



# 2010 Minerals Yearbook

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RECYCLING—METALS [ADVANCE RELEASE]

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# RECYCLING—METALS

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In 2010, the United States recycled 66 million metric tons (Mt) of selected metals, an amount equivalent to 65% of the apparent supply of those metals (table 1). More than 90% of recycled metal was steel, and almost 90% of apparent supply was steel. The United States exported 26.4 Mt of scrap metal and imported 5.6 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 of supply available for use by developing economical processes to recover metal from the Earth (the primary source of metal) and recycle metal from the use/process stream (the secondary source of metal). 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 our society, provides environmental benefits such as energy savings and reduced volumes of waste.

The term “primary” indicates material from ore deposits, and the term “secondary” indicates material from recycling, including used products and residuals 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 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.

Once a product completes its useful 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 U.S. Geological Survey (Sibley, 2006–11).

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 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 paginated and are available only 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)					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>
<b>Aluminum:</b> <sup>8</sup>									
2006 <sup>f</sup>	2,800,000	1,580,000	4,380,000	8,500,000	52	\$7,490,000	\$4,220,000	\$11,700,000	\$22,700,000
2007 <sup>f</sup>	2,450,000	1,660,000	4,120,000	7,320,000	56	6,610,000	4,480,000	11,100,000	19,700,000
2008 <sup>f</sup>	2,130,000	1,500,000	3,630,000	6,070,000	60	5,660,000	3,970,000	9,640,000	16,100,000
2009 <sup>f</sup>	1,570,000	1,260,000	2,820,000	4,890,000	58	2,740,000	2,200,000	4,940,000	8,550,000
2010	1,550,000	1,250,000	2,800,000	5,000,000	56	3,560,000	2,880,000	6,440,000	11,500,000
<b>Chromium:</b> <sup>9</sup>									
2006	NA	NA	179,000	432,000 <sup>r</sup>	41 <sup>r</sup>	NA	NA	213,000	1,870,000
2007	NA	NA	162,000	493,000	33	NA	NA	297,000	1,860,000
2008	NA	NA	146,000	432,000	34	NA	NA	491,000	2,600,000
2009	NA	NA	141,000	160,000	88	NA	NA	218,000 <sup>r</sup>	234,000 <sup>r</sup>
2010	NA	NA	144,000	383,000	38	NA	NA	171,000	883,000
<b>Copper:</b> <sup>10</sup>									
2006	819,000	150,000	968,000	3,010,000	32.1	5,680,000	1,040,000	6,720,000	20,900,000
2007	767,000	158,000	925,000	3,040,000	30.5	5,550,000	1,140,000	6,690,000	22,000,000
2008	697,000	156,000	852,000	2,690,000	31.7	4,900,000	1,100,000	6,000,000	18,900,000
2009	639,000 <sup>r</sup>	138,000 <sup>r</sup>	777,000 <sup>r</sup>	2,220,000 <sup>r</sup>	35.0	3,340,000 <sup>r</sup>	734,000 <sup>r</sup>	4,070,000 <sup>r</sup>	11,800,000
2010	639,000	131,000	770,000	2,380,000	32.4	4,930,000	1,010,000	5,940,000	18,300,000
<b>Iron and steel:</b> <sup>11</sup>									
2006	NA	NA	65,300,000	137,000,000	48	NA	NA	14,300,000	28,000,000
2007	NA	NA	64,000,000	119,000,000	54	NA	NA	16,200,000	29,200,000
2008	NA	NA	66,400,000	109,000,000	62	NA	NA	23,200,000	37,600,000
2009	NA	NA	53,200,000 <sup>r</sup>	69,300,000 <sup>r</sup>	77	NA	NA	11,000,000	12,600,000
2010	NA	NA	60,100,000	90,200,000	67	NA	NA	19,900,000	27,100,000
<b>Lead:</b> <sup>12</sup>									
2006	19,600	1,140,000	1,160,000	1,470,000	78.9	33,500	1,950,000	1,980,000	2,510,000
2007	24,100	1,160,000	1,180,000	1,540,000	76.7	65,700	3,150,000	3,220,000	4,200,000
2008	20,100	1,120,000	1,140,000	1,540,000	74.5	53,300	2,980,000	3,040,000	4,080,000
2009	21,600	1,090,000	1,110,000	1,380,000	80.5	41,400	2,090,000	2,130,000	2,640,000
2010	24,100	1,110,000	1,140,000	1,440,000	79.0	58,000	2,670,000	2,730,000	3,460,000
<b>Magnesium:</b> <sup>13</sup>									
2006	60,500	21,700	82,200	165,000	50	155,000	55,400	210,000	421,000
2007	59,900	23,500	83,300	160,000	52	227,000	89,000	316,000	608,000
2008	61,100	22,600	83,700	170,000	49	451,000	167,000	618,000	1,250,000
2009	47,100	20,500 <sup>r</sup>	67,600 <sup>r</sup>	118,000 <sup>r</sup>	58 <sup>r</sup>	269,000	117,000 <sup>r</sup>	386,000 <sup>r</sup>	672,000 <sup>r</sup>
2010	51,500	20,500	72,000	137,000	52	292,000	116,000	408,000	777,000
<b>Nickel:</b> <sup>14</sup>									
2006	NA	NA	104,000 <sup>r</sup>	247,000 <sup>r</sup>	42	NA	NA	2,510,000	5,990,000
2007	NA	NA	99,100 <sup>r</sup>	212,000 <sup>r</sup>	47	NA	NA	3,690,000 <sup>r</sup>	7,870,000
2008	NA	NA	85,300 <sup>r</sup>	200,000	43	NA	NA	1,800,000	4,230,000
2009	NA	NA	79,900	173,000	46	NA	NA	1,170,000	2,540,000 <sup>r</sup>
2010	NA	NA	106,000	219,000	49	NA	NA	2,320,000	4,760,000
<b>Tin:</b> <sup>15</sup>									
2006	2,340	11,600	13,900	51,600	27	29,100	145,000	174,000	642,000
2007	2,860	12,200	15,100	44,500	31	56,700	242,000	298,000	882,000
2008	2,100	11,700	13,800	24,700	56	52,300	291,000	344,000	615,000
2009	2,310	11,100	13,400	82,300	16	42,600	205,000	247,000	1,520,000
2010	2,680	10,900	13,600	42,600	32	73,200	298,000	371,000	1,160,000

