

# Cleaning Up Our Trash

Improving Recycling at UW-Madison by  
Reducing Recyclables in the Trash Stream

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A collaboration between We Conserve and Rethink Wisconsin

## Overview

The University is diverting refuse from the waste stream by programs like SWAP, and salvaging of equipment by the Physical Plant. In addition to those programs the University is diverting 28% of its waste by weight from the landfill through its recycling program and the waste and recycling department, which means over 2400 tons are diverted from area landfills each year. That is an impressive accomplishment of which the University can be proud; however there is still room for improvement. Towards that end, in the fall of 2008 discussions began regarding the University's recycling practices and programs. Those discussions led to systematic inquiries of the current strengths and weaknesses of recycling at UW-Madison. Trash composition studies were completed, the use of recycling "stations" was piloted, audits of buildings were conducted, and current recycling procedures observed. Cooperation between the Custodial Department, Waste and Recycling, Physical Plant Administration, and ReThink Wisconsin, a student group at UW-Madison, made the findings in this report possible.

## Goals

- To measure current levels of recycling in a sample of campus buildings
- To identify the composition of non-recyclable waste in those buildings
- To provide a baseline for evaluating the success of programs designed to increase recycling and reduce waste
- To gain experience with the volunteer trash sort methodology for future use as the University continues to work toward sustainability
- To make recommendations for improving recycling at the UW-Madison
- To decrease the number of bags/liners used on campus.

## Method

### Sample of Buildings

Five buildings were selected as the sample for this investigation: Memorial Library, Helen C. White Library, the Psychology Building, the Law School building, and the Computer Science building. The sample was chosen to include only medium-large sized buildings, serving many people every day in a diversity of functions. While future investigations may want to focus on the recycling behaviors of specific populations or building types, the aim of this first study was to obtain a general description of recycling in typical academic buildings, so buildings were chosen to be representative of all members of the University Community.

### Garbage Sorts

Three sorts were scheduled for each building between the dates of February 5<sup>th</sup> and February 17<sup>th</sup>, 2009. At each sort a team of student volunteers from Rethink Wisconsin opened a sample of garbage bags, ranging from 4 to 16 bags depending on building waste from the previous night and separated out all recyclable material into two streams: 1) mixed paper and 2) bottles & cans. At the end of each sort the weight of the recyclable and non-recyclable material was recorded so that a Contamination Percentage could be calculated by dividing the weight of the recyclables by the total weight of recyclables plus trash. Volunteers took notes on the relative proportions of mixed paper versus office paper, as well as the composition of non-recyclable trash.

$$\text{Percent Contamination} = \frac{\text{weight recyclables}}{\text{weight recyclables} + \text{weight trash}}$$

## Results

### Current Levels of Recycling

All buildings in the sample showed significant contamination of recyclable material in the trash stream, ranging from 25% - 47%. Furthermore, our numbers *underestimate* the true contamination rates, because many pounds of paper were too soiled by food waste to be recyclable and therefore were considered trash. Evidence for incorrect disposal of both recyclable paper and bottles & cans was found in every building. On average 20% of the trash stream was recyclable paper.

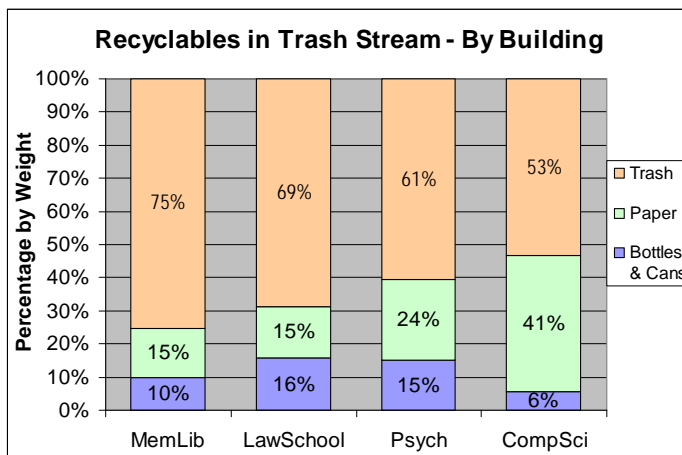


Figure 1: Bars in above graph show the percent of contamination of recyclable paper (green) and recyclable bottles & cans (blue) in each building.

