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2005 Minerals Yearbook

RECYCLING—METALS

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RECYCLING—METALS

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In 2005, the United States recycled 71 million metric tons (Mt) of metal, an amount equivalent to 52% of the apparent supply of those metals (table 1). The United States exported 17.7 Mt of scrap metal and imported 5.3 Mt (table 2).

Metals are important, reusable resources. Although the ultimate supply of metal is fixed by nature, human ingenuity determines the quantity of supply available for use by developing economic processes for the recovery from the Earth (the primary source of metal) and from secondary sources (recycled from the use/process stream). The reusable nature of metals contributes to the sustainability of their use.

Recycling, a significant factor in the supply of many of the metals used in our society, provides environmental benefits, such as energy savings, reduced volumes of waste, and reduced emissions associated with energy savings.

Individual annual reviews for each of the metals listed in the tables are in the respective chapters in this volume of the U.S. Geological Survey (USGS) Minerals Yearbook, volume I, Metals and Minerals.

The term "primary" indicates material from ore deposits, and the term "secondary" indicates material from recycled material, including used products and residual materials from manufacturing. Recycling practices and the description of those practices vary substantially among the metal industries. Generally, scrap is categorized as "new" or "old." "New" indicates preconsumer sources, and "old," postconsumer sources. The many stages of industrial processing that precede formation of an end product are the sources of new scrap. For example, when metal is converted into shapes—bars, plates, rods, or sheets—new scrap is generated in the form of cuttings, trimmings, and off-specification materials. When these shapes are converted to parts, new scrap may be generated in the form of cuttings, stampings, turnings, and off-specification materials. Similarly, when parts are assembled into products, new scrap is generated. Once a product completes its useful product life, it becomes old scrap. Used appliances, automobiles, and beverage cans are examples of old consumer scrap; used jet engine blades and vanes, junked machinery and ships, and metal recovered from commercial buildings or industrial plants are examples of old industrial scrap. A wide variety of descriptive terms, including external scrap, home scrap, internal scrap, mill scrap, prompt scrap, and purchased scrap, have evolved to describe scrap generated by diverse industry practices. The material flow of recycled metal commodities in the United States has been documented in a series of reports published by the USGS (Sibley, 2004).

Reference Cited

Sibley, S.F., ed., 2004, Flow studies for recycling metal commodities in the United States: U.S. Geological Survey Circular 1196–A–M, 210 p.

TABLE 1
SALIENT U.S. RECYCLING STATISTICS FOR SELECTED METALS[1]

