



# 2014 Minerals Yearbook

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## RECYCLING—METALS [ADVANCE RELEASE]

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# RECYCLING—METALS

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In 2014, the United States recycled 64.7 million metric tons (Mt) of selected metals, an amount equivalent to about 50% of the apparent supply of those metals (table 1). About 91% of recycled metal was iron and steel, and about 90% of apparent supply was iron and steel. By gross quantity, the United States exported 19.9 Mt of scrap metals and imported 6.28 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 and to recycle metal from the use and (or) 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 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, has 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, the 27 chapters are separately paged and are available at <http://pubs.usgs.gov/circ/circ1196/>. (Accessed May 29, 2012, via <http://minerals.usgs.gov/minerals/pubs/commodity/recycle/>.)

TABLE 1  
SALIENT U.S. RECYCLING STATISTICS FOR SELECTED METALS<sup>1</sup>

Year	Quantity of metal (metric tons)				Percentage recycled <sup>6</sup>	Value of metal (thousands)			
	Recycled from new scrap <sup>2</sup>	Recycled from old scrap <sup>3</sup>	Recycled <sup>4</sup>	Apparent supply <sup>5</sup>		Recycled from new scrap <sup>2</sup>	Recycled from old scrap <sup>3</sup>	Recycled <sup>4</sup>	Apparent supply <sup>7</sup>
<b>Aluminum:</b> <sup>8</sup>									
2010	1,540,000	1,250,000	2,790,000	5,000,000	56	\$3,550,000	\$2,880,000	\$6,430,000	\$11,500,000
2011	1,640,000	1,470,000	3,120,000	5,210,000	60	4,200,000	3,770,000	7,980,000	13,300,000
2012	1,830,000	1,440,000	3,270,000	5,780,000	57	4,080,000	3,210,000	7,290,000	12,900,000
2013	1,850,000	1,630,000	3,480,000	6,380,000	55	3,840,000	3,390,000	7,230,000	13,200,000
2014	1,930,000	1,700,000	3,640,000	7,010,000	52	4,450,000	3,930,000	8,380,000	16,200,000
<b>Chromium:</b> <sup>9</sup>									
2010	NA	NA	144,000	384,000	37	NA	NA	329,000	800,000
2011	NA	NA	147,000	450,000 <sup>r</sup>	33	NA	NA	334,000	825,000
2012	NA	NA	146,000	471,000 <sup>r</sup>	31	NA	NA	299,000 <sup>r</sup>	999,000
2013	NA	NA	150,000	400,000	37	NA	NA	276,000 <sup>r</sup>	257,000
2014	NA	NA	157,000	558,000	28	NA	NA	359,000	948,000
<b>Copper:</b> <sup>10</sup>									
2010	642,000	143,000	785,000	2,400,000	33	4,930,000	1,100,000	6,030,000	18,400,000
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 <sup>r</sup>	33	5,200,000	1,330,000	6,530,000	19,400,000 <sup>r</sup>
2013	630,000	166,000	796,000	2,390,000 <sup>r</sup>	33	4,720,000	1,240,000 <sup>r</sup>	5,960,000 <sup>r</sup>	17,900,000 <sup>r</sup>
2014	633,000	171,000	804,000	2,450,000	33	4,440,000	1,200,000	5,640,000	17,200,000
<b>Iron and steel:</b> <sup>11</sup>									
2010	NA	NA	59,700,000	90,200,000	66	NA	NA	19,500,000	27,100,000
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	21,900,000 <sup>r</sup>	36,200,000 <sup>r</sup>
2014	NA	NA	58,600,000	117,000,000	50	NA	NA	21,000,000	38,900,000
<b>Lead:</b> <sup>12</sup>									
2010	24,100	1,120,000	1,140,000	1,380,000	81	57,900	2,680,000	2,740,000	3,310,000
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	1,110,000	1,130,000	1,660,000	68	43,000	2,590,000	2,630,000	3,880,000
<b>Magnesium:</b> <sup>13</sup>									
2010	51,500	20,500	72,000	137,000	53	291,000	116,000	407,000	741,000
2011	43,100	24,100	67,200	133,000	50	228,000	127,000	355,000	702,000
2012	52,000	25,200	77,200 <sup>r</sup>	137,000 <sup>r</sup>	56 <sup>r</sup>	224,000 <sup>r</sup>	108,000	332,000	588,000 <sup>r</sup>
2013	54,200 <sup>r</sup>	25,000 <sup>r</sup>	79,200 <sup>r</sup>	136,000	58	254,000 <sup>r</sup>	117,000 <sup>r</sup>	371,000 <sup>r</sup>	639,000 <sup>r</sup>
2014	54,100	24,500	78,600	171,000	46	256,000	116,000	372,000	811,000
<b>Nickel:</b> <sup>14</sup>									
2010	NA	NA	81,900	196,000	42	NA	NA	1,790,000	4,270,000
2011	NA	NA	88,800	213,000	42	NA	NA	2,030,000	4,880,000
2012	NA	NA	92,400	218,000	42	NA	NA	1,620,000	3,820,000
2013	NA	NA	88,800	199,000	45	NA	NA	1,330,000	2,990,000
2014	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>Tin:</b> <sup>15</sup>									
2010	2,680	11,100	13,800	44,100	31	73,400	303,000	376,000	1,200,000
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 <sup>r</sup>	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
<b>Titanium:</b> <sup>16</sup>									
2010	28,200	1,000 <sup>e</sup>	29,200	W	46	NA	NA	212,000	NA
2011	30,900	1,000 <sup>e</sup>	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 <sup>r</sup>	1,000	40,100 <sup>r</sup>	W	60	NA	NA	210,000 <sup>r</sup>	NA
2014	44,300	1,000	45,300	W	63	NA	NA	244,000	NA
<b>Zinc:</b> <sup>17</sup>									
2010	208,000	123,000	332,000	1,120,000	30	468,000	277,000	746,000	2,510,000
2011	213,000	123,000	336,000	1,140,000	29	500,000	288,000	788,000	2,680,000

