



Wisconsin Wood Residue Study

WOOD RESIDUE FROM MANUFACTURING

2009

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AUTHORED/EDITED BY:

Sustainable Resources Institute, Inc.

Cram, Serena

Graff, Sarah M.

Peterson, Donald R.

Ross, Heather L.



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The figures and percentages used throughout the feasibility study are subject to change depending on the conditions of future markets, supply and demand, dollar value, local, state, and national economic status, national and state policy changes, and other unforeseeable variables. All information provided will be true to the best of Sustainable Resources Institute, Inc.'s knowledge and any oversight or misrepresentation is unintentional. All information is presumed to be the most up-to-date information available as of the official publication date. Direct research should be done for the most current information when looking for figures and/or percentages in the months/years following the publication. New technology and innovative practices are constantly being discovered and the most efficient systems and methods today could be outdated in the near future. This study is written to give the most accurate information as possible as of the publication date.

This document is for general information only and should not be used for any other purpose except to provide an estimation regarding industry concentration and wood residue availability. It is highly recommended that any company looking to develop a wood or wood residue using business, technology, or expand their existing operations conduct a comprehensive resource analysis in their particular procurement radius for accurate wood and wood residue resource availability. Contact the Wisconsin DNR Forest Product Specialist for guidance on developing such an analysis.

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WOOD RESIDUE FROM MANUFACTURING (EXCLUDING SAWMILLS) - 2009

PROLOGUE

For the purposes of this study:

- Wisconsin's "Primary Industry" refers to businesses that utilize material from the forest (sawlogs, pulpwood, poles, etc.) and process them. They are not part of this survey.
- Wisconsin's "Secondary Industry" refers to businesses that utilize wood products from the primary industry to manufacture products (cabinets, doors, moulding, etc.) or parts of a product (cabinet parts, tool handles, etc.).
- Wisconsin's "Manufacturing Industry" refers to any company that manufactures a non-wood product and receives wood (mostly from shipping) incidental to their operation and does not make wood products. The Secondary Industry is included in this section regarding their use of pallets and other wood packaging materials.

Wood "residue", as used herein, means wood no longer usable in its current form or at its current location. Wood residue consists of pallets, dunnage (wood packing material), sawdust, sanderdust, chips, shavings, edgings, cut-offs, and bark. Possible uses include particle/inorganic bonded board, fireplace logs, molded products, fuel, pulp, animal bedding, and landscape mulch.

EXECUTIVE SUMMARY

Wisconsin manufacturers generate nearly 2,000,000 tons of wood residue annually. Taking sawmills out of the equation reduces this number to just under 1,300,000 tons that is generated by the secondary forest industry and the non-wood manufacturing industry. There was a substantial reduction in residue from the primary and secondary forest industry companies in their manufacturing processes. This was mainly due to overall downturn in the forest industry, resulting in plant closures and reduced production.

Pallets and dunnage residue was up nearly 40% due, at least in part, to increased shipping of goods using pallets and wood crating. Wisconsin non-forest industry manufacturers generate over 328,542 tons of wood residue annually, of which at least 110,662 tons are disposed of annually. This disposal costs Wisconsin businesses approximately \$2,113,286 annually. This is a substantial decrease from 1983 in both disposed of volume (nearly 80% decrease) and disposal costs (nearly 70% decrease). This is due to more attention to recycling/waste reduction and increased markets for mulch, fuel, and other products.

The generation of pallet type and dunnage type residue is concentrated in the Southeast Forest Survey Unit. Much of the wood residue generated in Wisconsin is used as fuel or some other product. The greatest availability of unutilized wood residue is in the Southeast unit, where disposal problems are the most acute. The utilization of wood residue turns an expensive problem into a resource.

The primary objectives of the Wisconsin Wood Residue Study are to:

- Identify the quantity, type, location, and disposal methods of the wood residue stream in Wisconsin

- Encourage the use of wood residue
- Create a directory of wood residue-generating firms in Wisconsin

A survey questionnaire about wood residue was mailed to Wisconsin businesses and results were compiled. Survey data was analyzed by North American Industry Classification System (NAICS) code, number of employees per firm, disposal method, and disposal cost.

PROJECT OVERVIEW

Wood residue is an expensive problem for Wisconsin industry, but it can be a resource. There are many possible uses for wood residue, including particle/inorganic bonded board, fireplace logs, molded products, fuel, pulp, animal bedding, and landscape mulch. The purpose of this study is to encourage the use of wood residue by supplying information on wood residue in Wisconsin. Such detailed information is needed for intelligent planning and decision-making regarding a wood residue-using venture. The report identifies the quantity and type, location, and disposal methods of the wood residue stream in Wisconsin.

