

SILVER

By Henry E. Hilliard

Domestic survey data and tables were prepared by Mahbood Mahdavi, statistical assistant, and the world production table was prepared by Glenn J. Wallace, international data coordinator.

In 1999, the average annual price of silver was \$5.25 per troy ounce, down from \$5.54 per ounce in 1998. World mine production, which had fallen steadily between 1990 and 1994, increased for the fifth consecutive year. Global demand declined slightly owing to a drop in silverware and jewelry manufacture in India and other Asian countries. Fabrication demand, however, increased significantly in industrial and decorative uses, especially in photography. The photography and decorative sectors were the largest consumers of silver owing mainly to the metal's application in a wide variety of products, many of them domestic consumer products purchased worldwide. The significant increase in fabrication demand caused the gap between demand and the production of silver to widen further. This deficit was filled mostly by new mine production and scrap and part was filled by destocking.

In 1999, domestic mine production of silver was 1,950 metric tons (t), down 5% from 2,060 t in 1998. Seventy-six mines in 16 States reported production of silver with an estimated value of \$329 million (table 1). Nevada was the leading domestic silver producer; other large producers included Alaska, Arizona, and Idaho. Precious metal ores accounted for about one-half of domestic silver production; the remainder was recovered as a byproduct from copper, lead, and zinc ores. Estimated output of the 22 principal refiners of commercial-grade silver was approximately 3,500 t.

About 30 fabricators accounted for more than 90% of silver consumed in domestic arts and industrial applications. The remainder was consumed mostly by small companies and artisans. Aesthetic uses of silver for decorative articles, jewelry, tableware, and coinage were overshadowed by industrial uses. Industrial uses included photographic materials, electrical and electronic products, brazing alloys, dental amalgam, bearings, and catalysts.

The Silver Institute reported that in 1999, global mine production of silver was essentially unchanged from 1998 production and that this was the first time in 5 years that world mine production did not increase. Total silver supply, however, increased in 1999 owing to increased official sector sales and dishoarding by the private sector (Silver Institute, 2000, p. 6). Mine production of silver in Mexico, the world's largest silver producer, was 2,350 t, a 13% decrease from 2,686 t in 1998.

European silver mine production was essentially unchanged in 1999, while production in Central America and South America increased by about 17% owing primarily to growth in Chile (up 33%) and Peru (up 9%) from production in 1998 (table 6).

The United States was the leading silver recycling country at about 1,800 t, followed by Japan at about 918 t. In the United

States, photographic scrap was estimated to have generated 1,100 t of silver, most of which came from spent fixer solution and from X-ray and graphic arts wastes (Silver Institute, 2000, p. 32).

For the 11th consecutive year, global fabrication demand for silver exceeded supply in 1999, leading to reductions of above-ground stocks. World fabrication demand exceeded supply from mine production and the recycling of scrap by about 4,900 t. Photographic demand gained 3.9% to 8,300 t but was somewhat offset by slight declines in the larger, more price sensitive jewelry and silverware sectors (American Metal Market, 2000).

Stocks located in the principal exchanges were unchanged from stocks in 1998. As of December 31, 1999, COMEX (Commodity Exchange Inc., New York) stocks were 2,364 t and stocks at the Chicago Board of Trade were 124 t for a total of 2,488 t (table 1).

Legislation and Government Programs

United States Mint.—After several years of declining sales, 1999 American Eagle Silver Bullion coin sales increased in 1999. By September 30, the Mint had sold 16,734 kilograms (kg), a 26% increase over 1998, and projected a sellout of the program's 17,107 kg maximum mintage. The Mint also announced that the first of the 50 State quarters, the Delaware quarter, had been placed in circulation. Each year, five additional coins will be issued—in the order in which each State entered the union—until all 50 have been circulated. The Mint plans to sell to collectors and the general public a range of collector edition proof, uncirculated, and silver proof sets incorporating the State commemorative quarters. The product range will include complete collections, annual numismatic sets, and special offerings aimed at young collectors. The regularly issued annual proof, silver proof, and uncirculated sets will include all five yearly circulating quarters as well as all other denominations of circulating coinage. The Mint also plans to offer proof and silver proof 5-quarter sets (United States Mint, 2000, p. 6).

Silver reserves are classified by the U.S. Mint as reserves if in bar form. Silver reserves are reported by the Mint at either cost or market value, whichever is lower. Without historical cost records to determine the acquisition cost of the silver over the decades, the reserves are valued at the rate stated in the U.S. Code, Title 31, sections 5116 and 5117 (statutory rates), which is \$1.292929 per ounce. An offsetting custodial liability is also reported for these assets. As of September 30, 1999, the market value for silver was \$5.575 per ounce. Silver

inventories consisted of 616,961.62 kg of silver with a statutory value of \$25,646,220 and a market value of \$110,584,296. The change in numbers of fine silver ounces from year to year is due to the use of silver in the Mint's numismatic operations. In addition, the silver inventory may have increased as a result of receiving silver from the National Defense Stockpile (United States Mint, 2000, p. 44).

United States Food and Drug Administration.—Food and Drug Administration (FDA) rules that prohibit over the counter (OTC) sale of products containing silver or silver colloids appeared in the *Federal Register*, August 17, 1999, page 44653. Silver colloids have been marketed as an OTC material on the grounds that they are pre-1938 products and have been sold since the turn of the century. An FDA survey, however, found that OTC colloids were sold in concentrations that did not always match the claims listed on the container label. Compounds of silver or silver colloids are known to be powerful antibacterial agents.

