



2018 Minerals Yearbook

SILVER [ADVANCE RELEASE]

SILVER

By C. Schuyler Anderson

Domestic survey data and tables were prepared by Michelle B. Blackwell, statistical assistant.

In 2018, the United States produced 934 metric tons (t) of silver, which was 9% less than production in 2017 (table 1). Silver was produced in 11 States in 2018, and Alaska remained the leading silver-producing State, followed by Nevada (table 2). Approximately 47% of domestic silver production was from primary silver ore at 4 mines, 41% of domestic silver was produced from base-metal ores at 14 mines, and the remaining was from gold ores at 25 mines (table 3). Hecla Mining Co.'s Greens Creek Mine (for data collection purposes) had been considered a primary zinc mine until 2016, when it was redesignated as a primary silver mine, bringing the classification into alignment with Hecla's and the Mine Safety and Health Administration reporting.

The Engelhard price of silver averaged \$15.71 per troy ounce in 2018, an 8% decrease compared with the 2017 average price of \$17.07 per troy ounce (table 1).

Traditional use categories for silver included coin and medal fabrication; industrial applications such as brazing alloys and solders, electrical and electronics components, ethylene oxide, photography, and photovoltaics; jewelry; non-coin investments; and silverware. In 2018, global use of silver increased by 4% compared with that in 2017. Apart from ethylene oxide, photography, and photovoltaics (which decreased by 22%, 4%, and 9%, respectively), silver use in all other categories increased in 2018. Coin and medal fabrication increased by 20% in 2018 (Alexander and others, 2019, p. 8).

In 2018, silver was mined in approximately 60 countries and (or) localities. Global silver production was 27,000 t, a slight decrease from 27,300 t (revised) in 2017 (tables 1, 8). Mexico was the leading global silver producer, followed by Peru, China, Russia, Poland, Chile, and Australia. These leading countries accounted for 74% of the global production of silver. The United States ranked 10th in world silver mine production in 2018.

Legislation and Government Programs

On September 30, 2018, the amount and value of Deep Storage and Working Stock custodial silver reserves held by the U.S. Mint were 498 t with a total market value of \$229 million at \$14.31 per fine 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 supplies. In accordance with 31 U.S. Code § 5117(b) and 31 U.S. Code § 5116(b)(2), a statutory rate of no less than \$1.292929292 per fine troy ounce was used to value the custodial silver held by the U.S. Mint. Total silver bullion ounces sold decreased by 38% in fiscal year 2018 when compared with fiscal year 2017. Sales of the American Eagle silver dollar decreased by 41%, whereas the America the Beautiful silver dollar increased by 12% (U.S. Mint, 2019, p. 15–16, 48).

In January 2018, the United States placed a 30% tariff on all imports of solar equipment. Silver powder was used to produce silver paste, which was used in the fabrication of crystalline silicon photovoltaic solar panels, the most commonly used type of solar panel. Silver paste was used for electrical contacts owing to its high conductivity and was used at an average of 130 milligrams per solar cell. This tariff allowed up to 2,500 megawatts of unassembled solar cells to be imported tariff-free and would decrease by 5% annually over 4 years to a 15% tariff in 2021. This tariff led to reduced investments in renewable energy by \$2.5 billion (Silver Institute, The, 2018, p. 16; Alexander and others, 2019, p. 51, 64–66).

Production

Domestic lode mine production data for silver were compiled by the U.S. Geological Survey from two separate voluntary monthly surveys of U.S. mining operations and from publicly available sources and represented 100% of U.S. mine production listed in table 1. Domestic mine production of silver decreased by 9% in 2018 to 934 t, primarily because of decreased production at the Greens Creek Mine in Alaska, the Lucky Friday Mine in Idaho, and the Red Dog Mine in Alaska. Silver in the United States was produced as a principal product at, in descending order by quantity, the Greens Creek Mine, the Rochester Mine, the Galena Complex Mine, and the Lucky Friday Mine.

Hecla's Lucky Friday Mine, an underground silver-lead-zinc mine in the Coeur d'Alene mining district in northern Idaho, produced 5 t of silver in 2018. The Lucky Friday Mine produced 80% less silver in 2018 than in 2017 as a result of a workers' strike that started on March 13, 2017, and continued through 2018. The mill operated intermittently during the strike. Silver production at Hecla's Greens Creek Mine on Admiralty Island near Juneau, AK, was 247 t, a decrease of almost 5% compared with 2017 production (Hecla Mining Co., 2019, p. HL10-K 18–21).

Coeur Mining, Inc.'s Rochester Mine near Lovelock, NV, a silver surface mine with gold byproduct, produced 157 t of silver in 2018, 7% more than 2017 production. Higher silver production was because of the timing of recoveries, but partially offset by the decommissioning of a crusher (Coeur Mining, Inc., 2019, p. 24, 28, 45).

The Red Dog Mine in northwest Alaska, owned by Teck Resources Ltd., primarily a zinc-lead mine, produced 218 t of silver compared with 239 t in 2017, a 9% decrease. The Qanaiyaq deposit was opened in the first quarter of 2017 because of declining ore grade from the Awwaluk pit (Athey and Werdon, 2019, p. 57, 61).

The Galena Complex silver mine, near Silverton, ID, owned by Americas Silver Corp., produced 30 t of silver in 2018

compared with 35 t in 2017, a decrease of 15%. This decrease was attributed to mechanical issues with shaft number 3, which was suspended for 10 days in April and 17 days in June (Americas Silver Corp., 2019, p. 4, 8).

