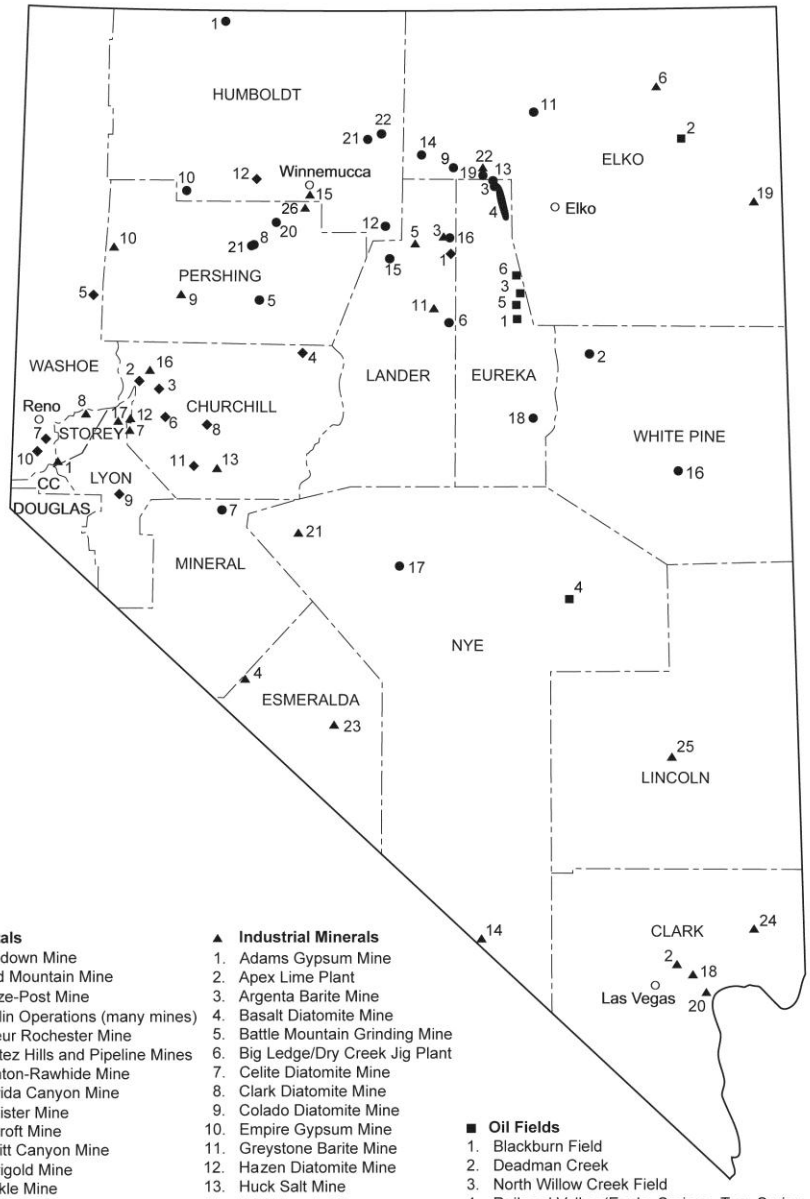
Nevada Bureau of Mines and Geology
Special Publication MI-2010

The Nevada Mineral Industry 2010

Contents

Mackay School of Earth Sciences and Engineering
College of Science
University of Nevada, Reno

2011



● Metals
1. Ashdown Mine
2. Bald Mountain Mine
3. Betze-Post Mine
4. Carlin Operations (many mines)
5. Coeur Rochester Mine
6. Cortez Hills and Pipeline Mines
7. Denton-Rawhide Mine
8. Florida Canyon Mine
9. Hollister Mine
10. Hycroft Mine
11. Jerritt Canyon Mine
12. Marigold Mine
13. Meikle Mine
14. Midas Mine
15. Phoenix Project
16. Robinson Mine
17. Smoky Valley Common Ops.
18. Ruby Hill Mine
19. Storm Mine
20. Sunrise Gold Placer Mine
21. Turquoise Ridge Joint Venture
22. Twin Creeks Mine

▲ Industrial Minerals
1. Adams Gypsum Mine
2. Apex Lime Plant
3. Argenta Barite Mine
4. Basalt Diatomite Mine
5. Battle Mountain Grinding Mine
6. Big Ledge/Dry Creek Jig Plant
7. Celite Diatomite Mine
8. Clark Diatomite Mine
9. Colado Diatomite Mine
10. Empire Gypsum Mine
11. Greystone Barite Mine
12. Hazen Diatomite Mine
13. Huck Salt Mine
14. IMV Nevada Clay
15. MIN-AD Dolomite Mine
16. Moltan Diatomite Mine
17. NCC Limestone Quarry
18. PABCO Gypsum
19. Pilot Peak Limestone Quarry
20. Pioneer Gypsum Mine
21. Premier Magnesite Mine
22. Rossi Barite Mine/Dunphy Mill
23. Silver Peak Lithium Carbonate
24. Simplot Silica Products
25. Tenacity Perlite Mine
26. W.Glen Sexton Dolomite Mine

■ Oil Fields
1. Blackburn Field
2. Deadman Creek
3. North Willow Creek Field
4. Railroad Valley (Eagle Springs, Trap Spring, Currant, Sand Dune, Grant Canyon, Bacon Flat, Kate Spring, Duckwater Creek, Sans Spring, and Ghost Ranch Fields)
5. Three Bar Field
6. Tomera Ranch Field

◆ Geothermal Power Plants
1. Beowawe
2. Bradys Hot Springs
3. Desert Peak 1 and 2
4. Dixie Valley
5. Empire
6. Soda Lake 1 and 2
7. Steamboat I, IA, II, and III, Galena
8. Stillwater 1 and 2
9. Wabuska
10. Steamboat Hills
11. Salt Wells
12. Blue Mountain

Major mines, oil fields, and geothermal plants, 2010.

Overview

by Jonathan G. Price

This report highlights activities through 2010 in metals, industrial minerals, geothermal energy, and petroleum. Numerous graphs and charts are incorporated for rapid inspection of trends in production and price. The value of overall mineral and energy production in Nevada increased to an all-time high of $7.72 billion, up substantially from the previous high of $6.26 billion in 2008. Gold production experienced an increase to 5.3 million ounces in 2010, after more or less steadily decreasing from a high of 8.86 million ounces in 1998 to 5.0 million ounces in 2009. 2010 was the 22nd consecutive year with production in excess of 5.0 million ounces. Nevada led the nation in the production of gold, barite, and gypsum, and was the only state that produced magnesite, lithium, and the specialty clays, sepiolite and saponite. Other commodities mined and produced in Nevada in 2010, more or less in order of value, included copper, construction aggregate (sand, gravel, and crushed stone, including limestone and dolomite), silver, geothermal energy, petroleum, lime (produced from limestone and dolomite), cement (produced from limestone, clay, gypsum, and iron ore), silica (industrial sand), diatomite, clays, molybdenum, perlite, iron ore, dimension stone, salt, semiprecious gemstones (turquoise and opal), and mercury (as a byproduct of gold and silver processing). Locations of many of the sites mentioned in the text of this report are shown on NBMG map E-49, *Nevada Active Mines and Energy Producers,* which is available at www.nbmg.unr.edu/dox/e49.pdf.

As was the case in 2009, Nevada ranked first in the United States in terms of value of overall nonfuel (excluding oil, gas, coal, uranium, and geothermal) mineral production in 2010 (according to the U.S. Geological Survey, Mineral Commodity Summaries 2011, http://minerals.usgs.gov/minerals/pubs/mcs/2011/mcs2011.pdf). Arizona, the country's major copper producer, retained second place. Utah, a major producer of copper and molybdenum, primarily from one mine near Salt Lake City, was third. Minnesota, the leading iron producer in the U.S., was fourth. Alaska, a significant producer of zinc, silver, and gold, was fifth. California, with its large population and commensurate demands for construction raw materials, dropped to sixth, because of the downturn in the housing market. Texas, another populous state and major producer of construction raw materials, was seventh.