Year	Quantity of metal (metric tons)					Value of metal (thousands)			
	Recycled from new scrap[2]	Recycled from old scrap[3]	Recycled[4]	Apparent supply[5]	Percentage recycled	Recycled from new scrap[2]	Recycled from old scrap[3]	Recycled[4]	Apparent supply[6]
Aluminum:[7]									
2001	1,760,000	1,210,000	2,970,000	7,990,000	37	2,670,000	1,830,000	4,500,000	12,100,000
2002	1,750,000	1,170,000	2,930,000	8,070,000	36	2,510,000	1,680,000	4,190,000	11,500,000
2003	1,750,000	1,070,000	2,820,000	7,880,000	36	2,620,000	1,610,000	4,230,000	11,800,000
2004	1,870,000	1,160,000	3,030,000	8,460,000	36	3,640,000	2,140,000	5,600,000	15,700,000
2005	1,930,000	1,060,000	2,990,000	8,390,000	36	3,870,000	2,140,000	6,000,000	16,800,000
Chromium:[8]									
2001	NA	NA	141,000	532,000 r	27 r	NA	NA	81,900	223,000
2002	NA	NA	174,000	479,000	36	NA	NA	95,100	293,000
2003	NA	NA	180,000	532,000	34	NA	NA	139,000	429,000
2004	NA	NA	168,000	555,000	30	NA	NA	207,000	681,000
2005	NA	NA	124,000	511,000	24	NA	NA	162,000	717,000
Copper:[9]									
2001	833,000	317,000	1,150,000	3,340,000	34.4	1,410,000	536,000	1,950,000	5,660,000
2002	842,000	208,000	1,050,000	3,450,000	30.4	1,410,000	348,000	1,760,000	5,770,000
2003	738,000	206,000	944,000	3,170,000	29.8	1,390,000	387,000	1,770,000	5,950,000
2004	774,000	191,000	965,000	3,330,000	28.9	2,290,000	565,000	2,850,000	9,830,000
2005	769,000	182,000	951,000	3,170,000	30.0	2,940,000	698,000	3,640,000	12,100,000
Iron and steel:[10]									
2001	NA	NA	70,600,000	118,000,000	60	NA	NA	5,320,000	8,880,000
2002	NA	NA	69,300,000 r	119,000,000	58	NA	NA	6,450,000	10,200,000
2003[11]	NA	NA	65,500,000	117,000,000	56	NA	NA	7,920,000 r	13,200,000
2004[11]	NA	NA	66,900,000 r	132,000,000	51	NA	NA	14,100,000 r	24,900,000
2005	NA	NA	65,400,000	122,000,000	54	NA	NA	12,600,000	21,900,000
Lead:[12]									
2001	55,300	1,040,000	1,100,000	1,670,000	75.6	53,200	1,010,000	1,060,000	1,610,000
2002	42,600	1,070,000	1,120,000	1,540,000	81.2	40,900	1,030,000	1,070,000	1,480,000
2003r	19,300	1,120,000	1,140,000	1,520,000	77.4	18,600	1,080,000	1,100,000	1,470,000
2004	12,900	1,110,000 r	1,130,000 r	1,460,000 r	77.3 r	15,600	1,350,000 r	1,370,000 r	1,440,000 r
2005	15,700	1,130,000	1,140,000	1,540,000	74.5	21,100	1,520,000	1,540,000	2,070,000
Magnesium:[13]									
2001	38,600	27,200	65,800	151,000	44	106,000	75,000	181,000	416,000
2002	47,100	26,400	73,600	148,000	50	126,000	70,500	196,000	395,000
2003	44,700	25,400	70,100	152,000	46	107,000	60,900	168,000	366,000
2004	51,500 r	20,500 r	72,000 r	179,000 r	40	167,000	66,400	233,000 r	582,000 r
2005	53,400	19,400	72,800	167,000	44	172,000	62,500	234,000	538,000
Nickel:[14]									
2001	NA	NA	81,200	210,000	39	NA	NA	483,000	1,250,000
2002r	NA	NA	83,900	205,000	41	NA	NA	568,000	1,380,000
2003	NA	NA	83,500	200,000 r	42	NA	NA	804,000	1,930,000 r
2004	NA	NA	83,300	212,000 r	39	NA	NA	1,150,000	2,930,000 r
2005	NA	NA	77,300	214,000	36	NA	NA	1,140,000	3,150,000
Tin:[15]									
2001	7,210	6,700	13,900	46,300	30	24,400	29,900	54,300	316,000
2002	3,790	6,760	10,600	49,100	22	18,400	40,600	59,000	307,000
2003	3,570	5,500	9,070	41,500	22	26,800	41,200	68,000	311,000
2004	3,590	5,240 r	8,830 r	53,800 r	16	43,300 r	63,200 r	107,000 r	649,000 r
2005	2,280	11,800	14,000	46,500	30	24,300	125,000	150,000	495,000
Titanium:[16]									
2001	NA	NA	17,000	W	39	NA	NA	35,200 e	NA
2002	NA	NA	11,600	W	40	NA	NA	25,600 e	NA
2003	NA	NA	14,300	W	46	NA	NA	48,000 e	NA
2004	NA	NA	18,300 r	W	46 r	NA	NA	127,000 e	NA
2005	NA	NA	25,700	W	50	NA	NA	445,000	NA

See footnotes at end of table.

TABLE 1—Continued
SALIENT U.S. RECYCLING STATISTICS FOR SELECTED METALS[1]

Year	Quantity of metal (metric tons)				Percentage recycled	Value of metal (thousands)			
	Recycled from new scrap[2]	Recycled from old scrap[3]	Recycled[4]	Apparent supply[5]		Recycled from new scrap[2]	Recycled from old scrap[3]	Recycled[4]	Apparent supply[6]
Zinc:[17]									
2001[r]	317,000	57,000	375,000	1,420,000	26.4	307,000	55,200	362,000	1,380,000
2002	319,000	47,300	366,000	1,420,000	25.8	272,000	40,300	312,000	1,210,000
2003	295,000	50,300	345,000	1,340,000	25.8	264,000	45,100	309,000	1,200,000
2004	302,000	47,100	349,000	1,400,000	24.9	350,000 [r]	54,500 [r]	404,000 [r]	1,620,000 [r]
2005	302,000	43,100	345,000	1,170,000	29.5	446,000	63,700	510,000	1,730,000

[e]Estimated. [r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data.