See footnotes at end of table.

TABLE 1—Continued  
SALIENT U.S. RECYCLING STATISTICS FOR SELECTED METALS<sup>1</sup>

Year	Quantity of metal (metric tons)				Value of metal (thousands)				
	Recycled from new scrap <sup>2</sup>	Recycled from old scrap <sup>3</sup>	Recycled <sup>4</sup>	Apparent supply <sup>5</sup>	Percentage recycled <sup>6</sup>	Recycled from new scrap <sup>2</sup>	Recycled from old scrap <sup>3</sup>	Recycled <sup>4</sup>	Apparent supply <sup>7</sup>
<u>Zinc:</u> <sup>17</sup> —Continued									
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

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

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

<sup>2</sup>Scrap 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.

<sup>3</sup>Scrap that results from consumer products.

<sup>4</sup>Metal recovered from new plus old scrap.

<sup>5</sup>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.

<sup>6</sup>Also referred to as recycling rate.

<sup>7</sup>Same as apparent supply defined in footnote 5 above but calculated based on a monetary value.

<sup>8</sup>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. Series revised by removing imported scrap to avoid double counting.

<sup>9</sup>Quantity 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.

<sup>10</sup>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.

<sup>11</sup>Recycled 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.

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

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

<sup>14</sup>Nickel statistics were derived from the following:

Production, consumption, receipts

- 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.

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

<sup>16</sup>Percentage recycled based on titanium scrap consumed divided by primary sponge and scrap consumption.

<sup>17</sup>Monetary 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 METALS<sup>1</sup>

