



2012 Minerals Yearbook

SILVER

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In 2012, U.S. mines produced 1,060 metric tons (t) of silver, which was 6% less than production in 2011. Silver was produced in 11 States in 2012, and Alaska remained the country's leading silver-producing State, followed by Nevada and Idaho. Approximately 99% of domestic silver was produced from 10 base-metal mines and from 12 precious-metal mines, including 3 mines that produced silver as the principal product (table 3). The Handy & Harman price of silver averaged \$31.21 per troy ounce in 2012, an 11% decrease compared with the 2011 average price of \$35.26 (table 1).

Traditional use categories for silver included coin and medal fabrication; industrial applications, including electrical and electronics components; jewelry and silverware; and photography. In 2012, global use of silver in all applications declined, with the largest declines in photography, down by 13%; and coin minting, down by almost 22% (Meader and others, 2013, p. 49).

U.S. imports of silver bullion and dore decreased by 20% to 5,060 t in 2012. The principal import sources of bullion and dore were, in descending order, Mexico (61%) and Canada (27%) (table 6). Exports of silver bullion and dore, which increased for the third consecutive year, increased by 24% to 905 t in 2012. Principal destinations in 2012 were, in descending order, the United Kingdom (40%), Mexico (28%), Japan (10%), and Canada (9%) (table 4).

In 2012, silver was mined in approximately 65 countries; global production was 6% greater than that in 2011. Mexico was the leading producer, followed by China and Peru. One-half of the world's production of silver came from these three countries. The United States ranked ninth in world silver mine production in 2012 (table 8).

Legislation and Government Programs

On September 30, 2012, the amount and value of Deep Storage and Working Stock custodial silver reserves in the U.S. Mint were 498 t with a total market value of \$554 million at \$34.65 per troy ounce and a statutory value of \$20.7 million. As custodian, the U.S. Mint is responsible for safeguarding much of the Nation's gold and silver. In accordance with 31 U.S. Code section 5117(b) and 31 U.S. Code section 5116(b)(2), a statutory rate of no less than \$1.292929292 per troy ounce was used to value the custodial silver held by the U.S. Mint (U.S. Mint, 2012, p. 42).

The U.S. Mint was the world's largest producer of silver bullion coins. The bullion program allows consumers to acquire precious metal coins and investors are guaranteed each coin's metal weight, content, and purity. The U.S. Mint also produced numismatic products for collectors who desire high-quality versions of coinage. The Philadelphia Mint manufactured the large, five-ounce America the Beautiful Silver Bullion Coins

and the San Francisco Mint supplemented West Point's capacity for one-ounce American Eagle Silver Bullion Coins. In 2012, the U.S. Mint brought to market several new silver coin sets including expanding the popular American Eagle Silver line of products with the American Eagle 25th Anniversary Set, the American Eagle San Francisco Two-Coin Silver Proof Set, as well as the Making American History Coin and Currency Set, which features an American Eagle Silver Proof Coin (U.S. Mint, 2012, p. 6).

In fiscal year (FY) 2012 ending September 30, lower unit volumes and lower silver prices resulted in a 29.1% decline in silver bullion coin revenue. Revenue from sales of American Eagle Silver Bullion Coins containing a total of 1,050 t of silver decreased by 25% to \$1.1 billion as demand declined. The U.S. Mint reported operating losses for both the American Eagle Silver Bullion Coins and the America the Beautiful Silver Bullion Coins. Most of the losses were attributed to the U.S. Mint's decision to produce coins at the San Francisco Mint that carried higher operating costs. In 2012, the U.S. Mint scaled back production of the America the Beautiful Silver Bullion Coins to reflect demand; however, excess inventories of these coins remained unsold (U.S. Mint, 2012, p. 2, 15–16).

Production

Domestic mine production data were requested from 40 operations. Of these operations, 38 responded to the U.S. Geological Survey (USGS) canvass, representing 100% of U.S. mine production listed in table 1. Domestic mines produced 1,060 t of silver in 2012, which was 6% less than that in 2011.

Silver in the United States was mainly produced as a byproduct from gold and base-metal ores, although silver was produced as a principal product at three mines: Coeur d'Alene Mines Corp.'s (Coeur d'Alene, ID) Rochester Mine near Winnemucca, in northwestern Nevada; U.S. Silver and Gold Inc.'s (Toronto, Ontario, Canada) Galena Mine in Idaho's Coeur d'Alene mining district, and U.S. Silver and Gold's Drumlummon Mine in the Marysville mining district, about 40 kilometers (km) northwest of Helena, MT. In 2012, Nevada's silver production increased by 20% from that of 2011. In addition to the Rochester silver mine, 15 gold mines in Nevada produced byproduct silver. Of these, production increased at 9 mines and production declined at 6 mines.

In 2012, Hecla Mining Co.'s (Coeur d'Alene, ID) Greens Creek Mine on Admiralty Island near Juneau, AK, produced 199 t of silver, a slight decrease from the 202 t produced in 2011 owing to lower ore grades and rehabilitation work during the first half of the year. The mine's proven and probable reserves at yearend 2012 were 2,940 t of silver (Hecla Mining Co., 2013). In February, the company announced that drilling defined two high-grade areas within the Gallagher zone with good

exploration potential that could extend the mine to the south (Hecla Mining Co., 2012a).

In January, the Mine Safety and Health Administration ordered the closure of Hecla's Silver Shaft at the Lucky Friday Mine, near Mullan, ID. The order was issued for removal of built-up material in the Silver Shaft following a December 2011 rock burst. The Silver Shaft is 1.6-km deep and the primary access to the Lucky Friday Mine (Hecla Mining Co., 2012b). In November, the company announced that rehabilitation of the Silver Shaft had proceeded according to schedule and that the mine was expected to resume silver production in the first quarter of 2013 (Hecla Mining Co., 2012c). The Lucky Friday Mine remained in care-and-maintenance status and did not produce silver in 2012. At yearend, the mine's proven and probable silver reserves were 1,700 t (Hecla Mining Co., 2013).

