

Municipal Solid Waste Landfills and Wood Pallets - What's Happening in the United States

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Editor's Note: This article on pallet disposal and Municipal Solid Waste sites includes material presented by Dr. Bush at the recent NWPCA Recycling Meeting. This is the first in a two-part series; the second will discuss pallet disposal in construction and demolition sites.

Summary

We estimate that 185 million pallets went through Municipal Solid Waste landfill gates in 1995. About 17 percent of these were recovered, but to low or no revenue uses. About 1/3 would not accept pallets as-is.

Many Want to Know

How many pallets are ending up in landfills? Are any being recovered? This is the first of two articles on landfill disposal of wood pallets in the United States to answer these and other question dealing with the fate of pallets. In this article we will focus on municipal solid waste (MSW) landfills, and in the second article we will describe the situation at construction and demolition (C&D) landfills. The study was conducted by the Center for Forest Products Marketing at Virginia Tech in cooperation with the USDA Forest Service Southern Research Station unit at Virginia Tech. This is one of several industrial tracking studies conducted by the Center for Forest Products Marketing. This study is also part of an overall pallet repair and recycling research program for the Southern Research Station and in conjunction with Virginia Tech's Department of Wood Science and Forest Products.

A History of Surveying

Industry surveys are a specialty of the Center for Forest Products Marketing. Recent surveys include material use by pallet, furniture and cabinet manufacturers, along with pallet repair and recycling. The Center has been estimating the volumes of wood materials used and quantities of wood pallets repaired and recycled by the pallet and container industry in the US since 1992.

Each year a large number of new wood

pallets are manufactured using approximately 40% of the hardwood lumber produced in the US. Each year the pallet and container industry receives a significant quantity of wood pallets for recycling.

In addition, many pallets end up in landfills, rendering this resource useless. Prior to our study no information was available regarding the number of pallets reaching US landfills for landfilling as-is and for recycling.

In this paper we focus on pallet waste received and recovered at MSW landfills. However, we do estimate the total quantity of all types of waste and the quantity of wood waste received at these landfills in 1995. In addition, we estimate the amount of yard/wood waste and pallet waste received for recycling in 1995 and the various uses of recovered pallets.

Response Rate Was Good

Following a thorough pre-test and pilot-test, a questionnaire was mailed in March 1996 to 1,690 randomly selected MSW facilities in the US (excluding

Alaska and Hawaii). The response rate for the study was 40 percent.

Figure 1 illustrates the number and percentage of responses received from each region. The number of responses received from the Midwest, Northeast, South, and West regions was 107 (20.8% of the total), 68 (13.2%), 198 (38.5%), and 141 (27.4%), respectively. The number of responses received from each region corresponds well to the number of licensed MSW landfills in each region. We estimated that there were approximately 2,829 state licensed MSW landfills in operation when the survey was conducted and that 19.5% were located in the Midwest, 13.3% in the Northeast, 38.8% in the South, and 28.4% in the West.

Total Waste at MSW Landfills

On average 103.3 thousand tons of waste were received at each MSW landfill in 1995. Landfills in the South accepted more waste, on average, than landfills in any other region. An average landfill in the South accepted 118.6

