
VIRGINIA TECH

RECYCLING IN THE U. S. PALLET
INDUSTRY: 1993



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Recycling in The U. S. Pallet Industry: 1993

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Executive Summary

This report provides the results of a study conducted by the Center for Forest Products Marketing at Virginia Tech. The goal of the study was to provide up-to-date estimates of the amount and types of recycling being conducted by the U. S. pallet industry (Standard Industrial Classification 2448). The major findings of the study are summarized below.

- ▶ Approximately 83.3 million pallets were received for recycling by the pallet industry in 1993. This figure represents a considerable increase from the estimated 1992 level of 65.8 million pallets.
- ▶ The pallets received for recycling in 1993 contained an estimated 1.24 billion board feet of wood.
- ▶ In 1993, 62.7 percent of the pallets received for recycling were the multiple-use grocery type. Other types of multiple-use pallets made up approximately 16 percent and single-use pallets accounted for nearly 18 percent.
- ▶ Approximately 61 percent of the pallets received by pallet recyclers were repaired. Another 13.3 percent required no repair and were simply reused.
- ▶ Of the pallets received for recycling, 15.4 percent were un-nailed. Approximately, 80 percent (by volume) of the parts resulting from un-nailing were used to rebuild pallets. Thirteen percent of un-nailed parts were ground/chipped.
- ▶ An estimated 125.3 million board feet of wood from pallets and pallet parts were ground/chipped by the pallet industry in 1993. The major uses for this material were fuel, furnish for wood-based products, and mulch.

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Introduction

This report provides the details of a study which investigated pallet recycling activity in the United States pallet industry (Standard Industrial Classification 2448) during 1993. The study was conducted by the Center for Forest Products Marketing at Virginia Tech and replicates a similar study that investigated pallet recycling during 1992. The following material provides the results of the study, compares recycling in 1992 to 1993, and describes the pallet recycling industry from the perspective of wood material utilization.

It is critically important for readers to note that this report deals with recycling by the pallet industry (SIC 2448) only. Establishments are listed in SIC 2448 if they are “. . . *primarily engaged in manufacturing wood or wood and metal combination pallets and skids.*”¹ Consequently, companies outside of SIC 2448 are not included in this report and the numbers and volumes in this report should not be interpreted as representing all of the pallet recycling activity in the U. S. Many companies repair and reuse pallets within their own operations, and many landfills are grinding or chipping pallets for reuse. These and other methods of pallet recycling are not covered in this report.

Results

Approximately 44 percent of the pallet firms responding to our study recycled pallets in 1993. This is the same percentage of firms that were found to recycle in 1992. However, the number of pallets recycled by the industry increased in 1993 as compared to the previous year. We reported that 65.8 million pallets (containing an estimated 1.03 billion board feet) were received for recycling by the pallet industry in 1992. We estimate that these values increased to approximately 83.3 million pallets (Table

¹Executive Office of the President, Office of Management and Budget. 1987. Standard Industrial Classification Manual. National Technical Information Service. Springfield, VA 22161.

1) and 1.24 billion board feet in 1993 (Figure 1). The average number of pallets received by respondents who recycled during 1993 was just over 174,000.

Table 1 (and A-1 in the Appendix to this report) shows the estimated total number of pallets received for recycling by the industry in 1993 and percentages by region. The Midwest region of the United States accounted for 42.8 percent of the total number of pallets received and the South followed with 32.4 percent. Firms in the West and the Northeast regions received fewer pallets for recycling; combined they accounted for the remaining one-quarter of the national total.

Table 1. Estimated Total Number of Pallets Received for Recycling in 1993 by Region¹

Estimated Total Number of Pallets Received for Recycling (millions)	Number of Pallets Received by Region (% of U. S. total)			
	West	Midwest	Northeast	South
83.3	11.1 (13.4%)	35.6 (42.8%)	9.5 (11.4%)	27.0 (32.4%)

¹ The states included in each region areas follows: **West** - Washington, Oregon, California, Idaho, Montana, Wyoming, Utah, Arizona, New Mexico, Colorado, Nevada; **Midwest** - North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, Ohio; **South** - Texas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, Florida, Georgia, Tennessee, South Carolina, North Carolina, Virginia, West Virginia, Kentucky, Maryland, Delaware; **Northeast** - Pennsylvania, New Jersey, New York, Rhode Island, Connecticut, Massachusetts, Vermont, New Hampshire, Maine.

