (1500 B.C. to 1780 C.E.)
- Steel Age (1780 to 1945)
- Nuclear Age (1945 to the present)
Native Americans depended upon minerals for their survival

- Obsidian and chert used for projectile points and cutting tools
- Clay for pottery
- Adobe and stone for construction of their homes
- Turquoise, native copper, gold, and other metals/gems for decoration and trade
- Hematite, malachite, other natural pigments used for decoration, paint, glazes
- Raw materials for pottery glazes
- Salt for preservatives, processing of silver, taste
Every American Born Will Need...

27,365 lbs. Salt
11,655 lbs. Clays
15,107 lbs. Phosphate
6.97 million cu. ft. Natural Gas
72,381 gallons Petroleum
51,720 lbs. Cement
968 lbs. Copper
23,011 lbs. Iron Ore
419 lbs. Zinc
3,656 lbs. Bauxite (Aluminum)
1.88 Troy oz. Gold
1.42 million lbs. Stone, Sand, & Gravel
828 lbs. Lead
355,951 lbs. Coal
plus 48,856 lbs. Other Minerals & Metals

3.188 million pounds of minerals, metals, and fuels in their lifetime

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TURQUOISE

- $\text{Cu Al}_6 (\text{PO}_4)_4 (\text{OH})_8 \cdot 4\text{H}_2\text{O}$
- believed to bring good fortune, success, and health, protect from danger
- thought by some to cure disease
- most turquoise is found near copper deposits in arid or semi-arid environments, typically near the surface
- name means Turkish stone, trade routes went through Turkey
Chaco Canyon, northern New Mexico

- turquoise was in use by about 750 A.D.
- excavations of features dating from 900 to 1150, have uncovered more than 100,000 pieces of turquoise
- at Pueblo Bonito more than 65,000 artifacts, fragments, and unworked pieces of turquoise were found
- no known prehistoric mines are in this area; all that turquoise was imported

https://en.wikipedia.org/wiki/Chaco_Culture_National_Historical_Park
LOCALITIES

- Burro Mountains, New Mexico
- Santa Rita, New Mexico
- Cerrillos mining district, New Mexico
- Kingman, Arizona
- Morenci, Arizona
- Conejos, Colorado
Geology and Mining History in Grant County
Mining districts in New Mexico
Mining districts in Grant County
Copper in Grant County, New Mexico
New Mexico is at the edge of one of the world’s greatest metal-bearing provinces.
## Copper in New Mexico

