



# 2016 Minerals Yearbook

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**SILVER [ADVANCE RELEASE]**

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# SILVER

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In 2016, the United States produced 1,150 metric tons (t) of silver, which was 5% more than that of 2015 (table 1). Silver was produced in 11 States in 2016, and Alaska remained the leading silver-producing State, followed by Nevada and Idaho. Approximately 74% of domestic silver was produced from base-metal ores at 10 mines and the remaining was from precious-metal ores at 15 mines (table 3).

The Engelhard price of silver averaged \$17.14 per troy ounce in 2016, a 9% increase compared with the 2015 average price of \$15.72 per troy ounce (table 1). Analysts attributed the price increase in 2016 to the combination of an improving sentiment in industrial commodities and a weakening stock market in China (Caplinger, 2017).

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 2016, global use of silver decreased by 11% compared with that of 2015. Apart from photovoltaics, silver use in all other categories decreased in 2016. Brazing alloys and solders, coins and bars, and silverware realized the heaviest decreases at 10%, 29%, and 17%, respectively (O'Connell and others, 2017, p. 8).

In 2016, silver was mined in approximately 70 countries. Production was 26,600 t, a slight decrease from revised production of 27,000 t in 2015 (table 8). Mexico was the leading producer, followed by Peru, China, Russia, and Chile. These five countries accounted for 61% of the global production of silver. The United States ranked ninth in world silver mine production in 2016.

## Legislation and Government Programs

On September 30, 2016, 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 \$310 million at \$19.35 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. In accordance with 31 U.S.C. § 5117(b) and 31 U.S.C. § 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 9% in fiscal year 2016 when compared with fiscal year 2015. Sales of the American Eagle Silver dollar decreased by 11%, whereas the America the Beautiful coin nearly doubled in sales between fiscal years 2015 and 2016. Owing to lower sales of the American Eagle coin, the U.S. Mint lifted allocations of the coin in July 2016, and allocations remained lifted for the rest of the fiscal year (U.S. Mint, 2017, p. 11, 12, 39).

## 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; these data represented 100% of U.S. mine production listed in table 1. Domestic mine production of silver increased by 4% in 2016 to 1,150 t, owing to increased production in Alaska, California, Idaho, New Mexico, South Dakota, and Utah. 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 the Galena Complex, Lucky Friday, and Rochester Mines, with mine production of about 4%, 10%, and 12%, respectively (based on company reports), of 2016 U.S. silver production.

Hecla Mining Co.'s (Coeur d'Alene, ID) Lucky Friday Mine, an underground silver-lead-zinc mine in the Coeur d'Alene mining district in northern Idaho, produced 19% more silver in 2016 than in 2015 as a result of improved silver ore grades, recovery of silver, and completed equipment upgrades in 2015. In 2008, Hecla began its largest capital project, the #4 shaft, which was considered to be substantially complete at the end of 2016. The #4 shaft project was expected to provide deeper access to extend the life of the mine and increase silver production. Excavation to the final depth of 2,900 meters (9,600 feet) was expected to be completed in January 2017, and the development of access to the ore from #4 shaft was expected to continue through 2017. Many miners at the Lucky Friday Mine were represented by a union; the most recent collective bargaining agreement with workers expired on April 30, 2016. The unionized employees voted against a contract offer on February 19, 2017, and went on strike in March 2017 (Hecla Mining Co., 2017, p. 18, 24, 43, 44, 48, 49). Silver production at the Greens Creek Mine on Admiralty Island near Juneau, AK, was 288 t, an increase of more than 9% compared with 2015 production, owing to a higher recovery rate and average silver ore grade. The expansion of the tailings facility at the Greens Creek Mine continued through 2016 (Hecla Mining Co., 2017, p. 31, 45–46, 57).

Coeur Mining, Inc.'s (Chicago, IL) Rochester Mine near Lovelock, NV, a silver and gold surface mine, produced 142 t of silver in 2016, slightly less than 2015 production. Lower silver recovery rates, lower silver ore grades, and timing of leach pad recoveries more than offset the increase in ore mined. Coeur began construction of an expanded leach pad at the Rochester Mine in 2016. The expansion was expected to be completed in the third quarter of 2017. Drilling work at the Rochester Mine completed in early 2016 led to a 41% increase in proven and probable silver reserves, which nearly doubled the expected mine life (Coeur Mining, Inc., 2017, p. 5–7, 13, 23, 40, 53).

Hycroft Mining Corp. (Reno, NV) continued work at the Hycroft Mine with a mill pilot plant, which provided confirmation of expected results. The company also constructed a test heap leach pad after successful sulfide leach column testing. Hycroft retained an engineering construction firm to update a feasibility study, which was expected to be completed at the end of the third quarter of 2016. Goldman, Sachs & Co. also was retained to evaluate strategic alternatives (Hycroft Mining Corp., 2016). During the restructuring described above, the Hycroft Mine produced 57 t of silver in 2014, 19 t of silver in 2015, and 7 t of silver in 2016 (Perry and Visser, 2015, p. 6; 2016, p. 6; 2017, p. 6).

## Consumption

Consumption of silver for fabrication in the United States was 7,100 t in 2016, a 4% decrease from that of the 2015 and the first decline in fabrication demand since 2012. Declines in silver consumption for coins and medals, and bullion, more than offset increases in consumption for industrial applications and jewelry (O'Connell and others, 2017, p. 52, 74, 84).

