INVENTORIES OF WOODY RESIDUES AND SOLID WOOD WASTE IN THE UNITED STATES, 2002

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Abstract

Large amounts of woody residues and wood waste are generated annually in the United States. In 2002, an estimated 240 million metric tons was generated during the extraction of timber from the Nation's forests, from forestry cultural operations, in the conversion of forest land to nonforest uses, in the initial processing of roundwood timber into usable products, in the construction and demolition of buildings and structures, and in the manufacture, use, and disposal of solid wood products. Much of this material is indeed waste, but increasingly large shares are becoming valuable resources. The major sources of waste wood are timber harvesting and processing residues, which include woody forest residues and primary timber processing mill residues, and urban wood waste, which includes construction and demolition (C&D) waste and municipal solid waste (MSW). Each type of waste wood differs in recyclability. Timber harvesting and processing generated nearly 178 million metric tons of woody residues in 2002, with 86 million metric tons being unused and deemed available for recovery. In comparison, urban waste wood in the MSW and C&D waste streams generated 63 million metric tons of waste wood, with 27 million metric tons remaining unused and deemed available for recovery. These estimates are based on published waste generation rates and recoverability, measures of economic activity, and trends in virgin wood use in specific markets. Waste wood from other lesser sources and debris from catastrophic natural events, which may be disposed of outside the primary waste streams, are not included in this report.

Keywords: forest residues, mill residues, municipal solid wood waste, construction and demolition wood waste, wood recycling.

INTRODUCTION

Large amounts of woody residues and solid wood waste are generated annually in the United States. In 2002, an estimated 240 million metric tons was generated during the extraction of timber from the Nation's forests, from forestry cultural operations, in the conversion of forest land to nonforest uses, in the initial processing of roundwood timber into usable products, in the construction and demolition of buildings and structures, and in the manufacture, use and disposal of solid wood products (McKeever 2003, McKeever and Falk 2004). Much of this

material is indeed waste, but increasingly large shares are becoming valuable resources. Wood residues from primary timber processing facilities have been made into usable products for decades. Nearly all particleboard produced in the United States, for example, is made from such residues. Wooden pallets, once destined for landfills after only a few trips, are now being repaired and recycled at increasing rates. About one-third of all pallets produced annually are made from recycled wood. Waste wood from construction and demolition sites and from the municipal solid waste stream is also gaining importance as a wood resource.

An important step in developing waste wood into a viable resource is to quantify the amounts that are available by source and type of material. The major sources of waste wood are timber harvesting and processing residues, which include woody forest residues and primary timber processing mill residues, and urban wood waste, which includes construction and demolition (C&D) waste and municipal solid waste (MSW). Each type of waste wood differs in recyclability.

Table 1 shows estimated amounts of waste wood generated, being recovered or diverted from landfills, and available for recovery in 2002 for each primary waste wood source. Waste wood from lesser sources is not included nor is debris from catastrophic natural events, which may be disposed of outside the waste streams examined here. All residues are measured in metric tons as generated. They vary in moisture content from green for forest residues, to air dry for many primary timber processing mill residues, and to 8%–12% moisture content for a large portion of urban waste. Estimates are based on published waste generation rates and recoverability, measures of economic activity, and trends in virgin wood use in specific markets.

TIMBER HARVESTING AND PROCESSING RESIDUES

Timber harvesting and processing residues are woody residues that are generated during the harvesting of timber from the Nation's forests, forestry cultural operations, land clearing, and the processing of timber into primary wood products. Residues can be separated into those originating directly from the forest (woody forest residues) and those originating at timber processing mills (primary timber processing residues) (McKeever and Falk 2004). Recently, residues associated with reducing the risk of wildfire on public and private lands have become important. Data on the amounts of these residues being generated are scarce and are not included in the figures reported here for woody forest residues.

Woody Forest Residues

Large amounts of woody forest residues are generated annually in the United States. Woody forest residues are categorized as "logging residues" if generated during timber harvesting operations, or as "other removals residues" if the result of forest cultural operations or land conversion (Smith et al. 2001). These residues are typically in the form of tree tops and branches, and trees cut or knocked down and left on site. The United States Forest Service compiles information on the volumes of both logging residues and other removals every 5 years, with the most recent year being 2001 (USDA Forest Service 2004). Estimates for

2002 are based on 2001 residue volumes adjusted by changes in industrial roundwood production between 2001 and 2002 (Howard 2004).