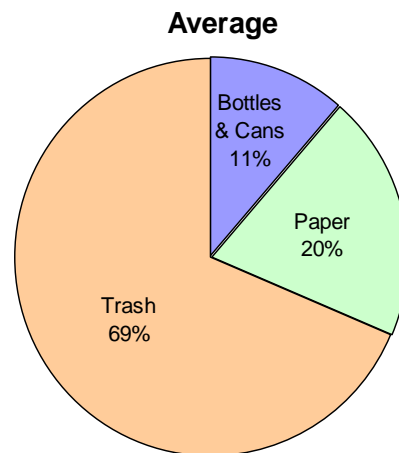


Figure 2: Graph above shows percent of recyclables in waste stream, averaged across all buildings in the sample.

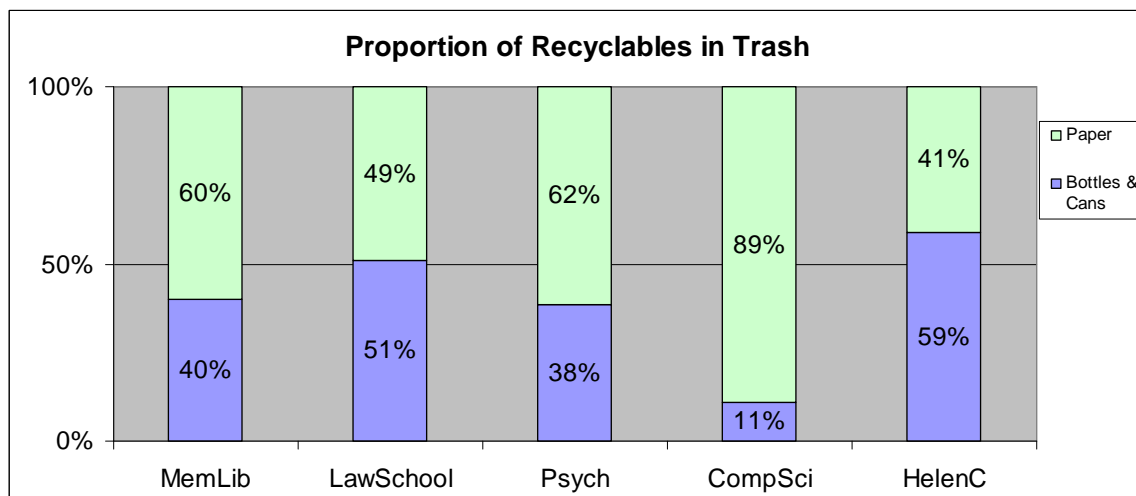


Figure 3: From all recyclables found in a building's waste stream, the above graph shows what percentage was paper and what percentage was bottles & cans.

### Recyclable Paper

Trash stream contamination from recyclable paper was evident in every building, but worst in the Psychology, Memorial Library, and the Computer Science Buildings, so data from those buildings were more thoroughly explored in this regard. Nearly all garbage bags contained some office paper and/or recyclable mixed paper. However volunteers' notes indicate that contamination was not evenly spread out across bags, but rather the majority of the contamination was driven by a small number of garbage bags that were nearly full of sorted office paper. In all three buildings over 15% of bags fit this highly contaminated pattern: (6 out of 36 at Memorial Library, 2 out of 12 in the Psychology Building, 3 out of 11 at Computer Science). In some cases it appeared that use of a black trash bag instead of a clear recycling bag caused it to be placed in the wrong pile. In other cases a bin of office paper may have been judged too contaminated from food waste and been dumped in the trash.