In 2012, Coeur d'Alene Mines' Rochester Mine doubled silver production to 87.1 t owing to the development of a heap leach pad. The company planned to further increase production through additional heap leach capacity and adding a larger crusher in 2013 (Coeur d'Alene Mines Corp., 2013). Rio Tinto plc's (London, United Kingdom) Bingham Canyon Mine, 53 km from Salt Lake City, UT, produced 75 t of silver, a decrease of 24.9 t, or 25%, from that of 2011. The decrease was attributed to lower grades of ore (Kennecott Utah Copper Corp., 2013a, b).

Consumption

Fabrication consumption of silver in the United States was 5,555 t, a decline of 7% compared with 5,945 t in 2011. Consumption in every silver fabrication sector declined, with a substantial decrease in photovoltaic cell fabrication (Meader and others, 2013, p. 49, 84).

Coin and Medal Fabrication.—Approximately 1,084 t of silver was used for coins and medals in the United States in 2012, a 15% decrease from the 1,276 t of silver used in 2011. The decrease in coin sales in the United States resulted from decreased investor interest in physical silver and declining silver prices. The absence of inflation pressure and investor expectations for higher silver prices during the first 9 months of the year reportedly reduced new investor interest in silver (Meader and others, 2013, p. 23).

Industrial Applications.—Approximately 3,608 t of silver was used in the United States for industrial applications, a 4% decrease from the 3,743 t of silver that was used for those applications in 2011 (Meader and others, 2013, p. 86). The principal components of industrial demand for silver were brazing alloys and solders, catalysts, electrical, electronic (including photovoltaics), and other applications. Adding silver to the process of soldering (joining metals at less than 600° C) or brazing (joining metals at more than 600° C) helps produce smooth, leak-tight and corrosion-resistant joints. One of silver's most significant industrial applications was for conductive pastes in photovoltaics. Silver paste, which was used in 90% of all crystalline silicon photovoltaic cells—the most common type of solar cell—has been a growth market in the United States for the past several years. In 2012, decreased consumption in the photovoltaic sector was attributed to substitution and decreased use per solar cell. New technology in the production of solar

cells used thin-film layers that require less silver than previous thick-film layers.

As a catalyst, silver mesh screens or crystals are used to produce ethylene oxide and formaldehyde, both of which are essential ingredients in plastics. Approximately 90% of the silver used as an industrial catalyst was for the production of ethylene oxide from ethylene.

One of silver's electronic applications was in batteries. The most common silver oxide battery was the small button-cell battery used in calculators, cameras, hearing aids, toys, and watches, and which contains about 35% silver by weight. Because of environmental and safety concerns, silver oxide batteries also were beginning to replace lithium-ion batteries in mobile phones and laptop computers. Silver-zinc batteries featured a water-based chemistry and contained no lithium or flammable liquids. Some larger silver-oxide and silver-zinc batteries were used in military applications. Silver was also used in conductors, contacts, fuses, switches, and timers.

Silver membrane switches were used in buttons on electronics such as computer keyboards, microwave ovens, telephones, televisions, and toys. Silver-based inks and films were applied to composite boards to create electrical pathways in printed circuit boards. Silver-based inks also were used in radio frequency identification (RFID) tags used in hundreds of millions of products to prevent theft and allow easy inventory control. Owing to silver's antibacterial properties, silver was also used in such products as clothing, laundry machines, shoes, and toothbrushes. Silver embedded in locker room surfaces was used to reduce staph infections, and silver-based disinfectants have been introduced as a low-cost, environmentally sensitive option for use in care centers and food processing facilities.

Jewelry and Silverware.—In 2012, U.S. consumption of silver for jewelry and silverware was 342 t, an 8% decrease compared with the 370 t used in 2011. Jewelry fabrication declined by 7% to 321 t from the 345 t used in 2011. Despite the decline, the U.S. jewelry market continued to be the largest in the world. Global silver consumption for jewelry decreased slightly as increased demand from China and India was offset by decreases in demand from Europe and Thailand. U.S. consumption of silver for silverware decreased by 13% to 21 t from that in 2011. This decrease in silver consumption marked the 17th year that this market has declined. Since 2004, consumption of silver in silverware has decreased by about 50% (Meader and others, 2013, p. 67–68, 92, 94).

Photography.—Silver was one of the essential materials used in the manufacture of films and photographic papers. The decline in the use of silver for photography began in 2000 in response to digital camera technology and the decline in the production of color film and paper. Domestic use of silver for photographic applications declined by 6% to 521 t in 2012 from 556 t in 2011, which was less than the average annual decline of 18% since 2006. Although use in photographic film (35 millimeter) declined by 25% in 2012, the slower overall decline resulted from a slow switch by motion picture theaters to digital format from film owing to limited financing availability (Meader and others, 2013, p. 64). Other photographic-use categories included commercial photography, dental and industrial x rays, graphic arts, and medical x rays.

Prices and Stocks

The Handy & Harman silver price began the year at \$29.50 per troy ounce, reached its high for the year of \$36.88 per troy ounce on February 28, and then followed a downward trend in the second and third quarters before rebounding in the last quarter to end 2012 at \$29.99 per troy ounce, approximately where it started the year. The average price for 2012 of \$31.21 per troy ounce was 11% lower than the 2011 average (table 1). According to the CPM Group (2013, p. 5, 25), investment demand, traditionally a significant driver of prices, increased by 32% to 3,810 t in 2012 and was the sixth highest on record. Increases in silver exchange-traded products and Chinese demand were cited as the primary reasons for investment demand growth. Investors purchase silver during times of concern over fiscal, monetary, and political issues as a hedge against inflation and currency losses. Global silver inventories in various exchange-traded funds increased by 8% to approximately 19,330 t at yearend 2012 compared with 17,920 t at yearend 2011 (Meader and others, 2013, p. 21).

Foreign Trade

U.S. imports of bullion and dore (table 6) decreased by 20% to 5,060 t in 2012. The principal import sources of bullion and dore were Mexico (61%) and Canada (27%). Exports of silver bullion and dore (table 4) increased by 24% to 905 t in 2012. Principal destinations were the United Kingdom (40%), Mexico (28%), Japan (10%), and Canada (9%).

