



2015 Minerals Yearbook

RECYCLING—METALS [ADVANCE RELEASE]

RECYCLING—METALS

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In 2015, the United States recycled 58.3 million metric tons (Mt) of selected metals, an amount equivalent to about 49% of the apparent supply of those metals (table 1). About 90% of recycled metal was iron and steel, and about 89% of apparent supply was iron and steel. By gross quantity, the United States exported 16.4 Mt of scrap metals and imported 4.74 Mt of these same metals (table 2).

Metals are important, reusable resources. Although the ultimate supply of metal is fixed by nature, human ingenuity determines the quantity available for use by developing economical processes to recover metal from the Earth, recycle metal from the use and (or) process stream, and develop efficient uses for those metals. 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 by society, provides environmental and economic benefits, such as energy savings and reduced volumes of waste.

The term “primary” is used to indicate materials from ore deposits, and the term “secondary” indicates materials from scrap, including used products and residuals from manufacturing. Recycling 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 forms. When these shapes are converted to parts, additional new scrap may be generated in the form of cuttings, stampings, turnings, and

off-specification parts. Similarly, when parts are assembled into products, new scrap may be generated. A wide variety of descriptive terms, many duplicative, including external scrap, home scrap, internal scrap, mill scrap, prompt scrap, and purchased scrap, have evolved to describe scrap generated by diverse industry practices.

Once a product completes its useful life, it becomes postconsumer material, often called old scrap or junk, which is recycled into scrap and reuse material streams. For example, a junked motor might be refurbished for reuse. If it cannot be refurbished, it could be deconstructed to recover its metal constituents, primarily copper and steel. Used appliances, automobiles, and beverage cans are examples of sources of old consumer scrap; used jet engine turbine blades and vanes, junked machinery and ships, and metal recovered from commercial buildings or industrial plants are examples of old industrial scrap. The material flow of recycled metal commodities in the United States has been documented in a series of reports published by the U.S. Geological Survey (Sibley, 2006–11).

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

Reference Cited

Sibley, S.F., ed., 2006–11, Flow studies for recycling metal commodities in the United States: U.S. Geological Survey Circular 1196–A–Z–AA, [variously paged], <http://pubs.usgs.gov/circ/circ1196/>. (Accessed January 11, 2017, via <https://pubs.usgs.gov/circ/circ1196/>.)