Consumption

Consumption of silver for fabrication in the United States was 5,220 t in 2018, a 3% decrease from that of 5,360 t (revised) in 2017. Silver consumption for coins declined by 38% and was offset by slight increases in consumption for industrial applications and jewelry. Globally, consumption of silver for fabrication was 30,700 t, a slight increase from the previous year. This increase in global consumption was driven by increased consumption in jewelry fabrication, silverware, and physical investment, but was offset by decreased consumption in industrial applications and photography (Alexander and others, 2019, p. 52, 63, 73, 76, 84; U.S. Mint, 2019, p. 16).

Coin Fabrication.—Approximately 461 t of silver was consumed for coins and medals in the United States in 2018, a 38% decrease from 746 t in 2017. In fiscal year 2018, the U.S. Mint sold 430 t of American Eagle silver bullion coins, a decrease of 40% from 718 t in 2017. Sales of the America the Beautiful silver coin increased by 11% in 2018 to 31 t from 28 t in 2017. The silver consumed in coins was the lowest since 2017 (U.S. Mint, 2019, p. 16).

Industrial Applications.—Silver consumed in domestic industrial applications increased for the fourth year in a row after 3 years of decreases from 2011 to 2014. Approximately 4,190 t of silver was used in the United States in 2018 for industrial applications, a 3% increase from 4,080 t (revised) in 2017 (Alexander and others, 2019, p. 52, 54).

The principal components of industrial demand for silver were, in descending order, electrical components and electronics (1,840 t), photovoltaics (560 t), photography (423 t), brazing alloys and solders (196 t), catalysts (102 t), and other applications (1,070 t).

In 2018, the domestic use of silver for electronic and electrical applications totaled 1,840 t, an increase of 6% from 1,740 t in 2017 (Alexander and others, 2019, p. 58). One of silver's electrical 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; these batteries contained 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 feature a water-based chemistry and contain no lithium or flammable liquids. Some larger silver-oxide and silver-zinc batteries were used in military applications. Silver also was used in conductors, contacts, fuses, switches, and timers (Silver Institute, The, undated).

In 2018, estimated domestic silver powder production for photovoltaic purposes decreased to 560 t from 579 t (revised) in 2017, a decrease of 3% owing to using less silver per solar panel. The average silver loading per cell was an estimated 0.12 grams (Alexander and others, 2019, p. 51, 64–66; National Renewable Energy Laboratory, 2019, p. 68; 2020, p. 70).

Silver was one of the essential materials used in the manufacture of photographic films and papers. The decline in

the use of silver for photography began in 2000 in response to the growth in digital camera technology and the decline in the production of color film and paper. The use of silver in film and paper for consumer applications declined more rapidly than its use in motion picture film because of the slower adoption of digital formats in motion picture production. Other photographic-use categories for silver-containing film and paper included commercial photography, dental and industrial X-ray film, graphic arts, and medical X-ray film. In 2018, domestic use of silver for photographic applications was 422 t, a slight decrease from 427 t in 2017 (Alexander and others, 2019, p. 62–64).

Adding silver to solder or brazing alloys helps produce smooth, leak-tight, and corrosion-resistant joints. Silver brazing alloys were used widely in a variety of applications, including air conditioning, refrigeration, and electric power distribution. These alloys also were important in the aerospace and automobile industries. In 2018, 196 t of silver were used domestically in brazing alloys and solders, slightly more than in 2017 (Alexander and others, 2019, p. 62).

As a catalyst, silver can be used in the form of mesh screens or crystals 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 used in the production of ethylene oxide from ethylene. Aside from plastics, ethylene oxide was used for antifreeze, detergents, and polyester fiber. Ethylene oxide catalyst use in the United States increased by 278% in 2018 to 102 t from 27 t owing to the commissioning of two new plants. Recovery of ethylene oxide was estimated at 98% over an 18-to-36-month cycle, so demand for silver directly depended on the building of new capacity (Alexander and others, 2019, p. 60, 89).

Silver membrane switches were used in electronic buttons such as on 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. Dental amalgam contained silver, but dental amalgam's use was declining because of concerns about its mercury content (U.S. Food and Drug Administration, 2015). Owing to silver's antibacterial properties, silver also was 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 (Silver Institute, The, undated).

Jewelry and Silverware.—In 2018, domestic consumption of silver for fabrication of jewelry and silverware was 566 t, a 7% increase compared with the 529 t consumed in 2017. Silver consumption for jewelry increased to 541 t, 7% more than that in 2017, and consumption for silverware was unchanged at 25 t. Demand for jewelry rose owing to higher retail demand by younger consumers. Industry sources reported that silver had the best inventory turnover rate and was in high demand, reaching a \$500 price point. Online shopping had also become more popular and with reduced brick and mortar presence, consumers were better informed and educated as to the most

value they could receive for their purchase (Alexander and others, 2019, p. 68–69, 73, 76).

Prices

From January 2 to December 31, 2018, there was an overall increase in silver prices of 5% compared with a 6% increase during the same time period in 2017. The yearly high of the daily Engelhard silver price was \$17.52 per troy ounce on January 25, and the yearly low was \$14.00 per troy ounce on November 14. The daily average price per troy ounce of silver was \$15.71, an 8% decrease compared with the daily average price in 2017 (table 1).