Production

In 1999, silver was produced in the United States from precious-metal ores at about 46 lode mines and from base metal ores at about 30 lode mines. More than 30 t of silver was produced at each of 14 mines; their aggregated production equaled about 80% of total domestic production. Fewer than 10 placer operations recovered silver in 1999, and the quantity recovered was less than 1% of total domestic production of 1,950 t.

In 1999, Alaska was the second largest domestic producer of silver. Alaska's production was buoyed by increased production at the Greens Creek and Red Dog Mines. Greens Creek was mining approximately 1,600 t of ore per day underground from the South, the Southwest, and West ore zones. Ore was milled at the mine site. The mill produced a gold/silver doré that was marketed to a precious metals refiner.

In 1999, Arizona was the fourth largest silver producer in the United States. The State maintained its ranking despite a 13% decrease from production in 1998. Silver production in Arizona totaled 183 t in 1999.

ASARCO Incorporated closed its Black Cloud Mine in Leadville, CO, at the end of January due to insufficient ore reserves. About 20 workers were retained for care-and-maintenance purposes and continuation of an exploration program in the vicinity of the mine. Production at Black Cloud in 1997 totaled 7,776 kg of silver in concentrates. Ore was extracted from an underground cut-and-fill mine and processed at 1,000 t/d (Engineering & Mining Journal, 1999b).

Silver production in the Coeur d'Alene District of Idaho during 1999 decreased by 7% to 416 t. Increases in production at the Lucky Friday Mine and the Sunshine Mine were more than offset by decreased production at other mines in the district. The Gold Hunter deposit in northern Idaho pushed the Lucky Friday Mine's annual silver production to more than 128,700 kg in 1998 and 138,100 kg in 1999. In 1999, ore was processed at the rate of approximately 1,000 tons per day (t/d) in a conventional flotation mill. The flotation process produced

a silver-lead concentrate and a zinc concentrate. Probable resources at the Gold Hunter deposit were estimated by Hecla Mining Co. at more than 1,560 t of silver. Total proven and probable reserves at Lucky Friday, including the Gold Hunter expansion are 783,600 kg of silver (Hecla Mining Co., 2000, p. 9).

Output from the Sunshine Mine, Shoshone County, ID, was mostly from the West Chance vein. Sunshine expected that most of the company's production during 1999 and 2000 would be from the West Chance section. Sunshine increased its silver production forecasts for the Sunshine Mine in 1999 and 2000 to more than 161,700 kg per year. The company previously reported that production was expected to decline to about 124,400 kg in 1999 (Sunshine Mining Co., 1999, p. 3-9).

On May 13, 1999, Asarco and Coeur d'Alene Mines Corp. announced that they had agreed to a transaction in which Asarco would acquire a diluted 19.3 common stock interest in Coeur d'Alene Mines in exchange for most of Asarco's silver mining assets. The transaction gave Coeur d'Alene Mines Corp. ownership of Asarco's 50% interest in Silver Valley Resources Corp., a 50-50 joint venture between the two companies. Silver Valley operated the Coeur and Galena silver mines near Wallace, ID, and Asarco's wholly owned subsidiary Empresa Minera Manquiri SRL, which owns the San Bartolome silver project in Bolivia. Asarco and Coeur d'Alene Mines have had a 52-year relationship principally involving the operation of the Coeur and Galena silver mines (ASARCO Incorporated, 1999).

Nevada was the leading domestic producer of silver. The McCoy/Cove property was the leading mine producer in the State. McCoy/Cove consists of approximately 1,663 unpatented claims covering approximately 13,400 hectares of United States Federal land administered by the Bureau of Land Management. The McCoy Mine and surrounding property is in Lander County, about 48 kilometers (km) southwest of the town of Battle Mountain. The Cove deposit is about 2 km northeast of the McCoy deposit (Echo Bay Mines Ltd., 2000, p. 15).

Domestic mine production data for silver were developed by the U.S. Geological Survey from three separate, voluntary surveys of U.S. operations. Typical of these surveys was the lode mine production survey of copper, gold, lead, silver, and zinc. Of the 76 silver-producing lode mines to which a survey was sent, 61 responded, accounting for an estimated 90% of the total U.S. mine production shown in table 1.

Consumption

Silver has become predominantly an industrial metal with demand made up almost exclusively of four major components—electrical and electronic, photography, jewelry, and silverware. In 1999, U.S. consumption of silver, including scrap, was estimated to have been about 5,600 t. Photography, the largest end-use category, accounted for about 2,990 t. The second largest end-use category, batteries/electrical/electronic products, consumed about 1,060 t. About 500 t of silver were consumed in sterlingware, jewelry, and silverplate. Global consumption was estimated to have been 25,000 t, an increase

of more than 435 t from consumption in 1998 (Silver Users Association, 2000).

Prices

In contrast to wide swings in the price of gold and unusually high prices for platinum-group metals, the price of silver remained remarkably stable in 1999. Except for a price increase of \$0.41 in February and a second jump of \$0.64 in September when the high for 1999 was set at \$5.75, volatility in the market was much less than in recent years. The average price for 1999 was \$5.25 per ounce, \$0.29 below the average for 1998 (Amey and Hilliard, 2000, p. 4).

Foreign Trade

In 1999, the United States imported 3,180 t of silver in ash and residues, ores and concentrates, doré, and refined bullion. The value of these imports was \$546 million. Canada (43%), Mexico (35%), and Peru (6%) were the major foreign sources of imports. The United States exported 616 t of silver in ore and concentrates, refined silver bullion, and doré. The value of these exports was \$110 million.