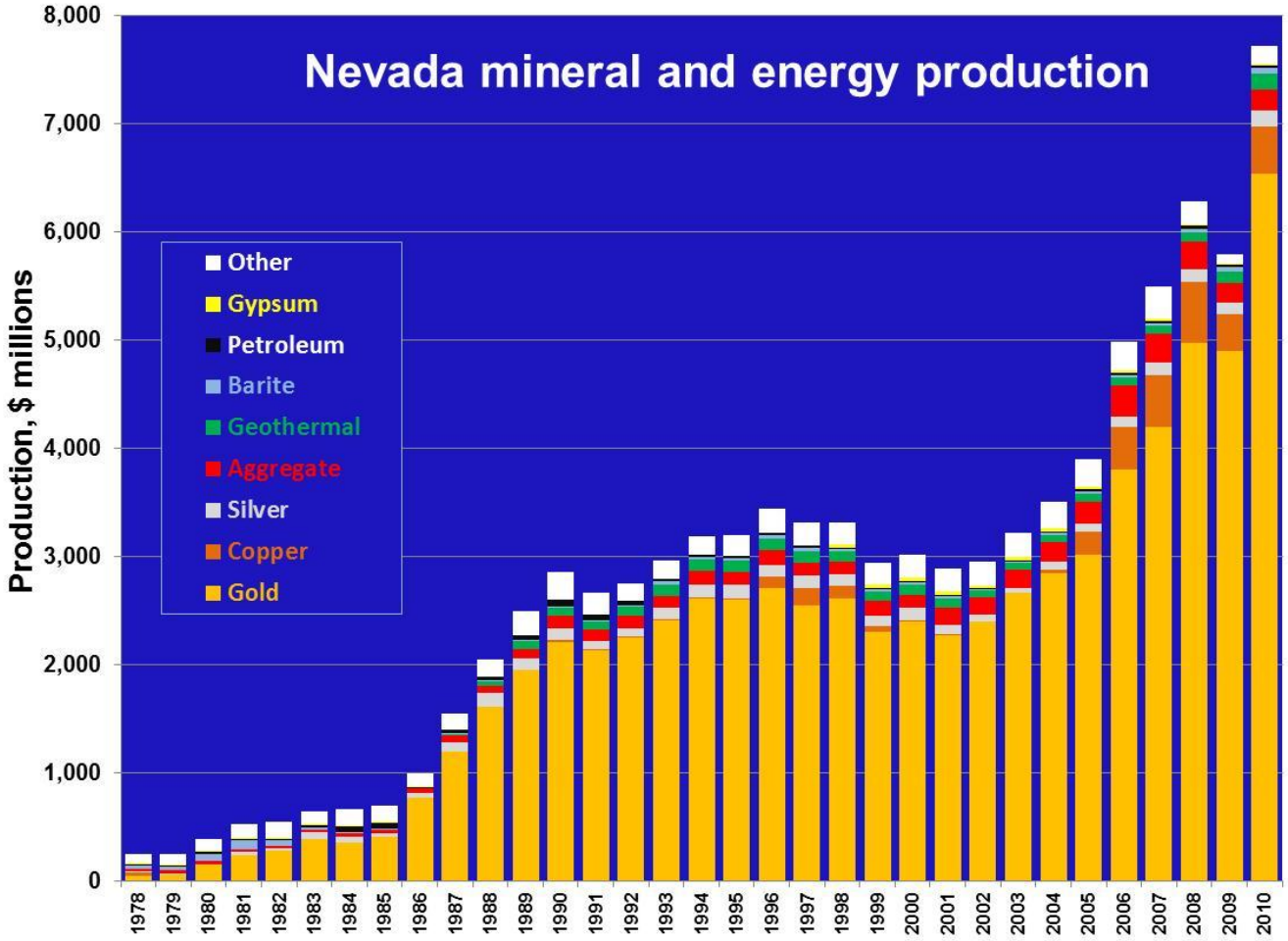
Nevada's production of gold, valued at $6.5 billion, was 73% of the U.S. total and helped make the U.S. the third leading gold producer in the world in 2010. Nevada alone accounted for 7% of world production of gold. China, Australia, South Africa, Russia, and Peru each produced more gold than the state of Nevada in 2010. Second to gold in terms of Nevada's mineral value in 2010 was copper ($438 million), followed by construction aggregate ($193 million). Silver, chiefly a byproduct or co-product of gold production, ranked as the fourth leading mineral commodity in 2010, with a value of $149 million. Electrical power from geothermal energy production in Nevada in 2010 was valued at $145 million; its 31% increase in value resulted from an increase in production (23%) and price.

MINERAL, GEOTHERMAL POWER, AND PETROLEUM PRODUCTION IN NEVADA[1]

Commodity	2009 (revised) Quantity	2009 (revised) Value (millions)	2010 Quantity	2010 Value (millions)	% change from 2009 to 2010 Quantity	% change from 2009 to 2010 Value
Gold (thousand troy ounces)	5,033	$4,893.7	5,339	$6,537.2	6.1	33.6
Silver (thousand troy ounces)	7,310	107.3	7,361	148.6	0.7	38.5
Copper (thousand pounds)	145,733	345.4	127,976	437.7	-12.2	26.7
Aggregate (thousand short tons)	27,760	175.4	26,800	190.8	-3.8	-0.1
Barite (thousand short tons)	476	38.8	657	49.3	38.1	27.1
Gypsum (thousand short tons)	983	12.1	851	11.7	-13.4	-3.0
Geothermal energy (thousand megawatt-hours)	1,669	110.8	2,060	145.3	23.4	31.1
Petroleum (thousand 42-gallon barrels)	455	21.8	427	26.7	-6.2	22.3
Other minerals[2]	-----	86.9	-----	169.5	-----	95.0
Total	-----	$5,792.2	-----	$7,716.8	-----	32.9

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers); compiled by the Nevada Division of Minerals and the Nevada Bureau of Mines and Geology. Products milled or processed in Nevada but mined from deposits in California are excluded. Specifically, zeolite from the Ash Meadows plant in Nye County is not included in these totals.

[2]Building stone, cement, clay, diatomite, lime, lithium, magnesite, mercury, molybdenum, iron ore, perlite, salt, and silica sand.



The contributions that mining makes to the economies of Nevada and the U.S. are significant in terms of jobs, commerce, taxes, improvements to the infrastructure, and lowering of the U.S. trade deficit. According to the U.S. Geological Survey, in 2010 the U.S. was a net importer of gold, most of which is sold on the international market for bullion, jewelry, and arts, and some of which is sold for its conductive and non-corrosive qualities in computers and other electronics, for its heat-reflecting quality as a coating on windows, and for use in dental work.

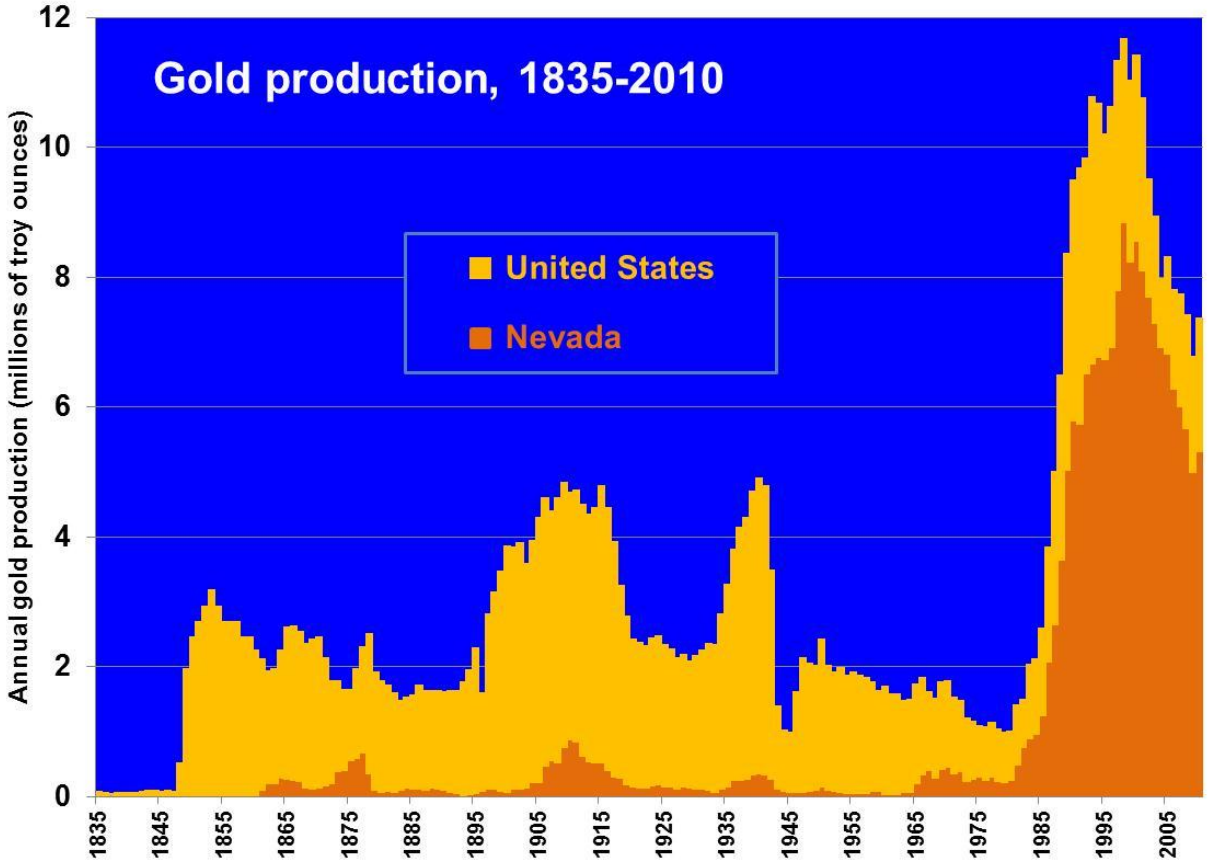
Through a survey conducted early in 2011, the Nevada Division of Minerals (NDOM) collected data for Nevada Bureau of Mines and Geology Special Publication P-22, *Major Mines of Nevada 2010*. This publication includes, in handbook form, location maps, names and telephone numbers of operators, numbers of employees, and nonproprietary production figures for most mines in Nevada. It also contains a section on economic impacts of the industry. The full contents are available free of charge on the World Wide Web (www.nbmg.unr.edu), as are the contents of this report. The data from the NDOM survey are used in this publication and, along with information from other sources, are used to update, revise, and check preliminary statistics collected and released by the U.S. Geological Survey.

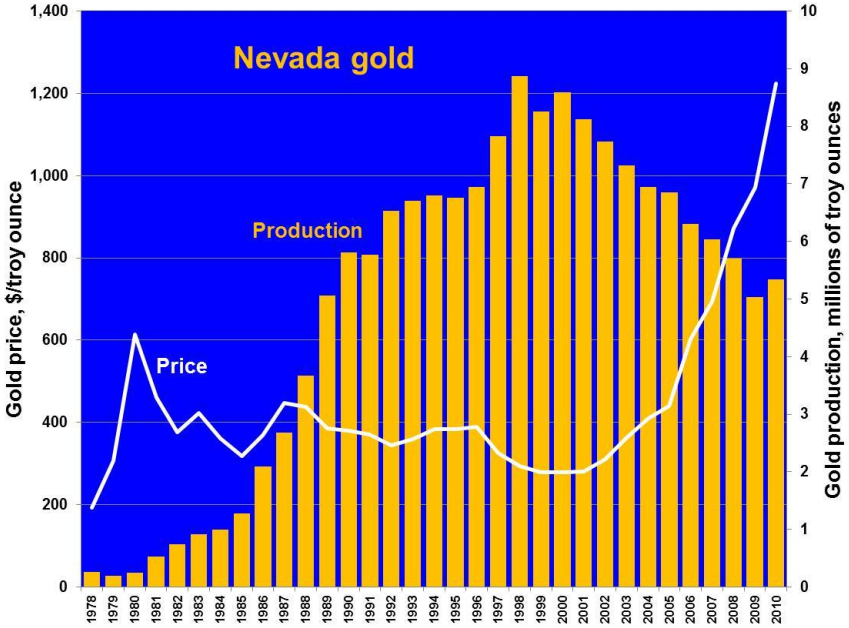
The section on **Metals** and the tables of **Major Precious-Metal Deposits** and **Other Metallic Deposits** provide details on new deposit discoveries, new mine openings, mine closures, additions to reserves, and mine expansions. As has been the case in recent years, gold continues to be the leading commodity produced in Nevada. Production of gold in 2010 came from 20 major mining operations. The Carlin trend in northeastern Nevada accounted for 41% of the total production, down from about 50% in recent previous years. Ten mining operations not on the Carlin trend each produced over 100,000 ounces of gold from mostly multimillion-ounce deposits, some of which are of the Carlin type.