**Coin and Medal Fabrication.**—Approximately 1,250 t of silver was consumed for coins and medals in the United States in 2016, a 17% decrease from 1,510 t in 2015. In fiscal year 2016, the U.S. Mint sold 1,320 t of American Eagle silver bullion coins, a decrease of 11% from the record high of 1,490 t in 2015. By comparison, sales of the America the Beautiful silver coin increased by 96% in 2016 to 52.2 t from 26.7 t in 2015. This increase was largely owing to the Shawnee National Forest silver coin that was launched on February 1, 2016, the first 5-ounce coin release of 2016. These two coins—America the Beautiful and Shawnee National Forest—generated \$785 million in revenue for the U.S. Mint. Globally, silver coins and medals fabrication decreased by 9% in 2016 compared with that in 2015. Even though there was a decrease in 2016, production of coins and medals was the second highest on record (O'Connell and others, 2017, p. 24–25; U.S. Mint, 2017 p. 11–12).

**Industrial Applications.**—Silver consumed in domestic industrial applications increased for a second year in a row after 4 years of decreases. Approximately 4,310 t of silver was used in the United States in 2016 for industrial applications, a 9% increase from 3,950 t in 2015 (O'Connell and others, 2017, p. 52, 54).

The principal components of industrial demand for silver were brazing alloys and solders, catalysts, electrical components and electronics, photography, photovoltaics, and other applications. 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 and refrigeration, and electric power distribution. They also were important in the aerospace and automobile industries. In 2016, about 191 t of silver was used domestically in brazing alloys and solders, slightly more than in 2015 (O'Connell and others, 2017, p. 88).

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 for 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 about 31% in 2016 to 17 t from 13 t owing to the commissioning of new plants (O'Connell and others, 2017, p. 60, 89).

In 2016, the domestic use of silver for the electronic and electrical applications totaled 1,710 t, a slight increase from 1,690 t in 2015 (O'Connell and others, 2017, p. 55, 88). One of silver's electrical applications is in batteries. The most common silver-oxide battery was the small button-cell battery used in calculators, cameras, hearing aids, toys, and watches; the batteries contain 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).

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 (Silver Institute, The, undated).

In 2016, silver powder production for the global photovoltaic industry increased by 34% from that in 2015, and domestic silver powder production for the photovoltaic industry increased by 43% to 955 t in 2016. Silver paste was used in approximately 90% of all crystalline silicon photovoltaic cells, the most common type of solar cell; this has been a growth market in the United States for the past several years. Silver powder was used to create a silver paste, which was applied to the front and back contact in a thick-film solar cell. The silver powder production for solar cells primarily took place in China, Japan, the Republic of Korea, and the United States; Japan and the United States accounted for about 87% of world production. Silver paste was primarily made in China, the Republic of Korea, Taiwan, and the United States. Taiwan and the United States accounted for about 70% of world production; however, China accounted for 70% of thick-film solar cell production. Newer technology has reduced the load of silver needed in photovoltaic cells, which could lead to a decline in the use of silver. The increase in silver consumption in solar cells was likely driven by a doubling of the installation of new solar panels in China and the United States. (O'Connell and others, 2017, p. 64–66).

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 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 broad 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 2016, domestic use of silver for photographic applications was 443 t, a 3% decrease from 459 t in 2015 (O'Connell and others, 2017, p. 63–64, 89).

Dental amalgam, although in declining use because of its mercury content, still may contain silver (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 2016, U.S. consumption of silver for jewelry and silverware was 528 t, a 13% increase compared with the 468 t consumed in 2015. Silver consumption for jewelry increased to 502 t, 12% more than that in 2015, and consumption for silverware increased to 26 t from 21 t (O'Connell and others, 2017, p. 90, 92, 96).

### Prices and Stocks

From January 1 to December 31, there was an overall increase in silver prices of 14%, which is the first annual increase in prices since 2011. The daily average Engelhard silver price was at a low of \$13.80 per troy ounce on January 14 and steadily increased to the yearly high of \$20.70 per troy ounce on August 2. The prices began a slow decent until reaching \$16.20 per troy ounce on December 31. The daily average price per troy ounce of silver was \$17.14, an increase of 9% when compared with the daily average price of silver in 2015 (table 1). Multiple geopolitical issues, a strengthening U.S. dollar, the price of gold, and the anticipation of the Federal Reserve Board of Governors raising interest rates contributed to the price of silver in 2016 (O'Connell and others, 2017, p. 8, 12–14).

### Foreign Trade

U.S. exports of silver bullion and dore decreased by 67% to 273 t in 2015 from 815 t in 2015. This decrease came after a record year for coin sales globally; coin sales decreased in 2016 following the increase in the price of silver. Principal destinations were Canada (50%), India (15%), and Australia (7%) (table 4). U.S. imports for consumption of bullion and dore increased by 4% to 6,160 t in 2016 from 5,930 t in 2015. The principal import sources of bullion and dore were Mexico (45%), Canada (28%), and Peru (7%) (table 6).

### World Review

World mine production of silver decreased for the first time in 4 years to 26,600 t in 2016, a slight decrease from the revised figure of 27,000 t in 2015. Mexico continued to be the leading producer of silver, accounting for 20% of world production. Mexico was followed by Peru (16%); China (13%); Chile and Russia (6% each); Australia, Bolivia, and Poland (5% each); the United States (4%); Argentina and Guatemala, (3% each); and Canada, India, Kazakhstan, and Sweden (2% each). These 15 countries accounted for about 94% of the global silver production. Silver production increased in Peru (by 272 t); other countries with increases in production were China (103 t),

Bolivia (47 t), Canada (32 t), Sweden (21 t), and Dominican Republic (19 t). World mine production decreased as a whole in 2016—the most notable decreases were in Argentina (337 t), Mexico (228 t), Australia (119 t), Eritrea (57 t), India (45 t), Papua New Guinea (40 t), and Indonesia (39 t) (table 8).