Mail survey techniques were used to collect primary data from both wood and non-wood using businesses located in Wisconsin. The survey questionnaire (Appendix I) was developed using the previous Wisconsin Department of Natural Resources (WDNR) survey conducted in 1993. The survey was then modified through a review of current literature and the use of personal knowledge of Sustainable Resources Institute, Inc. (SRI) and WDNR Forest Products Utilization and Marketing staff. The survey was reviewed by the USDA Forest Service Forest Products Laboratory, WDNR Bureau of Research, University of Wisconsin, SRI, and forest industry personnel.

The companies selected in this survey were taken from the Wisconsin Manufacturers' News, Inc. Wisconsin Manufacturers Database purchased in 2009. The database was sorted by NAICS code and all non-pertinent companies were removed (lumber, paper, and service industries). The database was then further sorted by number of employees and a random sampling of a pre-determined percentage was selected per employee number factions (1-4, 5-19, 20-49, 50-99, 100-249, 250-499, 500+).

Using funding received from a 2008 Focus on Energy – Environmental and Economic Research and Development Grant, the final survey instrument was printed and mailed to all Wisconsin manufacturers identified. All answers were collected and entered into a database for further extrapolation.

Survey numbers were not adjusted to a green or dry basis, but were weighted using a disproportionate stratified sampling method to provide an aggregate of each Wisconsin Industry sampled. Please note that tables may vary slightly due to rounding.

WISCONSIN MANUFACTURING COMPANIES - SURVEY SUCCESS*

	Employee Size Class Categories						
	1-4	5-19	20-49	50-99	100-249	250-499	500+
Total Companies in Class	2,453	4,906	2,617	1,263	1,026	343	178
Total Surveyed	152	330	877	919	821	294	178
Not In Business	12	7	34	16	9	6	1
Not Pertinent	21	52	98	70	53	11	9
Total Answered	5	6	44	40	41	18	12
Survey Success	19%	18%	17%	12%	12%	10%	12%
Total Not Returned	114	265	701	793	718	259	160

*See Appendix III for extrapolation data.

WISCONSIN'S MANUFACTURING WOOD RESIDUE GENERATION

GENERATION BY INDUSTRY TYPE

Wisconsin's Manufacturing Industry generates 328,542 tons of manufacturing wood residue annually.

Wisconsin's primary wood industry generates 692,752 tons of raw wood residue annually.

Wisconsin's secondary wood industry generates 944,703 tons of raw and processed wood residue annually.

GENERATION BY REGION

Of the 293,019 tons of wood residue produced annually by Wisconsin's Manufacturing Industry, the following shows the percent of Wisconsin Manufacturing Companies' total wood residue produced per region¹:

Northeast	4% (12,467 Tons)
Northwest	5% (15,527 Tons)
Central	11% (36,245 Tons)
Southeast	73% (238,485 Tons)
Southwest	8% (25,795 Tons)

(Above tonnages do not include an unaccounted for variable of approximately 23 tons due to rounding estimates.)

CORRELATION OF WOOD RESIDUE GENERATION WITH NUMBER OF EMPLOYEES

In regards to pallets in the residue/waste stream, five of the seven company categories follow the logical progression of the more employees you have the more residue/waste that will be generated. The other two 5-19 (1.13 tons) and 50-99 (259.12 tons) appear to be abnormalities most likely due to survey responses.

The three categories found between 20 and 249 companies account for 80% of the total annual pallet waste/residue from manufacturing companies, while representing only 38% of the 12,786 manufacturing companies in the state. The two categories from 1-19 represent 58% of the total manufacturing companies in the state and only 3% of the total annual waste/residue.

In regards to dunnage, there does not seem to be a logical pattern with the two categories from 1-19 representing 50% of the total annual waste/residue. The 100-249 category represents another 32% of the total annual waste residue, which leaves four other categories (20-49, 50-99, 250-499, and 500+) to account for the remaining 18%.

WOOD RESIDUE DISPOSAL

Of the 328,542 tons of wood residue generated annually by Wisconsin's manufacturing companies, approximately 110,662 tons is disposed of and 217,880 tons is either utilized on site, sold, or given away. Wood residue disposal costs Wisconsin Businesses an estimated \$2,113,286 annually.

¹ Please note that this was a stratified sampling and therefore percentage per region may be partially skewed.

SURVEY RESULTS – WISCONSIN’S MANUFACTURING INDUSTRY STATEWIDE

NOTE: "STATEWIDE" FIGURES BASED ON RESPONSE AVERAGES. PERCENTAGES BELOW ARE AVERAGES OF RESPONDENT ANSWERS AND ARE NOT WEIGHTED.

