

Materials Disposition

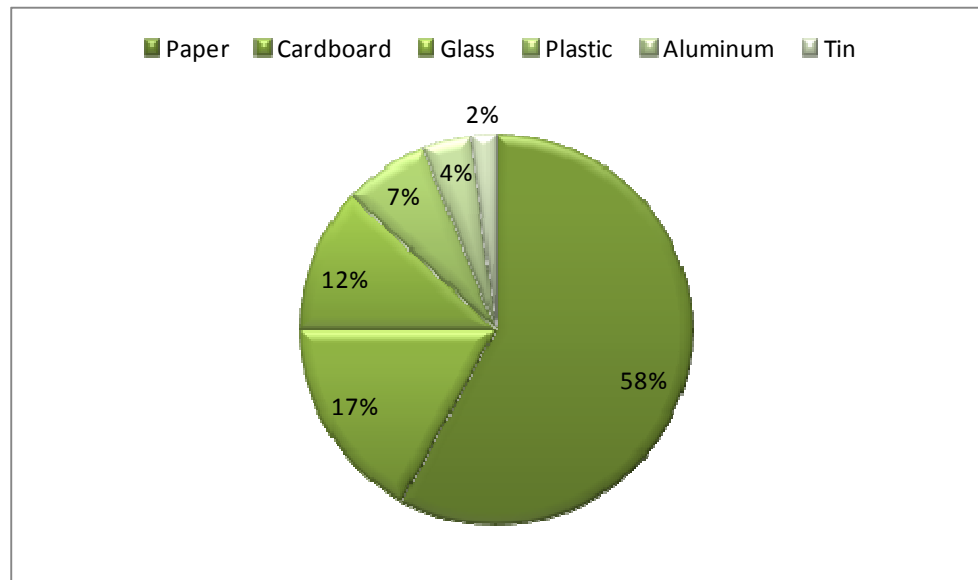


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When a product used by the University of Wisconsin – Whitewater (UW-Whitewater) has completed its useful life, it is disposed of in one of two ways. The product may be placed in a trash can or dumpster to be taken to the land fill, or it may be placed in a recycling bin. During the second quarter of this year, 234 tons of waste was collected. Of this total, 23 percent was recycled, while the remaining 77 percent was land filled.

UW-Whitewater employs one collection service, Johns Disposal Service, Inc., for both its land fill and recyclable waste. A single-sort process is utilized to collect the following recyclables: paper, aluminum cans, tin cans, plastic, glass and cardboard. Figure 1 shows the percentage of each of these materials that was recycled during the first two quarters of 2008. Paper recycling accounted for the largest amount, with approximately 58 percent of the total tons of materials recycled.

Figure 1
Percent of Total Tons of Materials Recycled During the First Two Quarters of 2008