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>
<b>Titanium:</b> <sup>16</sup>									
2006	NA	NA	25,000	W	47	NA	NA	\$253,000	NA
2007	NA	NA	23,800	W	41	NA	NA	167,000	NA
2008	NA	NA	23,200	W	W	NA	NA	148,000	NA
2009	24,700 <sup>e</sup>	1,000 <sup>e</sup>	25,700 <sup>e</sup>	W	W	NA	NA	101,000	NA
2010	28,200	1,000 <sup>e</sup>	29,200	W	46	NA	NA	212,000	NA
<b>Zinc:</b> <sup>17</sup>									
2006	294,000	47,900	342,000	1,530,000	22	\$1,030,000	\$168,000	1,200,000	\$5,370,000
2007	207,000	26,700	234,000	1,270,000	18	705,000	90,900	796,000	4,340,000
2008	247,000	92,900	339,000	1,350,000	25	483,000	182,000	665,000	2,650,000
2009	194,000	78,900 <sup>r</sup>	273,000	1,170,000	23	334,000	135,000	469,000	2,000,000
2010	208,000	123,000	331,000	1,240,000	27	468,000	276,000	744,000	2,780,000

<sup>e</sup>Estimated. <sup>r</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 excludes 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>Chromium quantity of 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 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.

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

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 excludes 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 (thousands)
	Gross weight (metric tons)	Contained weight (metric tons)		Gross weight (metric tons)	Contained weight (metric tons)	
<b>Aluminum:</b>						
2006	1,480,000	NA	\$2,550,000	527,000	NA	\$930,000
2007	1,550,000	NA	3,050,000	471,000	NA	803,000
2008	1,980,000	NA	3,420,000	494,000	NA	853,000
2009	1,660,000	NA	22,100,000	433,000	NA	503,000
2010	1,910,000	NA	3,190,000	504,000	NA	763,000
<b>Chromium:<sup>2</sup></b>						
2006	506,000	86,300	720,000	180,000	30,600	210,000
2007	882,000	150,000	1,620,000	118,000	20,400	200,000
2008	1,000,000	170,000	1,190,000	140,000	24,300	220,000
2009	1,130,000	192,000	778,000	124,000	21,200	138,000
2010	937,000	159,000	937,000	196,000	33,700	307,000
<b>Copper:<sup>3</sup></b>						
2006	803,000	662,000	2,350,000	118,000	91,600	474,000
2007	907,000	704,000	2,840,000	133,000	112,000	665,000
2008	908,000	688,000	2,960,000	106,000	85,700	480,000
2009	843,000	633,000	2,010,000	71,800	56,300	234,000
2010	1,030,000	788,000	3,550,000	95,800	75,000	399,000
<b>Iron and steel:</b>						
2006	14,100,000	14,100,000	4,270,000	5,000,000	5,000,000	1,310,000
2007	16,700,000	16,700,000	6,980,000	3,780,000	3,780,000	1,080,000
2008	21,500,000	21,500,000	10,400,000	3,600,000	3,600,000	1,450,000
2009	22,400,000	22,400,000	7,120,000	2,990,000	2,990,000	814,000
2010	20,500,000	20,500,000	8,380,000	3,780,000	3,780,000	1,420,000