Types of Pallets Received for Recycling

We estimate that 62.7 percent of the pallets received by pallet recyclers in 1993 were the multiple-use grocery type. This compares to an estimated 61.3 percent in 1992. Other types of multiple-use pallets made up 15.7 percent of the pallets received, a decrease from the estimated 1992 value of 23.2 percent. Single-use pallets accounted for nearly 18 percent of the pallets received in 1993. Approximately 3.8

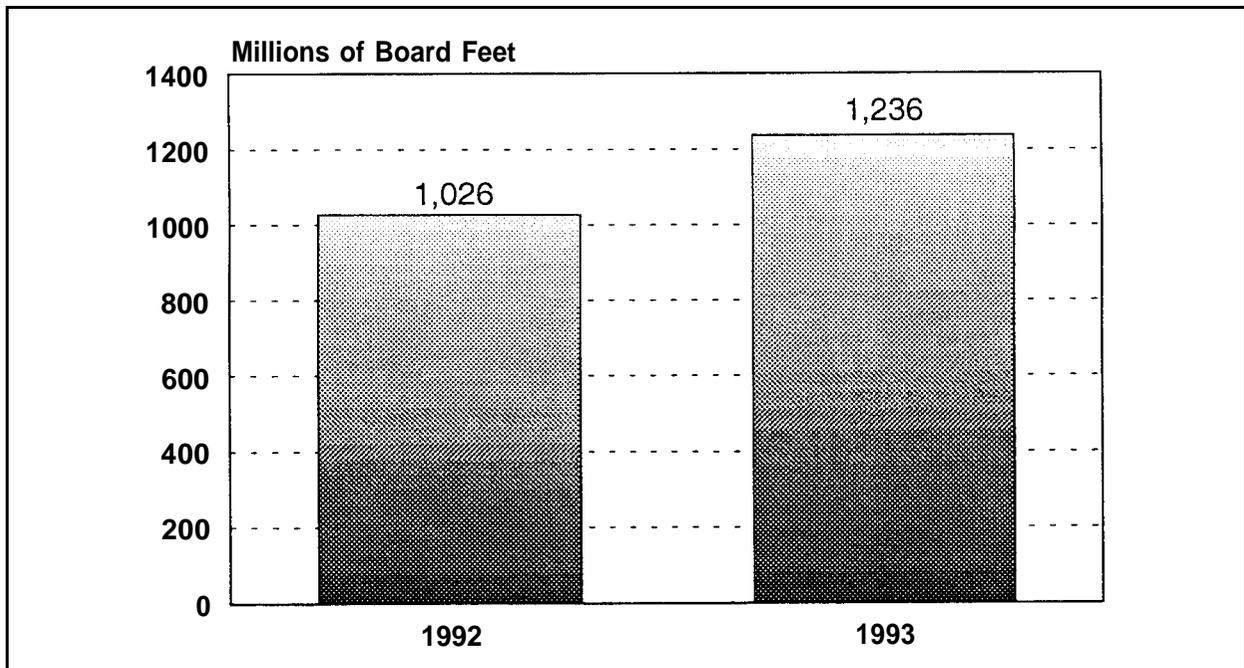


Figure 1. Estimated Wood Content of Pallets Received for Recycling by the Pallet Industry (SIC 2448): 1992 and 1993

percent of pallets received were outside these three categories. These values, in comparison to findings for 1992 are shown in Figure 2. Additional details are provided in Table A-2.

There were not large differences in the mix of pallet types received for recycling among the four regions of the country. Multiple-use grocery pallets ranged from a low of 57 percent in the Midwest to a high of 68 percent of pallets received in the South. Single-use pallets, as a proportion of the total, ranged from 22 percent in the Midwest to 11 percent in the South. Tables A-2 and A-3 show the mix of pallet types received for recycling by region.