According to the Silver Institute, about 30% of global silver production was from silver ores, 35% from lead and zinc ores, 23% from copper ores, 12% from gold ores, and less than 1% from other types of mining operations. Silver scrap recycling declined for the fifth year, slightly, to 4,346 t, owing to relatively lower silver prices, increased competition for scrap feedstock at the refiners, and the demand for primary sourced metal (O'Connell and others, 2017, p. 34, 42–44).

Global silver consumption decreased by 11% to 31,970 t in 2016 from 35,800 t in 2015. Industrial applications, accounting for 55% of the total global consumption, were the leading end uses of silver, followed by bars, coins, and medals (20%); jewelry (20%); and silverware (5%). Consumption of silver fell in all categories with the exception of photovoltaics, which had a 34% increase, and ethylene oxide, which held consistent for the second consecutive year. The largest decrease in consumption was in coins and bars (29%), silverware (17%), brazing alloys and solders (10%), and jewelry (9%) (O'Connell and others, 2017, p. 8, 11, 79).

**Argentina.**—In 2016, silver mine production in Argentina decreased by 29% from that of 2015. The main reason for the decrease was the 49% decrease in production from Goldcorp Inc.'s (Canada) Cerro Negro gold-silver mine. Labor disputes over workforce reduction at the mine resulted in lower mining rates and higher processing rates of low-grade stockpiled ores in 2016. Cerro Negro produced 96 t of silver, down from 190 t in 2015. The country's leading silver-producing mines were the Piriquitas Mine [a wholly owned operation of Silver Standard Resources Inc. (Canada)], which produced 324 t of silver, and the San Jose Mine [a joint venture between Hochschild Mining plc (United Kingdom, 51%) and McEwen Mining Inc. (Canada, 49%)], which produced 208 t of silver. These two mines accounted for about 63% of the country's silver production in 2016 (Goldcorp Inc., 2017, p. 30; Hochschild Mining plc, 2017, p. 21; Silver Standard Resources Inc., 2017, p. 4).

**Bolivia.**—Silver production in Bolivia increased by 4% in 2016 and accounted for 5% of the world's total silver production (table 8). In 2016, silver production at Coeur Mining's San Bartolomé open pit silver mine in Potosi increased slightly to 170 t despite a water shortage resulting from a nationwide drought. Higher levels of purchased ore more than offset lower mining rates. San Bartolomé's production accounted for about 13% of Bolivia's total silver mine output in 2016. Pan American Silver Corp.'s (Canada) San Vicente Mine produced a record 137 t of silver in 2016, which was an 8% increase compared with the 128 t produced in 2015, owing to higher silver ore grades and throughput (Coeur Mining Inc., 2017, p. 25, 45, 83; Pan American Silver Corp., 2017, p. 33).

**Canada.**—In 2016, silver production was 403 t compared with 371 t in 2015, a 9% increase. Depletion of reserves continued to be a concern in Canada during the past few years as some commodity prices were in decline and junior exploration companies faced difficulty raising capital to finance operations.

Decreasing proven and probable reserves have also been an expressed concern in the base- and precious-metal industries. Although silver was not produced as a primary product in Canada in 2016, it was produced as a coproduct or byproduct at 37 mines across the country (Mining Association of Canada, 2017, p. 35, 91–96). Payable silver production at Agnico Eagle Mines Ltd.'s LaRonde Mine increased slightly to 31 t, owing to increased throughput of ore from the new mining horizon in the deepest part of the mine, although the mine experienced periodic closures during the year to mitigate seismicity risk. Silver production over the life of the mine was expected to decrease owing to the shift toward deeper sections of the mine where gold grades are higher and contents of byproduct metals, including silver, are lower (Agnico Eagle Mines Ltd., 2017, p. MDA18–21).

**Mexico.**—In 2016, Mexico was the world's leading producer of silver despite production decreasing by 4% to 5,364 t in 2016 from 5,592 t in 2015. Silver production in Mexico accounted for about 20% of global production. Mexico's leading silver producers included Fresnillo plc; Goldcorp Inc. (Canada); Grupo México, S.A.B. de C.V.; Industrias Peñoles, S.A.B. de C.V.; and Pan American Silver Corp. (Canada). In 2016, Fresnillo's silver production rose by 7%, primarily owing to the startup of the San Julián Mine, higher silver ore grades at the Fresnillo and Ciénega Mines, and increased silver stream contributions. The company continued to develop its San Julián silver-gold project located in the San Julian District on the border between the States of Chihuahua and Durango. Phase I of the project, which included the construction of a mill and leaching plant, was completed in the third quarter of 2016, and phase II of the project, which included the construction of a flotation plant, was expected to be completed in the second quarter of 2017. In 2017, annual silver production at the San Julián Mine was expected to be about 361 t (Fresnillo plc, 2017, p. 1, 20, 24, 26, 230; O'Connell and others, 2017, p. 95).

**Peru.**—In 2016, Peru once again had the largest year-on-year increase in silver mine production (by 272 t from that of 2015). The leading silver-producing companies, in terms of output, were Compañía de Minas Buenaventura S.A.A., which produced about 16% of the country's total silver production, followed by Compañía Minera Antamina S.A., 15%; Compañía Minera Ares S.A.C., 10%; and Volcan Compañía Minera S.A.A., 8%. Junin Region was ranked first among the country's silver-producing regions and accounted for about 20% of the amount produced, followed by Lima and Ancash (18% each) and Pasco (15%) Regions. Hochschild Mining completed its first full year of production at the Inmaculada gold-silver underground mine in the Ayacucho Region. The mine produced 153 t of silver in 2016 (Hochschild Mining plc, 2017, p. 18, 139–140; Ministerio de Energía y Minas, 2017, p. 43, 59, 65, 67; Teck Resources Ltd., 2017, p. 17).