Figure 1. Number of usable responses received from each region

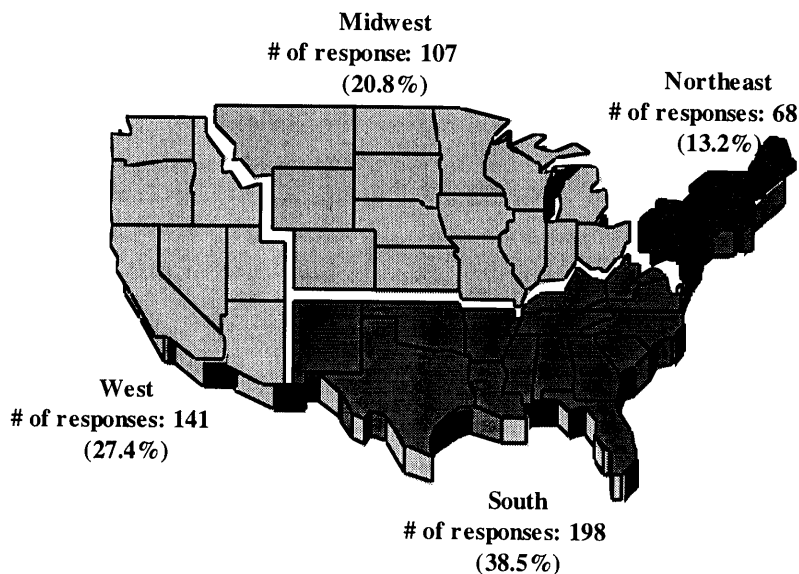
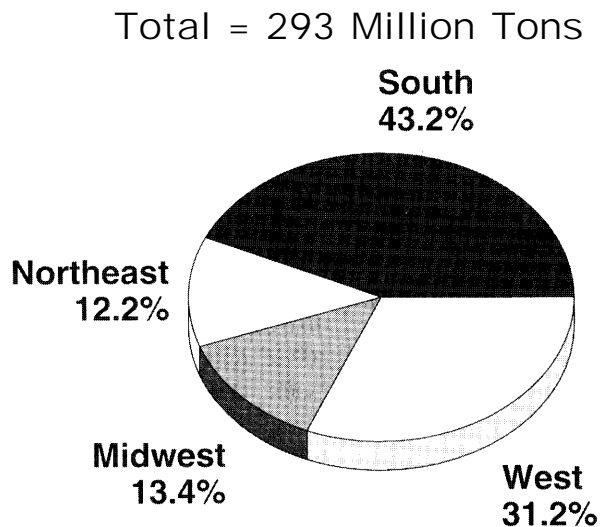


Figure 2. Estimated waste received at in MSW landfills in 1995 by region



thousand tons of waste where as an average landfill in the West, Northeast, and Midwest regions accepted 107.1, 97.5, and 73.2 thousand tons of waste in 1995, respectively.

We estimate that approximately 293 million tons of waste were received at MSW facilities in the US. Figure 2 provides the breakdown by each region. The South received the greatest amount of

waste, approximately 130 million tons or 44.4% of the total waste received in 1995.

Tipping Fees

Nationwide, the average tipping fee at MSW landfills was \$32.22 per ton. However, tipping fees are quite variable between and even within regions. Landfills in the Northeast region assessed a higher

Table 1. Percentage of MSW landfills accepting wood pallets for landfilling as-is and percentage operating a wood/yard waste processing facility: 1995

Region	Percentage accepting wood pallets for landfilling as-is (%)	Percentage operating a wood or yard waste processing facility (%)
Midwest	71.0	30.8
Northeast	55.9	38.2
South	63.6	49.5
West	77.3	27.0
United States	67.9	37.9

tipping fee (\$53.30/ton) than landfills in any other region. The average tipping fee in the West (\$26.40/ton) was lower than

that of any other region. The tipping fees in the Midwest and South were \$31.40 and \$29.30 per ton of waste, respectively.

Some tipping fees were lower for pallets received to be recycled at the landfill.

Wood Waste

In 1995 wood waste accounted for 7.3% of the total waste received at MSW landfills in the US. In other words, 21.4 million tons of wood waste went to MSW landfills in 1995. Wood waste includes not only pallets but boxes, dunnage, packaging, yard trimmings and other non-industrial wood discards. Landfills in the South received approximately 48% of the estimated 21.4 million tons of wood waste. The Western region accounted for approximately 29% of the total wood waste received in 1995. The Northeast region received the least amount of wood waste, 11.4% of the total. However, there was not much difference between the regions in terms of the percentage of waste that was wood. That is, the wood content of MSW was relatively constant, regardless of the total volume of waste received in the region. Approximately 8% of the waste received in the South and 6% of waste in the Midwest was wood. In the West and Northeast regions wood waste accounted for 7.3% and 6.6% of the total waste received, respectively.

Wood Pallet Waste

Are wood pallets accepted at MSW landfills for landfilling as-is (i.e., without processing such as grinding)? If so, what percentage of landfills accept wood pallets for landfilling as-is? How many wood pallets were landfilled in 1995?