World Review

World mine production of silver increased to 25,500 t in 2012, a 6% increase from production of 24,100 in 2012 (table 8). Silver production in 6 of the top 10 producing countries increased in 2012, and Bolivia had no change in silver production. Silver production decreased in Chile by 7%, in Poland by 2%, and in the United States by 6%. According to the Silver Institute, world silver consumption decreased by 7% to 26,300 t in 2012. Industrial applications, with 55% of the total, was the leading end use for silver, followed by jewelry (22%), coins and medals (11%), photography (7%), and silverware (5%) (Meader and others, 2013, p. 79).

Argentina.—Total silver production was 7% higher than that of 2011. Silver Standard Resources Inc.'s (Vancouver, British Columbia, Canada) Pirquitas Mine (Jujuy Province, northern Argentina), Argentina's leading silver-producing mine, increased production by 47 t or 21% from that of 2011, to a record-high 270 t. The increase was a result of improvements made to the crusher, the ball mill gearbox, and several operating processes. The mine's reported proven and probable reserves were 2,490 t. The company diversified its selling avenues by signing several long-term sales contracts directly with smelters (Silver Standard Resources Inc., 2013a, p. 6; 2013b, p. 4, 10). In 2012, Pan American Silver Corp.'s (Vancouver, British Columbia, Canada) Manantial Espejo Mine in Santa Cruz Province, southeastern Argentina, decreased production by 4% to 113 t from 117 t in 2011 owing to lower ore grade, throughput rates, and plant availability (Pan American Silver Corp., 2013, p. 21). In September, Coeur d'Alene Mines ceased operations at

the Martha silver mine and began reclamation activities. High operating costs and ore depletion were cited as reasons. The mine produced 10 t of silver in the first three quarters of 2012 (Coeur d'Alene Mines Corp., 2012).

Australia.—Silver production remained at the 2011 level of 1,728 t (table 8). Australia's Alcyone Resources Ltd. (South Perth, Western Australia) announced a 69% increase over previous estimates of contained silver reserves (Alcyone Resources Ltd., 2013, p. 6). BHP Billiton Ltd.'s (London, United Kingdom) Cannington Mine in northwest Queensland was one of the world's leading producers of silver. The mine produced 1,063 t of silver or 3% less than that of 2011's 1,100 t of silver (BHP Billiton Ltd., 2012, p. 42).

Bolivia.—Sumitomo Corp. (Tokyo, Japan) operated the San Cristóbal Mine, Bolivia's leading silver-producing mine, in Lipez, where silver production was estimated to have increased to 400 t of silver, a 9% increase compared with 2011 production. Offsetting part of this increase, Coeur d'Alene Mines' San Bartolomé Mine near Potosi produced 184 t of silver in 2012, a decrease of 21% from 2011 production owing to lower ore grades and mill throughput (Coeur d'Alene Mines Corp., 2013, p. 10; Meader and others, 2013, p. 29).

Chile.—Silver production in Chile decreased by 7% from that of 2011 to 1,195 t (table 8). The decrease was attributed to lower production from the country's copper industry (Meader and others, 2013, p. 2). Silver was produced mainly as a byproduct of copper or lead and zinc mining.

China.—Silver mine production in China, the world's second-ranked silver producer, increased by 5% to 3,900 t from that in 2011 (table 8). Approximately 70% of silver produced in China was a byproduct of copper, lead, and zinc concentrates. Production data for primary silver mines were not available, but it was estimated that during the past 10 years, it has increased as a result of higher silver prices (CPM Group, 2013, p. 56). In 2012, the Jiyuan Smelter [Yuguang Gold-Lead Co. Ltd. (Jiyuan City, Henan Province)], China's largest capacity smelter with an annual estimated capacity of 730 t of silver (Tse, 2013, p. 8.22), produced 715 t of silver, 2.4% greater than in 2011 (CPM Group, 2013, p. 58). Jiangxi Copper Co. Ltd. was estimated to have produced 510 t of silver, 7.3% less than that of 2011 (CPM Group, 2013, p. 57). The company produced silver from its own mines as well as from imported ore. Yunnan Copper Group Co. Ltd.'s (Kunming, Yunnan) Yunnan smelter increased silver output to 522 t despite temporary shutdowns and a production cutback for planned maintenance (CPM Group, 2013, p. 56). Silvercorp Metals Inc. (Vancouver, British Columbia, Canada), operated several mines in the Ying Mining District (Henan Province): the Ying Mine, the largest; the Haopinggou Mine, located adjacent to the Ying Mine; the TLP Mine (77.5% owned by Silvercorp) located directly east of the Ying Mine; and the LM Mine, just southeast of the Ying Mine. Silver equivalent production from these mines in FY 2013 (year ending March 2013) was reported to be 162 t, a 10% decrease from that of FY 2012 (year ending March 2012) (Silvercorp Metals Inc., 2014, p. 19).

Kazakhstan.—Kazakhstan's silver production rose to 963 t, a 48% increase from that of 2011 (table 8). Production came from two companies, Kazakhmys plc (London, United Kingdom) and

Kazzinc Ltd. (Ust-Kamenogorsk). Kazakhmys, which operated copper and zinc mines in the Central, East, and Zhezkazgan Regions, produced 393 t of byproduct silver, 15 t less than during 2011. The Zhezkazgan Region, the country's leading silver-producing area, produced 227 t of silver, an increase from 212 t in 2011 (Kazakhmys plc, 2013, p. 158–160). Kazzinc was a producer of zinc with considerable copper, precious metals, and lead credits. The company reported a 5% decrease in silver production from its own ores to 149 t (Kazzinc Ltd., undated).