Wood Content of Pallets Received for Recycling

We estimate that the pallets received by the industry (SIC 2448) in 1993 contained 1,236 million board feet of wood. Of that volume, approximately 1.1 billion board feet were used again in a pallet. Estimated total use of solid wood (lumber, cants, parts, and shook) by the pallet industry in 1993 was

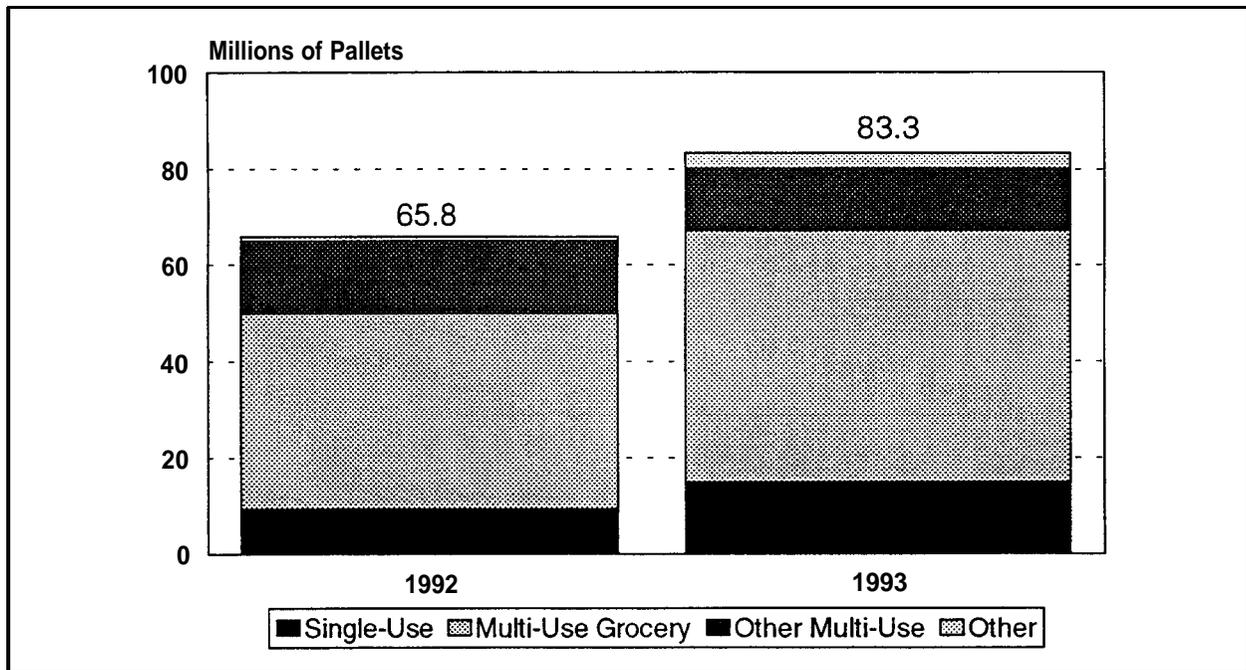


Figure 2. Estimated Mix of Pallet Types Received for Recycling by Pallet Companies (SIC 2448): 1992 and 1993

approximately 6.9 billion board feet.² Using this figure, the recycled to new material ratio in the industry during 1993 can be estimated at .159 (15.9%).

The wood content of pallets received for recycling (as discussed above) was estimated by multiplying the estimated total number of pallets received for recycling in 1993 by an assumed wood content. To improve the accuracy of this procedure, recycled pallets were separated into four categories (single-use, multiple-use grocery, other multiple-use, and *other*). A separate wood content value was used for each pallet type and results were summed to obtain an estimate of the total volume of wood material recycled by the industry in 1993.

Wood content estimates for the various pallet types were developed by William H. Sardo, Jr. Pallet and Container Laboratory personnel and these values were reviewed by industry and association

²Hansen, Eric, Robert Bush, and John Panches. 1994. Wood-Based Material Use in the U. S. Pallet and Container Industry: 1993 and 1995. Center for Forest Products Marketing. Virginia Polytechnic Institute and State University.

representatives. Single-use pallets were assigned a value of 10.1 board feet of wood; multiple-use grocery pallets 15.8 board feet; and other multiple-use pallets 18.5 board feet. All other types of pallets were assigned a content of 15.1 board feet. No special provisions were made to account for pallets made using panel products (e.g., plywood, OSB).