Another source of woody forest residues is the material being removed from the forest to reduce the risk of catastrophic wildfires and improve forest health. The Healthy Forest Restoration Act[1] authorizes the use of Federal money for high priority thinning and forest restoration. Amounts of these "fuel reduction residues" are not included in the statistics for logging residues or other removals residues because they are removed from the forest for use or disposal. National estimates of removals of fuel reduction residues are not currently available, but the amounts are expected to increase in the next 5 to 10 years.

Logging Residues

Logging residues are materials removed from growing stock and from other timber sources during timber harvesting and left unutilized on site. Growing stock is a "classification of timber inventory that includes live trees of commercial species meeting specified standards of quality or vigor. Cull trees are excluded. When associated with volume, it includes only trees 5.0 inches (12.7 cm) in diameter at breast height and larger" (USDA Forest Service 2004). Included in logging residues are growing stock and other wood cut and knocked down during harvest but left on site, the sound tops above the 4-inch (10.2-cm) growing stock top, trees smaller than 5 inches (12.7 cm) in diameter, and unutilized trees cut or knocked down, including dead and cull trees. All material must be sound enough to chip. Stumps and limbs are not included in logging residue volumes. Based on these definitions, 55.0 million metric tons of logging residues was generated in 2002. But stumps and limbs are also a usable resource, which contain a sizable amount of wood. On average, the volume of softwood residue increases by about 14% and that of hardwood by about 24% if stumps and limbs are included. The inclusion of stumps and limbs increased the amount of logging residues generated in 2002 by 11.2 to 66.2 million metric tons (Table 1).

By definition, no logging residues included in these volumes were recovered. If, on average, about 10% of logging residues was considered to be unusable because of size, location, or other reasons, then 59.6 million metric tons of logging residues was available for recovery in 2002.

Other Removals Residues

Other removals are defined as growing stock and other timber sources cut and burned or otherwise destroyed in the process of converting forest land to nonforest uses. Also included is growing stock removed in forestry cultural operations such as precommercial thinning. Characteristics of other removals residues are the same as characteristics of logging residues. In 2002, 22.4 million metric tons of other removals residues was generated. Stumps and limbs contributed another 4.8 million metric tons for a total of 27.2 million metric tons (Table 1).

[1] For additional information on the Healthy Forest Restoration Act, visit www.fs.fed.us/projects/hfi/

As with logging residues, no other removals residues were recovered. Assuming that, on average, 10% was considered to be unusable because of size, location, or other reasons, then 24.5 million metric tons of other removals residues was available for recovery in 2002.

Total Woody Forest Residues

Overall, 93.4 million metric tons of woody forest residues was generated in 2002 during timber harvesting operations, forestry cultural operations, and conversion of forest lands to nonforest uses (Table 1). By definition, all of this wood was sound, and none was recovered. Assuming that about 10% of the wood may not be usable because of size, location, condition or for other reasons, then the recoverable supply of woody forest residues in 2002 totaled 84.0 million metric tons.

Fuel Reduction Residues

Many forests in the western United States are succumbing to years of drought and insect attack. The dead and dying timber is adding to already high fuel levels caused by decades of fire suppression. National estimates of the amount of this wood being removed to reduce fuel burdens are not available, but it is large. In a three-county area in Southern California, for example, an estimated 142,000 ha of public and private lands are in various stages of vegetation mortality (Rynk 2004a). In August 2003, an estimated 600 metric tons per day of dead and dying timber was removed from high-risk areas. Removals are expected to increase to 1,500 metric tons per day and last for 5 years or more. Poor wood quality and high transportation costs limit the options for high-value uses of this material. Some is being chipped or ground and used for erosion control and biomass fuel (Rynk 2004b). Some is simply being burned for disposal. Efforts are underway to attract business ventures such as pallet manufacturers, portable sawmill operations, and biomass-to-energy producers to better use this material. This is but one of many examples of many locations throughout the country where large quantities of residues are being created from fuel reduction activities.

Primary Timber Processing Mill Residues

Primary timber processing mills are facilities that convert logs, bolts, and other round timber products into other wood products such as lumber, plywood, and woodpulp. These mills annually generate large amounts of residues in the form of bark, sawmill slabs and edgings, sawdust, and peeler log cores. The Forest Service compiles information on the volumes of these residues every 5 years. The most recent compilation was for 2001 (Forest Service 2004). The 2002 estimates in Table 1 are based on 2001 residue volumes adjusted by changes in industrial roundwood production between the 2001 and 2002 (Howard 2004).