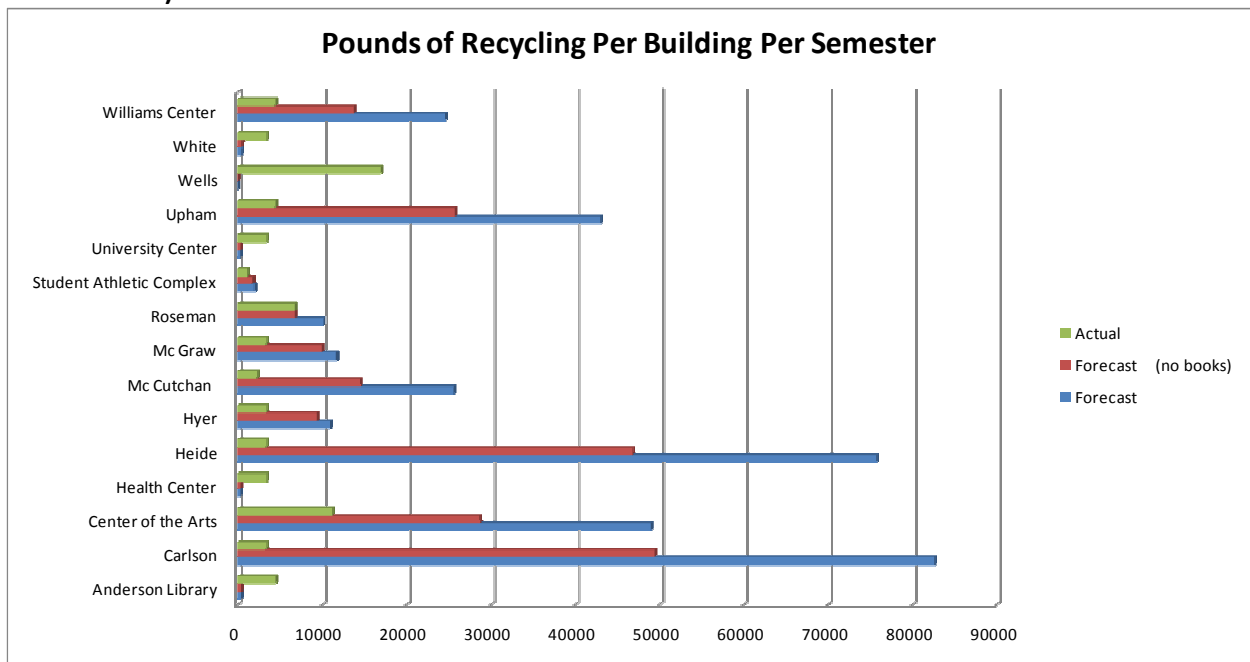
John’s Disposal Service, Inc. (John’s) collects land fill waste and recycling materials from outside dumpsters at 39 buildings on the UW-Whitewater campus. The amount of material collected at each building is not available. However, the amount of material collected per semester can be approximated based on the dumpster size at each building and the number of waste collection times per week. Appendix 1 at the end of this chapter provides a chart of approximate pounds of land fill waste collected for each building during a semester. Appendix 2 provides a chart of approximate pounds of recycling materials collected for each building per semester, and Appendix 3 shows the approximate CO₂ values associated with each of these materials.

How does this data compare with the forecast and MRP data discussed earlier in this report?

Forecast and MRP data were compiled for recyclable materials collected fifteen campus buildings.

Figure 2 shows these results (labeled “Forecast”) compared to the approximated actual recycling collection results from John’s (labeled “Actual”).

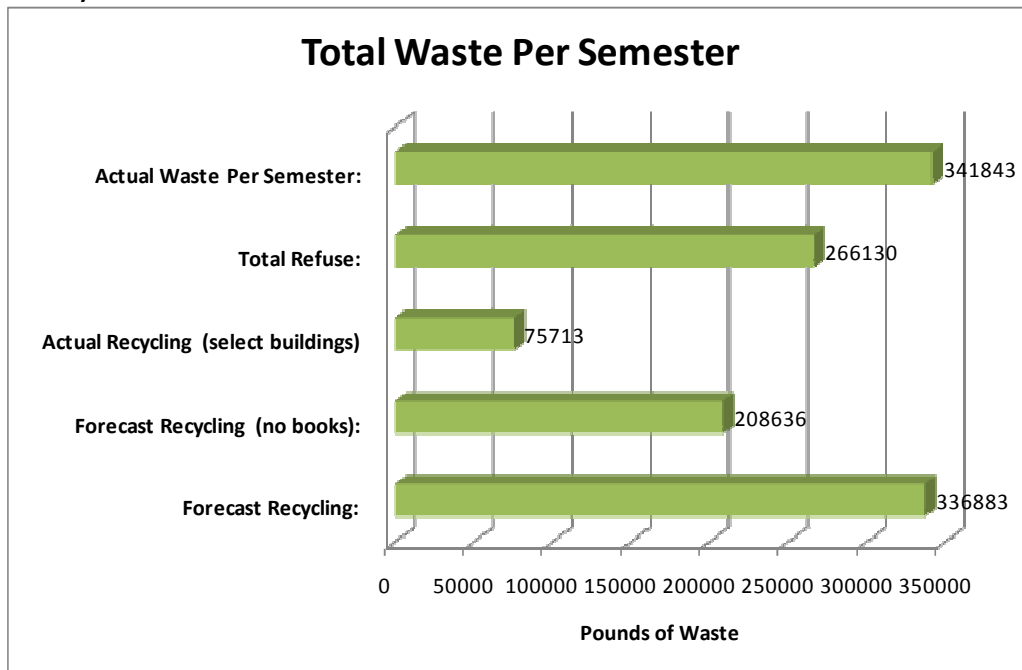
Figure 2
Pounds of Recyclable Materials Collected from 15 Campus Buildings during One Semester (Forecast versus Actual)