Nevada and the U.S. have produced a significant portion of world gold. The U.S. Geological Survey estimates that total world gold production, since the beginning of civilization, has been approximately 164,000 metric tons (5.3 billion troy ounces). Although this seems like a large quantity,

all the gold ever mined would fit into a cube only 20.4 meters (67 feet) on a side. Interestingly, about 85% of that gold is still in use (in bullion, coins, jewelry, electronics, etc.), and most gold currently being used will be recycled. Through 2010, cumulative gold production in Nevada (beginning with the Comstock Lode in 1859) stands at 5,969 metric tons (191.90 million ounces). Cumulative Nevada gold production will reach the milestone of 200 million ounces in 2012. Remarkably, 87% has been produced since the Carlin Mine began production in 1965; 85% has been produced during the current boom from 1981 to the present; and 34% has been produced in the decade from 2001 to 2010. Cumulative U.S. production, primarily since 1835, is approximately 17,200 metric tons (551 million ounces or approximately 10% of total world gold production), and total Nevada production is 3.6% of cumulative world production. The Carlin trend alone accounts for 1.4% of all the gold ever mined in the world. By the end of 2010, cumulative production from the Carlin trend had reached 2,373 metric tons of gold (76.3 million ounces), assuring its place as one of the most productive gold-mining districts in the world.

Nevada continues to be in the midst of the biggest gold boom in U.S. history, as the graph of historical U.S. gold production illustrates. The recent surge in production in the U.S. is largely the result of discoveries of Carlin-type gold deposits and other deposits in which gold occurs primarily in grains that are too small to be visible to the naked eye. These deposits are mostly in Nevada. The U.S. production so far in the current boom, the period since 1981, has been 232 million ounces. This is significantly greater than the total U.S. production during the era of the California gold rush (1849 to 1859, with 29 million ounces, although some estimates of unreported production may bring that figure up to 70 million ounces); the Comstock (Nevada) era from 1860 to 1875 (with 34 million ounces); and the period from 1897 to 1920, when Goldfield (Nevada), the Black Hills (South Dakota), Cripple Creek (Colorado), and byproduct gold production from copper mines in Arizona and Utah contributed to cumulative production of 95 million ounces. U.S. production in the decade from 2001 through 2010 alone was 82 million ounces. The current boom is bigger than previous booms not only in terms of cumulative production but also in terms of

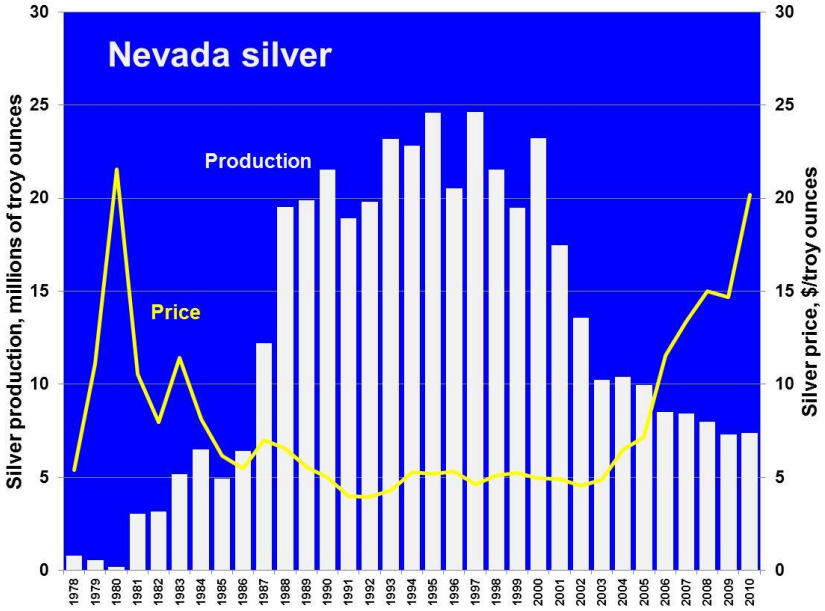


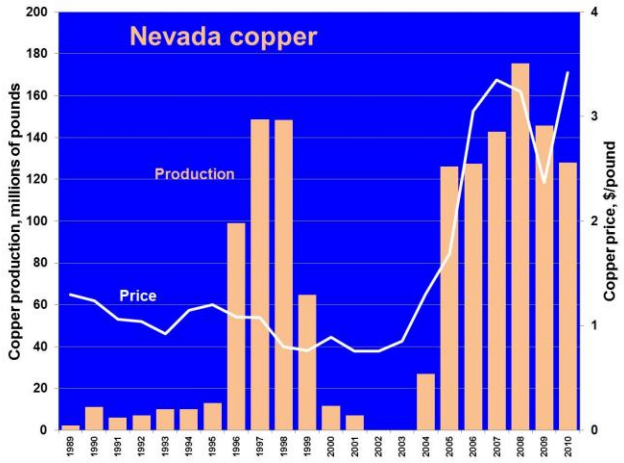


peak annual production (11.6 million ounces in 1998 versus 4.8 million ounces in 1909, 2.6 million ounces in 1866, and 3.1 million ounces in 1853) and duration (at least 32 years for the current boom versus no more than 24 years for any of the earlier booms).

In 2010, Nevada's largest gold operations included Barrick Gold Corporation's mines on the Carlin trend (1,239,937 ounces), Newmont Mining Corporation's mines on the Carlin trend (934,282 ounces) in Eureka and Elko Counties, Barrick's Pipeline and Cortez Hills mines (1,139,976 ounces) in Lander and Eureka Counties, Newmont's Twin Creeks mine (452,744 ounces) in Humboldt County, and the Kinross-Barrick Smoky Valley joint venture Round Mountain mine (358,614 ounces) in Nye County. Combined, Barrick and Newmont accounted for 81% of Nevada gold production in 2010.

Much of Nevada's silver production in 2010, which totaled 7.36 million ounces, was a co-product or byproduct of gold mining. With a ratio of value (average price of gold to average price of silver) of 61:1 in 2010, only those deposits with more than 61 times as much silver as gold can be considered primary silver deposits. Only one such deposit operated in Nevada in 2010—the Coeur Rochester Mine in Pershing County (with a silver-to-gold production ratio of 210:1 and total silver production of 2.0 million ounces). It produced 27% of Nevada's silver in 2010. Nevada's silver production in 2010 accounted for 18% of the U.S. total and 1.0% of the world total.





Nevada's copper production was dominated by the Robinson copper-gold-silver-molybdenum mine, operated by Quadra Mining Ltd. near Ely in White Pine County. Byproduct copper was also produced at Newmont's Phoenix project near Battle Mountain in Lander County.

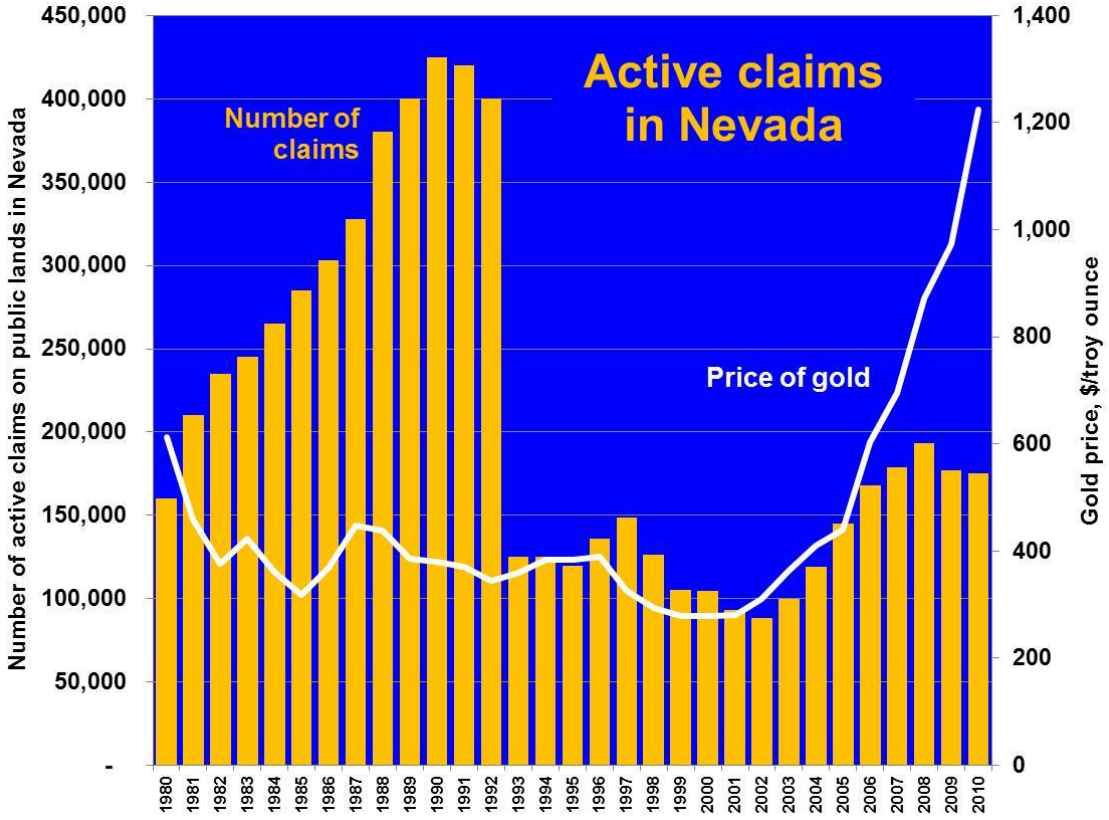
Golden Phoenix's molybdenum production from its Ashdown Mine in northwestern Humboldt County added to total molybdenum production from Nevada in 2010 (approximately 350,000 pounds valued at $5.6 million).