Use of Pallets Received for Recycling

Respondents were asked to indicate the percentage of pallets that were utilized in each of five ways: Reused or sold without repair, repaired and sold or reused, un-nailed, ground/chipped, and *other*. Approximately 61 percent of all pallets received were repaired and subsequently reused during 1993, nearly the same as our 1992 estimate of 62.3 percent. An additional 13.3 percent of the pallets received in 1993 were reused without any repair being performed. Approximately 15.4 percent of the pallets received were un-nailed, eight percent were ground/chipped, and two percent were used in other ways.

Recyclers in the Northeast, as compared to other regions, were able to reuse the largest percentage of the pallets they received without performing any repair. Approximately 24 percent of the pallets received by firms in this region were reused without repair. Pallet recyclers in the West were able to reuse 21.8 percent of the pallets they received without repair and the Midwest had the lowest percentage in this category at 6.6 percent. Firms in the Northeast ground and/or chipped the largest proportion (12.2%) of the pallets received while this proportion was smallest in the West at 5.8 percent. Tables A-4 and A-5 provide a detailed breakdown of this information. Figure 3 shows how pallets received for recycling in 1993 were used as well as how un-nailed parts were utilized.

Approximately 80 percent (79.9% to be exact) of the wood volume from un-nailed pallets was used to rebuild pallets and 13.2 percent was ground/chipped. The use of parts to rebuild pallets ranged from 83.5 percent of the total un-nailed volume in the Midwest to 59.9 percent in the Northeast. The volume of wood ground or chipped ranged from 6.2 percent of un-nailed volume in the South to 40.0

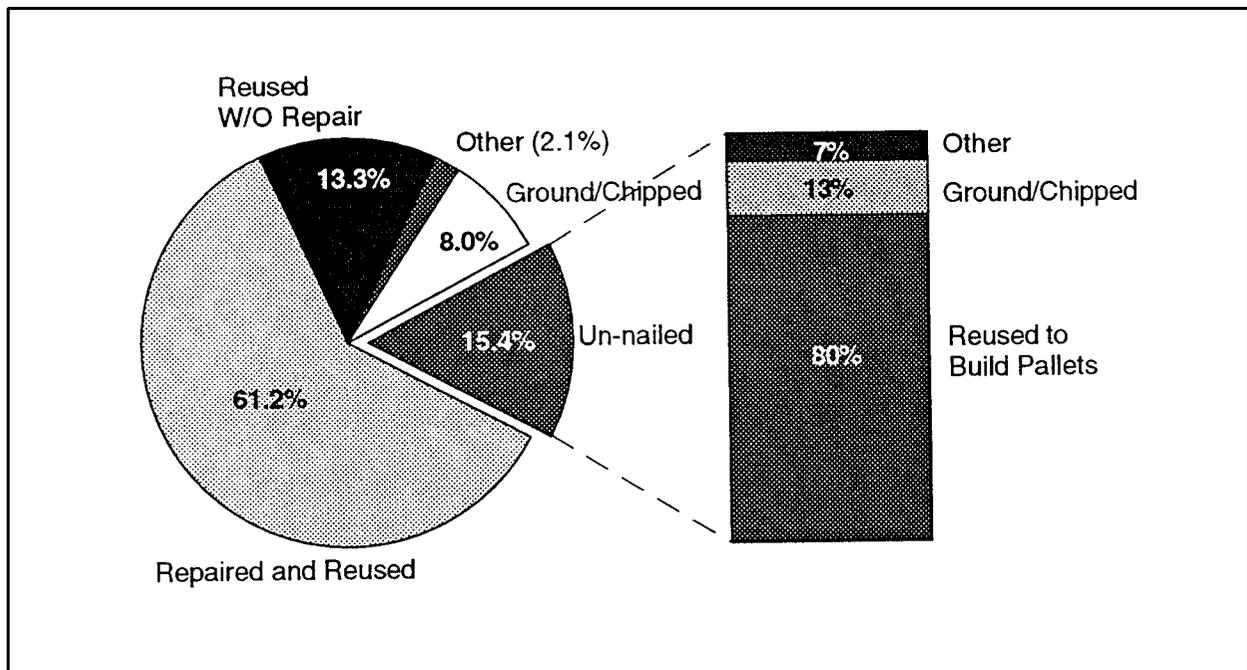


Figure 3. Use of Pallets Received for Recycling and Use of Un-nailed Pallet Parts: 1993

percent in the Northeast. Tables A-6 and A-7 provide further details concerning the use of un-nailed pallets.