As Figure 2 shows, there is a discrepancy between the forecasted amount and the actual amount of recyclable materials collected per semester. Because many assumptions were made during the compilation of this data, there are many potential reasons for this discrepancy. All materials reported in the forecast were assumed to be recyclable. These materials were also assumed to be recycled every semester. However, some purchased materials, such as text books, that were included in the forecast would not realistically be recycled every semester. To account for this discrepancy, a forecast category called “forecast, no books” was added to Figure 2. This category shows the forecast waste materials for each building if text books were not recycled during a given semester.

Comparing the weight of waste for all fifteen measured campus buildings yields the results shown in figure 3. As this figure shows, the actual weight of total waste and the forecast weight of recycling waste are almost identical.

Figure 3
Total Pounds of Waste Collected from 15 Campus Buildings during One Semester (Forecast versus Actual)



The forecast data is very similar to the actual data when comparing total weight, but very different from the actual data when broken down by recycling per building. One hundred percent of the forecast data is made of a potentially recyclable material. Therefore, 100 percent of the forecast data was assumed to have been recycled in Figure 2. Data from John’s however, shows that only 23 percent of the actual total waste was recycled. Figure 4 shows the percentage of total actual waste by weight that was actually recycled and land filled, compared to the percentage of the total actual waste weight that can be accounted for by the forecast (with and without text books).

Figure 4
Percentage of Total Pounds of Waste Collected from 15 Campus Buildings during One Semester (Forecast versus Actual)

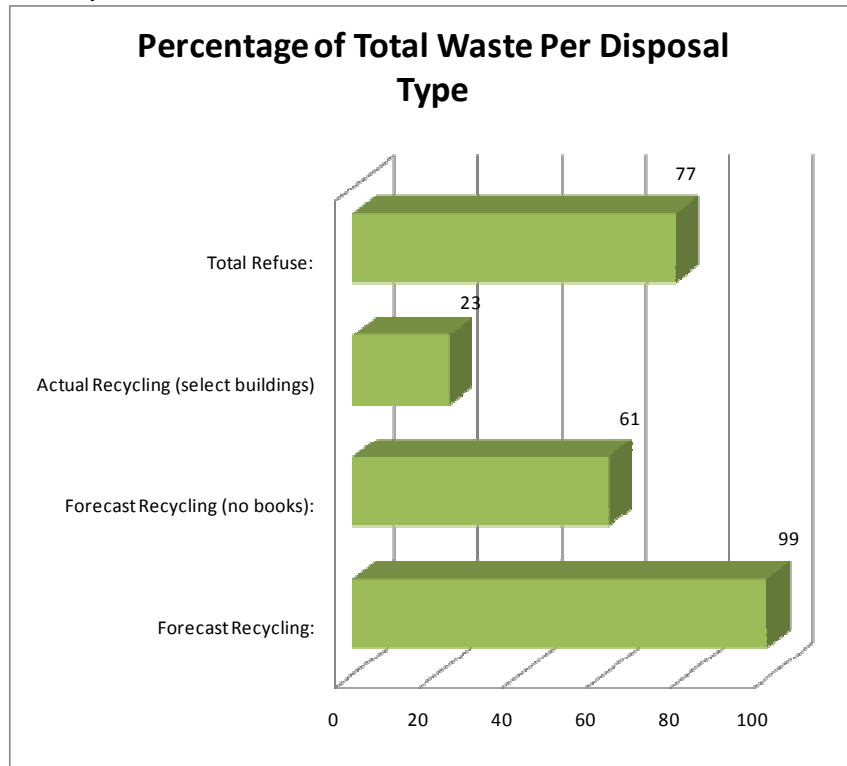


Figure 4 shows the potential for an increase in campus wide recycling. If materials projected in the “Forecast Recycling (no books) category were all recycling, campus wide recycling would increase from 23 percent of total waste by weight to 61 percent of total waste by weight.

Other assumptions were made as well that affected the computations of total actual and forecast waste. When breaking the actual recycling collection data from John's into pounds per building, an average amount of material collected per cubic yard of recycling bin was computed. Materials were then allotted per building based on the size of the collection bins in cubic yard located at the building and the number of collection times per week. It is very possible that the fifteen buildings forecast in this study do not generate the average amount of recyclable waste. In order to find a true actual amount of recyclable waste per building, more detailed collection records must be obtained from John's.