TABLE 1
SALIENT U.S. RECYCLING STATISTICS FOR SELECTED METALS¹

Year	Quantity of metal (metric tons)				Percentage recycled ⁶	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 ⁷
Aluminum:⁸									
2011	1,670,000 ^r	1,440,000 ^r	3,110,000 ^r	5,210,000	60	\$4,280,000 ^r	\$3,690,000 ^r	\$7,970,000 ^r	\$13,300,000
2012	1,760,000 ^r	1,630,000 ^r	3,380,000 ^r	5,890,000 ^r	57	4,500,000 ^r	4,170,000 ^r	8,660,000 ^r	15,100,000 ^r
2013	1,790,000 ^r	1,630,000	3,420,000 ^r	6,320,000 ^r	54 ^r	4,590,000 ^r	4,170,000 ^r	8,760,000 ^r	16,200,000 ^r
2014	1,880,000 ^r	1,700,000	3,570,000 ^r	6,950,000 ^r	51 ^r	4,800,000 ^r	4,340,000 ^r	9,140,000 ^r	17,800,000 ^r
2015	1,910,000	1,470,000	3,380,000	7,120,000	47	4,880,000	3,760,000	8,640,000	18,200,000
Chromium:⁹									
2011	NA	NA	147,000	514,000 ^r	29 ^r	NA	NA	334,000	2,570,000 ^r
2012	NA	NA	146,000	543,000 ^r	27 ^r	NA	NA	298,000 ^r	2,710,000 ^r
2013	NA	NA	150,000	477,000 ^r	31 ^r	NA	NA	275,000 ^r	1,640,000 ^r
2014	NA	NA	157,000	598,000 ^r	26 ^r	NA	NA	308,000 ^r	2,380,000 ^r
2015	NA	NA	154,000	438,000	35	NA	NA	350,000	1,660,000
Copper:¹⁰									
2011	649,000	153,000	802,000	2,380,000	34	5,810,000	1,370,000	7,180,000	21,300,000
2012	642,000	164,000	806,000	2,400,000	33	5,200,000	1,330,000	6,530,000	19,400,000
2013	630,000	166,000	796,000	2,390,000	33	4,720,000	1,240,000	5,960,000	17,900,000
2014	672,000 ^r	173,000 ^r	845,000 ^r	2,450,000	34 ^r	4,710,000 ^r	1,200,000	5,910,000 ^r	17,100,000 ^r
2015	638,000	167,000	805,000	2,450,000	33	3,610,000	940,000	4,550,000	13,800,000
Iron and steel:¹¹									
2011	NA	NA	62,800,000	99,300,000	63	NA	NA	25,400,000	37,000,000
2012	NA	NA	63,100,000	106,000,000	59	NA	NA	22,800,000	35,400,000
2013	NA	NA	59,000,000	106,000,000	56	NA	NA	20,100,000 ^r	36,200,000
2014	NA	NA	58,600,000	117,000,000	50	NA	NA	20,500,000 ^r	38,900,000
2015	NA	NA	52,500,000	106,000,000	49	NA	NA	11,200,000	20,900,000
Lead:¹²									
2011	21,600	1,110,000	1,130,000	1,520,000	73	58,000	2,980,000	3,040,000	4,080,000
2012	19,200	1,090,000	1,110,000	1,490,000	74	47,100	2,680,000	2,720,000	3,670,000
2013	20,700	1,130,000	1,150,000	1,600,000	72	51,000	2,780,000	2,830,000	3,930,000
2014	18,400	1,020,000 ^r	1,020,000 ^r	1,560,000 ^r	65 ^r	43,000	2,380,000 ^r	2,380,000 ^r	3,650,000 ^r
2015	19,300	1,030,000	1,050,000	1,540,000	68	38,700	2,080,000	2,120,000	3,100,000
Magnesium:¹³									
2011	43,000 ^r	24,100	67,100 ^r	133,000	51 ^r	227,000 ^r	127,000	354,000 ^r	700,000 ^r
2012	52,000	25,200	77,100 ^r	137,000	56	252,000 ^r	122,000 ^r	375,000 ^r	664,000 ^r
2013	54,300 ^r	25,000	79,300 ^r	136,000	58	255,000 ^r	117,000	372,000 ^r	639,000
2014 ^r	56,200	25,000	80,100	147,000	55	266,000	118,000	380,000	696,000
2015	57,400	22,700	80,000	153,000	51	272,000	107,000	379,000	740,000
Nickel:¹⁴									
2011	NA	NA	90,100 ^r	215,000 ^r	42	NA	NA	2,060,000 ^r	4,910,000 ^r
2012	NA	NA	89,800 ^r	215,000 ^r	42	NA	NA	1,570,000 ^r	3,770,000 ^r
2013	NA	NA	88,600 ^r	199,000	44 ^r	NA	NA	1,330,000	2,990,000
2014	NA	NA	90,900 ^r	238,000 ^r	38 ^r	NA	NA	1,530,000 ^r	4,010,000 ^r
2015	NA	NA	90,000	210,000	43	NA	NA	1,070,000	2,480,000
Tin:¹⁵									
2011	2,530	11,000	13,600	42,800	32	87,900	383,000	470,000	1,490,000
2012	2,380	11,200	13,500	43,100	31	67,300	316,000	383,000	1,220,000
2013	2,150	10,600	12,700	45,500	28	49,300	243,000	292,000	1,050,000
2014	2,060	10,600	12,600	46,200	27	46,400	238,000	285,000	1,040,000
2015	1,900	10,100	12,000	43,800	30	31,700	168,000	200,000	731,000
Titanium:¹⁶									
2011	30,900	1,000 ^e	31,900	W	39	NA	NA	270,000	NA
2012	38,700	1,000	39,700	W	52	NA	NA	278,000	NA
2013	39,100	1,000	40,100	W	60	NA	NA	210,000	NA
2014	44,300	1,000	45,300	W	63	NA	NA	244,000	NA
2015	52,200	1,000	53,200	W	63	NA	NA	310,000	NA
Zinc:¹⁷									
2011	213,000	123,000	336,000	1,140,000	29	500,000	288,000	788,000	2,680,000
2012	205,000	129,000	335,000	1,090,000	31	433,000	273,000	706,000	2,300,000
2013	153,000	113,000	267,000	1,070,000	25	323,000	238,000	562,000	2,260,000
2014	173,000	74,900	248,000	1,140,000	22	409,000	177,000	586,000	2,700,000
2015	145,000	53,300	198,000	1,080,000	18	305,000	112,000	417,000	2,280,000

See footnotes at end of table.