An estimated 41.6 percent of the volume of ground/chipped pallets and parts was used as fuel in 1993, a fairly significant decrease from 1992 when 53.1 percent of the material was used as fuel. Approximately 18.5 percent of the ground pallets and pallet parts were used as mulch and 17.1 percent were used as bedding in 1993. Both of these figures represent increases from 1992 when mulch and bedding represented 12.3 and 5.8 percent, respectively.

A category titled *Furnish for fiber based products* was added to the study this year. Furnish accounted for nearly 22 percent of ground pallet material. This percentage is likely to increase in the future as companies search for and utilize non-traditional sources of fiber for their mills. For example, two Oregon particleboard mills owned by Willamette Industries, Inc. used 300 truckloads of “Urban Wood” (pallets and construction materials) per month by the end of 1993. Willamette states that this

recycled fiber content is the reason that particleboard from their Eugene, Oregon plant received the Green Cross seal from Scientific Certification Systems.

Figure 4 shows how ground/chipped pallet material was utilized in each region. Tables A-8 and A-9 detail the use of ground/chipped pallets and pallet parts during 1993.

The use of ground/chipped material for fuel was much higher in the South than in other regions (66.8% based on wood volume). The West was on the other extreme with 11.5 percent of ground/chipped material used for fuel. Utilization as mulch was highest in the Midwest region (37.4%) and lowest in the South (1.0%). The use of pallet material as furnish for fiber based products was highest in the West at 81.3 percent and lowest in the Northeast where no respondents reported this type of use. In all regions, the use of the ground/chipped pallet material for uses other than fuel, bedding, mulch, or furnish was very limited.