Exploration activity in 2010 is summarized in the section on **Metals**. Most exploration focused on gold, which maintained high prices throughout the year; some companies explored for copper, molybdenum, silver, lithium, limestone for cement, diatomite, uranium, and rare earth elements. The average gold price in 2010 was $1,225 per ounce, well above prices in the previous nine years (rising steadily from a low of $280 in 2001 to $972 in 2009). Gold's continued rise in price in 2011 and an improving global economy have stimulated exploration. The gold price has reached historically high values in recent years, and it is approaching an inflation-adjusted all-time annual high. Adjusted for inflation, the average gold price in 1980 ($613/ounce, the previous peak value for a year) would equal $1,689/ounce in 2011.

New discoveries and promising drilling results were reported in several districts. To help guide exploration for concealed deposits below alluvial or young volcanic cover, geologists are successfully employing various geophysical methods (seismic, electrical, magnetic, gravity). Exploration activity, including new claims staked, was reported in most of Nevada's 17 counties. Advanced exploration projects show promise for major developments, particularly for gold along the Carlin and Battle Mountain-Eureka (Cortez) trends in Eureka and Elko Counties and in the Pequop Mountains in Elko County, in the Yerington district in Lyon County (at the Pumpkin Hollow copper-iron

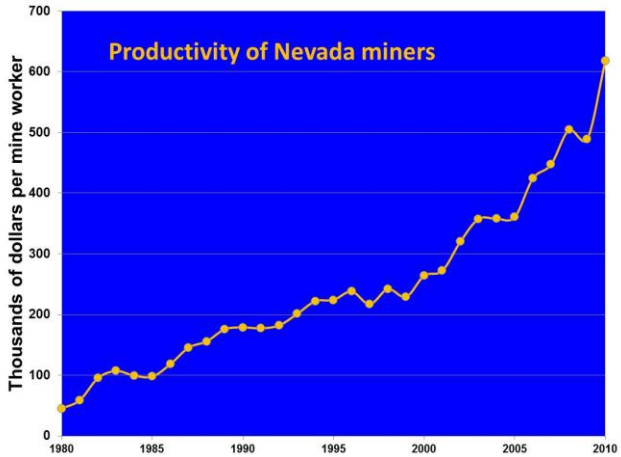
deposits and at the Ann Mason and MacArthur copper deposits) and at the Mount Hope molybdenum deposit in Eureka County.

According to a survey of exploration activities by the Nevada Division of Minerals (D. Driesner and A.R. Coyner, 2010, Nevada Exploration Survey 2010, available at http://minerals.state.nv.us/), exploration activity in Nevada in 2010 increased significantly from 2009. The 17 companies responding to the survey reported spending $214.1 million on exploration in Nevada in 2010, more than any recent year, including the $110.9 million reported by 20 companies in 2009, the $167.9 million reported by 31 companies in 2007, and well above the level of $51.2 million in 2001. Although the companies responded with guarded optimism, they planned to spend more, $295.5 million in 2011. Because of its favorable geology for gold deposits, and because of its regulatory climate, Nevada continues to attract a large portion of the worldwide exploration expenditures of the companies actively exploring in Nevada.



The Nevada Division of Minerals reported that the mining industry held 81.0 million ounces in gold reserves at the end of 2010. The announced gold resources in Nevada (as reported in announcements by companies, with deductions for production), are enough to sustain gold production at current levels for at least 15 years, assuming stable prices. With relatively high gold prices and continued technological improvements, some of the subeconomic resources of previous years will be upgraded to reserves.

Productivity of Nevada mining operations is exceptionally high. Measured simply by the value of the commodities produced divided by the number of employees, productivity of Nevada miners is outstanding. On the average, each of the workers in the non-energy mineral industry in Nevada produced approximately $618,000 in mined products in 2010, an all-time high.



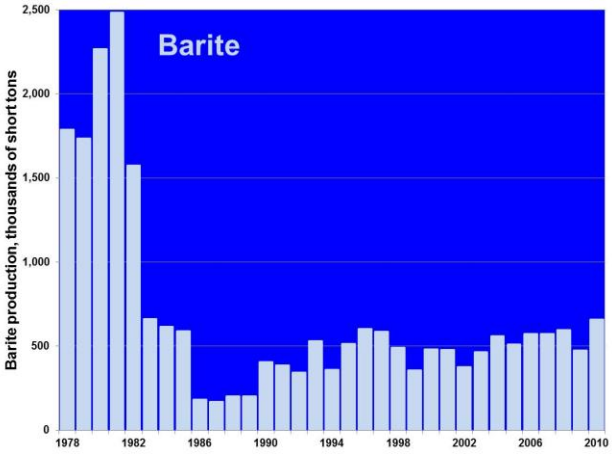
Challenges that face the precious metal mines in Nevada include:

- Economic, safety, and environmental concerns, particularly uncertainty in metal prices
- The ability to replace mined-out reserves through “greenfield” and “brownfield” exploration, that is, in areas without and with previous mining, respectively
- Obtaining financial assurances (bonds) for reclamation and closure
- Sustaining local economies when, sometime in the future, mining ceases
- Hazards of underground mining
- Possible regulatory and mining-law changes
- The length of time that it typically takes to obtain permits
- Preservation of archaeological and ecological resources
- Treating refractory (iron sulfide- and/or carbon-bearing) ores, including innovative ways to oxidize these ores and to recover gold-bearing pyrite by flotation
- Dewatering mines
- Predicting the ultimate chemical compositions of pit lakes
- Procedures for closure of heaps used for leaching gold and silver from ore
- Controlling the release of mercury to the atmosphere (mercury is typically concentrated along with gold during ore formation and is recovered along with gold during mineral processing)
- Treatment and disposal of large volumes of water, some of which may be too warm to introduce directly into streams or may contain potentially toxic elements that need to be removed.

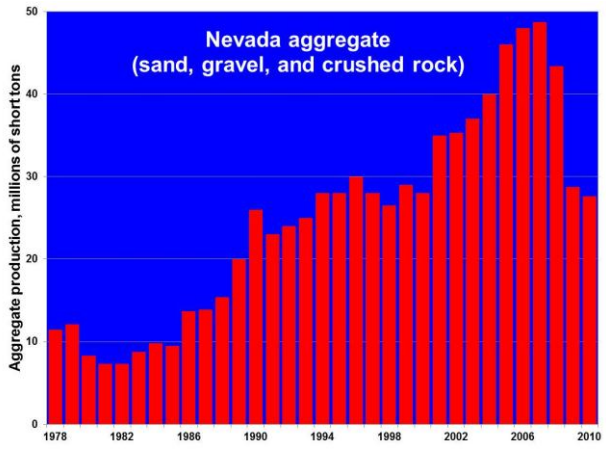
Industry is responding proactively to these challenges through research on and use of new technologies and engineering approaches, and through interaction with people in nearby communities.

The section on **Industrial Minerals** covers developments during 2010 and gives details on important commodities produced from or processed in Nevada, including aggregate, barite, cement, clays, diatomite, dimension stone, dolomite, gypsum, lime, limestone, lithium, magnesite and brucite, perlite, potassium alum (kalinite), pozzolan, salt, semiprecious gemstones (opal and turquoise), silica, and zeolites. Four major operations in Lander and Elko Counties combined to produce most of the barite mined in the U.S.; production increased in 2010 to a level that is higher than has been seen in more than 20 years.

Aggregate production, which, until the recession hit Nevada particularly hard, had been increasing as a result of Nevada's expanding

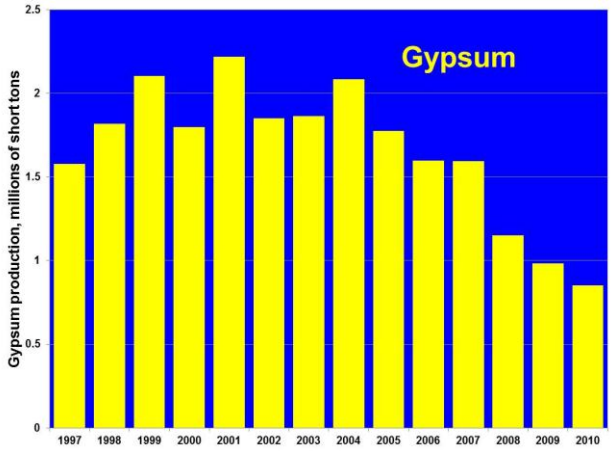


population and need for construction materials for homes, schools, streets, highways, airports, resort hotels, and other businesses, declined slightly from 2009 to 2010. Similarly, the production of gypsum declined in 2010, relative to 2009, because of the continuing effects of the economic recession on construction in Nevada and California. Nonetheless, demand for construction raw materials is likely to remain strong because of Nevada’s population and need for highways. The U.S. Census Bureau (www.census.gov) reported Nevada’s population as 2.701 million in 2010, up 35% from 1.998 million in the 2000 census.



An interesting trend that is occurring in the Las Vegas area as well as nationwide is the combination of aggregate quarries with landfill operations. Planning for the eventual uses of quarries is vital in areas where urban expansion encroaches on the mineral resources. Aggregate is mined locally to reduce transportation costs, associated air pollution, and related concerns regarding highway safety. Post-mining land uses include suburban developments, landfills, and

recreation areas. Gypsum mines near the urban growth areas of Las Vegas are now being considered as sites for housing developments.