**Russia.**—Silver production in Russia decreased slightly in 2016, primarily owing to a 9% decrease in production from Polymetal International plc's (United Kingdom) Dukat Mine, Russia's largest primary silver mine, where a drop in silver ore grade reduced output by 6%. Dukat accounted for 87% of Polymetal's silver production in 2016. Also, silver production declined by 10% at Polymetal's Omolon operations, owing to

the change of ore feedstock mixes to provide higher gold and lower silver ore grades (Polymetal International plc, 2017, p. 3, 23, 26, 56).

## Outlook

World production of silver is expected to decrease again in 2017. The use of silver in photographic applications is expected to continue to decrease. As hospitals convert their x-ray equipment to digital systems, silver use in photographic applications is expected to continue to decline until its use remains only in niche applications such as artistic photography.

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. 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. The use of RFIDs for tracking stocks and shipments, including silver-base high-data-capacity tags, readers, and computer systems, is expected to increase. Although silver-oxide batteries are already used in many products, demand for the batteries may increase with the proliferation of laptop and tablet computers and cellular telephones with advanced computing capabilities.

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TABLE 1  
SALIENT SILVER STATISTICS<sup>1</sup>

		2012	2013	2014	2015	2016
United States:						
Mine production:						
Quantity	metric tons	1,060	1,050	1,180	1,090	1,150
Value	thousands	\$1,060,000	\$804,000 <sup>r</sup>	\$727,000 <sup>r</sup>	\$551,000	\$633,000
Refinery production:						
Domestic and foreign ores and concentrates	metric tons	796	800	800	800	800
Recycled materials (new and old scrap)	do.	1,660	1,700	1,400	1,200	1,300
Exports:						
Ore and concentrate	do.	42	14	6	2	16
Bullion and dore	do.	905	395	374	815	273
Imports for consumption:						
Ore and concentrate <sup>2</sup>	do.	83	57	(3)	3 <sup>r</sup>	5
Bullion and dore	do.	5,060	5,020	5,000	5,930	6,160
Stocks, December 31:						
Industry	do.	109	110	120	130	140
COMEX	do.	4,610	5,350	5,610	5,000	5,710
U.S. Department of the Treasury	do.	498	498	498	498	498
Bullion coin production <sup>4</sup>	do.	1,060	1,390	1,210	1,520	1,370
Price, average <sup>5</sup>	dollars per troy ounce	31.23 <sup>r</sup>	23.89 <sup>r</sup>	19.09 <sup>r</sup>	15.72	17.14
Employment, mine and mill workers <sup>6</sup>		709	819	792	750	785
World, mine production	metric tons	24,900 <sup>r</sup>	25,900 <sup>r</sup>	26,700 <sup>r</sup>	27,000 <sup>r</sup>	26,600

<sup>1</sup>Revised. do. Ditto.

<sup>1</sup>Table includes data available through August 10, 2018. Data are rounded to no more than three significant digits, except prices.

<sup>2</sup>Includes silver content of ash and residues.

<sup>3</sup>Less than ½ unit.

<sup>4</sup>Data from the U.S. Mint.

<sup>5</sup>Price data are the annual average Engelhard quotations published in Platts Metals Week.

<sup>6</sup>Employment 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 STATE<sup>1</sup>

(Kilograms)

State	2014	2015	2016
Nevada	326,000	290,000	278,000
Other <sup>2</sup>	858,000	800,000	871,000
Total	1,180,000	1,090,000	1,150,000

<sup>1</sup>Table includes data available through August 10, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

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

TABLE 3  
LEADING SILVER-PRODUCING MINES IN THE UNITED STATES IN 2016, IN ORDER OF OUTPUT<sup>1</sup>

Rank	Mine	County and State <sup>2</sup>	Operator	Source of silver
1	Greens Creek	Southeastern Region, AK	Hecla Mining Co.	Zinc-silver ore.
2	Red Dog	Northern Region, AK	Teck Alaska Inc.	Zinc-lead ore.
3	Rochester	Pershing, NV	Coeur Mining, Inc.	Silver ore.
4	Lucky Friday	Shoshone, ID	Hecla Mining Co.	Do.
5	Bingham Canyon	Salt Lake, UT	Kennecott Utah Copper Corp. <sup>3</sup>	Copper-molybdenum ore.
6	Galena Complex	Shoshone, ID	Americas Silver Corp.	Silver ore.
7	Midas	Elko and Lander, NV	Klondex Mines Ltd.	Gold ore.
8	Phoenix	Lander, NV	Newmont Mining Corp.	Gold-copper ore.
9	Mission Complex	Pima, AZ	ASARCO LLC <sup>4</sup>	Copper-molybdenum ore.
10	Continental Pit	Silver Bow, MT	Montana Resources Inc.	Do.
11	Bagdad	Yavapai, AZ	Freeport-McMoRan Copper & Gold Inc.	Do.
12	Hycroft	Humboldt and Pershing, NV	Hycroft Mining Corp.	Gold ore.
13	Morenci	Greenlee, AZ	Freeport-McMoRan Copper & Gold Inc.	Copper-molybdenum ore.
14	Round Mountain <sup>5</sup>	Nye, NV	Kinross Gold Corp.	Gold ore.
15	Chino	Grant, NM	Freeport-McMoRan Copper & Gold Inc.	Copper-molybdenum ore.
16	Pinto Valley	Gila, AZ	Capstone Mining Corp.	Do.
17	Carlin Mines Operations <sup>6</sup>	Elko, Eureka and Humboldt, NV	Newmont Mining Corp.	Gold ore.
18	Denton-Rawhide	Mineral, NV	Rawhide Mining, LLC	Do.
19	Soledad Mountain	Kern, CA	Golden Queen Mining Co. Ltd.	Do.
20	Ray	Pinal, AZ	ASARCO LLC <sup>4</sup>	Copper ore.
21	Wharf	Lawrence, SD	Coeur Mining, Inc.	Gold ore.
22	Goldstrike	Elko and Eureka, NV	Barrick Gold Corp.	Do.
23	Fire Creek	Lander, NV	Klondex Mines Ltd.	Do.
24	Bald Mountain	White Pine, NV	Kinross Gold Corp.	Do.
25	Cripple Creek	Teller, CO	Newmont Mining Corp.	Do.