Mexico.—For the third consecutive year, Mexico was the world's leading producer of silver. The country was the leading world silver producer for 18 consecutive years between 1984 and 2001, trading off with Peru before and after this period (CPM Group, 2013, p. 62). Mexico's production rose to 5,358 t, an increase of 12% from that of 2011 (table 8). The country's leading silver-producing mines were, in descending order of production, Fresnillo plc's (London, United Kingdom) Fresnillo Mine, Coeur d'Alene Mines' Palmarejo Mine, Fresnillo's Saucito Mine, and Pan American's Alamo Dorado Mine. The Fresnillo Mine, in the State of Zacatecas, was the world's leading primary silver mine and produced 821 t of silver. Fresnillo's adjacent and new Saucito mine, produced 219 t of silver (Fresnillo plc, 2013, p. 60, 62). Coeur d'Alene Mines' Palmarejo Mine in the Sierra Madre Occidental silver-gold belt, 420 km southwest of the city of Chihuahua, produced 256 t of silver. Reported measured and indicated resources at Palmarejo increased by 169% to 1,423 t of silver (Coeur d'Alene Mines Corp., 2013, p. 8). Pan American Silver operated the Alamo Dorado and Dolores open pits and La Colorada underground mine with a combined production of 389 t of silver in 2012 (Pan American Silver Corp., 2013, p. 13).

Goldcorp Inc. (Vancouver, British Columbia, Canada) produced 737 t of silver from its Peñasquito Mine, a 24% increase from that of 2011 principally owing to an increase in mill throughput (Goldcorp Inc., 2013, p. 46). Gold Resource Corp.'s (Colorado Springs, CO) El Aguila project in Oaxaca produced 27 t of silver in 2012, its second year of operation (Meader and others, 2013, p. 25). The company processed all of its Arista Mine's ore (gold-silver-copper-lead-zinc) through the flotation circuit at its El Aguila mill (Gold Resource Corp., 2013, p. 11). SilverCrest Mines Inc. (Vancouver, British Columbia, Canada) produced 18 t of silver, a 54% increase from that of 2011, in its first full year of production at the Santa Elena Mine. Increases in production resulted from improved recovery rates and higher grade ore being loaded on the Phase II leach pad (SilverCrest Mines Inc., 2013).

Peru.—Peru was the world's third-ranked silver producer in 2012 and produced 3,479 t of silver, a slight increase from that of 2011 (table 8). Between 2002 and 2009, Peru was the world's leading silver producer. Volcan Compañía Minera S.A.A. had three mining units in Peru. Yauli was Volcan's leading unit and consisted of the San Cristóbal, Andaychagua, Ticlio, and Carahuacra Mines. The Cerro de Pasco unit, approximately 295 km from Lima, consisted of the Paragsha underground mine and the Raul Rojas open pit. The company's Chungar unit comprised two underground mines, the Animón and the Islay, and a concentrator with a processing capacity of 4,200 tons per day of ore (Volcan Compañía Minera S.A.A. and subsidiaries,

2013a, p. 2). The company reported silver production of 685 t from all three units, 4% higher than that of 2011. Volcan's Cerro de Pasco unit processed less ore than in 2011 owing to the completion of the current phase of the Raul Rojas open pit and the reduced ore contribution from the Paragsha Mine. This decrease was offset by an increase in production in the Chungar mining unit resulting from improvements in the crushing and milling processes and startup of an additional mill in 2011 as part of the Animón plant expansion plan (Volcan Compañía Minera S.A.A. and subsidiaries, 2013b, p. 1–2). Compañía Minera de Minas Buenaventura S.A.A.'s (Lima) Uchucchacua Mine produced 351 t of silver, a 12% increase from that of 2011. The reasons for the increase were higher mill throughput and a 5% higher recovery rate (Meader and others, 2013, p. 28).

Hochschild Mining plc (London, United Kingdom) operated three underground mines in southern Peru. The company's Pallancata Mine produced 231 t of silver, a 15% decrease from that of 2011; the Arcata Mine produced 172 t of silver, a 9% decrease from that of 2011, and the Ares Mine produced 15 t of silver, a 17% decrease from that of 2011. The decreases in production were owing to lower grades (Hochschild Mining plc, 2013, p. 181–182). Newmont Mining Corp. (Greenwood Village, CO) and Buenaventura jointly owned the Yanacocha Mine in the Cajamarca Region of northern Peru, which produced 27 t of silver, 35% less than that of 2011 (CPM Group, 2013, p. 58). The reason for the decline was a 25% decrease in throughput (Meader and others, 2013, p. 28). Pan American Silver operated three underground mines in Peru. The company's Huaron Mine produced 91 t of silver, a 5% increase from that in 2011. The Morococha Mine (92% ownership) produced 65 t of silver, a 22% increase from that in 2011, and the Quiruvilca Mine produced 9 t of silver, a 69% decrease from that in 2011. In June, Pan American Silver sold the Quiruvilca Mine (Pan American Silver Corp., 2013, p. 17, 21, 25).

Poland.—Poland produced 1,149 t of mined silver, a slight decrease from that of 2011 (table 8). The country's silver was a byproduct of the copper operations of KGHM Polska Miedź S.A. (Lubin, Poland). KGHM reported producing 1,274 t of silver ingots in 2012, a slight increase from that of 2011, from its Głogów Smelter Division (KGHM Polska Miedź S.A., 2013, p. 60–61).

Russia.—Russia produced 1,500 t of silver, an increase of 11% from that of 2011 (table 8). Byproduct silver production from gold mining increased by 30% (Meader and others, 2013, p. 29). The country's leading silver producer was Polymetal International plc's (St. Petersburg) Dukat hub located in the Magada region of Russia's far east. The property consisted of the Dukat open pit, the Lunnoye underground mines, and the Omsukchan concentrator. Silver production from the company's Dukat, Khakanja, and Kubaka Mines increased by 196 t owing to increased ore grades (CPM Group, 2013, p. 61). At Khakanja, a 60% increase in ore grade owing to increased ore contributions from the Avlayakan and the Ozerny pits resulted in a 56 t increase in silver production. Polymetal's Kubaka mill doubled production to 78 t of silver owing to higher grades at the Sopka deposit (Meader and others, 2013, p. 29).