Currently some 32% of MSW facilities do **not** accept wood pallets for landfilling. However, more than one-third of MSW landfills have a wood or yard waste facility where pallet waste can be processed and/or recycled. Table 1 provides the percentage of landfills that accept wood pallets for landfilling. In the Northeast, only 56% of MSW landfills accepted wood pallets for landfilling. In contrast, 77% of landfills in the West accepted wood pallets for landfilling.

We were also interested in knowing the quantity of wood pallets received at landfills that were actually landfilled without processing. We estimate that, in 1995, approximately 4.2 million tons of pallet material were landfilled in the US

Table 2. Estimated quantity of wood pallet material landfilled at MSW facilities in the contiguous United States by region: 1995

Region	Estimated quantity of wood pallet material landfilled (thousand tons)	Pallet material as a percentage of total waste landfilled (%)	Pallet material as a percentage of the total <u>wood</u> waste landfilled (%)
Midwest	725.6	1.8	29.3
Northeast	290.3	0.8	11.9
South	2,480.6	1.9	24.2
West	700.6	0.8	11.1
United States	4,197.2	1.4	19.6

(Table 2). **This equals 1.4% of the total waste and 19.6% of total wood waste landfilled at MSW facilities in the US. If we assume that each pallet weighs 55 lb., approximately 153 million wood pallets were landfilled in the US in 1995.**

Municipal solid waste facilities in the South landfilled the largest quantity of wood pallet material, 2.4 million tons or 59% of the total wood pallet material landfilled. The Midwest region landfilled the second largest quantity of wood pallet material, 17% or approximately 726 thousand tons.

In the South, pallet material accounted for 1.9% of total waste landfilled (all types). In the Midwest, Northeast, and Western regions, wood pallet material accounted for 1.8%, 0.8%, and 0.8% of the total waste landfilled, respectively. However, in terms of wood pallets as a percentage of total wood waste landfilled, the Midwest emerged as the number one region with 29.3% of its wood waste being pallet waste. In the South, pallet waste was 24.2% of the total wood waste landfilled.

MSW Landfill Recycling And Tipping Fees

As mentioned, over one-third (37.9% to be exact) of the responding MSW landfills operated a wood/yard waste processing facility (Table 1). In the South, almost one-half of the landfills operated a processing facility. The percentage of landfills that manage a wood/yard waste processing facility in the Midwest, Northeast, and West was 30.8, 38.2, and 27.0, respectively (Table 1). In addition, over 6% of the respondents indicated that they have plans to operate a wood/yard waste processing facility within the next two years. There appears to be interest in

recycling of wood/yard waste, primarily to save landfill space and secondarily to recover the wood.

The landfills that have a processing facility are either banning the landfilling of wood pallets or provid-

Table 3. Regional mean tipping fees for wood pallets at MSW landfills in the contiguous United States that operate wood/yard waste processing facilities: 1995

Region	Tipping fee (\$/ton)	
	At landfill for landfilling as-is	At wood/yard waste processing facility
Midwest	29.40	19.33
Northeast	57.80	32.46
South	30.70	23.08
West	32.80	22.85
United States	34.90	23.90

ing incentives in the form of lower tipping fees to bring pallets to the facility for recovery. Landfills that have a processing facility generally charge a higher tipping fee for landfilling wood pallets than for disposing of the pallets at the facility. In the US, the average tipping fee for wood pallets landfilled as-is was \$34.90 per ton while the fee for wood pallets that came to processing facilities was \$23.90 per ton (Table 3). Landfills in the Northeast region provide the greatest financial incentive to recover pallets in the form of a tipping fee differential of over \$25 per ton.

Wood Pallets Recovered & Recycled

In 1995, 7.4 million tons of wood/yard waste were received for recycling at landfill processing facilities. Figure 3 provides the quantity of wood/yard waste received for recycling in each region.

Of the 7.4 million tons of wood/yard waste, 880.8 thousand tons (11.9%) were wood pallet material. Again, if we assume that a pallet that is received at recycling facility weighs 55 lb., 32 million pallets were received at MSW processing facilities. The Southern region accounted for 60.6% of this wood pallet material. Figure 4 provides the quantity of wood pallet material recycled in each region.