Do. Ditto.

<sup>1</sup>Table includes data available through August 10, 2018. The mines on this list accounted for more than 99% of U.S. mine production in 2016.

<sup>2</sup>For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 72, Alaska's mineral industry 2016—Exploration activity.

<sup>3</sup>Wholly owned subsidiary of Rio Tinto plc.

<sup>4</sup>Wholly owned subsidiary of Grupo México, S.A.B. de C.V.

<sup>5</sup>Previously listed as Smoky Valley Common Operation.

<sup>6</sup>Includes four open pit operations and four underground operations.

TABLE 4  
U.S. EXPORTS OF REFINED SILVER, BY COUNTRY OR LOCALITY<sup>1</sup>

Year and country or locality	Ores and concentrates		Bullion		Dore		Total	
	Silver content (kilograms)	Value (thousands)						
2015	2,500	\$8,480	781,000	\$557,000	34,400	\$18,300	818,000	\$583,000
2016:								
Argentina	--	--	--	--	552	275	552	275
Australia	--	--	18,800	10,500	237	116	19,000	10,600
Canada	89	40	136,000	86,400	--	--	137,000	86,400
Cayman Islands	--	--	3,780	2,270	--	--	3,780	2,270
China	4,970	3,510	--	--	621	403	5,590	3,910
Estonia	--	--	254	97	--	--	254	97
Germany	136	78	10,400	4,010	8,280	5,760	18,800	9,840
Hong Kong	1	5	1,050	808	382	212	1,430	1,030
India	--	--	39,300	18,000	2,120	1,360	41,500	19,400
Israel	--	--	22	16	296	166	318	182
Italy	--	--	1,460	546	--	--	1,460	546
Korea, Republic of	10,300	23,500	49	25	--	--	10,300	23,500
Malaysia	28	17	1,540	709	--	--	1,570	726
Mexico	--	--	7,330	5,730	34	37	7,360	5,770
New Zealand	18	20	471	305	2,050	1,000	2,540	1,330
Norway	--	--	209	102	1,480	849	1,690	951
Panama	--	--	186	120	--	--	186	120
Singapore	33	40	6,120	3,320	6,330	3,730	12,500	7,080
Sweden	--	--	3,300	3,040	--	--	3,300	3,040
Switzerland	58	28	3,300	1,560	6,810	3,860	10,200	5,450
Taiwan	159	143	500	302	--	--	659	445
Thailand	--	--	117	118	--	--	117	118
United Kingdom	--	--	1,590	946	6,040	3,160	7,630	4,100
Uruguay	--	--	260	152	--	--	260	152
Other	132	88	472	353	587	342	1,190	783
Total	15,900	27,500	237,000	139,000	35,800	21,300	289,000	188,000

-- Zero.

<sup>1</sup>Table includes data available through August 10, 2018. Data 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 COUNTRY OR LOCALITY<sup>1</sup>

Year and country or locality	Other unwrought silver		Metal powder		Silver nitrate		Semimanufactured forms <sup>2</sup>		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)
2015	126,000	\$118,000	617,000	\$375,000	28,900	\$3,170	265,000	\$140,000	14,700,000	\$1,430,000
2016:										
Australia	142	57	7	9	1,190	265	3,520	1,900	4,950	184
Belgium	101	82	4,430	2,890	--	--	587	294	2,140,000	98,300
Canada	165,000	125,000	12,600	11,100	34,800	1,850	489,000	305,000	2,090,000	246,000
China	696	460	66,300	38,600	219	92	11,000	6,770	29,900	18,800
Costa Rica	2,160	1,100	103	68	322	99	1,460	943	--	--
France	375	405	46,800	29,200	--	--	2,970	2,060	19	17
Germany	1,480	876	28,600	15,700	5	3	6,950	4,480	2,400,000	195,000
Hong Kong	12,500	11,300	14,500	9,350	--	--	2,430	1,930	7,090	6,090
India	35,500	16,600	1,020	680	45	21	8,050	5,210	--	--
Ireland	--	--	20	17	--	--	39,400	19,300	--	--
Israel	264	68	43	36	--	--	851	602	16,200	2,360
Italy	1	4	37,600	20,800	--	--	1,650	1,170	1,880,000	507,000
Japan	18	38	42,700	29,600	12	4	1,240	699	2,200,000	134,000
Korea, Republic of	304	1,050	66,300	40,800	68	21	11,700	7,240	88,700	24,800
Malaysia	24	132	1,300	997	6	3	3,150	1,940	--	--
Mexico	4,520	3,010	12,700	9,960	4,850	1,210	62,800	36,200	215,000	30,000
Netherlands	1	8	16,700	10,400	--	--	26	13	18,200	849
Philippines	33	7	14	14	37	11	3,190	3,220	1	3
Singapore	201	107	140,000	84,800	420	164	5,220	2,870	1,440	44
Spain	--	--	105	84	--	--	7,400	3,740	--	--
Sweden	--	--	--	--	306	58	4,800	2,200	1,830,000	69,000
Switzerland	775	2,530	17	17	--	--	3,210	1,670	75,500	48,800
Taiwan	375	177	255,000	143,000	--	--	915	612	(3)	13
Thailand	2,810	1,310	1,500	994	--	--	3,210	1,840	--	--
Turkey	49	17	19	11	--	--	2	7	559	2,760
United Kingdom	96	68	20,500	14,800	174	13	15,900	8,490	440,000	64,800
Other	3,710	2,200	3,860	3,070	1,160	221	11,400	6,050	2,090	10,900
Total	231,000	166,000	772,000	468,000	43,600	4,040	702,000	427,000	13,400,000	1,460,000

-- Zero.