Outlook

The world mine supply of silver was expected to increase by 4% in 2013, less than the increase in 2012. Silver production was expected to mirror both gold production and industrial demand as it did in 2012 (Klapwijk and others, 2013, p. 8, 31). Production increases in the United States were expected from the Lucky Friday Mine resuming production and from Aurcana Corp.'s (Vancouver, British Columbia, Canada) Shafter Mine in southwest Texas starting production. The latter project, however, was placed on care-and-maintenance status owing to lower silver prices and did not come into production. Projects in Mexico, Central America, and South America, such as Mexico's Peñasquito Mine and Bolivia's Pueblo Viejo Mine, were expected to be significant silver producers. La Ronde and Langlois Mines were expected to increase Canada's silver production as they ramp up production (CPM Group, 2013, p. 60). Production in Australia and China also was expected to increase.

The renewable energy sector was expected to increase demand for silver. The use of silver in photographic applications was expected to continue to decrease; much of the remaining use is expected to be for medical x-ray film, which has fared better than other photographic uses partly because of funding limitations for digital changeovers (Meader and others, 2013, p. 63). As hospitals convert to digital x-ray systems, however, silver use in photography was expected to continue to decline until it remains only in niche applications such as artistic photography.

Some new uses for silver that were in their developmental phases may increase silver demand in the future. Those include silver used for its biocidal or conductive properties. These applications, including products such as textiles and food packaging, use "nanosilver," silver particles 1 to 100 nanometers in size, a substantial difference from traditional silver particle size. Other uses of silver's biocidal properties have been for wound dressings, undergarments, and bed linens. Other emerging biocidal applications included glass and tapware, stationary, playground equipment, and wood preservation (Meader and others, 2013, p. 61).

Growing applications for conductive silver continue to be in radio frequency identification tags and printed inks for tracking stocks and shipments, including silver-base high-data-capacity tags, solid state readers, solid state lighting and organic light-emitting diodes, and computer systems. Although already used in many products, demand for silver-oxide batteries may increase with the proliferation of laptop and tablet computers and cellular telephones with advanced computing capabilities. The automobile industry's increasing need for high capacity batteries for hybrid and electric vehicles may further spur a demand for silver (Meader and others, 2013, p. 61).

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TABLE 1
SALIENT SILVER STATISTICS¹

		2008	2009	2010	2011	2012
United States:						
Mine production:						
Quantity	metric tons	1,250	1,250	1,280	1,120	1,060
Value	thousands	\$600,000	\$588,000	\$829,000	\$1,270,000	\$1,060,000
Refinery production:						
Domestic and foreign ores and concentrates	metric tons	779	796	819	790	796
Scrap (old and new)	do.	1,210	1,340	1,330	1,710	1,660
Exports:						
Ore and concentrate	do.	130	122	82	172	42
Bullion and dore	do.	507	297	627	732	905
Imports for consumption:						
Ore and concentrate ²	do.	5 ^r	1 ^r	4 ^r	84	83
Bullion and dore	do.	4,430	3,450	5,370	6,320	5,060
Stocks, December 31:						
Industry	do.	153	150	123	150	109
COMEX	do.	3,970	3,500	3,260 ^r	3,650	4,610
U.S. Department of the Treasury	do.	498 ^r	498 ^r	498 ^r	498 ^r	498
Bullion coin production ³	do.	609	895	1,100	1,310	1,070
Price, average ⁴	dollars per troy ounce	15.00	14.69	20.20	35.26	31.21
Employment, mine and mill workers ⁵		492 ^r	452 ^r	814 ^r	632 ^r	709
World, mine production	metric tons	21,300 ^r	22,300 ^r	23,900 ^r	24,100 ^r	25,500 ^c

^cEstimated. ^rRevised. do. Ditto.

¹Data are rounded to no more than three significant digits, except prices.

²Includes silver content of ash and residues.

³Data from the U.S. Mint.

⁴Price data are the annual Handy & Harman quotations published in Platts Metals Week.

⁵Employment data are from the U.S. Department of Labor, Mine Safety and Health Administration, for mines classified as “active and temporarily idle” silver mines by the U.S. Geological Survey.

TABLE 2
MINE PRODUCTION OF SILVER IN THE UNITED STATES, BY STATE¹

(Kilograms)

State	2010	2011	2012
Nevada	224,000	209,000	250,000
Other ²	1,050,000	913,000	805,000
Total	1,280,000	1,120,000	1,060,000

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes Alaska, Arizona, California, Colorado, Idaho, Missouri, Montana, New Mexico, South Dakota, and Utah.

TABLE 3
LEADING SILVER-PRODUCING MINES IN THE UNITED STATES IN 2012, IN ORDER OF OUTPUT¹

Rank	Mine	County and State ²	Operator	Source of silver
1	Red Dog	Northern Region, AK	Teck Alaska Inc.	Zinc-lead ore.
2	Greens Creek	Southeastern Region, AK	Hecla Mining Co.	Zinc-silver ore.
3	Rochester	Pershing, NV	Coeur d'Alene Mines Corp.	Silver ore.
4	Galena	Shoshone, ID	U.S. Silver and Gold Inc.	Do.
5	Bingham Canyon	Salt Lake, UT	Kennecott Utah Copper Corp. ³	Copper-molybdenum ore.
6	Troy	Lincoln, MT	Revet Minerals Inc.	Copper-silver ore.
7	Mission Complex	Pima, AZ	ASARCO LLC ⁴	Copper ore.
8	Wharf	Lawrence, SD	Goldcorp Inc.	Gold ore.
9	Phoenix	Lander, NV	Newmont Mining Corp.	Gold-copper ore.
10	Midas	Elko, NV	do.	Gold ore.
11	Smoky Valley Common Operation	Nye, NV	Kinross Gold Corp.	Do.
12	Hycroft	Humboldt and Pershing, NV	Allied Nevada Gold Corp.	Gold-copper ore.
13	Mineral Park	Mohave, AZ	Mercator Minerals Ltd.	Copper-molybdenum ore.
14	Bagdad	Yavapai, AZ	Freeport-McMoRan Copper & Gold Inc.	Do.
15	Continental Pit	Silver Bow, MT	Montana Resources	Do.
16	Denton-Rawhide	Mineral, NV	Rawhide Mining, LLC	Gold ore.
17	Drumlummon	Lewis and Clark, MT	U.S. Silver and Gold Inc.	Silver ore.
18	Carlin Mines Operations ⁵	Eureka and Humboldt, NV	Newmont Mining Corp.	Gold ore.
19	Ray	Pinal, AZ	ASARCO LLC ⁴	Copper ore.
20	Hollister	Elko, NV	Great Basin Gold Ltd.	Gold ore.
21	Morenci	Greenlee, AZ	Freeport-McMoRan Copper & Gold Inc.	Copper-molybdenum ore.
22	Goldstrike ⁶	Elko and Eureka, NV	Barrick Gold Corp.	Gold ore.
23	Chino	Grant, NM	Freeport-McMoRan Copper & Gold Inc.	Copper-molybdenum ore.