Foreign Trade

U.S. exports of silver contained in bullion, dore, and ores and concentrates increased by 283% to 602 t in 2018 from 157 t in 2017 (table 4). Principal destinations were India (67%), the United Kingdom (11%), and Japan (4%). U.S. imports for consumption of silver contained in bullion, dore, and ores and concentrates decreased by 4% to 4,840 t in 2018 from 5,040 t (revised) in 2017 (table 6). The principal import sources were Mexico (50%), Canada (30%), and Chile (6%). United States exports of silver to India increased owing to increased jewelry and silverware fabrication there as well as increased global demand, which rose owing to lower prices in 2018 (Alexander and others, 2019, p. 47–49).

World Review

World mine production of silver decreased slightly to 27,000 t in 2018 from 27,300 t (revised) in 2017. Mexico continued to be the leading producer of silver, accounting for 22% of world production. Mexico was followed by Peru (15%); China (13%); Russia (8%); Australia, Chile, and Poland (5% each); Argentina and Bolivia (4% each); the United States (3%); and India and Sweden (2% each). These 12 countries accounted for 90% of global silver production. Silver production increased in Australia (by 134 t); other countries with increases in production were India (122 t), China (72 t), Chile (52 t), Turkey (46 t), Papua New Guinea (28 t), Argentina (26 t), the Dominican Republic (15 t), Portugal (14 t), and Russia (10 t). World mine production decreased as a whole in 2018—the most notable decreases were in Peru (143 t); the United States (97 t); Mexico (60 t); Kazakhstan (41 t); Eritrea and Indonesia (20 t each); Poland (19 t); Sweden (17 t); South Africa (16 t); Morocco (14 t); Canada (13 t); and Bulgaria (12 t) (table 8).

According to the Silver Institute, 26% of global silver production in 2018 was from silver ores, 38% from lead and zinc ores, 23% from copper ores, 13% from gold ores, and negligible amounts from other types of mining operations. Global silver scrap recycling declined slightly to 4,707 t, primarily owing to lower prices. The lower silver prices reduced the incentive for suppliers and consumers to recycle scrap. The leading countries for scrap recycling were the United States (1,052 t), China (704 t), Germany (604 t), Japan (464 t), and Russia (263 t) (Alexander and others, 2019, p. 34, 43–44).

Global silver consumption increased by 4% to 32,145 t in 2018 from 31,054 t in 2017. Industrial applications were the

leading end uses of silver (accounting for 56% of total global consumption), followed by jewelry (21%); bars, coins, and medals (18%); and silverware (5%). Silver use in all categories increased in 2018 except for ethylene oxide (which decreased by 22%), photovoltaic uses (9%), and photography (4%). Bars, coins and medals; and silverware had the largest increases at 20% and 6%, respectively (Alexander and others, 2019, p. 8).

World consumption of silver for jewelry increased by 4% in 2018 to 6,610 t from 6,360 t primarily driven by continued increased consumption in India. Consumption for jewelry in India increased by 15% to 2,380 t from 2,060 t, where it was frequently used as an alternative to gold jewelry because it was more affordable. Silver consumption in China decreased by 5% from that in 2017 to 789 t owing to a weaker economy and a reduced number of participants in the Chinese jewelry industry. Silver consumption in Thailand decreased by 4% from that in 2017 to 795 t (Alexander and others, 2019, p. 70–74).

Argentina.—In 2018, silver production in Argentina increased by 3% to 1,024 t from 2017 owing to increased production from Yamana Gold Inc.'s Cerro Moro Mine, which produced 128 t of silver after beginning commercial production on June 26. SSR Mining Inc.'s Puna operations decreased by 39% to 117 t of silver in 2018 from 192 t produced in the previous year (Yamana Gold Inc., 2018; 2019, p. 19; SSR Mining Inc., 2019, p. 9).

Australia.—In 2018, silver production in Australia increased by 12% to 1,254 t from 1,120 t (revised) in 2017. South32 Ltd.'s Cannington silver mine produced 416 t of silver in 2018, an 11% increase from 2017 production of 375 t. MMG Australia Ltd.'s Rosebery Mine produced 91 t, a 24% increase from 73 t in 2017, and the Dugald River Mine began operations in 2018, producing 28 t. BHP Group Ltd.'s Olympic Dam Mine produced 30 t, a 39% increase from 21 t in 2017 (BHP Group Ltd., 2018, p. 9; 2019a, p. 9; South32 Ltd., 2018, p. 24; 2019, p. 24; MMG Australia Ltd., 2019, p. 19–20).

Bolivia.—Silver production in Bolivia in 2018 was 1,191 t, essentially unchanged compared with 1,196 t (revised) in 2017. During 2018, the San Bartolomé Mine produced an estimated 136 t of silver. In February 2018, Coeur and its subsidiaries completed the sale of Empress Minera Manquiri, S.A. (the operator of the San Bartolomé Mine) to Ag-Mining Investments, AB (Coeur Mining, Inc., 2019, p. 4). Production of silver at the San Vicente Mine was 110 t in 2018, a slight decrease compared with 112 t in 2017 (Pan American Silver Corp., 2019, p. 16).