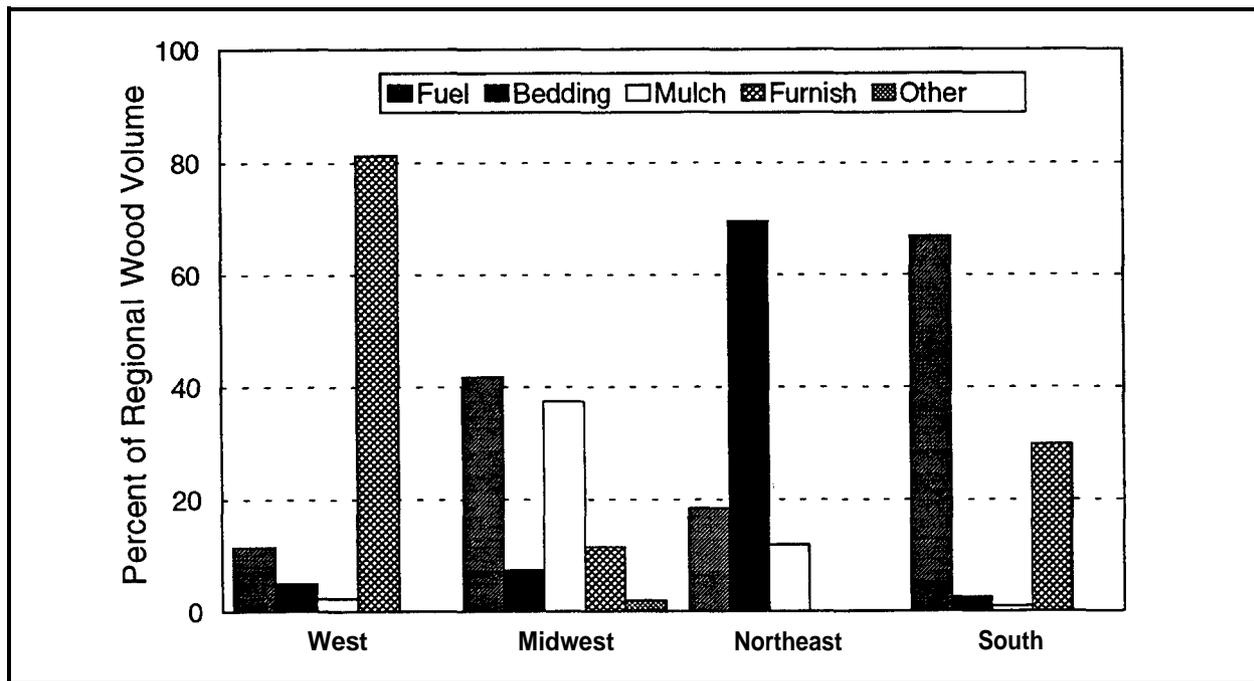


Figure 4. Use of Ground/Chipped Pallet Material by Region: 1993

Research Methods

Introduction

During the Spring of 1994, a survey of pallet and container manufacturers (Standard Industrial Classifications 2441, 2448, and 2449) was conducted by the Center for Forest Products Marketing. Questionnaires were mailed to approximately 1100 firms across the United States. An overall adjusted response rate of 35.9 percent was obtained. Approximately 44 percent of responding pallet firms (SIC 2448) recycled pallets during 1993.

Estimation Procedure

A procedure based on pallets recycled per employee was utilized to obtain an estimate of total industry recycling activity. Pallet recyclers are designated under SIC 2448, the same designation used for new wood pallet manufacturers. Total employment in SIC 2448 was obtained from the U. S. Department of Labor, Bureau of Labor Statistics through the U. S. Forest Service. These employment data are obtained from each state's unemployment insurance records and the penalties for not reporting this information are much greater than those associated with U. S. Department of Commerce surveys. Therefore, Bureau of Labor Statistics data are considered to be more accurate than Department of Commerce estimates.³

Values for pallets recycled per employee were calculated for the four regions of the United States as designated by the U. S. Department of Commerce (Figure 5). These values were then multiplied by total employment (within SIC 2448) in each of the regions. This calculation provided an estimate of the total number of pallets recycled in each of the four regions of the United States.

³Luppold, William G. 1992. Alternative Estimates of Pallet Production. Unpublished Working Paper. USDA Forest Service. Northeastern Forest Experiment Station. 6 pp.