Do., do. Ditto.

¹The mines on this list accounted for about 99% of U.S. mine production in 2012.

²For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 67, Alaska's mineral industry 2011—Exploration activity.

³Wholly owned subsidiary of Rio Tinto plc.

⁴Wholly owned subsidiary of Grupo México, S.A.B. de C.V.

⁵Includes eight open pit operations (Emigrant, Genesis, Gold Quarry, Lantern, Lone Tree, Pay Raise, Twin Creeks, and Widge Mines) and six underground operations (Carlin East, Chukar, Exodus, Leeville, Pete Bajo, and Vista Mines).

⁶Includes Betze-Post, Meikle, and Storm Mines.

TABLE 4
U.S. EXPORTS OF SILVER, BY COUNTRY¹

Year and country	Silver ores and concentrates			Bullion			Dore			Total		
	Silver content (kilograms)	Value (thousands)	\$94,200	Silver content (kilograms)	Value (thousands)	\$673,000	Silver content (kilograms)	Value (thousands)	\$133,000	Silver content (kilograms)	Value (thousands)	\$904,000
2011:	172,000	\$94,200		625,000	\$673,000		107,000	\$133,000		904,000	\$900,000	
2012:												
Argentina	--	--		144	158		--	--		144	158	
Australia	69	18		27,800	17,500		--	--		27,900	17,500	
Austria	--	--		1,130	723		934	1,020		2,060	1,740	
Belgium	--	--		6,700	2,410		--	--		6,700	2,410	
Canada	--	--		79,200	90,400		--	--		79,200	90,400	
China	15,600	14,300		--	--		3	3		15,600	14,300	
Czech Republic	111	60		1,520	1,140		152	144		1,780	1,350	
Estonia	--	--		620	602		--	--		620	602	
Germany	20,300	20,600		16,900	18,400		11,000	13,300		48,200	52,300	
Hong Kong	62	25		5,670	4,850		740	729		6,470	5,600	
India	--	--		19,100	17,100		69	57		19,100	17,200	
Italy	--	--		115	99		--	--		115	99	
Japan	--	--		86,200	80,600		--	--		86,200	80,600	
Korea, Republic of	5,240	4,800		--	--		39	35		5,280	4,840	
Malaysia	3	3		1,160	648		--	--		1,160	651	
Mexico	48	27		250,000	245,000		--	--		250,000	245,000	
New Zealand	--	--		1,210	1,140		2,210	2,180		3,420	3,320	
Norway	--	--		18	16		498	475		516	491	
Pakistan	--	--		1,870	1,720		--	--		1,870	1,720	
Peru	--	--		--	--		85	85		85	85	
Singapore	3	3		4,010	3,770		3,470	3,570		7,480	7,340	
Switzerland	--	--		12,100	12,500		1,430	1,210		13,500	13,700	
Turkey	--	--		48	50		28	28		76	78	
United Arab Emirates	71	13		270	245		7,360	6,790		7,700	7,050	
United Kingdom	37	18		320,000	295,000		39,200	40,100		360,000	335,000	
Other	46	16		664	578		686	741		1,400	1,340	
Total	41,500	39,900		837,000	795,000		67,900	70,400		946,000	905,000	

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 5
U.S. EXPORTS OF SILVER, BY COUNTRY¹

Year and country	Other unwrought silver		Metal powder		Silver nitrate		Semimanufactured forms ²		Waste and scrap	
	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)
2011	193,000	\$169,000	1,080,000	\$1,120,000	54,400	\$7,130	1,080,000	\$807,000	4,450,000	\$3,440,000
2012:										
Australia	80	54	25	34	656	208	2,490	1,580	119	40
Austria	128	130	149	227	--	--	146	73	33	165
Belgium	--	--	2,940	3,250	125	18	6	10	1,540,000	165,000
Brazil	1	3	2,700	2,700	275	32	755	688	--	--
Canada	193,000	214,000	47,000	13,500	31,100	2,860	439,000	432,000	2,350,000	260,000
China	3,530	2,480	91,600	59,700	884	240	5,920	3,200	80,500	32,900
Costa Rica	3,510	3,410	--	--	315	41	1,710	1,100	--	--
Czech Republic	--	--	200	228	--	--	73	39	892	822
Dominican Republic	590	590	--	--	739	144	377	219	85	92
France	3,370	1,860	62,700	64,400	1	3	3,520	2,360	2,260	7,340
Germany	3,490	3,630	53,700	62,100	18	3	12,000	10,000	2,610,000	422,000
Hong Kong	4,270	4,020	73,600	91,600	60	14	9,690	6,640	831	2,800
India	18,500	11,400	--	--	291	26	2,750	1,780	--	--
Israel	375	108	25	25	950	161	2,770	1,520	6	4
Italy	32	35	1,610	1,460	--	--	1,330	785	1,240,000	583,000
Japan	1,810	2,710	83,800	90,700	189	36	1,730	970	2,240,000	181,000
Korea, Republic of	34,800	40,500	58,900	64,400	408	255	1,300	1,100	1,400	19,500
Malaysia	60	58	2,920	3,610	100	44	1,830	1,030	3	6
Mexico	7,250	7,420	8,080	7,740	6,250	1,340	81,700	43,700	315,000	90,800
Netherlands	25	24	14,300	14,900	72	47	15	8	2	144
New Zealand	60	62	--	--	--	--	200	100	--	--
Philippines	115	98	--	--	350	66	841	440	--	--
Russia	640	103	--	--	--	--	45	31	--	--
Saudi Arabia	--	--	--	--	--	--	6,190	3,090	--	--
Singapore	546	538	50,600	24,200	630	136	8,420	4,080	546	32
South Africa	56	31	--	--	52	20	8	4	29,700	9,900
Spain	390	98	24	23	--	--	9,400	5,580	102	194
Sweden	--	--	--	--	86	23	3,590	2,110	2,220,000	111,000
Switzerland	332	356	--	--	1,730	146	368	202	578	2,900
Taiwan	180	196	167,000	181,000	24	5	3,040	1,640	--	--
Thailand	3,710	2,240	2,140	2,080	--	--	9,390	4,930	(3)	10
United Arab Emirates	156	120	--	--	--	--	2,340	1,210	--	--
United Kingdom	2,000	1,980	48,700	39,900	--	--	5,120	3,120	411,000	164,000
Vietnam	4	7	--	--	14	3	664	361	--	--
Other	447	452	959	735	2,070	306	9,270	6,730	671	318
Total	284,000	298,000	774,000	729,000	47,400	6,170	628,000	543,000	13,000,000	2,050,000