Canada.—Most of the silver in Canada was produced as a coproduct or byproduct of other metals in 35 mines. Silver production in Canada was 353 t in 2018, a 4% decrease from 366 t (revised) in 2017. This decrease was attributed to a decrease in production at Teck's Trail operation, Vale S.A.'s Sudbury operations, Glencore plc's Kidd Creek Mine, and Agnico Eagle Mines Ltd's LaRonde operations. Teck's Trail operation had a fire in its silver refinery, reducing refined silver production by 311 t (47%) from 2017. Vale's Sudbury operations produced less silver owing to reduced throughput. Glencore's Kidd Creek and Agnico Eagle's LaRonde operations had lower ore grades in 2018 (Alexander and others, 2019, p. 29; Teck Resources Ltd., 2019b; Mining Association of Canada, The, 2020, p. 80–84).

China.—Silver production in China was 3,574 t in 2018, a slight increase from that in 2017. About 90% of the silver produced in the country was produced as a byproduct of copper, lead, and zinc mining, and about 9% was from primary silver mines. In 2017, increased attention to environmental protection by the Government led to decreased lead and zinc production, resulting in a decrease in silver production. In 2018, some mines met the new Government requirements and increased silver production (Alexander and others, 2019, p. 31).

Mexico.—In 2018, Mexico was the leading producer of silver in the world with production of 6,049 t, a slight decrease from the 6,109 t in 2017. At Minera Fresnillo plc's Herradura Mine, higher grades of ores, improved recovery rates, and the rampup of the San Julian operations increased silver production. Minera Frisco, S.A.B de C.V.'s production decreased by 240 t (8%), owing to a decrease in throughput with the cessation of operations at the Porvenir and San Felipe open pit mines (Alexander and others, 2019, p. 29).

Peru.—In 2018, Peru was the second-leading producer of silver in the world with a production of 4,160 t, a 3% decrease from that in 2017. The leading silver producer was Compañía de Minas Buenaventura S.A.A. with production from the following mines—Uchucchacua (480 t), Cerro Verde (142 t), Tambomayo (122 t), El Brocal (121 t), Julcani (77 t), Yancocha (33 t), Tantauatay (25 t), Mallay (16 t), Orcopampa (10 t), and La Zanja (7 t). Of the 1,030 t of silver produced by Buenaventura mines, 836 t was attributed to the company because of the partial ownership of El Brocal (61.43%), La Zanja (53.06%), Yanacocha (43.65%), Tantauatay (40.10%), and Cerro Verde (19.58%). Silver production at Uchucchacua decreased by 10% to 480 t in 2018 from 535 t in 2017 because of reduced ore grades and two temporary shutdowns, one in August and one in December (Compañía de Minas Buenaventura S.A.A., 2019a, p. 14, 96; 2019b).

The second-leading producer of silver in Peru was Compañía Minera Antamina S.A. (544 t), which owned and operated the Antamina Mine, and was co-owned by four companies, BHP Billiton plc (33.75%), Glencore plc (33.75%), Teck (22.5%), and Mitsubishi Corp. (10%). Silver production at the Antamina Mine decreased by 16% to 544 t in 2018 from 646 t in 2017. The Antamina Union Agreement had expired on July 31, 2018, and was renegotiated on June 11, 2019 (BHP Group Ltd., 2019b, p. 7; Teck Resources Ltd., 2019a).

Compañía Minera Ares S.A.C. was the third-leading producer of silver in Peru and was owned by Hochschild Mining plc. Compañía Minera Ares S.A.C. operated three mines in Peru, with production from the following mines, Inmaculada (296 t), Arcata (105 t), and Pallancata (90 t). Compañía Minera Ares S.A.C.'s production increased by 4% to 516 t in 2018 from 494 t in 2017 (Hochschild Mining plc, 2019, p. 2, 20).

Other leading producers in Peru included Volcan Compañía Minera S.A.A. (244 t), Compañía Minera Chungar S.A.C. (168 t), Minera Chinalco Peru S.A. (154 t), and Compañía Minera Argentum S.A. (108 t) (Ministerio de Energía y Minas, 2019).

Russia.—In 2018, Russia was estimated to have produced 2,040 t of silver compared with 2,030 t (revised) in 2017. Silver production as a byproduct in gold mines in Russia increased by 392 t (32%). However, this increase was offset by a 50-t

decrease in production at Polymetal International plc's Dukat and Lunnoune silver mines, which had lower ore grades in 2018 (Alexander and others, 2019, p. 33).

Outlook

The use of silver in crystalline silicon photovoltaic cells is expected to increase as production increases, although, per solar cell, silver use is expected to decline owing to the relatively high cost of silver. The demand for silver from the electrical and electronics industries is expected to increase in 2019 with ongoing technological improvements. New uses for silver include those that take advantage of its biocidal or conductive properties. Antimicrobial silver technology is expected to be used in cooking utensils, food packaging, medical products, textiles, toiletries, and water-purification devices. In some cases, RFIDs can be used to replace bar codes for tracking shipments and stocks, including silver-based high-data-capacity tags, readers, and computer systems. Demand for silver coatings used in medical devices is expected to rise because silver can be used as a biocide without injuring mammalian cells. The use of silver in photographic applications is expected to continue to decline and, as hospitals convert their X-ray equipment to digital systems, silver use will probably remain only in niche applications such as artistic photography. The use of silver in automotive manufacturing is increasing in autonomous vehicles, internal combustion engines, and photovoltaics, producing new applications in the industry. Almost all contacts in automobiles have silver coatings. Silver membrane switches are used for various functions in vehicles such as opening windows, closing the trunk, and starting the engine. Increased demand for automobiles in developing countries is expected to increase silver consumption, as well as demand in more advanced vehicles that use silver for its electrical properties and resistance to oxidation (Alexander and others, 2019, p. 61).