Wood residues

An estimated 62.0 million metric tons of wood residues was generated by primary timber processing mills in 2002 (Table 1). Of this, 60.8 million metric tons (98%) was recovered—42.0 million metric tons for products such as woodpulp, nonstructural panels, and animal

bedding, and 18.8 million metric tons for fuel. Just 1.2 million metric tons remained after recovery, all of which could be recovered.

Bark Residues

In 2002, 22.2 million metric tons of bark residues was generated by primary timber processing mills (Table 1). Nearly 98% (21.6 million metric tons) was recovered for either products such as shredded mulch or fuel. The remaining 0.5 million metric tons of bark residues was considered available for further recovery.

Total Primary Timber Processing Mill Residues

Primary timber processing mills generated nearly 84.1 million metric tons of wood and bark residues in 2002, nearly three-fourths of which was wood (Table 1). These mills are very efficient in terms of complete utilization of the resource. Of the total residues generated, less than 2% was not used in the production of other wood products or as fuel. Just under 2 million metric tons of residues remained unused in 2002. Although these residues could conceivably be recovered, it is very unlikely that they will be.

Total Timber Processing and Harvesting Residues

Nearly 178 million metric tons of timber harvesting and processing residues was generated in the United States in 2002 (Table 1). In addition, large, unquantified volumes of residues were generated as part of fuel reduction efforts. Of the 178 million metric tons generated, 92 million metric tons was either recovered (47 million metric tons), combusted (36 million metric tons), or deemed not usable (9 million metric tons). The remaining 86 million metric tons was considered to be available for recovery.

URBAN WOOD WASTE

In general, urban wood waste is waste wood generated by the production, use, and disposal of finished wood products. Sources include the “wood” and the “woody yard trimmings” components of the MSW stream as well as the waste wood generated during the construction of new buildings and structures, the repair and remodeling of existing buildings and structures, and the demolition of existing buildings and structures (C&D waste) (Falk and McKeever 2004). Urban wood waste differs from timber harvesting and processing residues in that it is primarily finished wood products such as lumber, plywood, old furniture, pallets, and containers and other consumer wood products, not roundwood or roundwood residues.

Construction and Demolition Waste

Construction and demolition (C&D) waste is usually referred to as a single form of waste. But since both forms of waste originate from distinctly different types of activities, have different characteristics, and differ in their ease of separation, recovery, and recyclability, they should be evaluated separately. Construction waste originates from the construction and repair and remodeling of residential and nonresidential buildings and structures; it consists of

contemporary building materials, which can be readily separated at the job site. Demolition waste is generated in the demolition of buildings or other structures. It is often contaminated with paints, fasteners, adhesives, wall covering materials, insulation, and dirt, and typically contains a diverse mix of building materials. Some of these materials may no longer be in use or are now considered to be hazardous, making recovery more difficult. On-site separation of demolition waste can be very time-consuming and costly.

Little consistent information is available nationally on C&D generation and recovery, and even less on demolition debris generation and recovery. Available data are limited to anecdotal or case studies at specific points in time, exhibit a high degree of variability within and between studies, and tend to reflect local building practices and building products used (Solid Waste Association of North America 1993, McGregor et al. 1993). Many factors affect waste generation rates, including overall activity level, type of structures being built or demolished, type of building materials used, age of structure being demolished, and extent to which materials are removed for reuse or recycling prior to demolition. Because of this variability, information that was able to be linked to national levels of construction activity and population was used to estimate C&D waste generation. The resulting estimates, although not precise, provide a good, overall indication of the C&D waste resource.

Construction Waste

The economic well being of a nation directly affects its generation of construction waste. When prosperous, housing starts and average house size, expenditures for new nonresidential construction, and expenditures for the repair and remodeling of existing buildings and structures are high. High levels of building activity result in high levels of construction waste. The construction, repair, and remodeling of single-family houses, multifamily houses, and nonresidential buildings and structures are the bases for the construction waste estimates in Table 2.