See footnotes at end of table.

TABLE 5—Continued
U.S. EXPORTS OF SILVER, BY COUNTRY¹

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Containing 99.5% or more by weight of silver.

³Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF SILVER, BY COUNTRY¹

Year and country	Silver ores and concentrates		Ash and residues		Bullion		Dore		Total	
	Silver content (kilograms)	Value (thousands)	Silver content (kilograms)	Value (thousands)	Silver content (kilograms)	Value (thousands)	Silver content (kilograms)	Value (thousands)	Silver content (kilograms)	Value (thousands)
2011	84,200	\$31,900	114	\$27	5,250,000	\$5,660,000	1,070,000	\$1,530,000	6,410,000	\$7,220,000
2012:										
Argentina	--	--	--	--	5,460	5,020	34,300	49,700	39,800	54,700
Belgium	--	--	--	--	43,900	41,100	--	--	43,900	41,100
Bolivia	1,150	240	--	--	--	--	42,000	42,900	43,100	43,200
Canada	73,800	30,500	--	--	1,330,000	1,330,000	19,100	17,000	1,420,000	1,380,000
Chile	--	--	--	--	73,100	73,300	4,830	8,080	77,900	81,400
Colombia	--	--	--	--	903	813	15,500	15,200	16,400	16,000
Dominican Republic	--	--	--	--	906	890	501	524	1,410	1,410
Germany	--	--	--	--	5,550	5,680	50	48	5,600	5,720
Guatemala	--	--	--	--	16	16	68,400	72,400	68,400	72,400
Hong Kong	--	--	--	--	330	293	--	--	330	293
Italy	--	--	--	--	10,400	11,100	1,170	1,160	11,600	12,200
Korea, Republic of	--	--	--	--	55,600	60,000	--	--	55,600	60,000
Malaysia	--	--	59	16	--	--	--	--	59	16
Mexico	7,770	4,630	--	--	2,390,000	2,390,000	681,000	987,000	3,080,000	3,380,000
Morocco	--	--	--	--	22,400	19,900	--	--	22,400	19,900
Panama	--	--	--	--	1,040	979	927	890	1,970	1,870
Peru	--	--	--	--	44,100	45,100	97,400	168,000	142,000	214,000
Philippines	--	--	316	95	--	--	--	--	316	95
Poland	--	--	--	--	36,700	38,400	--	--	36,700	38,400
Russia	--	--	--	--	4,050	3,840	1,990	2,150	6,040	5,980
Spain	--	--	--	--	--	--	2,440	536	2,440	536
Switzerland	--	--	--	--	7,570	7,970	55,400	64,700	63,000	72,700
Taiwan	--	--	--	--	695	615	--	--	695	615
United Kingdom	--	--	--	--	330	235	643	59	973	294
Other	--	--	16	8	397	364	3,130	2,620	3,540	3,000
Total	82,700	35,400	391	119	4,030,000	4,040,000	1,030,000	1,430,000	5,140,000	5,500,000

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF SILVER, BY COUNTRY¹

Year and country	Other unwrought silver		Metal powder		Silver nitrate		Semimanufactured forms ²		Waste and scrap	
	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)
2011	217,000	\$108,000	344,000	\$214,000	1,870	\$727	690,000	\$796,000	8,820,000	\$519,000
2012:										
Australia	149	202	117	5	--	--	4,480	3,700	2	68
Belgium	--	--	--	--	510	18	--	--	515,000	10,800
Brazil	371	371	--	--	--	--	--	--	921,000	5,090
Canada	105,000	108,000	47,900	2,960	--	--	243,000	233,000	2,200,000	168,000
China	--	--	41,300	2,270	--	--	72	45	550,000	6,510
Colombia	--	--	137	92	--	--	3,570	3,490	94,000	1,550
Costa Rica	85	80	9	5	--	--	37	36	138,000	4,920
Czech Republic	98	87	444	532	9	17	7	8	1,060	42
Dominican Republic	2,840	2,350	--	--	--	--	--	--	60,300	11,900
France	--	--	28,000	2,980	--	--	--	--	33,000	156
Germany	92	94	2,360	1,860	166	28	264	178	317,000	104,000
Italy	853	960	71,500	72,000	--	--	417	265	13,700	68,800
Jamaica	258	241	--	--	--	--	23	26	558	2,380
Japan	--	--	229,000	225,000	--	--	167	41	80,900	7,820
Korea, Republic of	--	--	4,580	362	--	--	--	--	1,650	2,040
Mexico	88,700	90,000	29	30	--	--	243,000	240,000	976,000	33,400
Netherlands	35	38	--	--	10	7	(3)	5	652	735
Panama	--	--	--	--	--	--	391	294	69,700	500
Peru	500	533	7,990	7,910	--	--	1,440	1,510	7,040	3,720
Singapore	--	--	8	8	--	--	--	--	130,000	9,490
Sweden	--	--	1,850	1,790	--	--	--	--	6,450	51
Switzerland	24	31	1	2	--	--	1,110	1,280	22,900	72
Taiwan	22	21	7,280	4,400	--	--	--	--	91,800	87
Trinidad and Tobago	--	--	--	--	--	--	--	--	10,300	128
Turkey	--	--	--	--	--	--	21	22	562,000	21,500
United Kingdom	296	106	1,340	374	1,030	531	3	10	516,000	51,700
Other	4	5	21	24	--	--	77	80	--	--
Total	199,000	203,000	444,000	323,000	1,730	601	498,000	484,000	7,320,000	518,000

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Containing 99.5% or more by weight of silver.

³Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 8
SILVER: WORLD MINE PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2008	2009	2010	2011	2012 ^c
Algeria	(4)	(4)	(4)	(4) ^e	(4)
Argentina	356	533	723	747 ^r	800
Armenia	40	53	68	73 ^r	75
Australia	1,926	1,635	1,864	1,725	1,728 ⁵
Azerbaijan	--	--	2	1	1 ⁵
Bolivia	1,114	1,326	1,259	1,214	1,214 ⁵
Brazil	4 ^r	4 ^r	5 ^r	8 ^r	9 ^p
Bulgaria ^c	50 ^r	43 ^r	42 ^r	45 ^r	55
Burma	--	(4)	--	--	--
Canada	709 ^r	609 ^r	570 ^r	582 ^r	663 ^{p,5}
Chile	1,405	1,301	1,287	1,291	1,195 ⁵
China ^c	2,800	2,900	3,500	3,700	3,900
Colombia	9	11	15	24	9 ⁵
Congo (Kinshasa)	34	--	6	10	12 ⁵
Cote d'Ivoire	--	(4)	(4)	(4)	1 ⁵
Dominican Republic ^c	--	19	20	18	33
Ecuador	(4)	(4)	1 ^r	1 ^r	2
Ethiopia ^c	3 ⁵	1 ⁵	2	2	2
Finland	70	70	65 ^r	73 ^r	128 ⁵
France ^c	1	1	--	--	--
Ghana ^c	3 ⁵	4 ⁵	4	4	4
Greece ^c	28 ⁵	30	30	30	28
Guatemala	100	129 ^r	195	273	205 ⁵
Honduras	60	58 ^r	58 ^r	53 ^r	51 ⁵
India	96	138 ^r	165 ^r	204 ^r	330
Indonesia ^c	226	359	272	310 ^r	250
Iran	NA ^r	NA ^r	NA ^r	NA ^r	NA
Ireland ^c	4	4	4	4	4
Italy ^{e,5}	(4)	(4)	(4)	(4)	(4)
Japan	2	2	1	4	4 ⁵
Kazakhstan	646	618	552 ^r	651 ^r	963 ⁵
Korea, North ^c	20	20	20	20	20
Korea, Republic of	1	NA	2 ^r	3 ^r	3
Laos	5	14	18	18	19 ⁵
Macedonia ^c	9	9	9	9	9
Malaysia	(4)	(4)	(4)	(4)	2 ⁵
Mali ^c	2	3	2	2	2
Mexico	3,236	3,554	4,411	4,778 ^r	5,358 ⁵
Mongolia	20	20	20 ^r	19 ^r	19 ⁵
Morocco ^c	190	195	195	190	190
Namibia ^c	33 ^r	11 ^r	10 ^r	9 ^r	9
New Zealand	18	14	17 ^r	14 ^r	6 ⁵
Nicaragua	4	4	7	8 ^r	10 ⁵
Oman	(4)	(4)	(4)	(4)	--
Pakistan ^c	3	3	3	3	3
Panama ^c	--	--	1	2	2
Papua New Guinea	48	55	74 ^r	81 ^r	84 ⁵
Peru	3,686	3,923 ^r	3,640	3,419 ^r	3,479 ⁵
Philippines	14	34	41	46 ^r	67 ⁵
Poland	1,161	1,207	1,181	1,167	1,149 ⁵
Portugal	29	22	24	28 ^r	28 ^p
Romania ^c	18	18	18	18	18
Russia	1,132	1,313	1,356	1,350	1,500
Saudi Arabia	8	9	8	8	4
Serbia	2 ^e	3 ^e	5	5 ^r	5 ⁵

See footnotes at end of table.

TABLE 8—Continued
SILVER: WORLD MINE PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2008	2009	2010	2011	2012 ^e
Solomon Islands ^e	--	--	--	1	2
South Africa	75	78	79	73 ^r	66 ⁵
Spain ^e	3 ⁵	4 ⁵	23 ^r	33 ^r	39
Sudan	--	(4)	1	1 ^{r,e}	1
Sweden	293 ^r	289 ^r	302 ^r	302 ^r	305
Tajikistan	3	1 ^r	3	2 ^r	2 ⁵
Tanzania	10	8	12	14 ^r	13
Thailand	8	13	17	23	30
Turkey	294	352	364 ^r	247 ^r	250
United Kingdom	(4)	(4)	(4)	1	(4)
United States	1,250	1,250	1,280	1,120	1,060 ⁵
Uruguay ^e	4	3	3	3	3
Uzbekistan	75	53	59	60 ^r	63
Zimbabwe ^e	(4)	(4)	(4)	1 ^r	1
Total	21,300 ^r	22,300 ^r	23,900 ^r	24,100 ^r	25,500

^eEstimated. ^pPreliminary. ^rRevised. NA Not available. -- Zero.

¹World totals, U.S. data, and estimated data have been rounded to no more than three significant digits; may not add to totals shown.

²Recoverable content of ores and concentrates produced unless otherwise specified. Table includes data available through February 13, 2015.

³In addition to the countries listed, Botswana, Eritrea, Fiji, Georgia, Iran, Kyrgyzstan, and Zambia produced silver, but available information is inadequate to make reliable estimates of output levels.

⁴Less than ½ unit.

⁵Reported figure.