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TABLE 1
SALIENT SILVER STATISTICS¹

		2014	2015	2016	2017	2018
United States:						
Mine production:						
Quantity	metric tons	1,180	1,090	1,150	1,030	934
Value	thousands	\$727,000	\$551,000	\$627,000	\$566,000	\$473,000
Refinery production:						
Domestic and foreign ores and concentrates	metric tons	800	1,530 ^r	1,530 ^r	1,420 ^r	1,420
Scrap (old and new)	do.	1,400	869 ^r	866 ^r	490 ^r	632
Exports:						
Ore and concentrates	do.	6	2	16	16	8
Bullion and dore	do.	374	815	273	141	594
Imports for consumption:						
Ore and concentrates ²	do.	(3)	(3)	5	7	8
Bullion and dore	do.	5,000	5,930	6,160	5,040	4,840
Stocks, December 31:						
Industry	do.	120	130	140	150	170
COMEX	do.	5,610	5,000	5,710	7,570	9,150
U.S. Department of the Treasury	do.	498	498	498	498	498
Bullion coin production ⁴	do.	1,210	1,520	1,370	746	461
Price, average ⁵	dollars per troy ounce	19.09	15.72	17.20	17.07	15.71
Employment, mine and mill workers ⁶		792	750	785	1,030	946
World, mine production	metric tons	28,000 ^r	27,600 ^r	28,100 ^r	27,300 ^r	27,000

^rRevised. do. Ditto.

¹Table includes data available through March 1, 2021. Data are rounded to no more than three significant digits, except prices.

²Includes silver content of ash and residues.

³Less than ½ unit.

⁴Source: U.S. Mint.

⁵Source: Annual Engelhard quotations published in Platts Metals Week.

⁶Source: 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	2016	2017	2018
Alaska	520,000	514,000	465,000
Arizona	86,700	78,900	58,000
Nevada	276,000 ^r	265,000	247,000
Other ²	264,000	173,000	164,000
Total	1,150,000	1,030,000	934,000

^rRevised.

¹Table includes data available through March 1, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

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

TABLE 3
LEADING SILVER-PRODUCING MINES IN THE UNITED STATES IN 2018, IN ORDER OF OUTPUT¹

Rank	Mine	County and State ²	Operator	Source of silver
1	Greens Creek	Southeastern Region, AK	Hecla Mining Co.	Silver-zinc ore.
2	Red Dog	Northern Region, AK	Teck Alaska Inc.	Zinc-lead ore.
3	Rochester	Pershing, NV	Coeur Mining, Inc.	Silver ore.
4	Bingham Canyon	Salt Lake, UT	Rio Tinto Kennecott ³	Copper-molybdenum ore.
5	Galena Complex	Shoshone, ID	Americas Silver Corp.	Silver ore.
6	Round Mountain	Nye, NV	Kinross Gold Corp.	Gold ore.
7	Phoenix	Lander, NV	Newmont Mining Corp.	Gold-copper ore.
8	Bagdad	Yavapai, AZ	Freeport-McMoRan Inc.	Copper-molybdenum ore.
9	Continental Pit	Silver Bow, MT	Montana Resources LLP	Do.
10	Mission	Pima, AZ	ASARCO LLC ⁴	Copper ore.
11	Soledad Mountain	Kern, CA	Golden Queen Mining Co. Ltd (50%), Jefferies Financial Group (37.73%), Auvergne, LLC (12.27%)	Gold ore.
12	Chino	Grant, NM	Freeport-McMoRan Inc.	Copper ore.
13	Carlin Mines Operations	Various Counties, NV	Newmont Mining Corp.	Gold ore.
14	Pinto Valley	Gila, AZ	Capstone Mining Corp.	Copper-molybdenum ore.
15	Midas	Elko, NV	Hecla Mining Co.	Gold ore.
16	Rawhide	Mineral, NV	Coral Reef Capital LLC	Do.
17	Morenci	Greenlee, AZ	Freeport-McMoRan Inc.	Copper-molybdenum ore.
18	Fire Creek	Lander, NV	Hecla Mining Co.	Gold ore.
19	Lucky Friday	Shoshone, ID	do.	Silver ore.
20	Ray	Pinal, AZ	ASARCO LLC ⁴	Copper ore.
21	Haile	Lancaster, SC	OceanaGold Corp.	Gold ore.
22	Cortez Operations	Eureka and Lander, NV	Barrick Gold Corp.	Do.
23	Hollister	Elko, NV	Hecla Mining Co.	Do.
24	Wharf	Lawrence, SD	Coeur Mining, Inc.	Do.
25	Moss	Mohave, AZ	Northern Vertex Mining Corp.	Do.

Do., do. Ditto.

¹Table includes data available through March 1, 2021. The mines on this list accounted for more than 99% of U.S. mine production of silver in 2018.

²For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 74, Alaska's mineral industry 2018.

³Wholly owned subsidiary of Rio Tinto plc.