SEE APPENDIX III FOR CALCULATIONS

AVERAGE ANNUAL WEIGHT OF PALLETS (BLOCKS AND STRINGERS) SCRAPPED/NOT REUSED

Company Size ¹	Average Annual Tons/Company:	Total Tons Disposed Of Statewide	Total Tons Utilized [^] Statewide	Total Average Annual Tons - Statewide
1-4	13.26	1,422	4,266	5,688
5-19	1.13	217	326	543
20-49	53.89	13,876	19,967	33,843
50-99	259.12	31,416	80,783	112,199
100-249	92.77	15,442	22,222	37,664
250-499	94.5	5,052	13,659	18,711
500+	200.32	9,105	11,128	20,233
Totals		76,530	152,351	228,881

[^] On Site, Sold, or Given Away, ¹ By number of employees

AVERAGE ANNUAL WOOD WASTE/RESIDUE FROM DUNNAGE

Company Size ¹	Average Annual Tons/Company:	Total Tons Disposed Of Statewide	Total Tons Utilized Statewide	Total Average Annual Tons - Statewide
1-4	83.33	2,936	19,467	22,403
5-19	81.00	6,551	20,746	27,297
20-49	2.97	376	669	1,045
50-99	33.96	2,732	2,328	5,060
100-249	130.42	15,275	16,548	31,823
250-499	59.63	1,513	4,092	5,605
500+	122.5	4,748	1,499	6,247
Totals		34,131	65,349	99,480

¹ By number of employees

AVERAGE ANNUAL TONS OF WOOD WASTE/RESIDUE FROM PALLETS AND DUNNAGE - UTILIZED

Company Size ¹	Sold	Given Away	Used on Site	Total Utilized Statewide
1-4	5,201	10,641	8,071	23,913
5-19	4,073	12,995	4,004	21,072
20-49	2,893	14,514	3,230	20,636
50-99	22,997	41,331	18,791	83,111
100-249	10,518	19,397	8,847	38,770
250-499	5,599	8,261	3,891	17,751
500+	4,509	6,403	1,714	12,627
Totals	55,790	113,542	48,547	217,880

¹ By number of employees

AVERAGE ANNUAL TONS OF WOOD WASTE/RESIDUE FROM PALLETS AND DUNNAGE - UTILIZED

Company Size ¹	Industrial Fuel	Residential Fuel	Landscaping/ Mulch	Pallet Remanufacturing	Animal Bedding	Other	Total
1-4	0	16,022	0	7,891	0	0	23,913
5-19	0	11,590	0	0	4,214	5,268	21,072
* 20-49	1,919	9,206	473	5,758	834	2,456	20,636
50-99	1,097	18,525	9,649	45,270	0	8,569	83,111
** 100-249	3,067	6,242	5,257	20,591	109	3,505	38,770
250-499	1,457	4,438	951	9,573	64	1,267	17,751
500+	126	2,399	0	9,849	189	63	12,627
*** Totals	7,667	68,421	16,330	98,932	5,410	21,128	217,880

¹ By number of employees. *2.56% of the Total Utilized for the 20-49 category came from Dunnage, 100% of which was accounted for in the industrial fuel category (372.96). ** 4.52% of the Total Utilized for the 100-249 category came from Dunnage, 100% of which was accounted for in the residential fuel category (1,400.94).

***Due to rounding, answers are not exact.

AVERAGE ANNUAL TONS OF WOOD WASTE/RESIDUE FROM PALLETS AND DUNNAGE - DISPOSED OF

Company Size	Landfill	Incinerated	On Site Heating	Stock Piled	Pay to Remove	Other	Total Tons Disposed Of
1-4	4,358	0	0	0	0	0	4,358
5-19	3,384	0	1,128	2,256	0	0	6,769
20-49	5,451	1,821	1,388	0	2,705	2,887	14,252
50-99	20,431	2,465	0	0	4,904	6,348	34,148
100-249	13,307	885	2,543	1,017	4,644	8,318	30,717
250-499	3,540	505	1,515	0	500	505	6,565
500+	9,067	0	0	0	2,052	2,735	13,853
Totals	59,538	5,676	6,575	3,273	14,805	20,793	110,662

Due to rounding, answers are not exact.

AVERAGE ANNUAL DISPOSAL COSTS OF WOOD WASTE/RESIDUE FROM PALLETS AND DUNNAGE

Company Size ¹	Average Annual Cost/Company	Total Average Annual Cost
1-4 [^]	\$150.00	\$52,137
5-19	\$405.00	\$334,925
20-49	\$259.63	\$248,679
50-99	\$792.33	\$383,534
100-249	\$893.45	\$405,762
250-499	\$1,241.18	\$244,383
500+	\$4,812.91	\$443,866
Total		\$2,113,286

**Average of respondent answers; is not a weighted average. [^]Only one answer in this size class

¹ By number of employees

SURVEY RESULTS – WISCONSIN’S MANUFACTURING INDUSTRY BY FOREST SURVEY UNIT

NOTE: STATEWIDE ESTIMATIONS REDUCED BY TOTAL OF COMPANIES IN REGION AND EXTRAPOLATED USING SAME FORMULA AS STATEWIDE TOTALS.