<sup>1</sup>Table includes data available through August 10, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Containing 99.5% or more by weight of silver.

<sup>3</sup>Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 6  
U.S. IMPORTS FOR CONSUMPTION OF REFINED SILVER, BY COUNTRY OR LOCALITY<sup>1</sup>

Year and country or locality	Ores, 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)
2015	2,700 <sup>r</sup>	\$814 <sup>r</sup>	4,660,000	\$2,410,000	1,270,000	\$993,000	5,930,000	\$3,400,000
2016:								
Argentina	--	--	21,300	18,500	68,400	65,700	89,700	84,200
Australia	--	--	2,210	1,120	--	--	2,210	1,120
Belgium	--	--	132,000	65,700	--	--	132,000	65,700
Bolivia	--	--	171,000	92,700	--	--	171,000	92,700
Canada	4,430	1,470	1,720,000	955,000	20,100	11,200	1,740,000	967,000
Colombia	--	--	1,300	751	3,580	1,830	4,880	2,590
Dominican Republic	--	--	--	--	337	247	337	247
Germany	--	--	95,800	51,600	410	229	96,200	51,800
Guatemala	--	--	--	--	116,000	131,000	116,000	131,000
Italy	--	--	100	56	5,800	3,310	5,900	3,370
Korea, Republic of	--	--	188,000	97,400	--	--	188,000	97,400
Mexico	203	52	2,030,000	1,110,000	744,000	573,000	2,770,000	1,680,000
Mongolia	--	--	--	--	600	191	600	191
Nicaragua	(2)	4	--	--	3,030	1,600	3,030	1,600
Panama	--	--	295	155	354	201	649	356
Peru	--	--	128,000	70,000	279,000	263,000	407,000	333,000
Poland	--	--	250,000	140,000	15,000	8,330	265,000	149,000
Switzerland	--	--	1,260	559	2,570	1,960	3,830	2,520
Taiwan	--	--	209	104	--	--	209	104
United Kingdom	--	--	21,200	13,600	974	587	22,200	14,200
Other	(2)	6	109,000	65,400	28,900	26,100	138,000	91,500
Total	4,630	1,530	4,870,000	2,680,000	1,290,000	1,090,000	6,160,000	3,770,000

<sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through August 10, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7  
U.S. IMPORTS FOR CONSUMPTION OF SILVER, BY COUNTRY OR LOCALITY<sup>1</sup>

Year and country or locality	Other unwrought silver		Metal powder		Silver nitrate		Semimanufactured forms <sup>2</sup>		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)
2015	237,000	\$98,200	514,000	\$113,000	2,550	\$352 <sup>1</sup>	441,000	\$199,000	5,400,000	\$293,000
2016:										
Belgium	--	--	1,500	68	499	28	--	--	422,000	2,300
Brazil	--	--	--	--	86	29	--	--	1,800,000	9,300
Canada	96,000	29,900	45,800	1,650	524	135	293,000	137,000	739,000	62,700
China	131	32	18,600	879	--	--	2	8	992,000	7,950
Egypt	--	--	--	--	--	--	--	--	124,000	1,030
El Salvador	--	--	--	--	--	--	--	--	17,300	94
France	65	30	1,730	1,710	--	--	8	5	43,100	289
Germany	1,090	743	17,200	9,450	1,090	59	10,800	1,430	1,400,000	129,000
Hong Kong	--	--	--	--	--	--	--	--	32,100	173
Israel	--	--	--	--	--	--	79	58	16,200	1,440
Italy	4,680	2,540	15	16	--	--	242	80	811	121
Jamaica	--	--	--	--	--	--	--	--	24,000	207
Japan	44	38	199,000	30,300	--	--	66	27	16,000	536
Korea, Republic of	68	20	54	57	--	--	72,700	42,300	1,180	457
Malaysia	--	--	2	4	--	--	--	--	73,000	368
Mexico	239,000	129,000	38	13	--	--	16,900	2,460	334,000	13,200
Poland	--	--	5,000	2,770	--	--	18,500	11,700	--	--
Romania	--	--	12,000	378	--	--	--	--	--	--
Serbia	1,030	632	--	--	--	--	--	--	--	--
Singapore	--	--	2,630	1,390	--	--	--	--	30,100	2,960
Sweden	--	--	680	245	--	--	--	--	103,000	439
United Kingdom	118	68	562	349	970	451	198,000	116,000	121,000	8,280
Uruguay	--	--	--	--	--	--	--	--	39,900	75
Vietnam	--	--	--	--	--	--	--	--	49,000	838
Other	1,200	662	51,400	3,240	224	30	80,600	46,000	263,000	18,600
Total	343,000	164,000	356,000	52,500	3,390	731	692,000	357,000	6,650,000	260,000

<sup>1</sup>Revised. -- Zero.

<sup>2</sup>Table includes data available through August 10, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>3</sup>Containing 99.5% or more by weight of silver.

Source: U.S. Census Bureau.