http://geoinfo.nmt.edu/publications/periodicals/nmg/18/n2/nmg_v18_n2_p25.pdf

<table>
<thead>
<tr>
<th>District</th>
<th>County</th>
<th>Estimated copper production (lbs)</th>
<th>Type(s) of deposit</th>
<th>Major commodities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Santa Rita (Chino)</td>
<td>Grant</td>
<td>9,080,000,000</td>
<td>Porphyry copper</td>
<td>Cu (Ag, Au, Mo)</td>
</tr>
<tr>
<td>2. Burro Mountains (Tyrone)</td>
<td>Grant</td>
<td>5,240,000,000</td>
<td>Porphyry copper, Laramide vein</td>
<td>Cu (Ag, Au)</td>
</tr>
<tr>
<td>3. Fierro–Hanover</td>
<td>Grant</td>
<td>1,250,000,000</td>
<td>Laramide skarn, porphyry copper</td>
<td>Cu, Zn, Pb</td>
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<tr>
<td>4. Lordsburg</td>
<td>Hidalgo</td>
<td>229,577,000</td>
<td>Laramide vein</td>
<td>Cu, Au, Ag, Pb, Zn</td>
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<tr>
<td>5. Bayard</td>
<td>Grant</td>
<td>110,000,000</td>
<td>Laramide vein</td>
<td>Zn, Cu, Ag, Pb</td>
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<tr>
<td>6. Pinos Altos</td>
<td>Grant</td>
<td>59,500,000</td>
<td>Laramide vein</td>
<td>Cu, Zn, Pb, Ag (Au)</td>
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<tr>
<td>7. Willow Creek</td>
<td>San Miguel</td>
<td>18,687,426</td>
<td>Volcanogenic massive sulfide</td>
<td>Zn, Pb, Cu, Ag</td>
</tr>
<tr>
<td>8. Hillsboro</td>
<td>Sierra</td>
<td>17,000,000</td>
<td>Laramide vein, porphyry copper</td>
<td>Cu, Au (Ag, Pb)</td>
</tr>
<tr>
<td>9. New Placers</td>
<td>Santa Fe</td>
<td>17,000,000</td>
<td>Great Plains margin</td>
<td>Cu, Au, Ag (Pb, Zn)</td>
</tr>
<tr>
<td>10. Pastura</td>
<td>Guadalupe</td>
<td>13,378,214</td>
<td>Sedimentary copper</td>
<td>Cu (Ag, Pb)</td>
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<tr>
<td>11. Magdalena</td>
<td>Socorro</td>
<td>12,000,000</td>
<td>Carbonate-hosted Pb-Zn replacement</td>
<td>Zn, Pb, Cu (Ag)</td>
</tr>
<tr>
<td>12. Gallinas</td>
<td>Lincoln</td>
<td>8,000,000</td>
<td>Great Plains margin, sedimentary copper</td>
<td>Cu, Pb (Ag, Zn)</td>
</tr>
<tr>
<td>13. Nacimiento</td>
<td>Sandoval</td>
<td>7,561,567</td>
<td>Sedimentary copper</td>
<td>Cu (Ag)</td>
</tr>
<tr>
<td>14. Orogrande</td>
<td>Otero</td>
<td>5,700,000</td>
<td>Great Plains margin skarn</td>
<td>Au, Cu (Ag, Pb, Zn)</td>
</tr>
<tr>
<td>15. Organ Mountains</td>
<td>Doña Ana</td>
<td>4,636,000</td>
<td>Carbonate-hosted Pb-Zn replacement</td>
<td>Pb, Zn, Cu, Ag (Au)</td>
</tr>
<tr>
<td>16. Jicarilla</td>
<td>Lincoln</td>
<td>4,201,474</td>
<td>Great Plains margin</td>
<td>Au, Ag, Cu</td>
</tr>
<tr>
<td>17. Chloride</td>
<td>Sierra</td>
<td>3,060,000</td>
<td>Volcanic epithermal</td>
<td>Ag, Pb (Au, Cu)</td>
</tr>
<tr>
<td>18. Mogollon</td>
<td>Catron</td>
<td>1,500,000</td>
<td>Volcanic epithermal</td>
<td>Ag, Au, Pb, Cu</td>
</tr>
<tr>
<td>19. Apache No. 2</td>
<td>Hidalgo</td>
<td>1,300,000</td>
<td>Carbonate-hosted Pb-Zn replacement</td>
<td>Ag (Pb, Zn, Cu)</td>
</tr>
<tr>
<td>20. Steeple Rock</td>
<td>Grant</td>
<td>1,200,000</td>
<td>Volcanic epithermal</td>
<td>Ag, Au, Pb, Zn, Cu</td>
</tr>
</tbody>
</table>

Estimated total copper production in New Mexico: 16,720,000,000 lbs

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TABLE 2—Major copper districts in New Mexico (compiled by V. T. McLemore from U.S. Geological Survey, 1902–1927; U.S. Bureau of Mines, 1927–1994; and various published and unpublished sources, including company annual reports). District number refers to Fig. 1.
Copper reserves—2016

• Chino
  – milling reserves are 135 million tons of 0.59% copper, 0.04 g/t gold and 0.01% molybdenum
  – leaching reserves are 91 million tons of 0.28% Cu

• Tyrone
  – leaching reserves are estimated as 6 million tons of ore grading 0.51% Cu
  – Expected to close 2019

• Cobre
  – leaching reserves are 13 million tons of 0.57% Cu

• Niagara deposit
  – contains 500 million tons of ore grading 0.29% Cu (leaching)
Production & Resource Figures from Major Copper Mines in New Mexico
>11.5 million tons, $20.6 billion, 1804-2014
HISTORY

- Native Americans
- 1798 Col. Manuel Carrasco began mining
  - Est 6 mill lbs Cu per yr 1804-1809
- 1881 stamp mill and minor production
- 1904 John M. Sully arrived and began exploration and development
- 1910 production from the open pit began
- 2003 In 2003, Phelps Dodge became the sole owner
- 2007 Chino Mines joined Freeport-McMoRan

Apache Indian discloses the location of the Santa Rita del Cobre to Col. Carrasco, a Spanish Military officer in ca 1804
Magmatic processes

• The Chino and Tyrone deposits are copper porphyry (molybdenum, gold) deposits, which are large, low-grade (<0.8% Cu) deposits that contain disseminated and stockwork veinlets of copper and molybdenum sulfides associated with porphyritic intrusions

• 59-60 Ma ago
The sources for the variety of mineral phases and chemical elements found in porphyry copper deposits

- Primary phases formed in the magma chamber and preserved in the rock (feldspar, quartz, pyroxene, amphibole, magnetite, apatite, etc.)
- Primary ore minerals formed during the main mineralization phase (chalcopyrite, pyrite, etc.)
Hydrothermal alteration

- *Hypogene alteration* occurred during the formation of the ore body by upwelling, hydrothermal fluids.
- *Supergene alteration* is the natural weathering, before mining, of the ore body, at low temperatures near the Earth’s surface.
Hydrothermal alteration

- **Hypogene alteration** occurred during the formation of the ore body by upwelling, hydrothermal fluids.
- **Supergene alteration** is the natural weathering, before mining, of the ore body, at low temperatures near the Earth’s surface.