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

[2]Scrap that results from the manufacturing process, including metal and alloy production. New scrap of aluminum, copper, lead, tin, and zinc excludes home scrap, which is scrap generated and recycled in the metal producing plant.

[3]Scrap that results from consumer products.

[4]Metal recovered from new plus old scrap.

[5]Apparent supply is production plus net imports plus stock changes. Production is primary production plus recycled metal. Net imports are imports minus exports. Apparent supply is calculated on a contained-weight basis.

[6]Same as apparent supply defined in footnote 5 above but calculated based on a monetary value.

[7]Quantity of metal is the calculated metallic recovery from purchased new and old aluminum-base scrap, estimated for full industry coverage. Monetary value is estimated based on average U.S. market price for primary aluminum metal ingot.

[8]Chromium scrap includes estimated chromium content of stainless steel scrap receipts (reported by the iron and steel and pig iron industries) where chromium content was estimated to be 17%. Trade includes reported or estimated chromium content of chromite ore, ferrochromium, chromium metal and scrap, and a variety of chromium-containing chemicals. Stocks include estimated chromium content of reported and estimated producer, consumer, and Government stocks. Recycled value calculated from quantity using the average annual import value of high-carbon ferrochromium. Apparent supply value calculated from quantity using average annual trade value.

[9]Includes copper recovered from unalloyed and alloyed copper-base scrap, as refined copper or in alloy forms, as well as copper recovered from aluminum-, nickel-, and zinc-base scrap. Monetary value based on annual average refined copper prices.

[10]Iron production measured as shipments of iron and steel products plus castings corrected for imported ingots and blooms. Secondary production measured as reported consumption. Apparent supply includes production of raw steel.

[11]Before 2003, monetary value based on U.S. annual average composite price for No. 1 heavy-melting steel calculated from prices published in American Metal Market. After 2002, monetary value based on mass-weighted average of steel trade (exports plus imports) of selected Harmonized Tariff Schedule of the United States (HTS) categories. Recycled unit value based on HTS 7204 by year and per metric ton was 2003—$172 and 2004—$252. Steel production unit value based in HTS 7206 and 7207 by year and per metric ton was 2003—$259; 2004—$679. Apparent supply value is mass weighted-average of recycled production unit values.

[12]Lead processors are segregated by primary and secondary producers. This segregation permits inclusion of stock changes for secondary producers. Monetary value of scrap and apparent supply estimated based upon average quoted price of common lead.

[13]Includes magnesium content of aluminum-base scrap. Monetary value based on the annual average Platts Metals Week's U.S. spot Western price.

[14]Nickel statistics were derived from the following:

Canvass data

- •Reported nickel content of products made from reclaimed stainless steel dust, spent nickel-cadmium batteries, plating solutions, and other products.
- •Estimated nickel content of reported net receipts of alloy and stainless steel scrap.
- •Reported nickel content of recovered copper-base scrap.
- •Reported nickel content of obsolete and prompt purchased nickel-base scrap.
- •Estimated nickel content of various types of reported obsolete and prompt aluminum scrap.

Trade data

- •Reported nickel content of International Nickel Study Group (INSG) class I primary products, including briquets, cathode, flake, pellets, and powder.
- •Reported or estimated nickel content of INSG class II primary products, including ferronickel, metallurgical-grade nickel oxide, and a variety of nickel-containing chemicals.
- •Estimated nickel content of secondary products, including nickel waste and scrap and stainless steel scrap.

Stock data

- •Reported or estimated nickel content of all scrap stocks, except copper.
- •Reported nickel content of primary products held by world producers in U.S. warehouses.
- •Reported nickel content of primary products held by U.S. consumers.
- •Reported nickel content of U.S. Government stocks.

Monetary value based on annual average cash price for cathode, as reported by the London Metal Exchange.

[15]Monetary value based on Platts Metals Week composite price for tin.

[16]Percentage recycled based on titanium scrap consumed divided by primary sponge and scrap consumption.

[17]Monetary value based on annual average Platts Metal Week metal price for North American special high-grade zinc.