An estimated 34.5 million metric tons of wood products was used to build 1.3 million new single-family houses and 0.3 million new multifamily apartment units in 2002 (McKeever 2002, Bureau of the Census 2004) (Table 2). This level of construction resulted in an estimated 3.7 million metric tons of wood waste being generated, about 11% of the total volume of wood used. The repair and remodeling of existing residences, both single-family and multifamily, required an additional 29.3 million metric tons of wood products and generated 5.9 million metric tons of waste wood, or 20% of the total volume of wood used. The repair and remodeling of residential structures tends to generate more waste than does new residential construction because many of these projects involve both demolition and construction activities, each of which generates waste. Based on average rates of recoverability and usability, an estimated 7.1 million metric tons of wood waste was deemed available for further recovery from residential construction in 2002, nearly three-fourths of the waste wood generated.

In terms of total wood use, nonresidential construction is small compared to residential construction. In 2002 the construction, repair, and remodeling of nonresidential buildings and structures required only about one-tenth the amount of wood products required for residential

construction. This is because typically only smaller, low-rise nonresidential buildings use substantial amounts of wood. In 2002, 6.8 million metric tons of wood was used for the construction, repair, and remodeling of low-rise nonresidential buildings and structures, which resulted in the generation of 0.9 million metric tons of waste wood; nearly 0.8 million metric tons was considered available for recovery. Large nonresidential projects were not included in this analysis, but since wood is not the primary building material for most such projects, total waste wood generation and recovery estimates should not be greatly affected by the exclusion of these data.

Overall, 70.6 million metric tons of wood was used for construction in 2002. Wood waste was estimated to be 10.5 million metric tons (15% of total wood use), with 7.8 million metric tons available for recovery (75% of all construction waste wood generated) (Table 2). About 2.7 million metric tons of the generated waste wood was already being recovered or was not usable.

Demolition Waste

Demolition waste is a mixture of building materials and other building-related items generated when a building or other structure is razed. Demolition waste typically contains, in varying amounts, aggregate, concrete, wood, paper, metal, insulation, glass, and other types of building materials. Waste from older structures can also contain contaminates and hazardous materials such as asbestos, lead-based finishes, mercury, and polychlorinated biphenyl compounds. Estimates of demolition waste have been made over the years for specific localities. These estimates typically include new construction waste and are often based on the size of the resident population. (Urban areas tend to generate more C&D waste per capita than do suburban or rural areas.) A 1998 study conducted by the EPA reviewed all relevant demolition waste case studies (EPA 1998). Based on these studies, the EPA estimated that 58.8 million metric tons of demolition waste was generated in 1996. This was equivalent to about 0.6 kg of demolition waste per person per day. Based on this rate and the changing population, about 62.9 million metric tons of demolition waste was generated in 2002. Case studies on the mix of materials entering C&D landfills indicated that, on average, about 40% of C&D waste was wood. Thus, about 25.2 million metric tons of demolition waste wood was generated in 2002 (Table 1).

Demolition waste is much more difficult to recover and recycle than is construction waste. Contamination is a major deterrent to recovery, as is the commingling of wood with other nonwood building products. Demolition waste recycling operations typically reject entire loads of demolition waste if contaminated. Demolition waste wood recovery is difficult to determine because it is affected by many factors, including the technology used to process the waste, products manufactured from the waste, and source of waste. Based on limited case studies, an initial overall 30% recovery rate was assumed for 1990 with steady improvement over time.[2] An estimated 10.6 million metric tons of demolition waste wood was deemed recoverable in 2002.

[2] Personal communication, James McElvenny, Wood Recycling, Inc., Woburn, MA, March 27, 1995.

Efforts are now underway to recover material from buildings and other structures for reuse or recycling in lieu of demolition. This "deconstruction" or manual disassembly of wood-framed and other types of buildings may substantially reduce the amounts of demolition waste wood generated in the future.

Total Construction and Demolition Waste

Overall, about 35.7 million metric tons of C&D wood waste was generated in 2002 (Table 1). About 30% originated in construction activities and 70% in demolition activities. About 50% of this waste (18.4 million metric tons) was of acceptable size, quality, and condition to be considered available for recovery. Nearly 43% of the recoverable waste wood was from construction. About 17.3 million metric tons was already being recovered, was being combusted, or was unusable.