AVERAGE ANNUAL WEIGHT OF PALLETS (BLOCKS AND STRINGERS) SCRAPPED AND DUNNAGE BY FOREST SURVEY UNIT*

*Statewide estimations reduced by total number of companies in each region and extrapolated using same formula as statewide totals.

Forest Survey Units:

Northwest	Northeast	Central	Southeast	Southwest
▪ Douglas	▪ Florence	▪ Chippewa	▪ Brown	▪ Buffalo
▪ Bayfield	▪ Forest	▪ Eau Claire	▪ Calumet	▪ Crawford
▪ Burnett	▪ Langlade	▪ Clark	▪ Columbia	▪ Dunn
▪ Washburn	▪ Lincoln	▪ Jackson	▪ Dane	▪ Grant
▪ Sawyer	▪ Marinette	▪ Monroe	▪ Dodge	▪ Iowa
▪ Ashland	▪ Menominee	▪ Juneau	▪ Door	▪ La Crosse
▪ Price	▪ Oconto	▪ Adams	▪ Fond du Lac	▪ Lafayette
▪ Iron	▪ Oneida	▪ Marquette	▪ Green	▪ Pepin
▪ Rusk	▪ Shawano	▪ Waushara	▪ Green Lake	▪ Pierce
▪ Barron	▪ Vilas	▪ Portage	▪ Jefferson	▪ Richland
▪ Polk		▪ Wood	▪ Kenosha	▪ Sauk
▪ Taylor		▪ Marathon	▪ Kewaunee	▪ St. Croix
		▪ Waupaca	▪ Manitowoc	▪ Trempealeau
			▪ Milwaukee	▪ Vernon
			▪ Outagamie	
			▪ Ozaukee	
			▪ Racine	
			▪ Rock	
			▪ Sheboygan	
			▪ Walworth	
			▪ Washington	
			▪ Waukesha	
			▪ Winnebago	

NORTHWEST

Company Size	Total Companies	Est. Co.s in Business in Size Class & Region	Pallets – Total Tons	Dunnage – Total Tons	Total Wood Residue (Tons)
1-4	195	179	452	1,795	2,247
5-19	243	238	27	1,352	1,379
20-49	111	107	1,436	44	1,480
50-99	65	64	5,773	260	6,033
100-249	38	38	1,395	1,178	2,573
250-499	13	13	709	213	922
500+	6	4	682	211	893
Totals	671	642	10,474	5,053	15,527

NORTHEAST

Company Size	Total Companies	Est. Co.s in Business in Size Class & Region	Pallets – Total Tons	Dunnage – Total Tons	Total Wood Residue (Tons)
1-4	149	137	345	1,372	1,717
5-19	194	190	21.49	1,079.39	1,101
20-49	85	82	1,099	34	1,133
50-99	46	45	4,086	184	4,270
100-249	38	38	1,395	1,178	2,573
250-499	11	11	600	180	780
500+	6	4	682	211	893
Totals	529	506	8,229.06	4,237.96	12,467.02

CENTRAL

Company Size	Total Companies	Est. Co.s in Business in Size Class & Region	Pallets – Total Tons	Dunnage – Total Tons	Total Wood Residue (Tons)
1-4	277	255	642	2,550	3,192
5-19	549	538	60.82	3,054.56	3,115.38
20-49	265	254	3,427	106	3,533
50-99	124	122	11,013	497	11,510
100-249	118	117	4,331	3,659	7,990
250-499	47	46	2,565	768	3,333
500+	24	16	2,729	843	3,571
Totals	1,404	1,348	24,768.30	11,476.90	36,245.20

SOUTHEAST

Company Size	Total Companies	Est. Co.s in Business in Size Class & Region	Pallets – Total Tons	Dunnage – Total Tons	Total Wood Residue (Tons)
1-4	1,564	1,439	3,627	14,397	18,023
5-19	3,520	3,450	389.97	19,584.80	19,974.77
20-49	1,951	1,873	25,233	779	26,013
50-99	929	910	82,511	3,721	86,232
100-249	765	757	28,076	23,721	51,797
250-499	239	234	13,043	3,907	16,950
500+	131	89	14,895	4,599	19,494
Totals	9,099	8,753	167,774.83	70,710.06	238,484.89

SOUTHWEST

Company Size	Total Companies	Est. Co.s in Business in Size Class & Region	Pallets – Total Tons	Dunnage – Total Tons	Total Wood Residue (Tons)
1-4	268	247	621	2,467	3,088
5-19	400	392	44.31	2,225.55	2,269.86
20-49	205	197	2,651	82	2,733
50-99	99	97	8,793	397	9,189
100-249	67	66	2,459	2,078	4,536
250-499	33	32	1,801	540	2,340
500+	11	7	1,251	386	1,637
Totals	1,083	1,039	17,620.59	8,174.21	25,794.80

The estimates in all the region tables above were based on the overall percentages from the survey data. Numbers vary (a total of 23 tons) slightly/are not exact due to rounding.