TABLE 1—Continued
SALIENT U.S. RECYCLING STATISTICS FOR SELECTED METALS¹

⁶Estimated. ⁷Revised. NA Not available. W Withheld to avoid disclosing company proprietary data.

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

²Scrap that results from the manufacturing process, including metal and alloy production. New scrap of aluminum, copper, lead, tin, and zinc does not include home scrap, which is scrap generated and recycled in the metal-producing plant.

³Scrap that results from consumer products.

⁴Metal recovered from new plus old scrap.

⁵Production plus net imports plus stock changes, calculated on a contained-weight basis. Production is mine production plus recycled metal. Net imports are imports minus exports.

⁶Also referred to as recycling rate.

⁷Value of production plus net imports plus stock changes for the same materials used to compute quantity of apparent supply. Production is mine production plus recycled metal. Net imports are imports minus exports.

⁸Quantity 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. Series revised by removing imported scrap to avoid double counting.

⁹Quantity of chromium metal recycled was estimated as chromium content of stainless steel scrap receipts (reported by the iron and steel and pig iron industries). For the calculation of apparent supply, trade includes reported or estimated chromium content of chromite ore, ferrochromium, chromium metal and scrap, a variety of chromium-containing chemicals, and stainless steel mill products and scrap. Stocks include estimated chromium content of reported and estimated producer, consumer, and Government stocks. Recycled monetary value estimated as recycled quantity times the average import value of high-carbon ferrochromium. Apparent supply monetary value estimated like apparent supply quantity with monetary value substituted for chromium content.

¹⁰Includes 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.

¹¹Recycled scrap reported from consuming manufacturers. Apparent supply measured as shipments of iron and steel products plus castings corrected for imported semifinished products. Recycled unit value is the U.S. annual average composite price for No. 1 heavy-melting steel calculated from prices published in American Metal Market. Unit value for the year was used to calculate values of recycled scrap and apparent supply of scrap.

¹²Monetary value of scrap and apparent supply estimated based upon average quoted price of common lead.

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

¹⁴Nickel data includes materials and sources as follows:

Production, consumption, and receipts 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.

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.

¹⁵Monetary value based on Platts Metals Week composite price for tin. Apparent supply does not include withheld stock changes.

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

¹⁷Monetary value based on annual average Platts Metals Week metal price for North American Special High-Grade Zinc.

TABLE 2
SALIENT U.S. RECYCLING TRADE STATISTICS FOR SELECTED METALS¹

Year	Exports			Imports for consumption		
	Quantity (metric tons)		Value (thousands)	Quantity (metric tons)		Value ² (thousands)
	Gross quantity	Contained quantity		Gross quantity	Contained quantity	
Aluminum:						
2011	2,120,000 ^f	NA	\$4,010,000 ^f	579,000	NA	\$1,020,000
2012	2,030,000 ^f	NA	3,490,000	588,000 ^f	NA	905,000
2013	1,870,000	NA	3,270,000 ^f	565,000	NA	848,000 ^f
2014	1,720,000	NA	2,880,000 ^f	559,000	NA	931,000
2015	1,550,000	NA	2,450,000	521,000	NA	795,000
Chromium: ³						
2011	646,000 ^f	110,000 ^f	955,000 ^f	170,000	29,300 ^f	295,000 ^f
2012	623,000 ^f	106,000	804,000	156,000	26,900 ^f	236,000 ^f
2013	644,000	109,000 ^f	742,000 ^f	226,000	38,600	211,000
2014	548,000	93,200 ^f	674,000 ^f	329,000	56,000	426,000 ^f
2015	514,000	87,400	638,000	192,000	32,800	165,000
Copper: ⁴						
2011	1,240,000	984,000 ^f	4,990,000 ^f	110,000	87,500 ^f	547,000
2012	1,190,000 ^f	941,000 ^f	4,400,000	105,000	83,800	528,000 ^f
2013	1,150,000 ^f	908,000 ^f	4,070,000 ^f	106,000	84,700	521,000 ^f
2014	1,040,000 ^f	829,000 ^f	3,460,000 ^f	117,000	92,600	563,000 ^f
2015	955,000	770,000	2,750,000	112,000	88,400	457,000
Iron and steel:						
2011	24,500,000 ^f	24,500,000 ^f	11,400,000	4,010,000	4,010,000	1,660,000 ^f
2012	21,300,000 ^f	21,300,000 ^f	9,410,000 ^f	3,720,000	3,720,000	1,590,000
2013	18,500,000	18,500,000	7,550,000 ^f	3,930,000	3,930,000	1,470,000
2014	15,300,000	15,300,000	6,150,000 ^f	4,260,000	4,260,000	1,720,000
2015	12,800,000	12,800,000	4,010,000	3,590,000	3,590,000	967,000
Lead: ⁵						
2011	31,400 ^f	31,400 ^f	37,100 ^f	25,500 ^f	16,100	23,700
2012	25,900	25,900	30,600	23,700 ^f	13,100	19,100 ^f
2013	34,400 ^f	34,400 ^f	44,900 ^f	18,900 ^f	6,160	10,600 ^f
2014	36,300 ^f	36,300 ^f	51,200 ^f	16,200 ^f	7,820	15,200 ^f
2015	46,600	46,600	57,500	10,100	4,950	6,320
Magnesium:						
2011 ^f	1,700	1,700	4,000	22,100	22,100	48,900
2012	2,100	2,100	5,290	20,900	20,900	47,700 ^f
2013	471	471	1,420	17,500	17,500	43,300
2014	923	923	2,460	19,000	19,000	43,800
2015	432	432	895	21,300	21,300	44,300
Nickel: ⁶						
2011 ^f	668,000	64,100	955,000	186,000	21,300	295,000
2012 ^f	649,000	59,600	804,000	177,000	22,300	237,000
2013 ^f	669,000	61,100	742,000	245,000	26,300	211,000
2014 ^f	578,000	56,300	674,000	358,000	39,000	426,000
2015	540,000	51,900	638,000	218,000	27,100	165,000
Tin: ⁷						
2011	14,800	NA	31,300	57,700	NA	23,400
2012	10,300	NA	27,200	72,500	NA	24,800
2013	5,020	NA	17,300	63,700	NA	23,100
2014	7,480	NA	19,600	49,700	NA	19,400
2015	2,530	NA	7,360	32,700	NA	12,300
Titanium: ⁸						
2011	5,150	NA	33,300	13,900	NA	116,000
2012	8,760	NA	45,300	14,400	NA	98,500
2013	4,700	NA	21,800	12,700	NA	63,600 ^f
2014	4,610	NA	18,200	19,300 ^f	NA	101,000 ^f
2015	6,860	NA	25,900	22,100	NA	124,000