### Bottles & Cans

All buildings suffered from contamination of recyclable bottles and cans in the trash stream. The same problems discussed above for office paper were also true for bottles & cans. Use of a black bag in a recycling bin resulted in sorted bags of recyclables being incorrectly thrown out, and some clear bags had probably been judged too contaminated from trash to go in the recycling stream. Also notable was the fact that many bottles & cans were found inside the small garbage bags coming from the short trash bins in offices and hallways.



### Trash Composition

Food waste and food packaging were the largest sources of non-recyclable trash. Disposable coffee cups, soda cups, plastic deli containers, paper bags, yogurt containers, foil chip bags, candy wrappers, Styrofoam cups and containers, and wax wrapping paper were among the most prolific. Organic matter such as banana peels and coffee grounds were also found, however food packaging was a larger source of waste than food itself. Very few packing materials were found in this sample. Substantial amounts of electronic waste were found in the trash bags at the computer science building.

### Receptacles

Currently the University has numerous bins that play the role of recycling receptacles. Bins vary from building to building and unit to unit. Some locations do not even offer a receptacle for recycling. Confusion about recycling on campus due to inconsistent receptacles and labeling, particularly in regard to paper materials, is a frequent complaint among students and staff.



*Picture taken at Microbial Sciences. Notice there is no location for paper.*

A pilot study was run at Atmospheric, Oceanic and Space Sciences to arrange existing bins into stations that would consolidate recycling to one station in hallway locations. The stations contained 3 bins: mixed paper, glass/plastic/aluminum and trash, which ensured that recycling bins for all streams were

present and easily visible. Three weeks after the introduction of the stations contamination of recyclables in the trash bins was reduced by roughly 30% from previous sorts, though some users were still confused because office paper continued to be collected in offices and in areas where office paper was prominent.

Discussions with other universities including BYU and University of Colorado have also stressed the need for stations to be implemented wherever a garbage can is located. A station that is currently on campus and provides the greatest functionality is made by Rubbermaid. The product sells for roughly \$425 per station. Included in the station are four “Slim Jim” containers that would allow for separation of waste streams. This station is currently being piloted in Helen C. White library, which was one of the buildings investigated with trash sorts. Volunteers there reported considerably fewer recyclables in the trash stream than volunteers in other buildings.



*Product can be blue as shown or beige. Tops are interchangeable and come with labels. Example of product is on 2<sup>nd</sup> floor of the Service Building.*

Recycling stations need to be located in high traffic and visible areas. This accomplishes two goals. It promotes campus recycling by increasing the visibility of the program, and it also provides receptacles where the people are, instead of creating a situation where individuals are left looking for the correct receptacle. This change would be implemented with help from building managers and custodial leads.

Adding to confusion about campus recycling are differences with surrounding communities' recycling programs. The City of Madison accepts all recyclables in one bin, to be professionally separated at a later time. On campus however office paper,

mixed paper, cardboard and glass/plastic/aluminum are collected in different bins which requires separation by each user. This practice on campus is due to the fact that when products are pre-sorted by users they draw a higher value when recycled because they avoid the need for professional sorting fees.

## Recommendations

### Changes to Custodial Practices

While conducting the building tours and trash sorts, several items of business that custodial staff could do to help increase campus recycling and rubbish disposal efficiency were identified. The first item would be to confirm that all recycling containers are lined with a clear plastic bag. It was brought to our attention that the clear bags currently being used are not a thick enough mil, allowing the bag to easily rip when recyclables are disposed of. Custodial staff has dealt with this in two ways. The first is to double or triple the bag, and the other is discontinuing the use of the clear bag and using the sturdier black bag. Both ad-hoc solutions solve the breakage issue, but the first wastes time and bags, and the second leads to recyclable items getting placed in the trash because there is no way to distinguish the items in the bag. Data from the trash sorts suggest a rough estimate that 1 out of 6 bags (17%) in the trash stream actually contain sorted recyclable material. Building tours also confirmed that many recycling bins were lined with black bags, making it very likely their contents would mistakenly enter the trash stream.