Comparing the percentage of forecast recycling to the percentage of actual recycling shows that there are many opportunities to divert waste from landfills at the UW-Whitewater. Reverse logistics can be employed to determine some of these opportunities. Through reverse logistics, waste items can be retrieved prior to land filling and value can be recovered. The value of waste items can include refurbishing the entire item for resale, extracting components for use in manufacturing new products, or extracting valuable raw materials such as precious metals for resale (Bryne, 2007; Kocabasoglu, Prahinski and Klassen, 2007; and Srivastava, 2008). Waste items can be retrieved by the item's original manufacturer, or by a third party recycling company. At the UW-Whitewater, items that are not recyclable through John's disposal service are good candidates for this process. These items include ink cartridges and electronics (Nagurney and Toyasaki, 2005).

Another potential waste reduction strategy described through reverse logistics is leasing equipment instead of buying it outright. Advantages of leasing include repairs during the useful life of the product and return to the company instead of disposal to a landfill (Pagell, Wu and Murthy, 2007).

Composting food waste is a third potential waste reduction strategy that could be employed by the UW-Whitewater. Currently, no data is available on the total amount of food waste disposed of at

the UW-Whitewater. However, 11 percent of the municipal waste disposed of in the state of Wisconsin is food waste (WasteCap Wisconsin, 1997). More research should be conducted to determine if food waste constitutes a significant proportion of overall landfill refuse.

A final potential strategy for reducing landfill waste is increasing the number of recycling bins located throughout the UW-Whitewater campus. Many recycling bins are located within campus buildings. However, few bins are located along student, faculty and staff walking routes from parking lots to campus buildings. The average person will recycle when the benefits of recycling outweigh the costs. Benefits include the personal satisfaction gained from acting in a socially conscious manner and costs include the inconvenience of physically taking items to the recycling collection point (Meen-Chee and Narayanan, 2006). Heavier items such as bottles and cans are more inconvenient to transport than lighter items such as paper. For this reason, the average person will travel a much shorter distance to recycle an aluminum can than to recycle a piece of paper (Ando and Gosselin, 2005). This pattern holds true at the UW-Whitewater, where 58 percent of the total material recycled is paper. If recycling an item is just as convenient as placing it in a trash can, the majority of people will choose to recycle (Ando and Gosselin, 2005). Placing recycling bins beside outdoor trash cans, then, would make recycling more convenient and increase the overall amount of recycling.

Appendix 1: Actual 2008 UW-Whitewater Refuse Disposal by Building

Data from John's Disposal Service (1st and 2nd quarter of 2008)

Building	Pounds of Refuse Per Semester
General Services-Warehouse	1786
General Services	5358
Res Life Storage Shed	5358
Arey Hall	10717
Benson Hall	10717
Bigelow Hall	14289
Bookstore	5358
CA inside	3572
CA loading dock	2679
CA scene shop	1786
CA ceramics room	3572
Carlson	10717
Clem Hall	14289
Drumlin	10717
Drumlin	32150
Esker	42867
Fischer Hall	14289
Goodhue	5358
Grounds Crew	14289
Health Center	2679
Heating Plant	893
Heide Hall	7144
Hyer Hall	2679
Knilians Hall	14289
Lee Hall	28578
Library	8931
McCutchan Hall	2679
McGraw Computer Center	2679
Roseman Hall	16075
Tutt Hall	10717
University Center	16075
University Center	21433
Upham Hall	5358
Warhawk Stadium	2679
Wellers	14289
Wells East	53583
Wells West	75017
White Hall	10717
Williams Center	16075

Appendix 3: Actual 2008 UW-Whitewater Recycling Disposal by Building

Data from John's Disposal Service (1st and 2nd quarter of 2008)