World Review

For well over 50 years, most newly mined silver has come from just six countries—Australia, Canada, Chile, Mexico, Peru, and the United States. In 1999, these countries accounted for 57% of world mine production. The rankings have shifted somewhat with Mexico's share shrinking from 35% to 40% during the 1920's and 1930's, to 15% in 1999. Mexico remained the world's leading producer in 1999 and Peru was a close second with a 14% share. Chile posted dramatic growth in recent years and is now in third place. In contrast to the situation in North America and South America, Europe and Japan have declined in importance, although KGHM Polska Miedź S.A. in Poland remains one of the world's largest producing companies with a 1999 output of 1,093 t of refined silver (KGHM Polska Miedź website, accessed July 12, 2000, at URL <http://www.polishcopper.com/production.htm>).

Argentina.—In June 1999, U.S.-based Sunshine Mining and Refining Co. completed a feasibility study for its Piriquitas silver property in Jujuy Province, Argentina. The study projected a net cash operating cost of less than \$1.50 per ounce of silver (Engineering & Mining Journal, 1999a). After receiving approval of its environmental impact statement by the Jujuy provincial authorities, Sunshine was issued an operating permit for the mine. The company planned to operate the mine as a bulk tonnage, open pit operation, using a combination of gravity and flotation methods. Sunshine increased the reserve base at Piriquitas earlier in 1999 to 22.8 million metric tons (Mt) of ore grading an average 189-gram-per-ton silver, 0.3% tin, and 0.61% zinc for a total metal content of 3,610 t of silver, 70,800 t of tin, and 123,500 t of zinc (Metal Bulletin, 1999b).

Australia.—The Cannington Mine in North West Queensland, Australia, was the world's third largest silver

producer in 1999 and may become even larger when it reaches full production. The silver-lead-zinc mine produced 560 t of silver in 1998, placing it behind Peñoles Fresnillo Group (Proaño, Naica, and El Monte) in Mexico and Placer Dome/TVX's La Coipa/Chimberos Mines in Chile. At full production, Cannington is expected to produce more than 740 t of silver per year, about 6% of the world's output. According to the company, the ore body contains identified reserves of 47 Mt, and at full production 1.5 Mt of ore will be mined annually (Silver News, 1999a).

China.—The Chinese State Economic and Trade Council (SETC) approved a plan that ended the role of the People's Bank of China (PBOC) in unifying the purchase and sale of silver in the country. SETC placed responsibility of operating the silver market with the Huatong Nonferrous Metal Trading Wholesale Market. The market started operating concurrently with PBOC in advance of its launch on January 1, 2000. On that date, PBOC was expected to end its role in the market, leaving state-approved producers to trade on the spot market (CRU Precious Metals Monitor, 1999). The change meant that silver producers in China were no longer required to sell their production to the PBOC, which was the sole purchaser and distributor of the metal. It also ended official silver prices and the Government licensing system for the processing and trading of silver articles, excluding silver coins. The immediate effect of these anticipated changes was a rise in silver prices. While PBOC's last official price remained fixed at 1,290 yuan per kilogram (at an exchange rate of 8.26 yuan to the U.S. dollar), market prices rose to over 1,370 yuan per kilogram by the end of 1999 and were expected to increase to over 1,500 yuan per kilogram (US\$181 per kilogram) in 2000. Another effect was a steep increase in exports from a record 34 t in 1998 to 208 t in 1999 (Metal Bulletin Monthly, 2000).

Mexico.—Mexico continued to be the world's leading silver producer with mine production of 2,338 t in 1999. Most of Mexico's silver production was from primary mines. Lead and zinc mines accounted for about 30% of production, with significant amounts recovered as a byproduct of copper production. Industrias Peñoles S.A. de C.V. was Mexico's largest silver producer. The company operated the Torres Mine in Guanajuato, the Proaño operation near Fresnillo in Zacatecas, and La Ciénega project in Durango. Empresas Frisco S.A. de C.V., Grupo México S.A. de C.V., and Luismin S.A. de C.V. were the largest producers after Peñoles. These four companies accounted for more than 75% of Mexico's silver production.

In May 1999, Mexico's environmental protection agency (Profepa) ordered Industrias Peñoles to reduce lead emission at its Torreón smelting and refining complex in the northern Mexican State of Coahuila after tests showed that the blood of hundreds of children in the city of Torreón contained high levels of lead. Profepa introduced air pollution controls requiring Peñoles to monitor and report levels of sulfur dioxide emissions from the complex. When levels passed pre-set limits, the company was obligated to reduce operations according to the extent of the pollution. Owing to these restrictions, operations at the plant were reduced by as much as 50% at

various times, and at other times the plant was closed (Metal Bulletin, 1999a). By October 1999, the plant was operating at only about 50% capacity when Peñoles was given permission to increase production to the 75% level. Profepa announced on October 18 that environmental studies indicated that air and soil quality in the vicinity of the Met-Mex complex fell within the criteria approved by Profepa (Mining Journal, 1999b).

Peru.—In 1999, Peru produced 2,217 t of silver—a 9% increase from the 2,025 t produced in 1998 and 11% higher than production in 1997 (table 6). About one-third of Peru's silver was produced by primary silver mines. The remainder was produced as a byproduct of lead-zinc production. Peru was the world's second largest silver producer.