<b>Lead:<sup>4</sup></b>						
2006	121,000	121,000	37,200	1,800	1,510	1,650
2007	129,000	129,000	55,400	1,590	1,400	2,740
2008	175,000	175,000	92,800	1,470	1,290	2,040
2009	140,000	140,000	72,000	1,600	1,310	2,620
2010	43,500	43,500	33,800	5,020	3,730	8,880
<b>Magnesium:</b>						
2006	3,680	3,680	8,410	17,200	17,200	23,700
2007	1,800	1,800	4,000	21,200	21,200	35,500
2008	2,600	2,600	5,420	24,100	24,100	58,800
2009	2,280	2,280	5,200	20,900	20,900	40,300
2010	481	481	802	22,100	22,100	56,500

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 (thousands)
	Gross weight (metric tons)	Contained weight (metric tons)		Gross weight (metric tons)	Contained weight (metric tons)	
<b>Nickel:</b> <sup>5</sup>						
2006	2,890,000	68,600	\$1,730,000	717,000	22,400	\$416,000
2007	2,800,000	110,000	3,110,000	826,000	19,000	488,000
2008	2,720,000	101,000	2,670,000	788,000	22,600	613,000
2009	2,420,000	95,100	1,710,000	699,000	20,000	442,000
2010	1,870,000	84,000	1,870,000	954,000	26,700	711,000
<b>Tin:</b>						
2006	7,500	7,500	14,100	2,490	2,490	4,470
2007	9,930	9,930	26,900	10,200	10,200	7,430
2008	10,300	10,300	26,600	23,300	23,300	17,700
2009	9,430	9,430	25,600	80,600	80,600	16,200
2010	10,700	10,700	26,500	57,300	57,300	18,300
<b>Titanium:</b> <sup>6</sup>						
2006	10,800	NA	110,000	12,800	NA	200,000
2007	9,510	NA	67,300	12,200	NA	133,000
2008	8,180	NA	52,000	10,400	NA	68,900
2009	4,200	NA	14,000	4,770	NA	17,600
2010	3,480	NA	19,200	10,700	NA	75,500
<b>Zinc:</b>						
2006	83,800	NA	95,800	14,200	NA	18,700
2007	102,000	NA	103,000	21,800	NA	32,500
2008	91,000	NA	99,100	17,000	NA	20,300
2009	47,100	NA	54,300	9,100	NA	8,800
2010	77,900	NA	85,200	15,600	NA	19,400

NA Not available.

<sup>1</sup>Contained weight based upon 100% of gross, unless otherwise specified.

<sup>2</sup>Includes stainless steel scrap and chromium metal waste and scrap. Contained weight for import and export quantities of Harmonized Tariff Schedule of the United States (HTS) code 7204.21.0000 is 17% of gross weight; 8112.22.0000 is 100% of gross weight.

<sup>3</sup>For HTS codes 7404.00.0045, 7404.00.0062, and 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, 7404.00.6065, and 7404.00.6090 contained weight for import quantity is 72%.

<sup>4</sup>Lead content of waste and scrap obtained from lead-acid batteries (HTS 7802.00.0030) included in exports but excluded from imports.

<sup>5</sup>Contained weight for import and export quantities is 0.4% of gross weight for HTS code 7204.29.0000, 50% for HTS code 7503.00.0000, and 7.5% for HTS code 7204.21.0000.

<sup>6</sup>Includes titanium waste and scrap HTS code 8108.30.0000.