TABLE 8  
SILVER: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY<sup>1</sup>

(Kilograms)

Country or locality	2012	2013	2014	2015	2016
Algeria	42 <sup>r</sup>	27 <sup>r</sup>	16 <sup>r</sup>	15 <sup>r</sup>	10 <sup>e</sup>
Argentina	799,277 <sup>r</sup>	890,648 <sup>r</sup>	987,572 <sup>r</sup>	1,175,760	839,121
Armenia	22,244 <sup>r</sup>	19,458 <sup>r</sup>	19,333 <sup>r</sup>	14,346 <sup>r</sup>	2,802
Australia	1,727,000	1,840,000	1,484,000 <sup>r</sup>	1,537,000 <sup>r</sup>	1,418,000
Azerbaijan	626 <sup>r</sup>	630 <sup>r</sup>	239 <sup>r</sup>	133 <sup>r</sup>	1,323
Bolivia	1,207,158 <sup>r</sup>	1,287,200 <sup>r</sup>	1,345,200 <sup>r</sup>	1,306,000 <sup>r</sup>	1,353,000
Botswana	8,670 <sup>r</sup>	22,597 <sup>r</sup>	22,328 <sup>r</sup>	2,801 <sup>r</sup>	5,000
Brazil	36,400 <sup>r</sup>	38,200 <sup>r</sup>	36,700 <sup>r</sup>	37,000 <sup>r,e</sup>	25,380
Bulgaria	46,523 <sup>r</sup>	55,637 <sup>r</sup>	50,200 <sup>r</sup>	55,200 <sup>r</sup>	55,200
Burkina Faso	--	14,541 <sup>r</sup>	12,441 <sup>r</sup>	12,441 <sup>r</sup>	21,772
Canada	657,000 <sup>r</sup>	620,000 <sup>r</sup>	472,000 <sup>r</sup>	371,000 <sup>r</sup>	402,666
Chile	1,195,000	1,174,000 <sup>r</sup>	1,572,000 <sup>r</sup>	1,504,000 <sup>r</sup>	1,497,037
China	3,639,000 <sup>r</sup>	3,673,320 <sup>r</sup>	3,570,000 <sup>r,e</sup>	3,393,392 <sup>r</sup>	3,496,000
Colombia	19,368 <sup>r</sup>	13,968 <sup>r</sup>	11,498 <sup>r</sup>	10,155 <sup>r</sup>	10,422
Congo (Kinshasa)	12,342 <sup>r</sup>	60,431 <sup>r</sup>	6,492 <sup>r</sup>	2,412 <sup>r</sup>	300 <sup>e</sup>
Côte d'Ivoire	410 <sup>r</sup>	572 <sup>r</sup>	608 <sup>r,e</sup>	900 <sup>r</sup>	594
Dominican Republic	23,266 <sup>r</sup>	80,439 <sup>r</sup>	135,108 <sup>r</sup>	99,800 <sup>r</sup>	118,343
Ecuador	17,000 <sup>r</sup>	16,000 <sup>r</sup>	18,000 <sup>r</sup>	18,000 <sup>r</sup>	17,000
Eritrea	23,000 <sup>r</sup>	25,000 <sup>r</sup>	47,000 <sup>r</sup>	70,330 <sup>r</sup>	13,000
Ethiopia	1,900 <sup>r,e</sup>	3,000 <sup>r</sup>	3,000	3,000	3,000
Fiji	342 <sup>r</sup>	462 <sup>r</sup>	540 <sup>r,e</sup>	540	540
Finland	128,200 <sup>r</sup>	100,890 <sup>r</sup>	148,011 <sup>r</sup>	140,439 <sup>r</sup>	118,180
Georgia	1,000	1,100 <sup>r</sup>	700 <sup>r,e</sup>	800 <sup>r</sup>	800
Ghana <sup>e</sup>	3,200 <sup>r</sup>	3,300 <sup>r</sup>	3,400 <sup>r</sup>	3,000	2,000
Greece	31,231 <sup>r</sup>	36,393 <sup>r</sup>	34,400 <sup>r,e</sup>	24,000 <sup>r</sup>	36,023
Guatemala	204,682 <sup>r</sup>	283,856 <sup>r</sup>	857,499 <sup>r</sup>	803,489 <sup>r</sup>	786,794
Honduras	50,605 <sup>r</sup>	50,917 <sup>r</sup>	56,827 <sup>r</sup>	34,300 <sup>r</sup>	17,634
India	374,000 <sup>r</sup>	374,000 <sup>r</sup>	337,940 <sup>r</sup>	490,191 <sup>r</sup>	445,367
Indonesia	247,827 <sup>r</sup>	123,109 <sup>r</sup>	119,189 <sup>r</sup>	151,934 <sup>r</sup>	113,401
Iran	108,862 <sup>r</sup>	99,531 <sup>r</sup>	99,531 <sup>r</sup>	102,642 <sup>r</sup>	111,973
Ireland	9,454 <sup>r</sup>	7,822 <sup>r</sup>	6,400 <sup>r</sup>	7,800 <sup>r</sup>	7,800
Japan	3,577 <sup>r</sup>	3,644 <sup>r</sup>	3,541 <sup>r</sup>	4,616 <sup>r</sup>	5,076
Kazakhstan <sup>e</sup>	545,000 <sup>r</sup>	611,000 <sup>r</sup>	590,000 <sup>r</sup>	538,000 <sup>r</sup>	554,000
Korea, Republic of	2,925 <sup>r</sup>	3,897 <sup>r</sup>	3,289 <sup>r</sup>	4,586 <sup>r</sup>	6,579
Kyrgyzstan	6,221 <sup>r</sup>	9,331 <sup>r</sup>	9,331 <sup>r</sup>	12,441 <sup>r</sup>	18,662
Laos	20,895 <sup>r</sup>	33,348 <sup>r</sup>	35,159 <sup>r</sup>	49,900 <sup>r</sup>	38,000
Malaysia	1,547 <sup>r</sup>	362 <sup>r</sup>	315 <sup>r</sup>	180 <sup>r</sup>	180
Mali	3,110 <sup>r</sup>	3,110 <sup>r</sup>	3,110 <sup>r</sup>	3,110 <sup>r</sup>	3,110
Mexico	5,353,195 <sup>r</sup>	5,820,911 <sup>r</sup>	5,765,662 <sup>r</sup>	5,591,509 <sup>r</sup>	5,363,728
Mongolia	28,487 <sup>r</sup>	44,200 <sup>r,e</sup>	51,500 <sup>r,e</sup>	38,071 <sup>r</sup>	44,166
Morocco	170,340 <sup>r</sup>	194,080 <sup>r</sup>	185,770 <sup>r</sup>	215,964 <sup>r</sup>	222,895
Namibia <sup>e</sup>	966 <sup>r</sup>	1,400 <sup>r</sup>	1,130 <sup>r</sup>	689 <sup>r</sup>	600
New Zealand	5,630 <sup>r</sup>	11,223 <sup>r</sup>	15,812 <sup>r</sup>	3,703 <sup>r</sup>	3,120
Nicaragua	9,927 <sup>r</sup>	13,756 <sup>r</sup>	16,680 <sup>r</sup>	18,480 <sup>r</sup>	18,480
Niger <sup>e</sup>	329 <sup>r</sup>	300 <sup>r</sup>	300 <sup>r</sup>	300 <sup>r</sup>	300
Pakistan	3,110 <sup>r</sup>	3,110 <sup>r</sup>	3,110 <sup>r</sup>	3,110 <sup>r</sup>	3,110
Panama	2,000	2,000 <sup>e</sup>	2,000 <sup>r</sup>	2,000 <sup>r</sup>	2,000 <sup>e</sup>
Papua New Guinea	81,300 <sup>r</sup>	90,192 <sup>r</sup>	84,302 <sup>r</sup>	84,300 <sup>r</sup>	44,591
Peru	3,480,641 <sup>r</sup>	3,674,283 <sup>r</sup>	3,777,384 <sup>r</sup>	4,102,110 <sup>r</sup>	4,374,356
Philippines	49,211 <sup>r</sup>	40,043 <sup>r</sup>	23,005 <sup>r</sup>	29,780 <sup>r</sup>	34,216
Poland	1,284,000 <sup>r</sup>	1,170,000 <sup>r</sup>	1,260,000 <sup>r,e</sup>	1,291,000 <sup>r</sup>	1,265,000
Portugal	29,890 <sup>r</sup>	40,621 <sup>r</sup>	43,172 <sup>r</sup>	41,337 <sup>r</sup>	38,630
Russia	1,384,000 <sup>r</sup>	1,428,000	1,430,000 <sup>r,e</sup>	1,572,000 <sup>r</sup>	1,570,800
Saudi Arabia <sup>e</sup>	9,720 <sup>r</sup>	9,720 <sup>r</sup>	9,720 <sup>r</sup>	9,720 <sup>r</sup>	9,720
Serbia	8,400 <sup>r</sup>	8,400 <sup>r</sup>	8,400 <sup>r</sup>	8,400 <sup>r</sup>	8,400
Slovakia	441 <sup>r</sup>	508 <sup>r</sup>	437 <sup>r</sup>	440 <sup>r</sup>	450 <sup>e</sup>
Solomon Islands	932 <sup>r</sup>	413 <sup>r</sup>	280 <sup>r</sup>	-- <sup>r</sup>	--