Poland.—Poland has been the leading European producer and exporter of silver since the 1970's. In Poland, silver was mainly recovered as a byproduct of copper ore treatment, with declining amounts recovered from silver-bearing residues of lead-zinc smelting. KGHM Polska Miedź S.A. (S.A., in Polish, stands for joint-stock company) is the world's second largest producer of refined silver. KGHM's new 1,000-ton-per-year precious metals plant, based on Boliden Kaldo technology, is at the Głogów copper smelter. Silver production at KGHM in 1999 was essentially unchanged, at 1,093 t, about 5 t less than in 1998 (Mining Journal, 1999a).

Current Research and Technology

A lead-free solder of tin, silver, and copper that is easy to use, strong, and heat resistant was developed by the Department of Energy's Ames Laboratory, Ames, IA. The solder was developed in response to the environmental hazards caused by lead but has other advantages, including better heat resistance in high-heat conditions. Primary applications were expected to be in electronic circuit boards for sensors and automotive engine control computers. The alloy is tin with an admixture of silver and copper and is intended for electronic, electrical, and mechanical connections. The silver content is 4.7% and the copper content is 1.7%. The Ames tin-silver-copper alloy is a true 'eutectic' alloy (the lowest possible solidification temperature) providing the solder user with a single melting point at 217° C. The single melting/solidification point is a great advantage to electronic technicians, reducing the time needed to hold the parts together during solidification (Silver News, 1999b).

Outlook

Despite the recent weakness of silver prices, mine output of silver will continue to increase. Output will be influenced by a steady reduction in the cost of mining the ore, but more importantly, as a greater portion of silver is recovered as a byproduct of base metal and gold mining, production will become less sensitive to prices. Looking ahead, it appears that demand for base metals will remain strong and there have been few cutbacks in the production of base metals that would affect silver output. As more silver production shifts to the byproduct class, production costs will continue to decrease. Lower

production costs and increased production will lead to lower prices and less volatility in the market.

Lower silver prices could force some primary silver mines to close. There are, however, several new base metal mines that are just beginning production or are near opening that will offset any reduction in output from the closure of primary silver mines. These include the Cannington Mine in Australia and the Antamina, Chimberos, Las Cristinas, San Cristobal, and San Vicente Mines in South America.

According to the Silver Institute, global silver production is expected to increase by more than 2,000 t during the next 2 years as demand for the metal continues to grow. By 2001, worldwide silver production is expected to reach 18,400 t, compared with 17,700 t in 1999. Production increases can be expected to continue as long as demand for the base metals from which silver is recovered as a byproduct remains strong. Despite increased production, demand will continue to outstrip mine production, which will result in significant reductions of above-ground stocks (Silver Institute, 2000, p. 23-24).

References Cited

- American Metal Market, 2000, Silver—Waiting for deficit to flow through to pricing: American Metal Market, v. 108, no. 113, June 13, p. 8A.
- Amey, E.B., and Hilliard, H.E., 2000, Precious metals in December 1999: U.S. Geological Survey Mineral Industry Surveys, March, 9 p.
- ASARCO Incorporated, 1999, Coeur d'Alene Mines Corporation and ASARCO Incorporated combine silver interest: news release, ASARCO Incorporated, New York, May 13, p. 1.
- CRU Precious Metals Monitor, 1999, China to liberalise silver market: CRU Precious Metals Monitor, December, p. 10.
- Echo Bay Mines Ltd., 2000, Form 10-K: Securities and Exchange Commission, 96 p.
- Engineering & Mining Journal, 1999a, In Latin America: Engineering & Mining Journal, v. 200, no. 6, June, p.14-ww.
- 1999b, North American roundup: Engineering & Mining Journal, v. 200, no. 3, March, p. 21-22.
- Hecla Mining Co., 2000, Form 10-K: Securities and Exchange Commission, 119 p.
- Metal Bulletin, 1999a, Closure threat to Peñoles' Torreón refinery: Metal Bulletin, no. 8376, May 17, p. 6.
- 1999b, Pirquitas gets mine permits, settles royalty bases: Metal Bulletin, no. 8405, September 2, p. 11.
- Metal Bulletin Monthly, 2000, China opens up its silver market: Metal Bulletin Monthly, no. 354, June, p. 13.
- Mining Journal, 1999a, European silver centre: Mining Journal, v. 332, no. 8526, April 9, p. 264.
- 1999b, Peñoles allowed to raise Met-Mex output: Mining Journal, v. 333, no. 8554, October 22, p. 326.
- Precious Metals News, 1999, Silver users request OSHA revise airborne silver standards in workroom air: Precious Metals News, v. 23, no. 1, January, p. 4.
- Silver Institute, 2000, World silver survey 2000: Washington, DC, Silver Institute, May, 84 p.
- Silver News, 1999a, Cannington poised to be world's largest silver mine: Silver News, August/September, p. 3.
- 1999b, New silver solder safer than conventional metal bonds: Silver News, February/March, p. 1.
- Silver Users Association, 2000, U.S. silver summary—1999: Silver Users Association, Washington, DC, p. 2.
- Sunshine Mining Company, 1999, 1998 annual report: Boise, ID, Sunshine Mining Company, 55 p.
- United States Mint, 2000, 1999 annual report: Washington, DC, United States Mint, 49 p.

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Precious metals. Mineral Industry Surveys, monthly.¹
Silver. Ch. in Mineral Commodity Summaries, annual.¹
Silver. Ch. in Minerals Yearbook, annual.¹

¹Prior to January 1996, published by the U.S. Bureau of Mines.

Silver. Ch. in United States Mineral Resources, Professional Paper 820, 1973.