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

TABLE 4
U.S. EXPORTS OF REFINED SILVER, BY COUNTRY OR LOCALITY¹

Year and country or locality	Ores and concentrates		Bullion		Dore		Total	
	Silver content (kilograms)	Value (thousands)	Silver content (kilograms)	Value (thousands)	Silver content (kilograms)	Value (thousands)	Silver content (kilograms)	Value (thousands)
2017	16,300	\$26,800	91,600 ^r	\$54,000 ^r	49,400	\$34,700	157,000	\$115,000 ^r
2018:								
Australia	8	11	3,160	1,680	7	4	3,180	1,690
Austria	--	--	142	96	630	373	771	470
Canada	123	56	18,900	11,200	--	--	19,000	11,300
Cayman Islands	--	--	662	531	--	--	662	531
Chile	--	--	2,060	1,440	--	--	2,060	1,440
China	7,640	3,770	--	--	3,000	1,550	10,600	5,310
Czechia	--	--	1,390	710	14	7	1,400	717
Germany	--	--	6,460	4,150	4,940	2,910	11,400	7,060
Hong Kong	2	10	529	337	354	276	885	623
India	--	--	398,000	220,000	3,120	1,850	401,000	222,000
Israel	--	--	75	67	63	49	138	116
Italy	--	--	6,890	6,170	--	--	6,890	6,170
Japan	--	--	25,700	13,600	--	--	25,700	13,600
Korea, Republic of	--	--	81	28	799	461	881	489
Mexico	--	--	10,800	6,080	9,170	8,250	20,000	14,300
New Zealand	--	--	911	517	896	501	1,810	1,020
Norway	6	3	--	--	1,150	690	1,160	693
Panama	--	--	778	586	--	--	778	586
Singapore	--	--	7,770	4,550	3,880	2,070	11,600	6,620
Switzerland	--	--	6,600	3,400	7,020	4,260	13,600	7,650
Thailand	--	--	146	124	--	--	146	124
United Arab Emirates	--	--	--	--	423	223	423	223
United Kingdom	(2)	3	65,100	35,600	2,020	1,410	67,200	37,000
Other	53	44	649	378	84	51	786	473
Total	7,830	3,890	557,000	311,000	37,600	24,900	602,000	340,000

^rRevised. -- Zero.

¹Table includes data available through March 1, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 5
U.S. EXPORTS OF SILVER, BY COUNTRY OR LOCALITY¹

Year and country or locality	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)
2017	135,000 r	\$71,100 r	874,000 r	\$545,000 r	50,900	\$5,170	508,000	\$292,000	14,600,000 r	\$1,910,000 r
2018:										
Australia	324	117	--	--	511	140	2,170	1,090	51	24
Belgium	--	--	6,510	3,910	--	--	15	7	2,030,000	91,100
Brazil	176	138	1,770	1,850	--	--	292	184	--	--
Canada	50,200	26,600	13,900	12,100	26,800	1,330	45,700	24,000	1,680,000	189,000
China	977	617	106,000	61,600	348	101	19,700	11,600	6,710	2,230
Colombia	70	92	6	9	--	--	266	132	22	11
Costa Rica	859	597	154	104	427	27	2,620	1,530	--	--
Dominican Republic	767	341	14	12	--	--	1,050	742	--	--
France	395	181	54,600	32,000	--	--	6,630	3,710	4	19
Germany	574	435	46,400	21,400	7	12	20,000	10,700	2,920,000	651,000
Hong Kong	4,720	2,140	27,300	16,300	13	7	16,800	12,200	4,910	2,660
India	25,900	8,910	813	540	112	27	10,600	6,370	--	--
Ireland	--	--	40	30	--	--	23,800	11,600	--	--
Israel	332	56	10	8	--	--	816	617	3	3
Italy	3,240	1,670	64,000	28,900	--	--	1,950	1,150	2,200,000	513,000
Japan	6	25	56,600	38,600	--	--	19,600	10,800	4,950,000	296,000
Korea, Republic of	182	76	45,600	28,000	17	3	22,700	13,800	248,000	22,300
Malaysia	103	46	2,040	1,380	70	34	4,230	2,520	1,550	726
Mexico	14,800	9,080	11,800	10,800	11,600	1,480	78,600	41,900	248,000	33,100
Netherlands	--	--	21,600	13,100	--	--	9	6	434	555
Philippines	46	37	--	--	63	24	3,180	3,010	83	48
Russia	174	67	10	7	3,810	407	261	142	--	--
Singapore	716	499	304,000	170,000	6,380	2,740	5,670	3,140	98	42
Spain	12	3	7	4	--	--	8,890	4,530	--	--
Sweden	13	4	975	424	435	77	6,180	3,190	2,370,000	62,400
Switzerland	338	101	60	28	--	--	10,700	5,840	4,520	2,400
Taiwan	13	17	117,000	68,700	721	107	1,100	782	61	999
Thailand	3,060	1,450	1,360	781	--	--	4,310	2,490	54	27
United Kingdom	477	195	34,200	22,100	44	5	91,400	50,700	498,000	608,000
Vietnam	1,440	380	--	--	114	5	1,840	1,020	--	--
Other	2,650	2,030	913	569	639	166	12,300	6,550	7,490	2,780
Total	113,000	55,900	917,000	534,000	52,100	6,690	423,000	236,000	17,200,000	2,480,000

^rRevised. -- Zero.¹Table includes data available through March 1, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.²Containing 99.5% or more by weight of silver.