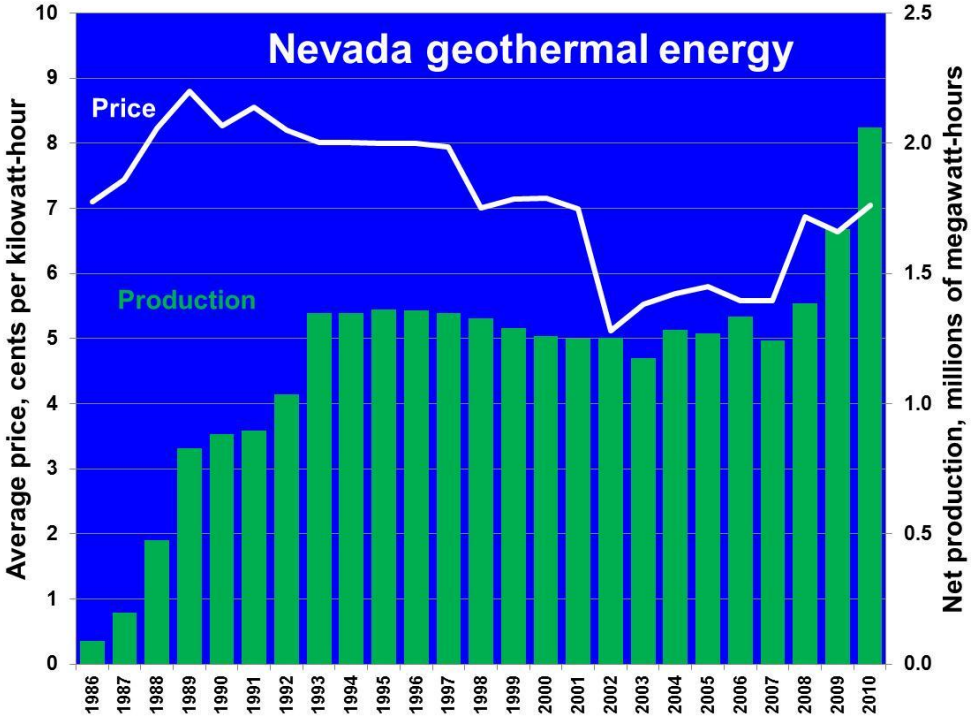


Chemetall Foote Corporation's Silver Peak lithium operation in Clayton Valley, Esmeralda County, where subsurface brines are evaporated on a playa, is the only domestic lithium producer, and Premier Chemicals' (now Premier Magnesia) Gabbs Mine in Nye County is currently the nation's only hard-rock producer of magnesite.

Developments in the geothermal industry are covered in the section on **Geothermal Energy**. Approximately 18 plants operating at 12 sites sold a record amount of electricity in 2010.

Additionally, geothermal energy is used at numerous places in Nevada for space heating, domestic warm water, recreation, dehydrating vegetables, and other agricultural applications. Programs in the U.S. Department of Energy, energy bills passed by the Nevada and California legislatures, and activities of researchers at the University of Nevada, Reno are stimulating geothermal development in Nevada. One new plant went into production early in 2011 (Ormat's Jersey Valley plant in Pershing County), and several new plants are under construction or planned to meet Nevada's renewable energy portfolio standard. Nevada Bureau of Mines and Geology Map 161, *Nevada Geothermal Resources (2010)*, available online at http://www.nbmg.unr.edu/sales/pbsdtls.php?sku=M161, shows the locations of geothermal plants, direct-use locations, hot springs, and hot wells; it demonstrates the fact that Nevada has considerable potential for geothermal development. Nevada Bureau of Mines and Geology Open-File Report 09-10, *Preliminary Geothermal Potential and Exploration Activity in Nevada* (2009), available at http://www.nbmg.unr.edu/dox/dox.htm, provides regional information for assessing the potential for high-temperature (>150ºC) geothermal systems. Considerable information on geothermal energy resources in Nevada is provided on the Web at: www.nbmg.unr.edu/geothermal/gthome.htm.

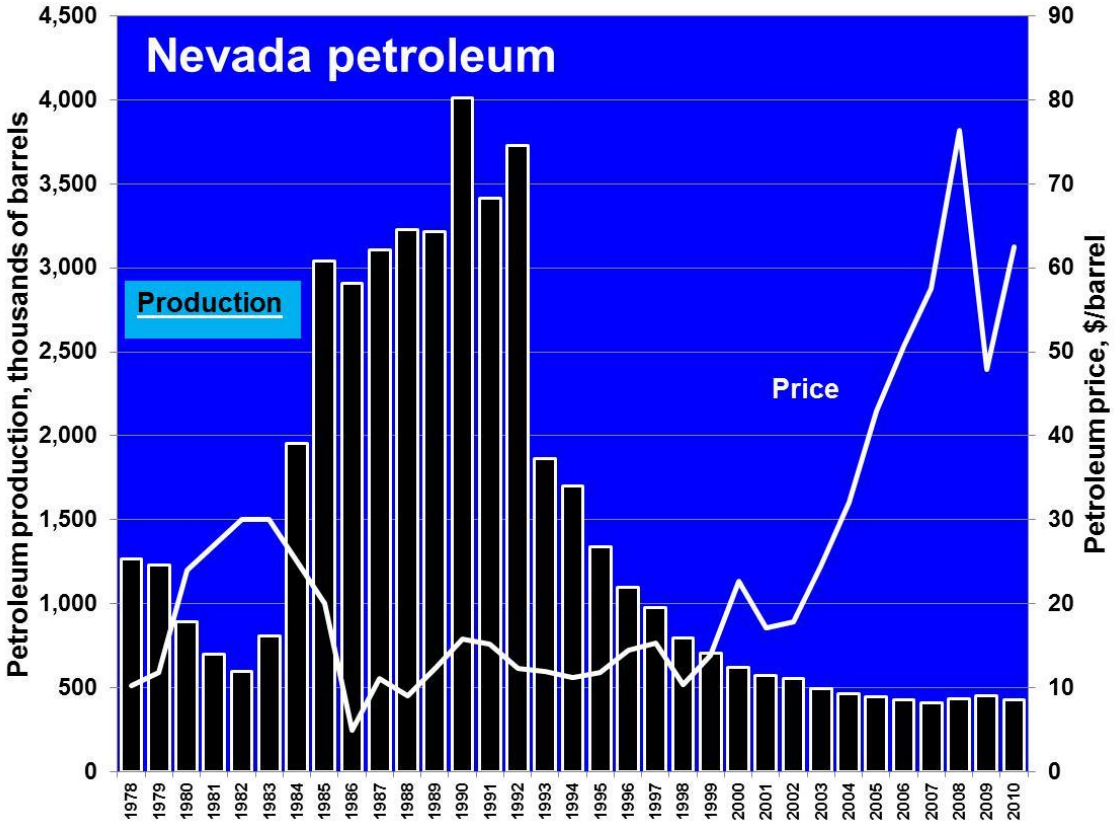
At a 2005 meeting of a task force set up by the Western Governors' Association to assess geothermal resource potential, geothermal energy experts estimated that by 2025 Nevada could add



approximately 1,500 to 2,900 megawatts of geothermal power-generating capacity. If this potential were realized, and if energy prices continue to rise, geothermal power could become a billion-dollar per year business in Nevada. Current projects under development in Nevada should result in construction of between 2,100 and 2,400 megawatts of capacity within 10 years. Production capacity stood at 437.9 megawatts at the beginning of 2011.

Nevada has great potential for renewable energy (particularly geothermal, wind, and solar energy for electricity). Currently, of all the energy consumed by people in Nevada, approximately 91.8% comes from fossil fuels (12.6% from coal, 42.7% from natural gas, and 36.5% from petroleum products). Hydroelectric dams account for 3.6%, followed by geothermal power (2.6%), biomass (1.5%), and solar (0.5%). (Data are from the latest, 2009 statistics of the Energy Information Administration, Table CT2, http://www.eia.gov/). New solar plants are being constructed, primarily in southern Nevada, and new wind farms are planned for several areas.

Developments in the Nevada petroleum industry are covered in the section on **Oil and Gas**. Oil is produced primarily in two areas—Railroad Valley in Nye County and Pine Valley in Eureka County. Total annual oil production from Nevada (valued at $21.8 million in 2010) is a minor part of U.S. production. The amount of Nevada oil production decreased slightly from 2009, and no new fields were discovered. Small amounts of co-produced natural gas are used to fuel equipment used for oil production. The value of Nevada oil production increased from 2009 to 2010 as a result of higher prices for Nevada's oil.



In 2005, the U.S. Geological Survey released its assessment of undiscovered oil and gas resources of the Eastern Great Basin (available at http://energy.cr.usgs.gov/oilgas/noga/index.htm), an area that includes the eastern portion of Nevada, western Utah, and part of southeastern Idaho. The U.S. Geological Survey estimated mean figures of 1.6 billion barrels of oil and 1.8 trillion cubic feet of natural gas remaining to be found in this region. In 2011, the Nevada Bureau of Mines and Geology released Open-File Report 11-2, *Qualitative Petroleum Potential Map of Nevada* (available at http://www.nbmg.unr.edu/dox/dox.htm#8), which highlights areas of relative potential for discovery of oil in Nevada, based primarily on the presence and thermal maturity of likely source rocks.

Exploration for oil in Nevada is encouraged by the cumulative production from the two premier fields in Railroad Valley: Grant Canyon and Trap Spring (21 million and 14 million

barrels, respectively). Historically, few exploration wells have been drilled in the state (fewer than 1,000 wells, or fewer than one well per 111 square miles or 286 square kilometers). With so much area unexplored, even discounting areas underlain by high-grade metamorphic and granitic rocks, Nevada has the potential for discovery of more multimillion-barrel fields. Four new exploration wells were spudded, and four wells were permitted in 2010, up from three each in 2009.

The U.S. is a net exporter of few mined commodities and a net importer of many. These exports help offset the staggering U.S. trade deficit (difference between imports and exports of goods and services), which amounted to $500 billion in 2010 (according to the Department of Commerce, Bureau of Economic Analysis, www.bea.gov). Among the major products mined in Nevada, the U.S. relies upon imports for barite (76% of total U.S. consumption from imports in 2010, according to the U.S. Geological Survey, used primarily to prevent blowouts in oil and gas drilling) and silver (65%, used in photographic and other applications). The U.S. also depends on imports of copper (30%, used primarily to conduct electricity) and gypsum (15%, used in wallboard). Somewhat surprisingly, the U.S. was a net importer of gold in 2010 (33%).