Other

Silver. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

TABLE 1
SALIENT SILVER STATISTICS 1/

		1995	1996	1997	1998	1999
United States:						
Mine production	metric tons	1,560 r/	1,570	2,180	2,060	1,950
Value	thousands	\$259,000	\$262,000	\$329,000	\$368,000 r/	\$329,000
Refinery production:						
Domestic and foreign ores and concentrates	metric tons	NA	NA	2,200	2,300	2,000
Scrap (old and new)	do.	NA	NA	1,360	1,700	1,500
Exports, refined	do.	2,810	2,900	2,980	2,250	481
Imports for consumption: Refined	do.	2,630	2,580	2,120	2,800	2,660
Stocks, December 31:						
Industry	do.	NA	NA	395	400	NA
Futures exchanges	do.	6,290	4,550	3,430	2,360	2,360
Department of the Treasury	do.	520	402	484	582	617
National Defense Stockpile	do.	1,450	1,450	1,220	1,030	778
Price, average per troy ounce 2/		\$5.15	\$5.19	\$4.89	\$5.54	\$5.25
Employment, mine and mill workers 3/		1,200	1,400	1,550	1,550	1,500
World, mine production	metric tons	14,900 r/	15,000 r/	16,100 r/	17,000 r/	17,700

r/ Revised. NA Not available.

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

2/ Price data are the annual Handy & Harman quotations published in Platt's Metals Week.

3/ Employment data are from the Mine Safety and Health Administration.

TABLE 2
MINE PRODUCTION OF SILVER IN THE UNITED STATES, BY STATE 1/

(Kilograms)

State	1997	1998	1999
Arizona	190,000	211,000	183,000
California	23,100	11,300	7,670
Colorado	W	W	W
Idaho	341,000	447,000	416,000
Nevada	787,000	670,000	597,000
South Dakota	4,410	1,960	W
Washington	1,810	622	W
Other 2/	833,000	723,000	748,000
Total	2,180,000	2,060,000	1,950,000

W Withheld to avoid disclosing company proprietary data, included with "Other."

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

2/ Includes Alaska, Missouri, Montana, New Mexico, New York, South Carolina, Tennessee, Utah, and States indicated by symbol W.

TABLE 3
LEADING SILVER-PRODUCING MINES IN THE UNITED STATES IN 1999, IN ORDER OF OUTPUT 1/

Rank	Mine	County and State	Operator	Source of silver
1	Greens Creek	Admiralty Island, AK	Kennecott Greens Creek Mining Co.	Zinc ore.
2	McCoy/Cove	Lander, NV	Echo Bay Mines Limited	Gold ore.
3	Rochester	Pershing, NV	Coeur Rochester, Inc.	Do.
4	Red Dog	Northwest Arctic, AK	Cominco Alaska, Inc.	Lead-zinc ore.
5	Sunshine	Shoshone, ID	Sunshine Mining Company	Silver ore.
6	Lucky Friday	do.	Hecla Mining Company	Do.
7	Bingham Canyon	Salt Lake, UT	Kennecott Utah Copper Corp.	Copper-molybdenum ore.
8	Galena	Shoshone, ID	Silver Valley Resources Corp.	Silver ore.
9	Ken Snyder	Elko, NV	Euro-Nevada	Gold ore.
10	Mission Complex 2/	Pima, AZ	ASARCO Incorporated	Copper ore.
11	Morenci	Greenlee, AZ	Phelps Dodge Corp.	Copper-molybdenum ore.
12	Sierrita	Pima, AZ	Cyprus Amax Minerals Co.	Do.
13	Continental	Silver Bow, MT	Montana Resources Inc.	Do.
14	Bagdad	Yavapai, AZ	Cyprus Amax Minerals Co.	Do.
15	Montana Tunnels	Jefferson, MT	Apollo Gold Co.	Zinc ore.
16	Denton-Rawhide	Mineral, NV	Kennecott Minerals Company	Gold ore.
17	Ray	Pinal, AZ	ASARCO Incorporated	Copper ore.
18	Round Mountain	Nye, NV	Round Mountain Gold Corp.	Gold ore.
19	Casteel 3/	Iron, MO	Doe Run Resources Corp.	Lead ore.
20	Buick	do.	do.	Do.
21	Carlin Mines Complex	Eureka, NV	Newmont Gold Company	Gold ore.
22	Chino	Grant, NM	Phelps Dodge Corp.	Copper-molybdenum ore.
23	Rosebud	Pershing, NV	Hecla Mining Company	Gold ore.
24	West Fork	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
25	San Manuel	Pinal, AZ	BHP Copper Inc.	Copper-molybdenum ore.
26	Hycroft	Humboldt, NV	Vista Gold Corp.	Gold ore.
27	Beartrack	Lemhi, ID	Meridian Gold Inc.	Do.
28	Robinson	White Pine, NV	BHP Copper Inc.	Copper ore.
29	McLaughlin	Napa, CA	Homestake Mining Company	Gold ore.
30	Sweetwater	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
31	Twin Creeks	Humboldt, NV	Newmont Gold Company	Gold ore.
32	Fletcher	Reynolds, MO	Doe Run Resources Corp.	Lead ore.

1/ The mines on this list accounted for 97% of U.S. mine production in 1999.

2/ Includes Eisenhower, Mission, Pima, and San Xavier Mines.

3/ Includes Brushy Creek Mill.