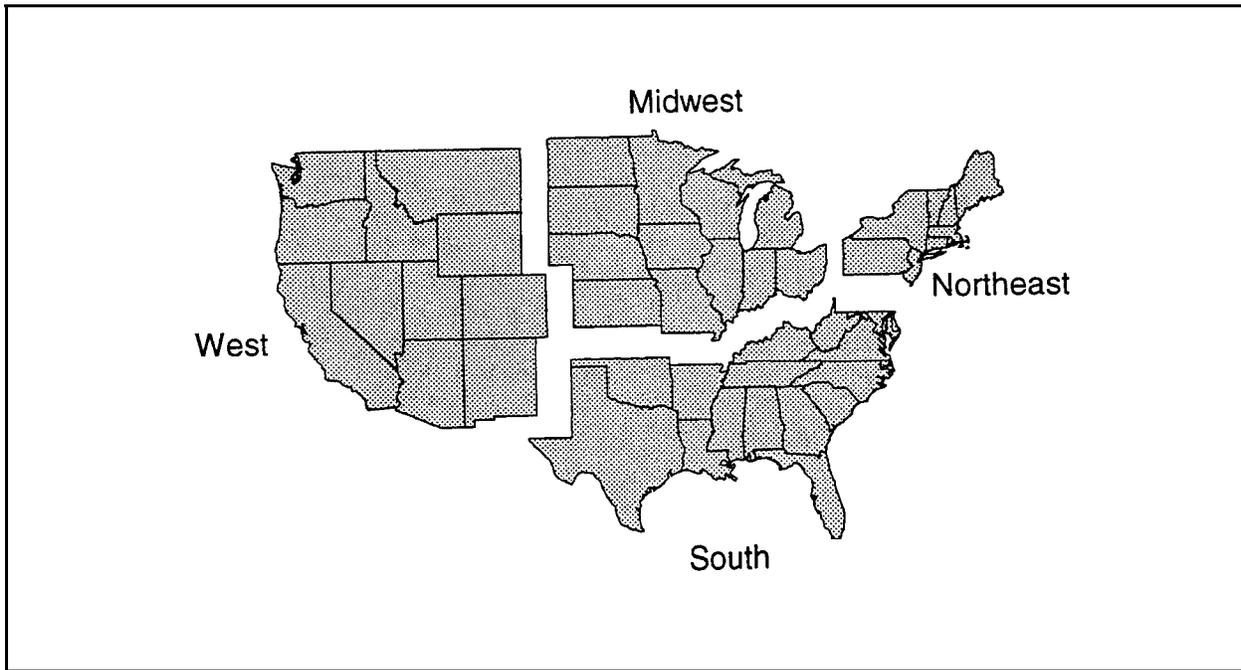


Figure 5. Regions of the U. S. as Defined by the U. S. Department of Commerce

Wood volume estimates were made by multiplying the number of pallets in each of four pallet type categories by the estimated wood content of that pallet type. Wood content estimates were provided by William H. Sardo, Jr. Pallet and Container Laboratory personnel and calculated values were reviewed by industry and association representatives. Single-use pallets were assigned a value of 10.1 board feet of wood; multiple-use grocery pallets 15.8 board feet; and other multiple-use pallets 18.5 board feet. All other types of pallets were assigned a content of 15.1 board feet.

Total pallet recycling in the U. S. is undoubtedly larger than our estimates since our figures reflect only recycling by firms in the pallet industry (SIC 2448). For example, the inclusion of firms primarily producing containers (SIC 2449) would boost estimates of total recycling. In addition, corporations that maintain their own pallets as part of their distribution system recycle pallets and landfills recycle pallets and other wood waste by grinding/chipping. This latter example of wood recycling may be addressed in a future study.

Appendix A - Tabulated Results

Table A-1. Estimated Total Number of Pallets Received for Recycling by the Pallet Industry (SIC 2448) in 1993 With Percentages by Region¹

Estimated Total Number of Pallets Received for Recycling (millions)	Number of Pallets Received by Region (% of U. S. Total)			
	West	Midwest	Northeast	South
83.3	11.1 (13.4%)	35.6 (42.8%)	9.5 (11.4%)	27.0 (32.4%)

¹ The states included in each region are as follows: **West** - Washington, Oregon, California, Idaho, Montana, Wyoming, Utah, Arizona, New Mexico, Colorado, Nevada; **Midwest** - North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, Ohio; **South** - Texas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, Florida, Georgia, Tennessee, South Carolina, North Carolina, Virginia, West Virginia, Kentucky, Maryland, Delaware; **Northeast** - Pennsylvania, New Jersey, New York, Rhode Island, Connecticut, Massachusetts, Vermont, New Hampshire, Maine.

Table A-2. Estimated Number of Pallets Received for Recycling by Pallet Type and Region: 1993¹

Type of Pallet Received	West	Midwest	Northeast	South	Total Pallets (Millions)	% of Total
	----- millions of pallets -----					
Single-use	2.35	7.96	1.58	3.03	14.92	17.90
Multiple-Use Grocery	7.44	20.41	5.91	18.44	52.20	62.65
Other Multiple-Use	1.21	5.73	1.87	4.24	13.06	15.68
Other Pallet Types	0.15	1.53	0.17	1.30	3.14	3.77
Total	11.15	35.63	9.53	27.01	83.32	100

¹ Row and column totals may not equal reported totals as a result of rounding.

Table A-3. Estimated Wood Content of Pallets Received for Recycling by Pallet Type and Region: 1993¹

Type of Pallet Received	West	Midwest	Northeast	South	Total Bd. Ft. (Millions)	% of Total
	----- millions of board feet ² -----					
Single-use	19.72	80.33	15.94	30.56	146.54	11.86
Multiple-Use Grocery	97.62	322.16	93.39	291.24	804.41	65.10
Other Multiple-Use	18.64	105.92	34.65	78.51	237.73	19.24
Other Pallet Types	1.85	23.02	2.51	19.61	47.00	3.80
Total	137.83	531.43	146.49	419.92	1,235.68	100

¹ Column and row totals may not equal reported totals as a result of rounding.

² Board foot volume estimates were made by multiplying the number of each type of pallet by the board foot content of that pallet type. Pallet content estimates were made by William H. Sardo, Jr. Pallet and Container Laboratory personnel and reviewed by industry and association representatives. Single-use pallets were assigned a value of 10.1 board feet of lumber, multi-use grocery pallets 15.8 board feet, other multi-use pallets 18.5 board feet, and *other* 15.1 board feet.