Statistics on selected mineral resources, 2010[1]

Commodity	US Import Reliance (% of US consumption)	Leading Producers (% of world mine production in 2010)
Aluminum ore	100	Australia (33%), China (19%), Brazil (15%), India (9%)
Manganese	100	China (22%), Australia (18%), South Africa (17%), Gabon (11%)
Rare Earths	100	China (97%), India (2%), Brazil (0.4%), Malaysia (0.3%)
Platinum	94	South Africa (75%), Russia (13%), Zimbabwe (3%), Canada (3%)
Potash	83	Canada (29%), Russia (21%), Belarus (15%), China (9%)
Barite	76	China (52%), India (14%), US (10%), Morocco (7%)
Zinc	77	China (29%), Peru (13%), Australia (12%), India & US (6%)
Tin	69	China (44%), Indonesia (23%), Peru (15%), Bolivia (6%)
Silver	65	Peru (18%), Mexico (16%), China (14%), Australia (8%)
Tungsten	68	China (85%), Russia (4%), Bolivia (2%), Austria (2%)
Chromium	56	South Africa (39%), India (17%), Kazakhstan (15%)
Nickel	43	Russia (17%), Indonesia (15%), Philippines (10%), Canada (13%)
Gold	33	China (14%), Australia (10%), US (9%), South Africa & Russia (8%)
Copper	30	Chile (34%), Peru (8%), China (7%), US (7%)
Gypsum	15	China (31%), Iran (9%), Spain (8%), US (6%)
Phosphate rock	15	China (37%), US (15%), Morocco (15%), Russia (6%)
Cement	8	China (55%), India (7%), US (2%), Turkey (2%)
Coal	(US is exporter)	China (46%), US (14%), India (8%), Australia (6%)
Iron ore	(US is exporter)	China (38%), Australia (18%), Brazil (15%), India (11%)
Molybdenum	(US is exporter)	China (40%), US (24%), Chile (17%), Peru (5%)
Silica	(US is exporter)	US (25%), Italy (13%), Germany (6%), UK (5%)
Diatomite	(US is exporter)	US (30%), China (25%), Denmark (12%), Mexico (7%)
Beryllium	(US is exporter)	US (89%), China (11%), Mozambique (1%)

[1] Sources: Production data and import reliance are from USGS Mineral Commodity Summaries 2011 for most commodities, Energy Information Administration for coal. Percentages are calculated from these data.

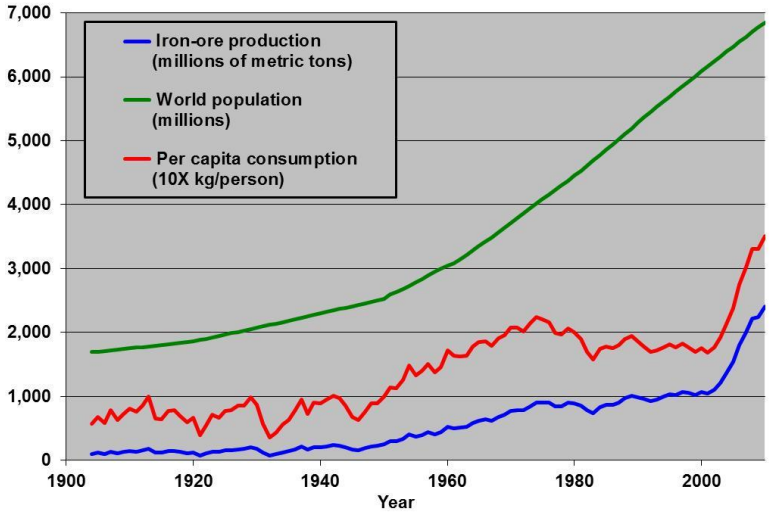
Local economies benefit from mining in Nevada. Construction of new homes, hotels, casinos, other businesses, schools, and roads requires local sources of sand, gravel, crushed stone, gypsum, and raw materials for cement, all of which are abundant in Nevada. The mining industry directly employed 12,210 people in 2010 (including oil; according to the Nevada Department of Employment, Training and Rehabilitation, http://www.nevadaworkforce.com/), and the industry is responsible for another 51,000 jobs related to providing the goods and services needed by the industry and its employees (D. Driesner and A.R. Coyner, 2010, Major Mines of Nevada 2010, Mineral Industries in Nevada's Economy, Nevada Bureau of Mines and Geology Special Publication P-21, 28 p.; available at www.nbmg.unr.edu/dox/mm/mm10.pdf).

Nevada and the U.S. make significant contributions to the world's production of several mineral commodities. Thanks in part to Nevada's production, the U.S. is a major producer, as well as consumer, of gypsum (with the U.S. accounting for 6% of world production in 2010) and industrial sand (25% of world production). In addition to gold, the U.S. is a leading silver producer (8% of world production). The U.S. is essentially self-sufficient, as are most countries, in construction aggregate, which usually is mined from sources near where it is used. Total U.S. production of construction sand, gravel, and crushed stone in 2010 (approximately 1.9 billion

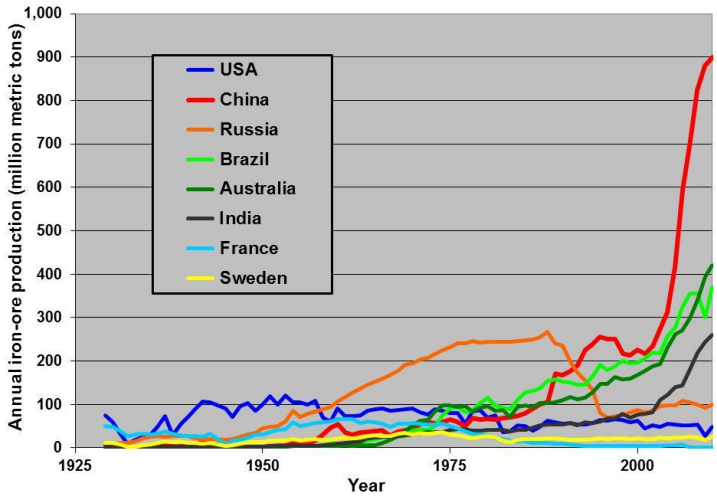
metric tons, according to the U.S. Geological Survey) decreased by 2% from 2009 (after decreasing that year by 22% from 2008), because of weaker demand from the residential and commercial construction industry. Net imports of aggregate account for approximately 1% of consumption. The U.S. is also self-sufficient in the other major mined material, coal. According to the U.S. Energy Information Administration (www.eia.doe.gov), the U.S. produced approximately 985 million metric tons of coal in 2010, up 1.2% from 2009, but lower than the record high of 1.063 billion metric tons of coal in 2008. Although no coal is produced in Nevada, coal is a major source of energy for generation of electricity in Nevada and many other states.

Global demand for nearly every mineral (and energy) commodity has increased sharply over the last decade, and, despite the current economic recession, trends suggest heavy demand for the foreseeable future. Demand is growing partly because world population is increasing, and partly because standards of living (measured by per capita consumption) are increasing.

Annual global iron-ore production reached an all-time high of 2.4 billion metric tons in 2010. That equals approximately 0.4 km^3 of magnetite or hematite ore, or at least 1 km^3 of ore plus overburden and waste rock – the equivalent of one huge mine, per year.

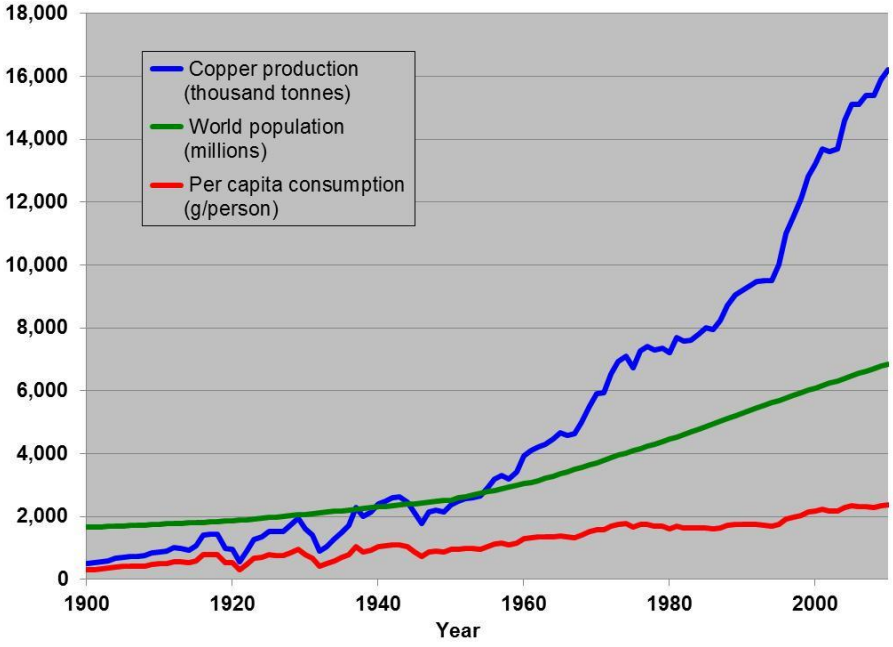


Global iron-ore production, per capita consumption (approximated as global production divided by population), and world population, 1904-2010.