Year	Exports			Imports for consumption		
	Quantity		Value (thousands)	Quantity		Value <sup>2</sup> (thousands)
	Gross quantity (metric tons)	Contained quantity (metric tons)		Gross quantity (metric tons)	Contained quantity (metric tons)	
<b>Aluminum:</b>						
2010	1,910,000	NA	\$3,190,000	504,000	NA	\$763,000
2011	2,140,000	NA	4,050,000	579,000	NA	1,020,000
2012	2,040,000	NA	3,490,000	589,000	NA	905,000
2013	1,870,000	NA	3,290,000	565,000	NA	847,000
2014	1,720,000	NA	2,890,000	559,000	NA	931,000
<b>Chromium:<sup>3</sup></b>						
2010	937,000	159,000	937,000	196,000	33,700	307,000
2011	656,000	111,000	959,000	170,000	29,400	297,000
2012	624,000	106,000	804,000	156,000	26,800	238,000
2013	644,000	110,000	743,000	226,000	38,600	211,000
2014	548,000	93,300	675,000	329,000	56,000	427,000
<b>Copper:<sup>4</sup></b>						
2010	1,030,000	788,000	3,550,000	95,800	75,000	399,000
2011	1,240,000	981,000	4,980,000	110,000	87,600	547,000
2012	1,200,000	945,000	4,400,000	105,000	83,800	533,000
2013	1,160,000	909,000	4,080,000	106,000	84,700	525,000
2014	1,050,000	831,000	3,480,000	117,000	92,600	567,000
<b>Iron and steel:</b>						
2010	20,500,000	20,500,000	8,380,000	3,780,000	3,780,000	1,420,000
2011	24,300,000	24,300,000	11,400,000	4,010,000	4,010,000	1,650,000
2012	21,400,000	21,400,000	9,430,000	3,720,000	3,720,000	1,590,000
2013	18,500,000	18,500,000	7,570,000	3,930,000	3,930,000	1,470,000
2014	15,300,000	15,300,000	6,160,000	4,260,000	4,260,000	1,720,000
<b>Lead:<sup>5</sup></b>						
2010	43,500	43,500	33,800	20,100	13,300	21,700
2011	31,100	31,100	36,800	25,400	16,100	23,700
2012	25,900	25,900	30,600	19,900	13,100	18,300
2013	34,900	34,900	45,400	9,450	6,160	8,490
2014	36,400	36,400	51,300	12,600	7,820	14,400
<b>Magnesium:</b>						
2010	481	481	802	22,100	22,100	56,500
2011	1,680	1,680	3,960	22,000	22,000	48,700
2012	2,100	2,100	5,290	20,900	20,900	47,800
2013	471	471	1,420	17,500	17,500	43,300
2014	923	923	2,460	19,000	19,000	43,800
<b>Nickel:<sup>6</sup></b>						
2010	1,870,000	84,000	1,870,000	954,000	26,700	711,000
2011	1,630,000	68,600	1,670,000	983,000	24,500	794,000
2012	1,370,000	62,600	1,460,000	631,000	24,100	759,000
2013	1,190,000	63,300	1,240,000	664,000	28,000	561,000
2014	1,110,000	58,500	1,160,000	887,000	41,100	837,000
<b>Tin:<sup>7</sup></b>						
2010	10,700	NA	26,500	57,300	NA	18,300
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
<b>Titanium:<sup>8</sup></b>						
2010	3,480	NA	19,200	10,700	NA	75,500
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	63,500
2014	4,610	NA	18,200	19,200	NA	100,000

See footnotes at end of table.

TABLE 2—Continued  
SALIENT U.S. RECYCLING TRADE STATISTICS FOR SELECTED METALS<sup>1</sup>

Year	Exports			Imports for consumption		
	Quantity		Value (thousands)	Quantity		Value <sup>2</sup> (thousands)
	Gross quantity (metric tons)	Contained quantity (metric tons)		Gross quantity (metric tons)	Contained quantity (metric tons)	
Zinc: <sup>9</sup>						
2010	77,900	NA	85,300	15,600	NA	19,400
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

NA Not available.

<sup>1</sup>Contained quantity equal to gross quantity, unless otherwise specified.

<sup>2</sup>Imports value is customs value.

<sup>3</sup>Includes 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.

<sup>4</sup>For HTS codes 7404.00.0045, 7404.00.0062, and 7404.00.0080, contained quantity for import quantity is 65% 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% of gross quantity.

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

<sup>6</sup>Contained 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.

<sup>7</sup>Includes tin waste and scrap HTS code 8002.00.0000.

<sup>8</sup>Includes titanium waste and scrap HTS code 8108.30.0000.

<sup>9</sup>Includes zinc waste and scrap HTS code 7902.00.00.