Table A-4. Estimated Number of Pallets Received for Recycling by Utilization Category and Region: 1993¹

How Pallets Were Utilized	West	Midwest	Northeast	South	Total Pallets (Millions)	% of Total
	----- millions of pallets -----					
Reused W/O Repair	2.44	2.37	2.29	4.01	11.10	13.34
Repaired and Reused	6.59	22.38	5.15	16.85	50.96	61.17
Un-nailed	1.34	7.02	0.90	3.58	12.84	15.41
Ground/Chipped	0.65	2.78	1.16	2.08	6.68	8.02
Other	0.14	1.08	0.03	0.48	1.72	2.07
Total	11.16	35.63	9.53	27.00	83.30	100

¹ Column and row totals may not equal reported totals as a result of rounding.

Table A-5. Estimated Wood Content of Pallets Received for Recycling by Utilization Category and Region: 1993¹

How Pallets Were Utilized	West	Midwest	Northeast	South	Total Bd. Ft. (Millions)	% of Total
	----- millions of board feet -----					
Reused W/O Repair	36.59	36.33	36.66	63.00	172.59	13.97
Repaired and Reused	72.30	335.03	78.26	261.68	747.26	60.47
Un-nailed	17.53	103.82	13.81	54.87	190.03	15.38
Ground/Chipped	9.33	40.38	17.46	33.15	100.32	8.12
Other	2.08	15.87	0.30	7.23	25.48	2.06
Total	137.83	531.43	146.49	419.93	1,235.68	100

¹ Column and row totals may not equal reported totals as a result of rounding.

Table A-6. Use of Un-nailed Pallets by Region: 1993¹

Use of Un-nailed Pallets	West	Midwest	Northeast	South	Total Pallets (Thousands)	% of Total
	----- thousands of pallets -----					
Reused to Build Pallets	1,045.08	5,865.79	539.54	2,831.83	10,282.24	80.10
Ground or Chipped	259.47	832.84	361.20	229.81	1,683.32	13.11
Other	32.60	317.53	1.66	519.75	871.53	6.79
Total	1,337.15	7,016.16	902.40	3,581.39	12,837.09	100

¹ Column and row totals may not equal reported totals as a result of rounding.

Table A-7. Use of Wood from Un-nailed Pallets by Region: 1993¹

Type of Use	West	Midwest	Northeast	South	Total Bd. Ft. (Millions)	% of Total
	----- millions of board feet -----					
Reused to Build Pallets	13.27	86.67	8.27	43.61	151.81	79.89
Ground or Chipped	3.75	12.32	5.52	3.40	25.00	13.16
Other	0.51	4.83	0.02	7.86	13.22	6.96
Total	17.53	103.82	13.81	54.87	190.03	100

¹ Column and row totals may not equal reported totals as a result of rounding

Table A-8. Use of Ground/Chipped Pallets by Region: 1993¹

Use of Ground/Chipped Pallets	West	Midwest	Northeast	South	Total Pallets (Thousands)	% of Total
	----- thousands of pallets -----					
Fuel	106.10	1,458.58	267.36	1,517.83	3,349.87	40.05
Bedding	42.23	267.03	1,046.84	63.65	1,419.75	16.98
Mulch	22.00	1,418.58	207.87	24.15	1,672.59	20.00
Furnish	740.34	400.59	0.00	707.28	1,848.20	22.10
Other	0.13	69.42	3.76	0.00	73.31	0.88
Total	910.80	3,614.20	1,525.83	2,312.91	8,363.72	100

¹ Row totals may not equal reported totals as a result of rounding.

Table A-9. Use of Ground/Chipped Pallet Material by Region: 1993¹

Use of Ground/Chipped Material	West	Midwest	Northeast	South	Total Bd. Ft. (Millions)	% of Total
	----- millions of board feet -----					
Fuel	1.50	21.96	4.23	24.42	52.10	41.57
Bedding	0.65	3.90	15.97	0.93	21.46	17.12
Mulch	0.30	19.73	2.74	0.35	23.13	18.45
Furnish	10.63	6.06	0.00	10.86	27.54	21.97
Other	<.01	1.06	0.04	0.00	1.10	0.88
Total	13.08	52.71	22.98	36.56	125.33	100

¹ Row totals may not equal reported totals as a result of rounding.