See footnotes at end of table.

TABLE 2—Continued
SALIENT U.S. RECYCLING TRADE STATISTICS FOR SELECTED METALS¹

Year	Exports			Imports for consumption		
	Quantity (metric tons)		Value (thousands)	Quantity (metric tons)		Value ² (thousands)
	Gross quantity	Contained quantity		Gross quantity	Contained quantity	
Zinc: ⁹						
2011	85,200	NA	93,400	18,500	NA	23,400
2012	90,400	NA	107,000	20,000	NA	24,600
2013	88,000	NA	105,000	21,000	NA	25,300
2014	71,400	NA	93,700	24,900	NA	30,900
2015	55,200	NA	68,600	18,000	NA	20,100

¹Revised. NA Not available.

¹Contained quantity equal to gross quantity, unless otherwise specified.

²Imports value is customs value.

³Includes stainless steel scrap and chromium metal waste and scrap. Contained quantity for import and export quantities of Harmonized Tariff Schedule of the United States (HTS) code 7204.21.0000 is 17% of gross quantity; for HTS code 8112.22.0000, contained quantity is 100% of gross quantity.

⁴For HTS codes 7404.00.0045, 7404.00.0062, and 7404.00.0080, contained quantity for import quantity is 65.0% of gross quantity. For HTS codes 7404.00.3045, 7404.00.3055, 7404.00.3065, 7404.00.3090, 7404.00.6045, 7404.00.6055, 7404.00.6065, and 7404.00.6090, contained quantity for import quantity is 72.0% of gross quantity. For HTS codes 7404.00.0041, 7404.00.0046, 7404.00.0051, 7404.00.0056, 7404.00.0061, 7404.00.0066, 7404.00.0070, 7404.00.0075, 7404.00.0085, and 7404.00.0095, contained quantity for export quantity is 65.0% of gross quantity.

⁵Includes lead content of waste and scrap obtained from lead-acid batteries HTS codes 7802.00.0030 and 7802.00.0060.

⁶Contained quantity for import and export quantities is 0.4% of gross quantity for HTS code 7204.29.0000, 50% for HTS code 7503.00.0000, and 7.5% for HTS code 7204.21.0000.

⁷Includes tin waste and scrap HTS code 8002.00.0000.

⁸Includes titanium waste and scrap HTS code 8108.30.0000.

⁹Includes zinc waste and scrap HTS code 7902.00.0000.