![Diagram of hydrothermal processes (Fig. 1.6)](image-url)
The sources for the variety of mineral phases and chemical elements found in porphyry copper deposits

- Primary phases formed in the magma chamber and preserved in the rock (feldspar, quartz, pyroxene, amphibole, magnetite, apatite, etc.)
- Primary ore minerals formed during the main mineralization phase (chalcopyrite, pyrite)
- Minerals formed when the ore deposit was hydrothermally altered (chalcopyrite, feldspar, pyrite, clay minerals, quartz, epidote, apatite, rutile, Fe- and Mn-oxides, etc.)
  - Addition of new elements by the hydrothermal fluids at different times
  - Redistribution of primary phases
Summary

• Formation of a copper porphyry deposit is very complex and not as well understood as geologists would like
  – Magmatic processes
  – Hydrothermal processes
  – Supergene or weathering processes

• Stratigraphy and structure in this area is complex
  – Pre-porphyry rocks
  – Porphyry
  – Younger rocks
    • Kneeling Nun Rhyolite Tuff overlies the deposit
Production from Chino mine

More than 5.9 million tons Cu, 500,000 oz Au, and 5.36 million oz Ag plus some molybdenum and iron ore since 1911 worth >$2 billion
Copper reserves—2016

- **Chino**
  - milling reserves are 135 million tons of 0.59% copper, 0.04 g/t gold and 0.01% molybdenum
  - leaching reserves are 91 million tons of 0.28% Cu

- **Tyrone**
  - leaching reserves are estimated as 6 million tons of ore grading 0.51% Cu
  - Expected to close 2019

- **Cobre**
  - leaching reserves are 13 million tons of 0.57% Cu

- **Niagara deposit**
  - contains 500 million tons of ore grading 0.29% Cu (leaching)
Decreasing copper grade with time

- In 1912, the grade was over 2% copper
- In 1925, it was averaging 1.5%
- In 1948, the grade was less than 1%
- In 1980, the copper grade was 0.81%
- In 2006, the grade is 0.67%
- In 2016, the grade is 0.59%
Gold, Silver in Grant County, New Mexico
1804-2015 >3.3 million troy ounces Au worth >$487 million
1804-2015 >118.7 million troy ounces Ag worth >$279 million

FIGURE 2. Silver production in New Mexico from 1828 to 2014.
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.

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

- Placer gold—1.5 mi² in Bear Creek, Rich, Whisky, and Santo Domingo Gulches
  - General Pedro Almendaris about 1837
  - re-discovered in 1860 in Bear Creek by three prospectors; Birch, Snively, and Hicks
- By September 1860, several hundred men were working the area
- World War I, Piños Altos yielded a considerable tonnage of zinc ore
Arrastre in action with John and Jake Long at Piños Altos New Mexico, 1892
Placer Gold

- Gold that has been weathered from the host rock where it was formed and been re-deposited either on a hillside, stream bed, or alluvial fan – typically by the action of gravity and water
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
Piños Altos district

• Production from the entire district is estimated as
  o 59.5 million lbs Cu
  o 169,000 oz Au
  o 2.6 million oz Ag
  o 6 million lbs Pb
  o 64 million lbs Zn
  o worth more than $10.3 million

• Some iron ore was also produced.
Arrastre in action with John and Jake Long
at Piños Altos New Mexico, 1892
Using Trace Element Analysis of Placer Gold to Determine Source and type of original deposit
Backscattered Electron Imaging

Analysis began with backscattered electron (BSE) imaging using an electron microprobe to determine if chemical or weathering zonation was present in gold particles.
Quantitative Analysis

- Determine composition of different areas of a selected grain.