SURVEY RESULTS – SECONDARY INDUSTRY WOOD WASTE STREAMS STATEWIDE

THE SURVEY WAS SENT TO 100% OF THE INDUSTRY; THEREFORE, TOTALS BELOW **ARE NOT** EXTRAPOLATED AND REPRESENT ALL ANSWERS

MANUFACTURE OF FIBER PRODUCTS OR COMPOSITE PRODUCTS SUCH AS PULP OR PARTICLEBOARD

	Coarse Residues - Conifer Tons	Coarse Residues - Hardwood Tons	Fine Residues - Conifer Tons	Fine Residues - Hardwood Tons	Total
Sold	3,745	36,822	3,483	1,461	45,511
Given Away	3	131	1	13	147
Processed	170	6,000	-	-	6,170
Unknown	-	40,000	1,540	100	41,640
Total	3,918	82,953	5,024	1,574	93,468
Avg./Company	784	8,295	628	131	3,116

ANIMAL BEDDING

	Coarse Residues - Conifer Tons	Coarse Residues - Hardwood Tons	Fine Residues - Conifer Tons	Fine Residues - Hardwood Tons	Total
Sold	183	7,362	41,441	35,952	84,939
Given Away	4	250,508	250,768	1,564	502,843
Processed	-	-	-	-	-
Unknown	965	136	1,488	13,173	15,761
Total	1,151	258,006	293,698	50,688	603,543
Avg./Company	128	13,579	4,079	406	3,550

INDUSTRIAL FUEL AT PLANT

	Coarse Residues - Conifer Tons	Coarse Residues - Hardwood Tons	Fine Residues - Conifer Tons	Fine Residues - Hardwood Tons	Total
Sold	-	750	-	1,150	1,900
Given Away	-	200	-	3	203
Processed	243	8,984	861	25,727	35,815
Unknown	10	33	-	-	43
Total	253	9,967	861	26,880	37,961
Avg./Company	25	383	108	896	593

INDUSTRIAL FUEL AT OTHER PLANTS

	Coarse Residues - Conifer Tons	Coarse Residues - Hardwood Tons	Fine Residues - Conifer Tons	Fine Residues - Hardwood Tons	Total
Sold	3,466	16,046	437	7,172	27,121
Given Away	428	2,184	203	1,303	4,118
Processed	-	500	-	500	1,000
Unknown	14	1,769	1,200	10,000	12,983
Total	3,908	20,499	1,840	18,975	45,222
Avg./Company	301	1,139	230	1,581	1,256

HOUSEHOLD FIREWOOD

	Coarse Residues - Conifer Tons	Coarse Residues - Hardwood Tons	Fine Residues - Conifer Tons	Fine Residues - Hardwood Tons	Total
Sold	18	300	-	-	318
Given Away	291	838	8	10	1,147
Processed	1	31	-	11	42
Unknown	40	284	-	0	323
Total	349	1,452	8	21	1,830
Avg./Company	10	20	3	3	19

OTHER BIO-ENERGY PRODUCTS SUCH AS PELLETS, BRIQUETTES, BIODIESEL, ETHANOL

	Coarse Residues - Conifer Tons	Coarse Residues - Hardwood Tons	Fine Residues - Conifer Tons	Fine Residues - Hardwood Tons	Total
Sold	650	68,078	100	10,413	79,241
Given Away	-	37	5	116	158
Processed	-	-	-	-	-
Unknown	-	20	1,607	18,565	20,192
Total	650	68,135	1,712	29,094	99,591
Avg./Company	217	6,814	428	2,425	4,150

MULCH

	Coarse Residues - Conifer Tons	Coarse Residues - Hardwood Tons	Fine Residues - Conifer Tons	Fine Residues - Hardwood Tons	Total
Sold	9,155	28,949	910	9,918	48,932
Given Away	210	962	1	86	1,259
Processed	-	-	19	-	19
Unknown	2,526	8,292	-	1	10,819
Total	11,891	38,203	930	10,005	61,029
Avg./Company	699	1,273	186	834	1,151

MISCELLANEOUS USES SUCH AS CHARCOAL, SMALL DIMENSION, AND SPECIALTY ITEMS

	Coarse Residues - Conifer Tons	Coarse Residues - Hardwood Tons	Fine Residues - Conifer Tons	Fine Residues - Hardwood Tons	Total
Sold	-	1	-	-	1
Given Away	21	30	-	1	52
Processed	-	0	40	0	40
Unknown	2	11	-	-	13
Total	23	42	40	1	106
Avg./Company	6	6	40	1	9

1,953 tons of wood residue is “not used” annually, bringing WI’s Secondary Wood Industry’s total annual tons of raw and processed wood residue to 944,703.