When asked how the volume of wood pallets processed at wood/yard waste facilities has changed over the past two years, 24% of the respondents reported that the volume has increased. The average increase was approximately 8%. Nearly 16% of the respondents reported a decrease in volume and the average decrease was 4.3%. In addition, 48% of the respondents indicated that the volume of pallets received

for recycling has not changed over the past two years. Approximately 13.5% of the respondents reported that they have been operating the wood/yard waste processing facility for fewer than two years and therefore could not comment on changes.

How was the pallet material used at the processing facilities? Grinding or chipping was the most common process used. Approximately 38 percent of the ground or chipped material was used for mulch, animal bedding, compost, soil amendment, core material for particleboard, and similar uses. Nearly 8% of the reduced material was used as landfill or road cover and another 34% of the ground or chipped material was used for fuel. Approximately 3% of the pallet material was reused as pallets. Table 4 provides the percentage of pal-

let material used for various purposes. Figure 5 shows the percentage of pallets landfilled and uses for those pallets that are recovered.

Approximately 58% of the recyclers reported that they give away ground or chipped pallet material. Of the respondents who sell ground or chipped pallets, the average (mean) sale price was \$13.17 and the median sale price was \$10.67.

So What Might All of This Mean

It means that we should be concerned about 185 million pallets going through landfill gates. And therefore, we need to think about municipal solid waste landfills being good sources for:

- used pallets to repair
- replacement boards
- colorized mulch material
- fuel pellet stock
- board products fiber

Use your imagination.

Another Thought

A substantial quantity of wood pallets is entering US landfills each year, thus rendering this valuable resource useless. Producers of wood pallet waste believe that it is more cost effective to send the used pallets to landfills than finding a recycler or putting them into

Figure 3. Estimated regional quantity and percentage of wood/yard waste recycled in 1995.

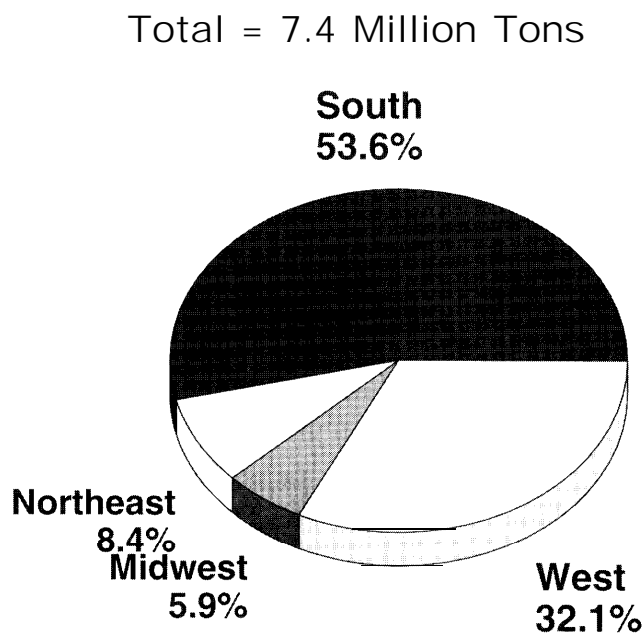
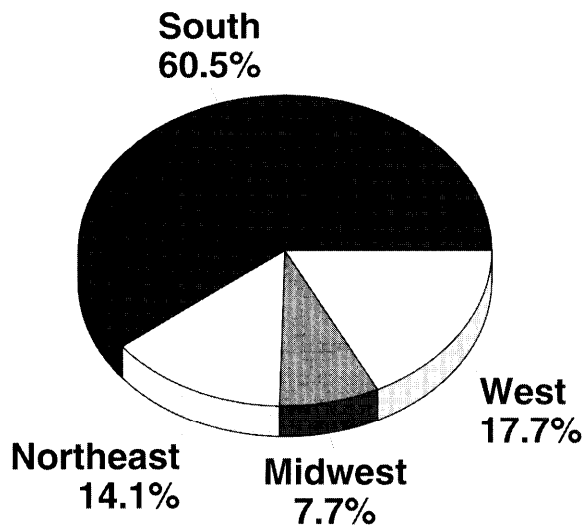


Figure 4. Estimated regional quantity and percentage of wood pallet material recycled in 1995.