Source: U.S. Census Bureau.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF REFINED SILVER, BY COUNTRY OR LOCALITY¹

Year and country or locality	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)
2017	6,840	\$2,370	3,950,000	\$2,150,000 ^r	1,090,000 ^r	\$959,000 ^r	5,040,000 ^r	\$3,110,000 ^r
2018:								
Argentina	--	--	4,780	4,960	136,000	148,000	141,000	153,000
Australia	--	--	542	306	--	--	542	306
Belgium	--	--	53,300	28,400	--	--	53,300	28,400
Bolivia	--	--	47,800	24,100	44,400	21,900	92,100	46,100
Canada	5,160	1,700	1,430,000	716,000	25,900	12,200	1,460,000	730,000
Chile	--	--	292,000	149,000	--	--	292,000	149,000
China	--	--	646	334	--	--	646	334
Colombia	--	--	2,080	1,140	111	53	2,190	1,190
Curacao	--	--	--	--	1,230	636	1,230	636
Dominican Republic	--	--	--	--	424	249	424	249
Germany	--	--	2,340	1,270	10,000	5,370	12,400	6,640
Italy	--	--	13,400	7,450	3,510	2,090	16,900	9,540
Kazakhstan	--	--	2,730	1,300	--	--	2,730	1,300
Korea, Republic of	--	--	53,900	28,100	--	--	53,900	28,100
Mexico	2,460	517	1,650,000	830,000	763,000	662,000	2,420,000	1,490,000
Namibia	161	34	--	--	--	--	161	34
Panama	--	--	999	499	80	42	1,080	541
Peru	--	--	86,000	43,100	94,500	103,000	181,000	146,000
Poland	--	--	112,000	57,300	--	--	112,000	57,300
Russia	--	--	2,600	1,240	--	--	2,600	1,240
Switzerland	--	--	79	39	1,170	772	1,250	811
United Kingdom	--	--	175	90	301	193	476	283
Other	--	--	819	447	15	8	834	456
Total	7,790	2,260	3,750,000	1,890,000	1,080,000	956,000	4,840,000	2,850,000

^rRevised. -- Zero.

¹Table includes data available through March 1, 2021. Data 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 COUNTRY OR LOCALITY¹

Year and country or locality	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)
	391,000 r	\$182,000	414,000 r	\$59,800 r	4,570 r	\$645 r	462,000	\$247,000	5,430,000 r	\$388,000 r
2017:										
2018:										
Australia	--	--	--	--	--	--	1,040	499	932	398
Belgium	--	--	--	--	1,660	113	--	--	345,000	810
Bolivia	--	--	57,800	31,900	--	--	--	--	--	--
Brazil	--	--	--	--	140	47	--	--	23,600	658
Canada	83,700	28,000	21,500	985	72	42	20,000	10,500	657,000	136,000
Chile	--	--	--	--	--	--	49,600	25,200	2,190	489
China	221	35	25,900	1,210	10	5	281	132	103,000	3,590
Colombia	286	160	--	--	--	--	--	--	60,100	6,020
Dominican Republic	97	72	135	29	--	--	--	--	18,500	3,340
Egypt	25	6	--	--	--	--	--	--	44,600	2,680
France	25	5	24,400	2,070	--	--	(3)	9	63,600	257
Germany	443	273	22,200	11,200	780	62	3,760	2,020	1,540,000	261,000
Hong Kong	--	--	--	--	--	--	--	--	183,000	413
Hungary	16,200	491	50,000	2,640	--	--	--	--	--	--
India	43	14	--	--	8	6	147	58	11,300	3,940
Ireland	--	--	--	--	--	--	--	--	23,700	166
Italy	34	8	78	4	--	--	527	396	778	134
Japan	31	32	198,000	12,300	--	--	32	28	62,700	1,340
Korea, Republic of	374	25	36	54	111	42	72,300	38,800	9,270	422
Malaysia	--	--	10	6	--	--	--	--	530,000	2,750
Mexico	228,000	114,000	2,710	1,060	--	--	113,000	41,400	804,000	30,600
Netherlands	4,920	113	--	--	--	--	150	92	436	14
Peru	89,400	44,400	--	--	--	--	260	124	39,700	381
Singapore	--	--	2	3	--	--	4	2	158,000	657
Slovakia	--	--	--	--	--	--	--	--	1,490,000	6,650
Sweden	--	--	654	255	--	--	--	--	7,580	204
Switzerland	--	--	626	339	--	--	96	63	16	6
Taiwan	--	--	3,080	175	--	--	114,000	57,100	89,600	9,390
United Kingdom	31	17	131	84	469	143	2,870	1,580	151,000	11,500
Vietnam	--	--	--	--	--	--	--	--	209,000	3,770
Other	212	100	185	13	--	--	1,050	585	77,600	8,320
Total	424,000	188,000	407,000	64,300	3,250	459	380,000	179,000	6,710,000	495,000

¹Revised. -- Zero.²Table includes data available through March 1, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.³Containing 99.5% or more by weight of silver.⁴Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8
SILVER: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY¹

(Kilograms)