APPENDICES

WI Manufacturing Wood/Paper Residue Generation – 2009

Contact information

(Please Correct the Contact Information if Necessary)

Company: _____
Contact Person/Title: _____
Address: _____
City, State, Zip: _____
Phone: _____ **Fax:** _____
Email: _____ **Website:** _____

Name of Person Completing Form: _____

ALL VOLUMES REPORTED WILL BE HELD CONFIDENTIAL AND WILL ONLY BE USED TO AGGREGATE TO THE COUNTY AND STATE LEVEL. Other information may be used to update the "Wisconsin Wood Residue Study – wood residue from manufacturing excluding sawmills" and "Directory of Wood Residue Generators in Wisconsin – Wood Residue from Manufacturing Excluding Sawmills".

I would like to **receive** a copy of the "Wisconsin Wood Residue Study " when it is published

I would like to be **omitted** from the "Directory of Wood Residue Generators in Wisconsin "

Please complete this form and return it promptly in the enclosed envelope. Please give your best **estimates** in answering the following survey questions. If you have any questions regarding the survey, please contact Don Peterson at 877-284-3882.

Wood / Paper Residue Generation

1. Wood waste/residue may be in the form of sawdust, shavings, edgings, etc. or in the form of wood packaging materials or pallets received with other goods. Paper/cardboard residue generation may be in any form. Does your company produce any of this type of material?

Yes [please complete the survey and return in the enclosed envelope] No [please return the survey in the enclosed envelope]

2. What is the weight or number of pallets scrapped (not reused as pallets) annually by your operations?

Pallet Type:	Weight (tons):	Average Pallet Size:	Disposed Of:	Utilized*:
Block			%	%
Stringer			%	%
Other:			%	%

** On Site, Sold, or Given Away*

3. How much wood waste/residue of other types is generated annually?

Type	Weight (tons)	Disposed Of	Utilized*
Dunnage [packing material]		%	%
Sawdust or sanderdust		%	%
Chips or shavings		%	%
Edgings or cut-offs		%	%
Other:		%	%

** On Site, Sold, or Given Away*

4. What % of your wood waste/residue is:

Sold _____ % Given Away _____ % Used On Site _____ %

5. Of the total wood waste/residue that is sold or given away please identify...

Type	Industrial Fuel	Residential Fuel	Landscaping /Mulch	Pallet Remanufacturing	Animal Bedding	Other:
Pallets	_____ %	_____ %	_____ %	_____ %	_____ %	_____ %
Other:	_____ %	_____ %	_____ %	_____ %	_____ %	_____ %
Other:	_____ %	_____ %	_____ %	_____ %	_____ %	_____ %
Other:	_____ %	_____ %	_____ %	_____ %	_____ %	_____ %

6. How do you dispose of wood waste/residue that you do not sell or give away?

Landfill _____ % Incinerated* _____ % On Site Heating _____ %
 Stock Piled _____ % Pay to Remove _____ % Other : _____ %
** Heat/energy is not recovered*

7. What is the approximate annual disposal cost for your wood waste/residue?

\$ _____

8. Does your company generate any paper or cardboard waste?

Paper: Yes No Cardboard: Yes No

If yes, what is the approximate volume of your annual paper/cardboard waste?

_____ Tons/Year Other: _____/Year
Please Select Unit of Measure

_____ Tons/Year Other: _____/Year
Please Select Unit of Measure

9. How do you dispose of the paper/cardboard residue?

Type	Recycled	Landfilled	Incinerated*	Other:
Paper	_____ %	_____ %	_____ %	_____ %
Cardboard	_____ %	_____ %	_____ %	_____ %

** Heat/energy is not recovered*

10. What is the approximate annual disposal cost for your paper/cardboard waste?

\$ _____

11. Is the wood/paper residue generated by your operations in the city this survey was mailed to?

Yes No: _____
please name the city and/or country in which it is generated

If you have any comments you would like to make, please do so in the space below:

APPENDIX II: WISCONSIN SECONDARY INDUSTRY SURVEY

DISPOSAL OF BARK AND WOOD RESIDUES GENERATED

Instructions: For each type of wood residue generated at your mill, enter the **percentage** and **volume** that was disposed of by the various means. Each column should sum to 100% for each species group recorded.