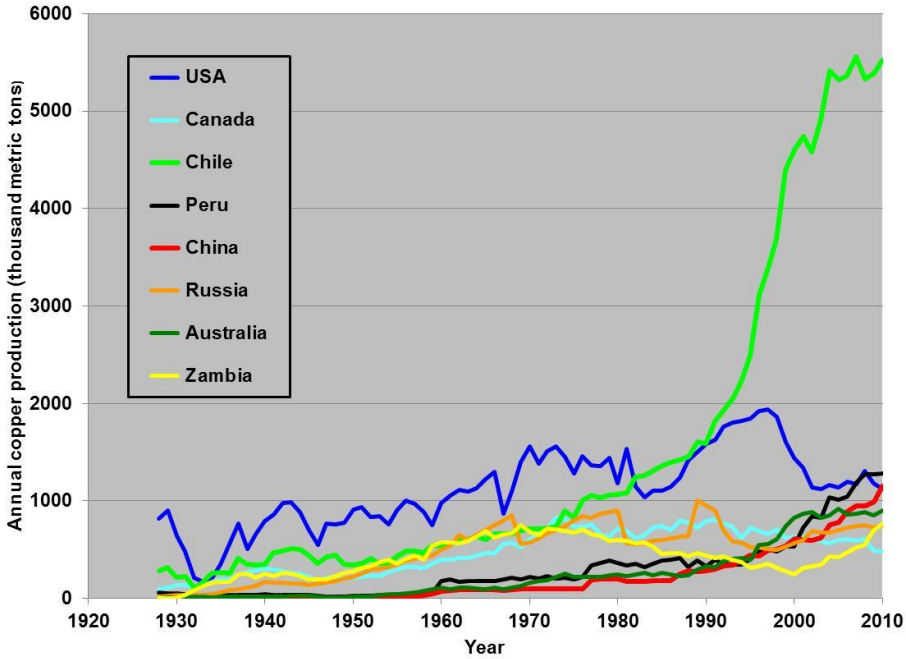


Iron-ore production by country, 1929-2010.

Global copper production, which reached an all-time high of 16.2 million metric tons in 2010, nearly equaled more than 100 years of production from the Bingham Canyon Mine in Utah (17.0 million metric tons).

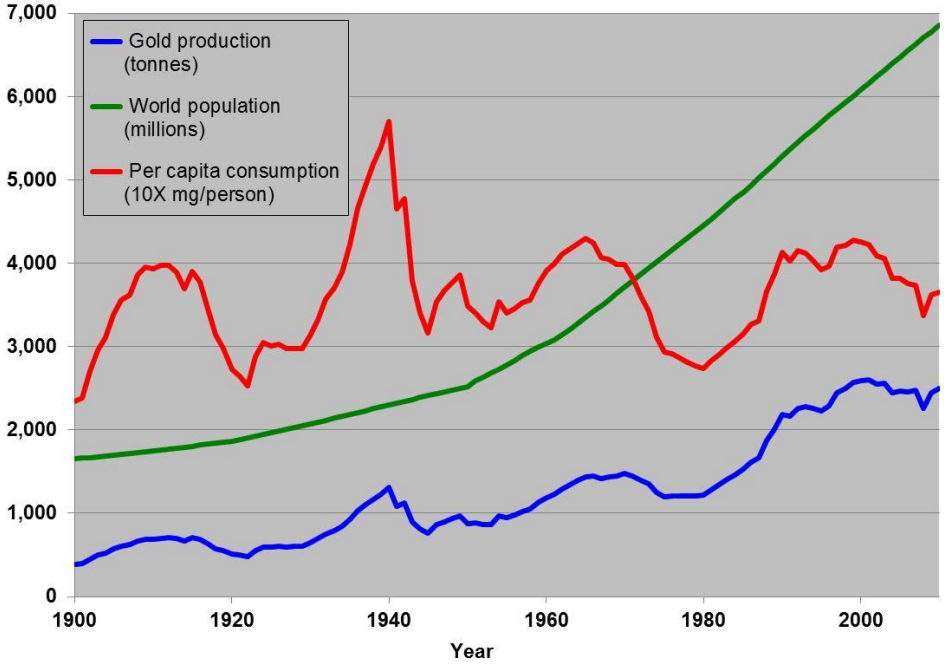


Global copper production, per capita consumption, and population, 1900-2010.

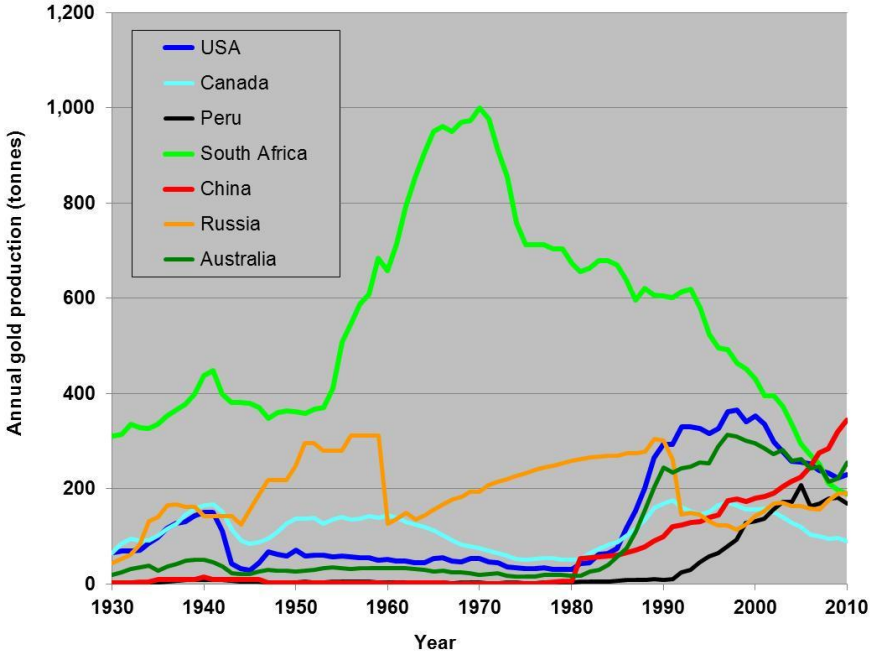


Copper production by country, 1928-2010.

Global gold production in 2010 (2,500 metric tons) exceeded the cumulative production from the Carlin trend (2,373 tons), one of world's top gold-mining regions. Despite the rise in gold price in recent years, production has not reached the peak of 2,600 metric tons in 2001.



Global gold production, per capita consumption, and population, 1900-2010.



Gold production by country, 1930-2010.

Global production of selected mineral commodities (metric tons)* by country in 2010, compared to Nevada.

Country/State	Area (10^6 km^2)	Gold	Silver	Copper	Gypsum	Barite	Industrial Sand
Algeria	2.38	1			1,700,000	60,000	
Argentina	2.78	60			1,300,000		
Australia	7.68	261	1,860	900,000	3,500,000		5,200,000
Austria	0.08						1,500,000
Belgium	0.03						1,800,000
Bolivia	1.10	6	1,260				
Brazil	8.51	58			1,900,000		
Bulgaria	0.11	4					650,000
Canada	9.96	91	600	480,000	3,500,000		1,300,000
Chile	0.76	38	1,280	5,520,000			1,400,000
China	9.57	345	3,500	1,150,000	45,000,000	3,600,000	
Czech Republic	0.08						1,370,000
Egypt	1.00	3			2,500,000		1,750,000
France	0.57	2			2,300,000		5,000,000
Germany	0.36				1,900,000	75,000	6,500,000
Ghana	0.24	82					
India	3.28	3			2,500,000	1,000,000	1,700,000
Indonesia	1.90	120		840,000			
Iran	1.65	<1			13,000,000	250,000	1,500,000
Italy	0.30	<1			4,100,000		14,000,000
Japan	0.38	8			5,800,000		3,500,000
Kazakhstan	2.72	30		400,000		100,000	
Korea, South	0.10	<1					450,000
Mexico	1.97	73	4,410	230,000	5,800,000	140,000	2,800,000
Morocco	0.45	1				460,000	
Norway	0.32						1,500,000
Papua New Guinea	0.46	68					
Peru	1.29	164	3,640	1,285,000			900,000
Poland	0.31	<1	1,180	430,000	1,500,000		4,350,000
Russia	17.07	192	1,150	750,000	2,900,000	65,000	
Saudi Arabia	2.15	5			2,100,000		
Slovakia	0.05	<1					620,000
South Africa	1.22	189					2,300,000
Spain	0.50	4			11,500,000		5,000,000
Thailand	0.51	5			8,500,000		
Turkey	0.78	17			3,100,000	150,000	1,300,000
United Kingdom	0.24	<1			1,700,000	50,000	5,600,000
Uzbekistan	0.43	90					
Zambia	0.75	3		770,000			
USA	9.37	231	1,270	1,120,000	9,000,000	670,000	26,500,000
Nevada	**0.29**	**166**	**229**	**58,000**	**772,000**	**596,000**	**363,000**
WORLD	149.90	2,500	22,200	16,200,000	146,000,000	6,900,000	108,000,000

* Production data for all areas except Nevada are from the U.S. Geological Survey (USGS) minerals information publications (http://minerals.usgs.gov/minerals/), with revisions from USGS mineral commodity specialists during their review of a draft of this report; USGS lacks data for some commodities in some countries; production data for Nevada are from Driesner and Coyner (2010), with modifications as noted in this report; USGS statistics are adjusted to be consistent with Nevada data.

Historical iron-ore production reflects significant economic changes. For example, the 20th century history of iron-ore production reflects the decline of France as a superpower, the impact of the Great Depression on the U.S. economy, and the economic boom after World War II. The 52% drop in U.S. iron-ore production from 2008 to 2009 (with a rebound in 2010) illustrates the depth of the recession in the U.S., whereas the global impacts of the recession are hardly visible on the graphs of global iron, copper, and gold production, thanks primarily to China's booming economy.

Although China lags behind the European Union and the U.S. in gross domestic product (estimated as $10.09 trillion for China, $14.82 trillion for the EU, $14.66 trillion for the U.S., $4.31 trillion for Japan, and $4.06 trillion for India in 2010, according to https://www.cia.gov/), China can be considered the world's dominant economic superpower today in terms of mineral production. Russia and the U.S. have declined. For gold, copper, and iron, China's domestic production reached all-time highs in 2010. With 19% of the world's population, China can be expected to be a major producer of mineral resources for the foreseeable future. India, with 17% of the world's population, is also emerging as an economic superpower, but not on the scale of China. Of the countries listed as producers of 23 key mineral commodities in 2010, China was a significant producer (with ≥10% of the world's supply) of 17, and the U.S., with 4% of the world's population, was a significant producer of four. In 2010, China accounted for 46% of global coal production, compared with 14% for the U.S. Global coal production reached its all-time high of approximately 7.3 billion metric tons in 2010.