- Element selection
  - Ag, Au, Cu, As, Pb, Fe, S

- Analyses on:
  - Rims
  - Cores
  - Inclusions

<table>
<thead>
<tr>
<th>Point</th>
<th>Sample</th>
<th>Ag</th>
<th>Au</th>
<th>Cu</th>
<th>As</th>
<th>Pb</th>
<th>Fe</th>
<th>S</th>
<th>Total</th>
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<tbody>
<tr>
<td>01</td>
<td>DeadwoodGulch-01</td>
<td>24.55</td>
<td>72.77</td>
<td>0.02</td>
<td>0</td>
<td>0</td>
<td>0.01</td>
<td>0.02</td>
<td>97.38</td>
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<tr>
<td>02</td>
<td>DeadwoodGulch-02</td>
<td>0.87</td>
<td>96.34</td>
<td>0.06</td>
<td>0</td>
<td>0</td>
<td>0.01</td>
<td>0.03</td>
<td>97.31</td>
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<td>24.62</td>
<td>72.95</td>
<td>0.02</td>
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<td>97.6</td>
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<td>04</td>
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<td>1.32</td>
<td>95.48</td>
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<td>0.01</td>
<td>0</td>
<td>0</td>
<td>0.03</td>
<td>96.88</td>
</tr>
</tbody>
</table>
Piños Altos, NM

Suspected Au-rich Cu porphyry source with Pb-Zn and Cu skarns and polymetallic veins
New Mexico placer gold districts

- New Mexico’s placer gold didn’t travel far from source
- Chemical compositions of placer gold samples can be correlated with specific
Steeple Rock district (volcanic epithermal veins)
In 2009, Santa Fe Gold opened the Summit mine in the Steeple Rock district. The ore was milled at Lordsburg and sold as silica flux.
Relationship between alteration and vein deposits along the Carlisle fault (modified in part from Weaco drill data, McLemore, 1993, 2000).
Photograph and sketch of a handspecimen that shows the four stages of mineralization in epithermal veins. Breccia fragment is approximately 10 cm across.
Breccia ore
Clay
Clay

- Pottery
- Adobe bricks
- Tiles
- Fired bricks
- Smelting
- Other uses
  - treat minor ailments such as food poisoning, aches and pains, infections, and mineral deficiencies
  - cosmetics
Common clay that could be used for pottery in the Cañada Alamosa area, Socorro County. This consists of illite and smectite.
One of the pots made with the clay
Clay

- Pottery
- Adobe bricks
- Tiles
- Fired bricks
- Smelting
- Other uses
  - treat minor ailments such as food poisoning, aches and pains, infections, and mineral deficiencies
  - cosmetics
Clay pit at Pratt New Mexico, ca 1940's
Preparing fireclay in wet pan at Kennecott Copper Corporation's Hurley smelter in Hurley, New Mexico, August 22, 1949
Meerschaum

- Meerschaum or sepiolite
  - Mg₈(Si₁₂O₃₀) (OH)₄(OH₂)₄ • N H₂O
  - is a tough clay material
  - so lightweight that dry meerschaum (German word for sea foam) will float on water

- Used in pipes

- Sapillo Creek in the Alum Mountain district in 1875

- Estimated 2 million pounds of meerschaum was shipped from the Meerschaum mine (NMGR0223) and from the Dorsey mine (NMGR0665) along Bear Creek in the Piños Altos district (DIS062)

- Ceased shortly before World War I, but resumed in 1943 when approximately 1000 lbs was shipped for experimental purposes in an attempt to find improved materials for insulators in radios

Meerschaum at Diablo Mountain (Alum Mountain district), New Mexico, June 1, 1907
Ricolite (a form of banded serpentine) has been produced from the Ricolite district in Grant County for carving, decorative, and dimension stone.
Ricolite quarry in Grant County, New Mexico, 1946
Summary

• Minerals are needed to improve our way of life
• The formation of mineral deposits require specific geologic processes
• New Mexico, especially Grant County has significant mineral resources that have been exploited in the past, present, and future
In Grant County

• Some of the earliest mining in New Mexico with production of turquoise and native copper
• Many districts were discovered by Mexican explorers and rediscovered by Anglos after the area became part of the U.S.
• Mining in 1800s was by small companies or individuals with primitive processing techniques
• After the Civil War (1860s), mining increased with the settling of the west by Americans from the east coast and European immigrants and the Hispanic residents played an important role
• Mining continues today and into the near future
More Information

- NM Mines and Minerals Division
  http://www.emnrd.state.nm.us/MMD/index.html
- Virginia McLemore web page
  http://geoinfo.nmt.edu/staff/mclemore/home.html
- New Mexico Bureau of Geology and Mineral Resources
  http://geoinfo.nmt.edu/
RM-21—Silver and Gold in New Mexico, reprinted in 2010
Resource Map 24- Mining Districts and Prospect Areas in New Mexico
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.
VISIT OUR WEB PAGE
http://geoinfo.nmt.edu/
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/
QUESTIONS?