1. USED FOR:	COARSE RESIDUES (such as chips, cut-offs, edgings, etc.)		Sold	Given Away	Processed on Site	FINE RESIDUES (such as sawdust, veneer clippings, shavings, etc.)		Sold	Given Away	Processed on Site
	Conifer 21	Hardwood 22				Conifer 31	Hardwood 32			
a. Manufacture of fiber products or composite products such as pulp or particleboard	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	tons	tons				tons	tons			
b. Animal bedding	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	tons	tons				tons	tons			
c. Industrial fuel at this plant.	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	tons	tons				tons	tons			
d. Industrial fuel at other plants.	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	tons	tons				tons	tons			
e. Household firewood	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	tons	tons				tons	tons			
f. Other Bio-energy products such as pellets, briquettes, biodiesel, ethanol	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	tons	tons				tons	tons			
g. Mulch	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	tons	tons				tons	tons			
h. Miscellaneous uses such as charcoal, small dimension, and specialty items	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	tons	tons				tons	tons			
2. NOT USED (including landfill and bark burned as waste)	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	%	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	tons	tons				tons	tons			

APPENDIX III: WISCONSIN MANUFACTURING COMPANIES – SURVEY EXTRAPOLATION NUMBERS

Employee Size Class Category: 1-4

Total Companies in Class	2,453
Total Companies Surveyed in Class	152
Companies Not in Business Surveys	12
Percent of Companies with Failed Addresses	8%
Estimated Companies in Class Projecting an 8% Failed Rate	2,257

Companies Surveyed Minus Failed Addresses	140
Responding Companies Without Definitive Wood Waste	21
Responding Companies With Wood Waste	5
Total Surveys Not Returned	114
Percent Response Rate $\{(21+5)/140\}$	19%
Surveyed Companies With Pallet Waste	4
Projected Companies with Pallet Waste $\{(4/26)(2,257)\}$	339
Volume Per Surveyed Company (Tons)	10.61
Surveyed Companies with Dunnage/Other Wood Waste	3
Projected Companies with Dunnage/Other Wood Waste $(3/26)(2,257)$	271
Volume per Surveyed Company	10.7

Employee Size Class Category: 5-19

Total Companies in Class	4,906
Total Companies Surveyed in Class	330
Companies Not In Business from Surveys	7
Percent of Companies with Failed Addresses	2%
Estimated Companies in Class Projecting an 2% Failed Rate	4,808

Companies Surveyed Minus Failed Addresses	323
Responding Companies Without Definitive Wood Waste	52
Responding Companies With Wood Waste	6
Total Surveys Not Returned	265
Percent Response Rate $(58/323)$	18%
Surveyed Companies With Pallet Waste	6
Projected Companies with Pallet Waste $\{(6/58)(4,808)\}$	481
Volume Per Surveyed Company (Tons)	1.22
Surveyed Companies with Dunnage/Other Wood Waste	4
Projected Companies with Dunnage/Other Wood Waste $(4/58)(2,257)$	337
Volume per Surveyed Company	.81

Employee Size Class Category: 20-49

Total Companies in Class	2,617
Total Companies Surveyed in Class	877
Companies Not in Business from Surveys	34
Percent of Companies with Failed Addresses	4%
Estimated Companies in Class Projecting an 4% Failed Rate	2,512

Companies Surveyed Minus Failed Addresses	843
Responding Companies Without Definitive Wood Waste	98
Responding Companies With Wood Waste	44
Total Surveys Not Returned	701

Percent Response Rate $\{(98+44)/843\}$	17
Surveyed Companies With Pallet Waste	36
Projected Companies with Pallet Waste $\{(36/142)(2,512)\}$	628
Volume Per Surveyed Company (Tons)	24.09
Surveyed Companies with Dunnage/Other Wood Waste	20
Projected Companies with Dunnage/Other Wood Waste $(3/26)(2,257)$	352
Volume per Surveyed Company	2.97

Employee Size Class Category: 50-99

Total Companies in Class	1,263
Total Companies Surveyed in Class	919
Companies Not In Business from Surveys	16
Percent of Companies with Failed Addresses	2%
Estimated Companies in Class Projecting an 2% Failed Rate	1,238

Companies Surveyed Minus Failed Addresses	903
Responding Companies Without Definitive Wood Waste	20
Responding Companies With Wood Waste	40
Total Surveys Not Returned	793
Percent Response Rate $\{(70+40)/903\}$	12%
Surveyed Companies With Pallet Waste	40
Projected Companies with Pallet Waste $\{(39/110)(1,238)\}$	433
Volume Per Surveyed Company (Tons)	258.13
Surveyed Companies with Dunnage/Other Wood Waste	13
Projected Companies with Dunnage/Other Wood Waste $(13/110)(1,238)$	149
Volume per Surveyed Company	33.96