TABLE 2
SALIENT U.S. RECYCLING TRADE STATISTICS FOR SELECTED METALS[1]

	Exports			Imports for consumption		
	Quantity			Quantity		
Year	Gross weight (metric tons)	Contained weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Contained weight (metric tons)	Value (thousands)
Aluminum:						
2001	580,000	NA	588,000	497,000	NA	552,000
2002	613,000	NA	603,000	466,000	NA	502,000
2003	577,000	NA	633,000	440,000	NA	496,000
2004	660,000	NA	773,000	535,000	NA	655,000
2005	1,090,000	NA	1,370,000	482,000	NA	658,000
Chromium:[2]						
2001	439,000	75,600	281,000	50,500	15,400	74,100
2002	343,000	59,000	259,000	88,500	21,200	92,200
2003	505,000	86,700	394,000	97,700	23,700	115,000
2004	479,000	82,200	565,000	156,000	34,500	216,000
2005	586,000	100,000	687,000	122,000	29,900	211,000
Copper:[3]						
2001	534,000	439,000	538,000	115,000	91,100	140,000
2002	511,000	407,000	509,000	100,000	80,300	124,000
2003	689,000	558,000	664,000	90,600	70,700	121,000
2004	714,000	578,000	882,000	102,000	79,800	183,000
2005	658,000	556,000	1,060,000	114,000	90,300	270,000
Iron and steel:						
2001	7,530,000	7,530,000	1,150,000	2,810,000	2,810,000	298,000
2002	9,000,000	9,000,000	1,300,000	3,320,000	3,320,000	403,000
2003	10,900,000	10,900,000	1,960,000	3,690,000	3,690,000	556,000
2004	11,800,000	11,800,000	2,930,000	4,790,000	4,790,000	1,280,000
2005	13,000,000	13,000,000	3,460,000	4,000,000	4,000,000	972,000
Lead:						
2001	108,000	108,000	24,900	10,700	10,000	4,260
2002	106,000	106,000	23,300	2,880	2,570	1,740
2003	92,800	92,800	23,300	4,970	4,600	2,460
2004	56,300	56,300	14,800	5,320	4,770	3,510
2005	67,300	67,300	21,600	3,840	3,340	2,880
Magnesium:						
2001	6,950	6,950	18,600	11,000	11,000	19,200
2002	5,850	5,850	14,700	14,100	14,100	20,900
2003	5,040	5,040	11,800	16,200	16,200	22,000
2004	4,790	4,790	11,300	11,700	11,700	17,600
2005	5,630	5,630	13,100	14,700	14,700	22,700
Nickel:[4]						
2001	1,070,000	51,000	533,000	252,000	9,550	95,000
2002	1,070,000	42,200	506,000	358,000	10,200	107,000
2003	1,410,000	50,900	704,000	230,000	12,000	138,000
2004	2,240,000	55,200	995,000	453,000	20,000	328,000
2005	2,170,000	61,900	1,190,000	550,000	17,200	304,000
Tin:						
2001	3,230	3,230	4,640	3,700	3,700	1,860
2002	5,940	5,940	9,740	561	561	736
2003	5,040	5,040	8,630	921	921	686
2004	9,310	9,310	13,200	1,950	1,950	1,700
2005	10,600	10,600	12,100	3,530	3,530	2,010
Titanium:						
2001	7,500	7,500	18,300	11,600	11,600	41,200
2002	6,000	6,000	14,200	6,270	6,270	17,800
2003	5,320	5,320	29,200	5,550	5,550	19,700
2004	9,760	9,760	56,000	8,830	8,830	53,600
2005	20,600	20,600	91,400	12,400	12,400	162,000

See footnotes at end of table.

TABLE 2—Continued
SALIENT U.S. RECYCLING TRADE STATISTICS FOR SELECTED METALS[1]

	Exports			Imports for consumption		
	Quantity			Quantity		
Year	Gross weight (metric tons)	Contained weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Contained weight (metric tons)	Value (thousands)
Zinc:						
2001	26,800	NA	14,200	39,300	NA	11,600
2002	19,800	NA	11,200	31,200	NA	9,530
2003	32,300	NA	23,300	10,300	NA	5,740
2004	40,300	NA	39,400	10,800	NA	7,740
2005	46,800	NA	55,000	9,580	NA	8,820

[r]Revised. NA Not available.

[1]Contained weight based upon 100% of gross, unless otherwise specified.

[2]Contained weight for import and export quantities of Harmonized Tariff Schedule of the United States (HTS) code 7204.21.000 is 17% of gross weight.

[3]For HTS codes 7404.00.0045, 7404.00.0062, 7404.00.0080 contained weight for import quantity is 65% of gross weight. For HTS codes 7404.00.3045, 7404.00.3055, 7404.00.3065, 7404.00.3090, 7404.00.6045, 7404.00.6055, 7404.00.65, and 7404.00.6090 contained weight for import quantity is 72%.

[4]Contained weight for import and export quantities is 0.4% of gross weight for HTS code 7204.29.000, 50% for HTS code 7503.00.00, and 7.5% for HTS code 7204.21.0000.