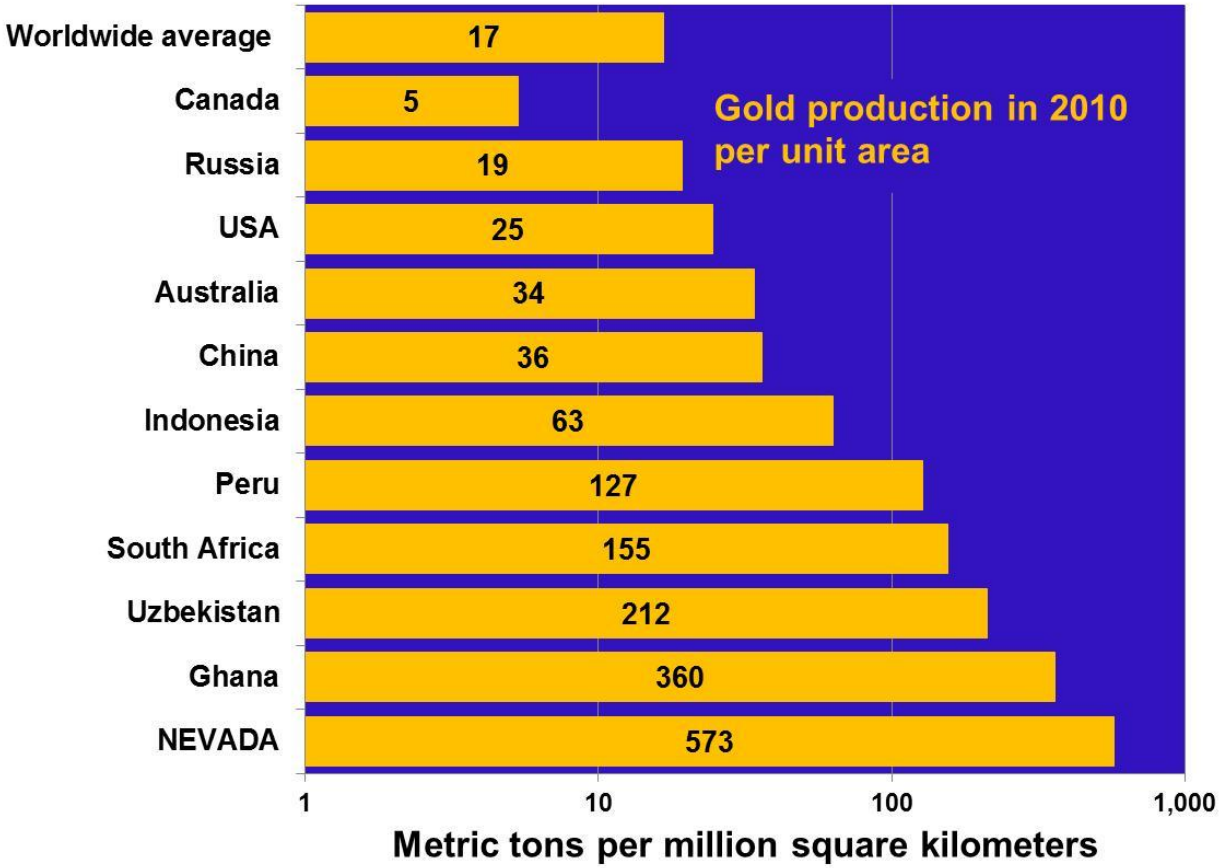
China actually needs more iron ore than it can supply domestically. Much of the recent increase in iron-ore production in Australia and Brazil (2.4 and 1.8 times more in 2010 than in 2000, respectively) is supplying demand from China. Some iron ore from the U.S. (Iron Mountain, Utah) is shipped to China for steel production. The U.S. is a supplier of raw materials to an increasingly industrialized China. Nevada is experiencing interest from China as a source of raw materials (particularly copper, molybdenum, and iron) for their industries.

China overtook South Africa as the leading gold producer in 2007 and extended its percentage lead in 2010. South Africa, whose production peaked at 1,000 metric tons of gold in 1970, had held the lead for over 100 years. China's production reached an all-time high of 345 metric tons in 2010. The South African mines on the Witwatersrand are getting deeper and more costly to operate than ever before. Production in the USSR peaked at approximately 311 tons of gold per year in 1956-1959 and reached 304 tons in 1989. Production in the USA peaked at 366 metric tons (11.7 million troy ounces) of gold in 1998, approximately one third of South Africa's peak. Today, China accounts for 14% of world gold production; Australia is second with 10%, followed by the U.S. at 9% and South Africa and Russia each with 8%.

For industry, the global demand for minerals is creating opportunities for exploration both domestically and worldwide, particularly in areas with potential for large deposits. New opportunities exist for increased development and production, including new technologies for extracting metals from known deposits, and for sustainability, including the future of the environment, local and national economies, social and governmental stability, recycling, and substitutions of other minerals and products. Emerging technologies are increasing demand for many mineral commodities (such as lithium for automobile batteries; neodymium and dysprosium, two of the rare earth elements, for magnets in wind turbines; tellurium and cadmium for solar panels).

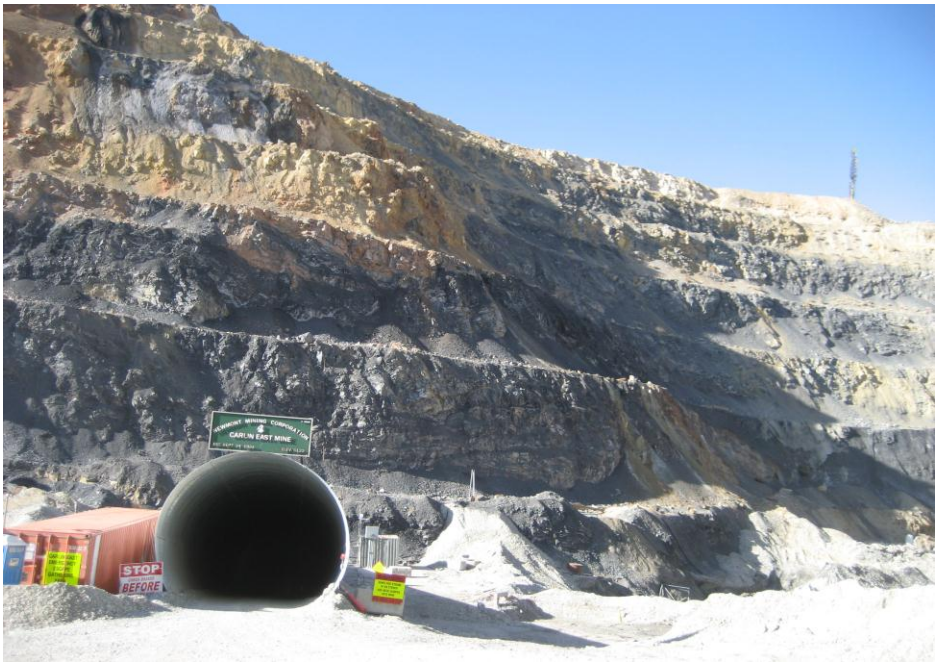
For geological surveys and academia, the high level of demand for mineral resources is creating opportunities for such activities as geologic mapping and interpretation of the 4D geologic framework; geoscience sample and data preservation; and collaborations among states, universities, industry, and the federal government on mineral-resource research, information, and policy. A 2011 report on *Energy Critical Elements – Securing Materials for Emerging Technologies*, by the American Physical Society and Materials Research Society (http://www.aps.org/policy/reports/popa-reports/index.cfm) highlights some of the research, information, and policy opportunities.

As a result of its favorable geology, Nevada has tremendous potential for the discovery of additional mineral deposits. Areas where prospective rocks exist beneath a cover of young, valley-filling sediments or volcanic rocks have only been explored to a limited extent, and ore deposits continue to be discovered in and near Nevada's 526 historical mining districts. Nevada is a world leader in terms of gold production per unit area, as shown in the following figure.



Comparison of gold production in Nevada, measured in metric tons per million square kilometers of total area, versus the worldwide average (using area of land mass) and major producing countries.

Additional information about the Nevada mineral industry and the U.S. gold industry, including the contents of selected publications, is readily available on line through the World Wide Web from the Nevada Bureau of Mines and Geology (www.nbmg.unr.edu/) and the Nevada Division of Minerals (http://minerals.state.nv.us/). Useful national and international data on nonfuel minerals can be obtained from the U.S. Geological Survey (http://minerals.usgs.gov/minerals/), and the U.S. Energy Information Administration (www.eia.doe.gov) provides data on oil and gas, geothermal, solar, wind, hydroelectric, and other energy sources. The Nevada Bureau of Mines and Geology supports several interactive maps on the Web that are backed by periodically updated databases on mineral and energy resources and potential, exploration activity, land ownership and restrictions, and other geographic information.



Blast-hole drill (upper right) at the Carlin mine, near the portal of the Carlin East underground mine.

CONVERSION FACTORS

1 metric ton = 1.1023113 short ton = 1,000 kilograms = 2,204.6226 pounds = 32,150.7 troy ounces.

31.1035 metric tons = 1 million troy ounces (31.1035 grams = 1 troy ounce).

453.592 grams = 1 pound (avoirdupois) = 16 ounces (avoirdupois) = 14.5833 troy ounces.

34.2857 grams per metric ton = 34.2857 parts per million by weight = 1 troy ounce per short ton.

Complexly folded sedimentary rocks of the Devonian Rodeo Creek Formation,
host of ore in the Gold Quarry mine on the Carlin trend.

TO BE INSERTED AT THE VERY END – after all the other sections.

Acknowledgments

We thank Alan R. Coyner with the Nevada Division of Minerals, John H. DeYoung, Jr., Florence Katrivanos, and others with the U.S. Geological Survey's National Minerals Information Center, and James E. Faulds with the Nevada Bureau of Mines and Geology for their reviews of a draft of this report. We also thank Daphne D. LaPointe for her assistance in handling the review process and editing the final document.

Publication Design and Updates

This publication was designed for reading on the web. Updates and corrections may be made before publication of the volume for next year. This version was updated on March 27, 2012.