Employee Size Class Category: 100-249

Total Companies in Class	1,026
Total Companies Surveyed in Class	821
Companies Not In Business from Surveys	9
Percent of Companies with Failed Addresses	1%
Estimated Companies in Class Projecting an 1% Failed Rate	1,016

Companies Surveyed Minus Failed Addresses	812
Responding Companies Without Definitive Wood Waste	53
Responding Companies With Wood Waste	41
Total Surveys Not Returned	718
Percent Response Rate $\{(53+41)/812\}$	12%
Surveyed Companies With Pallet Waste	38
Projected Companies with Pallet Waste $\{(38/94)(1,016)\}$	406
Volume Per Surveyed Company (Tons)	92.79
Surveyed Companies with Dunnage/Other Wood Waste	23
Projected Companies with Dunnage/Other Wood Waste $(23/94)(1,016)$	244
Volume per Surveyed Company	115

Employee Size Class Category: 250-499

Total Companies in Class	343
Total Companies Surveyed in Class	294

Companies Not In Business from Surveys	6
Percent of Companies with Failed Addresses	2%
Estimated Companies in Class Projecting an 2% Failed Rate	336

Companies Surveyed Minus Failed Addresses	288
Responding Companies Without Definitive Wood Waste	11
Responding Companies With Wood Waste	18
Total Surveys Not Returned	259
Percent Response Rate $\{(11+18)/288\}$	10%
Surveyed Companies With Pallet Waste	17
Projected Companies with Pallet Waste $\{(17/29)(336)\}$	197
Volume Per Surveyed Company (Tons)	94.5
Surveyed Companies with Dunnage/Other Wood Waste	8
Projected Companies with Dunnage/Other Wood Waste $(8/29)(336)$	94
Volume per Surveyed Company	62.43

Employee Size Class Category 500+

Total Companies in Class	178
Total Companies Surveyed in Class	178
Companies Not In Business from Surveys	1
Percent of Companies with Failed Addresses	-----
Companies in Class	177

Companies Surveyed Minus Failed Addresses	177
Responding Companies Without Definitive Wood Waste	9
Responding Companies With Wood Waste	12
Total Surveys Not Returned	160
Percent Response Rate $\{(9+12)/177\}$	12%
Surveyed Companies With Pallet Waste	12
Projected Companies with Pallet Waste $\{(12/21)(177)\}$	101
Volume Per Surveyed Company (Tons)	200.32
Surveyed Companies with Dunnage/Other Wood Waste	6
Projected Companies with Dunnage/Other Wood Waste $(6/21)(177)$	51
Volume per Surveyed Company	122.5

	Employee Size Class Categories						
	1-4	5-19	20-49	50-99	100-249	250-499	500+
Total Companies in Class	2,453	4,906	2,617	1,263	1,026	343	178
Total Surveyed	152	330	877	919	821	294	178
Companies Not In Business	12	7	34	16	9	6	1
Not Pertinent	21	52	98	70	53	11	9
Total Answered	5	6	44	40	41	18	12
Survey Success	19%	18%	17%	12%	12%	10%	12%
Total Not Returned	114	265	701	793	718	259	160

ASSUMPTIONS FOR STRATIFICATION

Utilized/Disposed of Figures

- In questions 2 and 3 of the Wisconsin Manufacturing Survey (Appendix I), the percentage of pallets and dunnage respectively utilized and disposed of was captured in the survey questions. The percentages for each respective category of Pallets (Utilized and Disposed Of) and Dunnage (Utilized and Disposed Of) was totaled to reflect 100% of the waste in each category. Using the totals, a percent was applied to both utilized and disposal. Extrapolating the total number of tons in each size class by class size-specific percent utilized and disposed of, a total number of tons utilized and disposed of was developed. The following table shows the estimated percentages applied to the total tons of residue available in both of these categories:

Block/Stringer		Dunnage			
Company Size	%Disposed Of:	% Utilized:	Company Size	%Disposed Of**:	% Utilized**:
1-4	25	75	1-4	13	87
5-19	40	60	5-19	24	76
20-49	41	59	20-49	36	64
50-99	28	72	50-99	54	46
100-249	41	59	100-249	48	52
250-499	27	73	250-499	27	73
500+	45	55	500+	76	24

- Once a total ton figure was obtained for wood waste/dunnage utilized and disposed of for each size class, the percentages received from survey respondents for end-uses (utilized and disposed of respectively) were applied to the tonnage totals to estimate tons in each sub-category (i.e. industrial fuel, residential fuel, etc.).