TABLE 4
U.S. EXPORTS OF SILVER, BY COUNTRY 1/

(Kilograms silver content and thousand dollars, unless otherwise specified)

Year and country	Silver ores and concentrates		Bullion		Doré		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1998	6,540	1,480	2,250,000	466,000	241,000	49,000	2,500,000	516,000
1999:								
Argentina	--	--	--	--	--	--	--	--
Australia	--	--	726	147	--	--	726	147
Austria	--	--	--	--	--	--	--	--
Belgium	--	--	18,800	3,180	--	--	18,800	3,180
Brazil	--	--	--	--	--	--	--	--
Canada	67,400	13,600	342	59	--	--	67,800	13,700
China	32	4	--	--	--	--	32	4
Colombia	--	--	212	21	--	--	212	21
Costa Rica	--	--	--	--	--	--	--	--
Denmark	--	--	--	--	--	--	--	--
Dominican Republic	--	--	--	--	--	--	--	--
Egypt	--	--	--	--	--	--	--	--
France	--	--	63	14	--	--	63	14
Germany	--	--	37	7	--	--	37	7
Guatemala	--	--	386	71	--	--	386	71
Hong Kong	--	--	--	--	--	--	--	--
India	2,200	344	51,800	11,800	1,990	332	55,900	12,500
Ireland	--	--	--	--	--	--	--	--
Israel	--	--	--	--	--	--	--	--
Italy	--	--	32	6	--	--	32	6
Japan	40	7	18,200	3,150	--	--	18,200	3,160
Korea, Republic of	976	176	--	--	--	--	976	176
Malaysia	73	23	--	--	--	--	73	23
Mexico	--	--	13,800	2,410	37,200	6,710	51,000	9,120
Netherlands	--	--	--	--	--	--	--	--
New Zealand	--	--	--	--	--	--	--	--
Oman	--	--	--	--	--	--	--	--
Panama	--	--	--	--	--	--	--	--
Peru	--	--	--	--	--	--	--	--
Philippines	--	--	--	--	--	--	--	--
Poland	--	--	--	--	--	--	--	--
Singapore	--	--	1,140	223	--	--	1,140	223
South Africa	--	--	--	--	--	--	--	--
Spain	--	--	--	--	--	--	--	--
Suriname	--	--	102	18	--	--	102	18
Sweden	--	--	--	--	--	--	--	--
Switzerland	--	--	--	--	19,400	3,260	19,400	3,260
Taiwan	17	3	2,500	491	--	--	2,520	494
Thailand	--	--	242	44	--	--	242	44
Turkey	--	--	--	--	--	--	--	--
United Arab Emirates	--	--	132,000	21,200	--	--	132,000	21,200
United Kingdom	29	5	240,000	41,500	280	56	240,000	41,600
Uruguay	--	--	--	--	5,590	1,010	5,590	1,010
Other	34	6	120	27	--	--	154	33
Total	70,800	14,200	481,000	84,400	64,400	11,400	616,000	110,000

See footnotes at end of table.

TABLE 4--Continued
U.S. EXPORTS OF SILVER, BY COUNTRY 1/

(Kilograms silver content and thousand dollars, unless otherwise specified)

Year and country	Other unwrought silver (gross weight)		Metal powder (gross weight)		Silver nitrate (gross weight)		Semimanufactured forms 2/ (gross weight)		Waste and scrap (gross weight)	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1998	39,900	8,050	290,000	45,200	164,000	26,300	154,000	31,600	1,060,000	224,000
1999:										
Argentina	--	--	--	--	--	--	333	64	--	--
Australia	--	--	47	7	6,530	1,300	110	24	--	--
Austria	--	--	305	31	--	--	--	--	--	--
Belgium	220	66	2,240	426	20	7	3,860	995	186,000	38,000
Brazil	15	3	209	45	--	--	3,270	368	308	40
Canada	31,400	5,280	14,700	2,410	10,500	1,030	36,400	6,190	584,000	84,900
China	--	--	5,880	1,180	7,770	867	2,650	695	155,000	20,200
Colombia	--	--	--	--	--	--	--	--	--	--
Costa Rica	--	--	--	--	--	--	193	37	--	--
Denmark	229	48	26	9	--	--	--	--	--	--
Dominican Republic	4,050	890	--	--	--	--	12	4	1,240	161
Egypt	--	--	--	--	--	--	542	108	--	--
France	1,900	375	5,150	1,030	20	5	1,880	1,060	983	252
Germany	7,420	1,590	87,300	12,400	6	4	3,140	773	219,000	50,000
Guatemala	--	--	--	--	--	--	--	--	--	--
Hong Kong	2,950	657	19,200	3,380	53	10	1,580	388	5,360	684
India	92	20	462	121	--	--	51	39	744	97
Ireland	--	--	1,720	177	--	--	--	--	--	--
Israel	--	--	769	248	7	8	522	323	22	44
Italy	309	117	263	38	--	--	6,230	1,300	29,400	4,740
Japan	253	58	89,100	16,400	77	8	3,300	1,020	34,300	6,830
Korea, Republic of	1,010	359	10,500	2,110	--	--	966	276	201	35
Malaysia	--	--	--	--	--	--	138	12	--	--
Mexico	435	99	5,600	1,170	37,200	4,050	13,100	3,130	3	14
Netherlands	845	166	17,500	3,030	--	--	252	131	--	--
New Zealand	--	--	--	--	--	--	629	131	151	20
Oman	183	40	--	--	--	--	--	--	--	--
Panama	--	--	--	--	--	--	112	22	--	--
Peru	--	--	--	--	--	--	106	12	1,930	751
Philippines	--	--	--	--	--	--	275	388	--	--
Poland	--	--	--	--	--	--	--	--	479	62
Singapore	67	15	20,100	3,420	--	--	2,150	595	--	--
South Africa	798	145	--	--	--	--	81	24	9,900	1,850
Spain	--	--	--	--	--	--	14,400	3,390	--	--
Suriname	--	--	--	--	--	--	--	--	--	--
Sweden	--	--	12,700	1,200	--	--	9	12	44,400	7,110
Switzerland	--	--	112	25	--	--	1,070	402	141	26
Taiwan	11,900	2,230	16,600	3,920	170	26	16,800	4,700	1,080	149
Thailand	6,900	1,310	136	26	--	--	--	--	--	--
Turkey	--	--	--	--	--	--	1,690	201	--	--
United Arab Emirates	--	--	--	--	--	--	353	71	--	--
United Kingdom	4,060	851	12,900	2,230	--	--	5,440	1,630	35,200	6,750
Uruguay	--	--	--	--	--	--	--	--	--	--
Other	105	56	84	18	82	12	613	250	286	117
Total	75,100	14,400	324,000	55,100	62,500	7,330	122,000	28,700	1,310,000	223,000