Municipal Solid Waste

Municipal solid waste (MSW), also known as trash or garbage, consists of everyday items such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, and batteries (EPA 2003). Materials that may also be disposed in landfills but are not generally considered MSW include construction and demolition debris, municipal wastewater treatment sludges, and non-hazardous industrial wastes. In 2002, nearly 209 million metric tons of MSW was generated by 288 million Americans. This represents about 724 kg per person per day. MSW is typically divided into product components. Paper and paperboard was the single largest component of MSW at 75 million metric tons, or about 36% of all MSW (Fig. 1). Yard trimmings was second at 25 million metric tons (12%), followed closely by food waste and plastics at 24 and 23 million metric tons, respectively. These four components accounted for 70% of total MSW. Overall, about 62 million metric tons (30%) of this material was recovered for recycling or composting; 147 million metric tons (70%) was discarded in landfills or sent to combustion facilities. Paper and paperboard, and yard trimmings accounted for about three-fourths of all recovery.

Two components of MSW contain solid waste wood, "wood" and "yard trimmings." The wood component includes items such as wooden furniture and cabinets, pallets and containers, scrap lumber and wooden panels, and wood from manufacturing facilities. It does not include roundwood or unprocessed wood, and repaired or recycled pallets. Yard trimmings include leaves and grass clippings, brush, and tree trimmings and removals. Each of these two components is an important source of wood waste.

Wood Component

The wood component of MSW accounted for 12.0 million metric tons of waste wood in 2002, about 6% of all MSW (Table 1). Less than 10% (1.1 million metric tons) was recovered for recycling or composting, and 22% (2.7 million metric tons) was combusted (nearly all for energy recovery). The remaining 8.2 million metric tons was discarded. Of the discarded wood, about one-third (2.7 million metric tons) was estimated to be unacceptable for recovery for other uses because of excessive contamination, commingling with other

waste, size and distribution of material, or other reasons. The remaining 5.5 million metric tons of waste wood was available for further recovery.

Yard Trimmings Component

Yard trimmings are a mixture of woody and herbaceous material that varies in composition by geographical location and time of year. Included are tree and brush trimmings, grass clippings, leaves, and garden material from residential, institutional, and commercial sources. In 2002, 25.4 million metric tons of yard trimmings was generated in the United States (Fig. 1). Detailed information on the composition of this material is not readily available from the EPA, who tracks such data, but is based on an analysis of the woody component of yard trimmings conducted in 1994 (NEOS Corp. 1995). An estimated 14.8 million metric tons of wood chips, logs, stumps, tree tops, and brush was generated as part of MSW in 2002. Of this, about 8.5 million metric tons was recovered, primarily for compost and mulch. Of the remaining 6.3 million metric tons, nearly equal amounts were sent to combustion facilities or were deemed unusable (1.5 and 1.6 million metric tons, respectively). The remaining 3.2 million metric tons of woody yard trimmings was available for further recovery. It is interesting to note that the volume of woody yard trimmings generated as part of MSW in 2002 exceeded the volume of timber harvested from National Forests in the United States in the same year (McKeever and Skog 2003).

Total Wood in Municipal Solid Waste

In 2002, 26.8 million metric tons of wood waste was generated as part of MSW (Table 1). This accounts for about 13% of all MSW generated. About 9.7 million metric tons was recovered for recycling or composting, with the remainder being discarded. Of this discarded portion, 4.2 million metric tons was combusted and 13.0 million metric tons was sent to landfills. About one-third (4.3 million metric tons) of the landfilled material was considered to be of little or no value for further recovery. The remaining 8.7 million metric tons was deemed available for recovery for recycling. However, many factors affect the recoverability and usability of MSW, such as the size and condition of the material, extent of commingling with other types of waste, contamination and physical location of the material, and costs associated with acquiring, transporting, and processing the material into a usable raw material. Overall economic conditions and changing recycling rates also affect supplies.

Total Urban Wood Waste

In 2002, 62.5 million metric tons of urban wood waste was generated in the United States (Table 1). This consisted of 26.8 million metric tons of wood in MSW and 35.7 million metric tons in C&D waste. More than half the MSW waste wood was in the form of woody yard trimmings (wood chips, logs, stumps, tree tops, and brush), which more closely resembles forest residues than MSW waste wood (wooden furniture and cabinets, pallets and containers, scrap lumber and wooden panels, and wood from manufacturing facilities). Demolition waste was the largest individual category (25.2 million metric tons), slightly less than all waste wood in MSW. More than half (57%) of all urban waste wood was either recovered for recycling, combusted, or deemed unacceptable for recovery for other uses

because of excessive contamination, commingling with other waste, size and distribution of material, or other reasons. The remaining 27.1 million metric tons of urban waste wood was considered to be available for further recovery. Of this amount, about one-third was MSW (37% woody yard trimmings) and two-thirds from the construction and demolition of buildings and structures (57% demolition waste).