Building	Total Pounds of Recycling Per Semester	Pounds of Paper Per Semester	Pounds of Card Board Per Semester	Pounds of Glass Per Semester	Pounds of Plastic Per Semester	Pounds of Aluminum Per Semester	Pounds of Tin Per Semester
General Services-Warehouse	1130	655	192	136	79	45	23
General Services	2260	1311	384	271	158	90	45
Arey Hall	3390	1966	576	407	237	136	68
Benson Hall	6780	3933	1153	814	475	271	136
Bigelow Hall	6780	3933	1153	814	475	271	136
Bookstore	3390	1966	576	407	237	136	68
CA inside	3390	1966	576	407	237	136	68
CA loading dock	2260	1311	384	271	158	90	45
CA scene shop	2260	1311	384	271	158	90	45
CA ceramics room	4520	2622	768	542	316	181	90
Carlson	3390	1966	576	407	237	136	68
Clem Hall	6780	3933	1153	814	475	271	136
Esker	20341	11798	3458	2441	1424	814	407
Fischer Hall	5085	2949	864	610	356	203	102
Goodhue	3390	1966	576	407	237	136	68
Health Center	3390	1966	576	407	237	136	68
Heide Hall	3390	1966	576	407	237	136	68
Hyer Hall	3390	1966	576	407	237	136	68
Knilians Hall	5085	2949	864	610	356	203	102
Lee Hall	3390	1966	576	407	237	136	68
Library	4520	2622	768	542	316	181	90
McCutchan Hall	2260	1311	384	271	158	90	45
McGraw Computer Center	3390	1966	576	407	237	136	68
Roseman Hall	6780	3933	1153	814	475	271	136
Tutt Hall	5085	2949	864	610	356	203	102
University Center	3390	1966	576	407	237	136	68
University Center	3390	1966	576	407	237	136	68
Upham Hall	4520	2622	768	542	316	181	90
Warhawk Stadium	1130	655	192	136	79	45	23
Wellers	6780	3933	1153	814	475	271	136
Wells East	6780	3933	1153	814	475	271	136
Wells West	10170	5899	1729	1220	712	407	203
White Hall	3390	1966	576	407	237	136	68
Williams Center	4520	2622	768	542	316	181	90

Appendix 3: 2008 UW-Whitewater CO₂ per Recycled Product by Building

(CO₂ conversion same as used in mapping section of report)

Building	Total Units of CO ₂	Paper CO ₂	Card Board CO ₂	Glass CO ₂	Plastic CO ₂	Aluminum CO ₂	Tin CO ₂
General Services-Warehouse	6568	1268	54	4339	364	362	181
General Services	13136	2537	108	8679	728	723	362
Arey Hall	19704	3805	161	13018	1092	1085	542
Benson Hall	39407	7610	323	26036	2183	2170	1085
Bigelow Hall	39407	7610	323	26036	2183	2170	1085
Bookstore	19704	3805	161	13018	1092	1085	542
CA inside	19704	3805	161	13018	1092	1085	542
CA loading dock	13136	2537	108	8679	728	723	362
CA scene shop	13136	2537	108	8679	728	723	362
CA ceramics room	26271	5074	215	17358	1455	1446	723
Carlson	19704	3805	161	13018	1092	1085	542
Clem Hall	39407	7610	323	26036	2183	2170	1085
Esker	118221	22831	968	78109	6550	6509	3255
Fischer Hall	29555	5708	242	19527	1637	1627	814
Goodhue	19704	3805	161	13018	1092	1085	542
Health Center	19704	3805	161	13018	1092	1085	542
Heide Hall	19704	3805	161	13018	1092	1085	542
Hyer Hall	19704	3805	161	13018	1092	1085	542
Knilians Hall	29555	5708	242	19527	1637	1627	814
Lee Hall	19704	3805	161	13018	1092	1085	542
Library	26271	5074	215	17358	1455	1446	723
McCutchan Hall	13136	2537	108	8679	728	723	362
McGraw Computer Center	19704	3805	161	13018	1092	1085	542
Roseman Hall	39407	7610	323	26036	2183	2170	1085
Tutt Hall	29555	5708	242	19527	1637	1627	814
University Center	19704	3805	161	13018	1092	1085	542
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Upham Hall	26271	5074	215	17358	1455	1446	723
Warhawk Stadium	6568	1268	54	4339	364	362	181
Wellers	39407	7610	323	26036	2183	2170	1085
Wells East	39407	7610	323	26036	2183	2170	1085
Wells West	59111	11415	484	39054	3275	3255	1627
White Hall	19704	3805	161	13018	1092	1085	542
Williams Center	26271	5074	215	17358	1455	1446	723

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