-- Zero.

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

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

Source: U.S. Census Bureau.

TABLE 5
U.S. IMPORTS FOR CONSUMPTION OF SILVER, BY COUNTRY 1/

(Kilograms silver content and thousand dollars, unless otherwise specified)

Year and country	Silver ores and concentrates		Base metal ores and concentrates		Ash and residues		Bullion		Doré	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1998	197,000	34,500	14,200	2,390	47,200	8,760	2,800,000	509,000	340,000	57,100
1999:										
Australia	--	--	--	--	1,580	258	--	--	--	--
Belgium	--	--	--	--	--	--	--	--	--	--
Brazil	--	--	--	--	--	--	--	--	--	--
Canada	348	53	--	--	16,600	2,990	1,350,000	232,000	18,700	3,190
Chile	--	--	--	--	15	3	32,600	5,500	280,000	52,200
China	--	--	--	--	--	--	--	--	--	--
Colombia	--	--	--	--	--	--	64	10	2,760	497
Costa Rica	--	--	--	--	--	--	--	--	188	32
Dominican Republic	--	--	--	--	--	--	--	--	--	--
France	--	--	--	--	--	--	--	--	--	--
Germany	--	--	--	--	--	--	148	24	--	--
Hong Kong	--	--	--	--	--	--	14,000	2,540	--	--
Ireland	--	--	--	--	--	--	--	--	--	--
Israel	--	--	--	--	--	--	--	--	--	--
Italy	--	--	--	--	--	--	--	--	--	--
Japan	--	--	--	--	46,300	303	--	--	--	--
Korea, Republic of	--	--	--	--	--	--	--	--	--	--
Malaysia	--	--	--	--	--	--	--	--	--	--
Mexico	10,400	1,920	--	--	6,990	467	1,030,000	173,000	72,600	15,300
Netherlands	--	--	--	--	--	--	--	--	79	28
Nicaragua	--	--	--	--	--	--	175	31	1,030	172
Panama	--	--	--	--	--	--	563	65	--	--
Peru	--	--	2,750	440	--	--	169,000	28,100	28,500	10,100
Philippines	--	--	--	--	--	--	--	--	--	--
Poland	--	--	--	--	--	--	--	--	--	--
Russia	--	--	--	--	--	--	--	--	--	--
Singapore	--	--	--	--	35	5	--	--	--	--
South Africa	--	--	--	--	--	--	4,610	780	--	--
Switzerland	--	--	--	--	--	--	1,040	180	--	--
Taiwan	--	--	--	--	--	--	--	--	--	--
United Kingdom	--	--	--	--	29,600	4,950	59,400	10,900	--	--
Other	--	--	--	--	--	--	31	5	36	6
Total	10,800	1,970	2,750	440	101,000	8,970	2,660,000	453,000	404,000	81,600

See footnotes at end of table.

TABLE 5--Continued
U.S. IMPORTS FOR CONSUMPTION OF SILVER, BY COUNTRY 1/

(Kilograms silver content and thousand dollars, unless otherwise specified)

Year and country	Other unwrought silver (gross weight)		Metal powder (gross weight)		Silver nitrate (gross weight)		Semimanufactured Forms 2/ (gross weight)		Waste and scrap (gross weight)	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1998	102,000	18,400	129,000	26,700	8,030	1,030	181,000	35,700	1,800,000	97,500
1999:										
Australia	--	--	--	--	--	--	--	--	76	249
Belgium	--	--	--	--	1,170	74	--	--	10,000	30
Brazil	--	--	552	102	--	--	1,800	231	3	4
Canada	123,000	21,800	926	167	1,850	209	105,000	19,300	534,000	56,700
Chile	--	--	--	--	--	--	--	--	840	342
China	--	--	--	--	--	--	771	17	68	73
Colombia	--	--	--	--	--	--	--	--	--	--
Costa Rica	57	10	--	--	--	--	--	--	18,900	75
Dominican Republic	--	--	90	16	--	--	--	--	13,600	1,230
France	--	--	--	--	--	--	(3/)	9	16,100	379
Germany	13	7	2,990	663	1,120	72	9,550	2,100	327,000	2,560
Hong Kong	--	--	--	--	--	--	--	--	8,160	1,440
Ireland	--	--	--	--	--	--	139	29	17,700	4,360
Israel	--	--	--	--	--	--	39	16	18,300	160
Italy	--	--	--	--	--	--	1,450	128	484	69
Japan	23	8	70,200	18,200	--	--	1,370	579	59,000	1,170
Korea, Republic of	--	--	165	30	--	--	346	29	11,300	2,450
Malaysia	76	65	750	96	--	--	--	--	116,000	7,440
Mexico	3,030	290	(3/)	2	--	--	12,700	624	39,900	6,400
Netherlands	15	14	--	--	300	10	483	50	227,000	294
Nicaragua	--	--	--	--	--	--	--	--	--	--
Panama	--	--	--	--	--	--	--	--	184	5
Peru	--	--	33,900	5,610	--	--	--	--	43,900	9,350
Philippines	--	--	--	--	--	--	--	--	23,800	460
Poland	--	--	--	--	--	--	506	55	(3/)	3
Russia	--	--	10,000	1,400	--	--	--	--	247	2,720
Singapore	--	--	--	--	--	--	--	--	1,080	275
South Africa	--	--	--	--	--	--	--	--	615	1,360
Switzerland	--	--	256	64	--	--	353	117	1,460	515
Taiwan	--	--	--	--	--	--	20	3	128	73
United Kingdom	--	--	40	17	--	--	4,300	593	149,000	19,600
Other	69	28	(3/)	2	--	--	148	65	190	782
Total	126,000	22,200	120,000	26,400	4,450	364	139,000	24,000	1,640,000	121,000