Total = 880.8 Thousand Tons



Landfilled = 83% Recovered = 17%

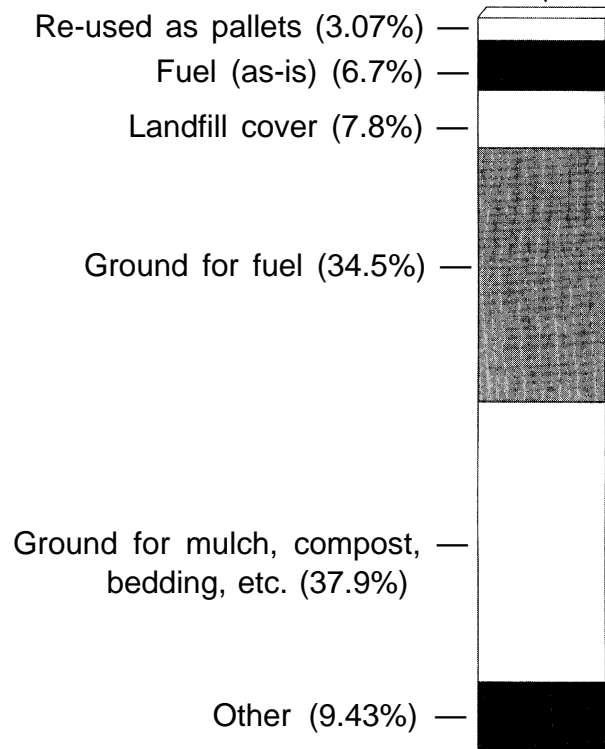


Figure 5. Percent of wood pallet landfilled and recovered and the recovery uses.

Table 4. Quantity and percentage of pallet material recovered for various uses at MSW landfills in the contiguous United States that have a recovery facility: 1995

Use of recycled pallet material	Quantity recovered for each use (thousand tons)	Percentage recovered for each use (%)
Given away or sold as-is for reuse as pallets	29.0	3.3
Given away or sold as-is for fuel	59.5	6.8
Ground or chipped for fuel	300.1	34.1
Ground or chipped for use as landfill cover	69.5	7.9
Ground or chipped for other uses ¹	337.9	38.4
Other uses	84.9	9.6
TOTAL	880.8	100

1. e.g., mulch, animal bedding, compost, soil amendments, furnish for particleboard

use themselves. State and local agencies could provide some incentives to attract more recyclers into the area to utilize the currently underutilized wood and pallet material. In addition, they could provide some incentives for the producers of wood pallet waste so that it would be cost effective for them to take the pallets to recycling facilities rather than to landfills for landfilling.

Some Quick Facts —

A survey municipal solid waste (MSW) facilities by the Center for Forest Products Marketing provided estimates of wood and pallet waste landfilled in 1995. Here are some of the study results.

- On average, MSW landfills charged \$32 for every ton of waste received for landfilling.

- Wood waste accounted for 7.3% of all types of waste received at MSW landfills in 1995.

- Of the wood waste landfilled, approximately 4.2 million tons was pallet material.
- Approximately 32% of MSW landfills reported that they do not accept wood pallets for landfilling as-is.

- Approximately 38% of MSW landfills operate at least one wood/yard waste processing facility.

- Approximately 880.8 thousand tons of wood pallet material was recovered at MSW facilities in 1995.

- Recovered pallet material was used in a variety of ways. Approximately 41% of the pallet material was used for fuel. Another 38.4% of the pallet material was processed for use as mulch, animal bedding, composting, soil amendment, and material in particleboard.

- Approximately 80% of the recovered pallets were ground or chipped.

- Approximately 58% of the landfill operations gave away ground or chipped pallets. Among the facilities that sold the ground or chipped pallet material, the average price was \$13 per ton. 