Country or locality ²	2014	2015	2016	2017	2018
Algeria	16	20 ^r	20 ^r	20 ^{r,c}	50 ^e
Argentina	989,950	1,175,760	1,055,700	997,961 ^r	1,023,800
Armenia	19,333	14,346	16,000 ^{r,c}	15,500 ^{r,c}	18,700 ^e
Australia	1,847,000 ^r	1,430,000 ^r	1,418,000 ^r	1,120,000 ^r	1,254,000
Azerbaijan	239	133	320	3,429 ^r	3,229
Bolivia	1,398,163	1,306,098	1,353,202	1,196,416 ^r	1,191,024
Botswana	22,228 ^r	2,801	--	--	--
Brazil	36,700	41,300 ^r	38,800 ^{r,c}	39,000 ^{r,c}	40,000 ^e
Bulgaria	50,200	37,955	52,526	53,053 ^r	41,315
Burkina Faso	14,000 ^e	12,441	22,000 ^{r,c}	6,000 ^{r,c}	1,000 ^e
Canada ³	472,000 ^r	371,000 ^r	385,000 ^r	366,000 ^r	353,000
Chile	1,571,788 ^r	1,504,271 ^r	1,501,436 ^r	1,318,582 ^r	1,370,237
China	3,568,000 ^r	3,393,000 ^r	3,496,000	3,502,000	3,574,000
Colombia	11,498	10,155	10,427	10,922 ^r	15,967
Congo (Kinshasa)	6,492	2,412	835	-- ^{r,c}	-- ^e
Côte d'Ivoire	586	587	594	485	500 ^e
Cyprus	--	--	--	96	180
Dominican Republic	135,108	99,800	121,749	151,757 ^r	166,500
Ecuador	577	1,494	934	955 ^r	1,000 ^e
Eritrea	52,668	70,330	13,200	49,921	30,000 ^e
Ethiopia	1,020	1,000 ^e	1,000 ^e	1,000 ^e	1,000 ^e
Fiji ⁴	361	354	354	350	358
Finland	14,500 ^e	13,051	16,348 ^r	13,654 ^r	12,849
Georgia ^e	700	800	900	700 ^r	700
Ghana ^e	3,400	3,200	2,300	1,800	1,800
Greece	35,785	25,170	29,409	23,967 ^r	25,237
Guatemala	631,382	862,197	793,083	336,943 ^r	--
Honduras	56,827	34,369	19,275	21,785 ^r	31,182
India	338,084	383,479	445,367	526,604 ^r	648,600
Indonesia	119,189	151,934	185,234	329,000 ^r	309,000
Iran ^c	80,000	90,000	90,000	90,000	90,000
Ireland	6,436	3,770	1,080	1,340	1,160
Japan	3,541	4,616	5,076	3,408 ^r	3,596
Kazakhstan	474,991	370,404	413,821	441,056	400,000 ^e
Korea, North ^c	50,000	50,300	30,000 ^r	20,000 ^r	20,000
Korea, Republic of	3,289	4,586	6,579	8,788 ^r	7,090
Kyrgyzstan	5,609 ^r	9,890	18,410	17,097 ^r	16,000 ^e
Laos	39,806	51,763	50,904	42,841 ^r	37,465
Malaysia	533	945	1,075	1,404	1,702
Mexico	5,765,662	5,591,510	5,408,521	6,108,722	6,049,000
Mongolia ^c	49,000 ^r	60,000	69,000	62,000 ^r	60,000
Morocco	270,000 ^r	298,000 ^r	337,000 ^r	362,000 ^r	348,000
Namibia ⁵	1,129 ⁶	11,555 ⁷	8,771 ^{r,8}	7,014 ^r	4,666
New Zealand	15,811	12,498	7,960	8,022 ^r	5,000 ^e
Nicaragua	13,889	18,577	21,382	15,149 ^r	11,263
Niger	67	119	120 ^e	120 ^e	120 ^e
Oman	3,285	2,645	3,621	120	--
Pakistan	1,609	9,693	3,110	3,000 ^e	3,000 ^e
Papua New Guinea	91,843	77,666	90,498	86,700 ^r	114,900
Peru	3,768,147	4,101,568	4,375,337	4,303,541	4,160,162
Philippines	23,005	29,952	35,186	31,737 ^r	29,782
Poland	1,384,000	1,407,000	1,482,000	1,490,000 ^r	1,471,000
Portugal	39,350	37,677	35,211	36,713	50,774
Russia	2,360,000 ^e	2,297,000	2,261,000 ^r	2,030,000	2,040,000 ^e
Slovakia	437	440	449 ^r	460 ^r	460 ^e
Solomon Islands	271 ^r	--	--	--	--
South Africa	49,220	51,861	55,622 ^r	62,536 ^r	46,467

See footnotes at end of table.

TABLE 8—Continued
SILVER: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY¹

(Kilograms)

Country or locality ²	2014	2015	2016	2017	2018
Spain	27,306	27,287	26,099	30,596	30,000 ^e
Sweden	382,611	479,700	515,039 ^r	488,135 ^r	471,325
Tajikistan	3,000 ^e	4,000 ^e	3,000	4,300 ^r	6,300 ^e
Tanzania	14,493 ^r	15,569	17,984	10,911 ^r	12,041
Thailand	31,046	21,047	35,954	-- ^r	--
Turkey	183,880	190,550	376,640	151,490 ^r	197,320
United States	1,180,000	1,090,000	1,150,000	1,030,000	934,000
Uzbekistan	230,000 ^{r,e}	230,000 ^{r,e}	230,000 ^{r,e}	232,300 ^r	223,900
Zimbabwe	1,297	1,212	1,463	1,480	1,542
Total	28,000,000 ^r	27,600,000 ^r	28,100,000 ^r	27,300,000 ^r	27,000,000

^eEstimated. ^rRevised. -- Zero.

¹Table includes data available through October 10, 2019. All data are reported unless otherwise noted. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the countries and (or) localities listed, Macedonia, Mali, Romania, Saudi Arabia, Venezuela, and Zambia may have produced silver, but available information was inadequate to make reliable estimates of output.

³Silver content of concentrates produced.

⁴Mine output, silver content.

⁵Silver content of concentrates, estimated.

⁶From copper concentrates.

⁷From gold bullion.

⁸From zinc concentrates.