-- Zero.

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

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

3/ Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 6
SILVER: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1995	1996	1997	1998	1999 e/
Algeria e/	2	2	2	2	2
Argentina	48	50	53 r/	36 r/	39 3/
Armenia	(4/)	1	1	NA	NA
Australia	939	1,013	1,106	1,474 r/	1,720 3/
Austria e/	2	--	--	--	--
Bolivia	425	384	387	404 r/	422 3/
Brazil 5/	50	30	27	34 r/	34
Bulgaria	35 e/	49 r/	32 r/	24 r/	25
Burma	4	4	2	3 r/	4 3/
Canada	1,285	1,309	1,224	1,196 r/	1,246 p/
Chile	1,041	1,047	1,091	1,340	1,780 3/
China e/	910	1,140	1,300	1,400	1,400
Colombia 6/	6 r/	6 r/	4 r/	5 r/	5
Congo (Kinshasa) e/ 7/	1	1	1	1	1
Costa Rica e/	(4/)	(4/)	(4/)	(4/)	(4/)
Dominican Republic	21	17	12	7 r/	4
Ecuador	(4/)	1 r/	2	2 e/	2
El Salvador	--	--	(4/)	(4/)	(4/)
Fiji	2	2	3	2	3
Finland 8/	26	33	32 e/	30 r/	30
France	1	2 e/	2	2 e/	2
Ghana e/	3	2	3	4	4
Greece	33	17	45	45 e/	44
Honduras	35 r/	29	35 r/ e/	43 r/	47 3/
India	38	36	50 r/	52 r/	54
Indonesia	276 r/	255 r/	219 r/	349 r/	292 3/
Iran e/	60	60	60	60	60
Ireland	14	15	13	13 e/	12
Italy 9/	14	9	10 e/	10 e/	10
Japan	100	85	87	94	94 3/
Kazakhstan e/	489	468 3/	465	470	575
Korea, North e/	50	50	50	50	50
Korea, Republic of 6/	299	254	268	339 r/	489 3/
Macedonia e/	10	10	10	10	10
Malaysia	11	10	10	7 r/	5
Mali e/	(4/)	(4/)	1	1	1
Mexico	2,324	2,528	2,679	2,686	2,338 p/
Morocco	204	200	261	306 r/	300
Namibia	69	42	41 r/	23 r/	18
New Zealand	28	30 r/	32 r/	32 r/ e/	32
Nicaragua	1 r/	2 r/ e/	3 r/	4 r/	3
Panama	(4/)	1	2	2 e/	2
Papua New Guinea	68	58	45 r/	65 r/	83 3/
Peru	1,929	1,970	1,998	2,025 r/	2,217 3/
Philippines	27	25	20	13 e/	19
Poland	1,001	935	1,029 r/	1,100 r/	1,100
Portugal	39 3/	36	34	32	30
Romania e/	60	60	60	60	60
Russia e/	600	400	400	350	375
Saudi Arabia	17	17	17	20 r/	20
Serbia and Montenegro	31	69	43 r/	34 r/	7
Solomon Islands e/	(4/)	(4/)	(4/)	1	2
South Africa	174	169	144	144 r/	141 3/
Spain	102	66	66 e/	65 e/	25
Sweden	268	272	304 r/	299 r/	300
Tajikistan	NA	NA	NA	5	5
Tunisia	4	3	1 e/	1 e/	1
Turkey e/	70	70	90	110 r/	110
United States	1,560	1,570	2,180	2,060	1,950 3/
Uzbekistan e/	65	70	70	70	75
Zambia 10/	9	9	7	8 r/	8
Zimbabwe	16	10	6	7 r/	7

See footnotes at end of table.

TABLE 6--Continued
 SILVER: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1995	1996	1997	1998	1999 e/
Total	14,900 r/	15,000 r/	16,100 r/	17,000 r/	17,700

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. -- Zero.

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

2/ Recoverable content of ores and concentrates produced unless otherwise specified. Table includes data available through August 11, 2000.

3/ Reported figure.

4/ Less than 1/2 unit.

5/ Includes the following quantities, in kilograms, identified as secondary silver: 1995--35,000; 1996--38,000; 1997--32,000; 1998--40,000 (revised); and 1999--40,000 (estimated).

6/ Smelter and/or refinery production.

7/ Formerly Zaire.

8/ Metal content.

9/ Includes production from imported ores.

10/ Year beginning April 1 of that stated.