OTHER SOURCES OF WASTE WOOD

Other sources of waste wood include chemically treated wood from railroad ties, telephone and utility poles, and pier and dock timbers; chipped brush and limbs from utility right-of-way maintenance; and industrial waste wood outside the normal waste streams. Some of this material is being reused, burned, or disposed of in hazardous waste landfills but much is being left on site. Chemical treatments and costs of collection make much of this material difficult to recover. The amounts of wood available from these other sources are fairly small. For example, in 1996, approximately 13.6 million railroad ties were replaced (Railway Tie Association 1998). These ties weighed approximately 0.7 million metric tons. If half of this wood were sound, less than 0.4 million metric tons of wood would be recoverable.

CONCLUSIONS

Woody forest residues and solid waste wood are a large, viable resource in the United States. An estimated 240 million metric tons of such material was generated in 2002. Much of this material was used to produce new products or fuel, or it was not suitable for recovery. Of the total amount generated, about 113 million metric tons (47%) was deemed suitable for further recovery for recycling or re-use. In comparison, an estimated 248 million metric tons of roundwood timber products was produced in 2002 (excluding fuelwood). Recoverable waste wood was therefore less than half (46%) of roundwood timber production. Nearly three-fourths of the recoverable wood was in woody forest residues.

Timber harvesting and processing accounted for about three-fourths of all waste wood generated, recovered, combusted, or not usable and available for recovery in 2002. Waste wood from the logging and other removals portion of timber harvesting and processing was by far the single largest source of waste wood available for recovery, constituting 75% of all available waste wood. Currently, nearly all of this material remains in the forest, and it contributes to excessively high levels of fuel loading. Better utilization of this material, coupled with removal of dead and dying timber and brush, could greatly reduce fuel burdens and subsequent risk of catastrophic wildfires, while providing employment for local communities. Waste wood from C&D activities is a distant second to logging waste wood, at about 16% of total availability.

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Table 1. Woody residues and waste wood generated, recovered, combusted or not usable, and available for recovery in the United States, 2002 [a]

	Generated			Recovered, combusted, not usable				Available for recovery		
				Recovered	Combusted	Not usable	Total			
Source	($\times 10^6$ t)	(%)	(% total)	($\times 10^6$ t)	($\times 10^6$ t)	($\times 10^6$ t)	($\times 10^6$ t)	($\times 10^6$ t)	(%)	(% total)
Timber harvesting & processing residues										
Logging & other removals residues										
Logging residues	66.2	71%	28%	—	—	6.6	6.6	59.6	71%	53%
Other removals residues	27.2	29%	11%	—	—	2.7	2.7	24.5	29%	22%
Total	93.4	100%	39%	—	—	9.3	9.3	84.1	100%	75%
Primary timber processing residues										
Wood residues	62.0	74%	26%	42.0	18.8	—	60.8	1.2	69%	1%
Bark residues	22.2	26%	9%	4.5	17.1	—	21.6	0.5	31%	0%
Total	84.1	100%	35%	46.5	35.9	—	82.4	1.7	100%	1%
Total, Timber harvesting & processing	177.5	—	74%	46.5	35.9	9.3	91.8	85.8	—	76%
Urban wood waste										
Construction & demolition waste										
Construction waste wood	10.5	29%	4%	—	—	—	2.7	7.8	43%	7%
Demolition waste wood	25.2	71%	10%	—	—	—	14.6	10.6	57%	9%
Total	35.7	100%	15%	—	—	—	17.3	18.4	100%	16%
Municipal solid waste										
Wood component	12.0	45%	5%	1.1	2.7	2.7	6.5	5.5	63%	5%
Woody yard trimmings	14.8	55%	6%	8.5	1.5	1.6	11.6	3.2	37%	3%
Total	26.8	100%	11%	9.7	4.2	4.3	18.2	8.7	100%	8%
Total, urban wood waste	62.5	—	26%	9.7	4.2	4.3	35.5	27.1	—	24%
Total woody residues & waste wood										
Logging & other removals	93.4	39%	39%	—	—	—	9.3	84.0	75%	75%
Primary timber processing	84.1	35%	35%	—	—	—	82.4	1.7	1%	1%
Construction & demolition	35.7	15%	15%	—	—	—	17.3	18.4	16%	16%
Municipal solid waste	26.8	11%	11%	—	—	—	18.2	8.7	8%	8%
Total	240.0	100%	100%	—	—	—	127.2	112.8	100%	100%

[a] Volumes provided in metric tons.