See footnotes at end of table.

TABLE 8—Continued  
SILVER: WORLD MINE PRODUCTION, BY COUNTRY OR LOCALITY<sup>1</sup>

(Kilograms)

Country or locality	2012	2013	2014	2015	2016
South Africa	67,305 <sup>r</sup>	68,633 <sup>r</sup>	37,268 <sup>r</sup>	46,901 <sup>r</sup>	52,127
Spain	31,054 <sup>r</sup>	27,979 <sup>r</sup>	27,306 <sup>r</sup>	27,287 <sup>r</sup>	26,099
Sudan <sup>c</sup>	700 <sup>r</sup>	800 <sup>r</sup>	9,000 <sup>r</sup>	10,000 <sup>r</sup>	12,000
Sweden	309,337 <sup>r</sup>	341,346 <sup>r</sup>	382,611 <sup>r</sup>	494,000 <sup>r</sup>	515,039
Tajikistan	1,767 <sup>r</sup>	1,800 <sup>r</sup>	3,000	4,000 <sup>r</sup>	1,740
Tanzania	11,227 <sup>r</sup>	12,159 <sup>r</sup>	14,493 <sup>r</sup>	5,579 <sup>r</sup>	3,936
Thailand	31,997 <sup>r</sup>	32,794 <sup>r</sup>	30,568 <sup>r</sup>	27,638 <sup>r</sup>	35,896
Turkey	193,890 <sup>r</sup>	189,600 <sup>r</sup>	183,880 <sup>r</sup>	202,000 <sup>r</sup>	202,400
United Kingdom	228 <sup>r</sup>	82 <sup>r</sup>	--	--	--
United States	1,060,000	1,050,000	1,180,000	1,090,000	1,150,000
Uzbekistan	60,000 <sup>r</sup>	61,000 <sup>r, c</sup>	54,000	47,000	59,775
Zambia <sup>c</sup>	15,000	16,000	15,000	15,000	15,000
Zimbabwe <sup>c</sup>	4,000	4,000	4,000	4,000	4,000
Total	24,900,000 <sup>r</sup>	25,900,000 <sup>r</sup>	26,700,000 <sup>r</sup>	27,000,000 <sup>r</sup>	26,600,000

<sup>c</sup>Estimated. <sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through May 18, 2017. 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.