Table 2. Wood products used and waste wood generated, recovered, combusted, or not usable, and available for recovery from construction in the United States, 2002

		Waste wood					
		Generated			Available for recovery		
Construction type	Total wood use ($\times 10^6$ t)	Amount ($\times 10^6$ t)	% total use	Recovered, combusted, not usable ($\times 10^6$ t)	Amount ($\times 10^6$ t)	Gener-ated (% amt)	Avail-able (% amt)
Residential							
Single-family	31.8	3.4	11%	0.4	3.0	88%	39%
Multifamily	2.7	0.2	9%	0.0	0.2	88%	3%
Total, new residential	34.5	3.7	11%	0.4	3.3	88%	42%
Repair & remodeling	29.3	5.9	20%	2.1	3.8	64%	48%
Total, all residential	63.8	9.6	15%	2.5	7.1	74%	90%
Nonresidential							
Buildings	5.3	0.6	11%	0.1	0.5	88%	6%
Other construction	1.3	0.2	13%	0.0	0.1	88%	2%
Total, new nonresidential	6.5	0.7	11%	0.1	0.6	88%	8%
Repair & remodeling	0.3	0.2	74%	0.1	0.1	71%	2%
Total, nonresidential	6.8	0.9	14%	0.1	0.8	85%	10%
Total, all construction	70.6	10.5	15%	2.7	7.8	75%	100%

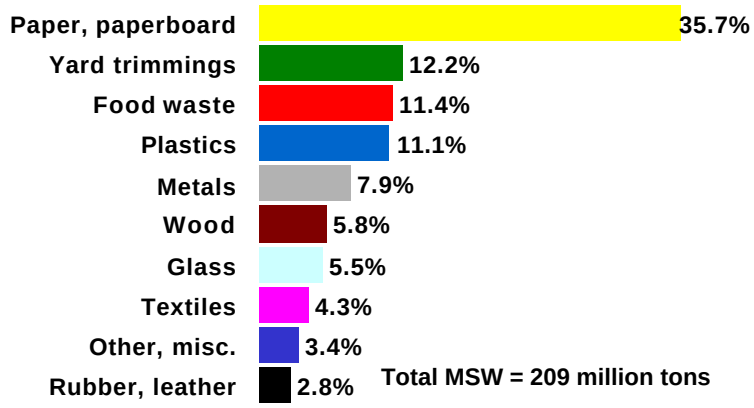

Figure 1. Components of municipal solid waste, 2002

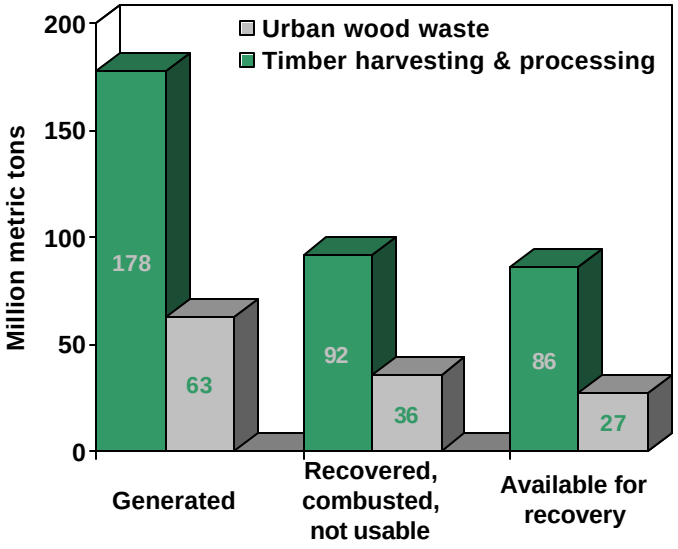

Figure 2. Waste wood generated, recovered, combusted or not usable, and available for recovery in the United States, 2002

IN The Ninth International Conference on Inorganic-Bonded Composite Materials Conference, October 10-13, 2004, Pan Pacific Hotel, Vancouver, British Columbia, Canada. [Moscow, ID] : University of Idaho, c2004. (1 CD-ROM)