*Note that the black bags consisted of recyclable materials. These items were discovered and placed in the proper location. (Waisman Center)*

Currently 4,137 cases or 1,034,250 clear recycling bags are purchased each year with a cost of nearly \$150,000. Purchasing an equivalent number of thicker mil bags would cost an additional \$20,000 to \$30,000 over the current budget, however due to rampant double and triple bagging with the current bag it is likely that considerably fewer bags would be needed. Furthermore, as pointed out by The Waste and Recycling Department, many recycling bins are currently being lined with heavy mil black bags anyway, so replacing these with heavy mil clear bags (which cost about the same) would not have an additional impact on bag cost.

Even if we conservatively assume that the trash sorts overestimate the problem of bags entering the wrong stream by a factor of 2, and assume the actual rate is closer to 10%, eliminating errors due to mis-bagged recyclables would result in 620 fewer tons of trash the University sent to the landfill for a cost avoidance of \$28,000. At the present time (03/2009) the recycling market is flat so possible revenues from recycling are not included. These savings, and the added value of a more efficient recycling program, would more than offset the price increase of higher mil clear bags.

Bag costs could be further reduced by implementing more substantial changes to recycling policies, as outlined in the next section on *More Extensive Changes*.

Equally important to changing the physical bags themselves is training for custodial staff members, and explaining the importance of making sure bags that are set out during cleaning routes are separated from each other. Clearly separated piles of trash and recycling bags will reduce error and labor during pick up, work has already begun with custodial services on this issue.



*This was found at many locations. Unorganized piles make pick up difficult because separation needs to be performed, which leads to recyclables making their way into trash. (Note that most pick ups occur during periods when daylight is not present, further complicating the task.)*



*This is an example of ideal separation when waste comes from buildings for pickup and discourages contamination of recyclables in trash.*

### Implementation of Recycling Stations

The cost for outfitting buildings with all new recycling units would be significant and would not be a good use of the current units that are in relatively good condition. Instead the University should implement the new Rubbermaid stations over the next 3-5 years, beginning with the following facilities which see much traffic throughout the year. Results from trash sorts show these facilities are seeing that 25% or more of their trash is recyclable. Smart placement of recycling stations has been shown to reduce this contamination in the pilot at Helen C. White Library, as well as at other universities. The stations would also go in areas where facility managers are requesting new containers. Suggested buildings and numbers of stations are:

Total for Round One Phase in:  $66 * \$425 = \$28,050$

Steenbock Library - 16

Memorial Library- 10

Humanities- 16

Memorial Library / Helen C. White (a few new stations are already at this location) - 14

Microbial Sciences (there is currently no paper recycling in commons areas) - 10

Possible Buildings to look into for Round Two:

Law Building

Psychology Building

Computer Science Building

Ingrahm Hall

Van Vleck

Engineering Halls

At our discounted rate of \$425/ piece there would still be significant costs, however, if campus wide, we were to increase recycling even 10% there would be a realized cost avoidance of nearly \$30,000 per year using 2008 rubbish weights and current tipping charges of \$45 per ton<sup>1</sup>. There may also be income from the sales of recyclables in the future but at current pricing and trends no estimate will be provided, however recycling remains the most cost efficient way to dispose of rubbish.

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<sup>1</sup> Data attained from Pete Lowery, Director of UW-Madison Waste and Recycling.

## Education

Education continues to be an important aspect of recycling and its success. Education needs to occur with both those who are using the receptacles and those who manage the receptacles.

Confusion about what is recyclable and which bin to put it in, particularly regarding paper products, is a frequent complaint from students and likely contributes to recyclable material being placed in trash. Education for students will be approached in several ways. A short email will go to all students and staff explaining what is recyclable and why it is important to recycle. A power point slide for professors to use at the end of each lecture will be available on the We Conserve Website explaining the recycling program, and encouraging students to properly dispose of their waste. Support staff will also be available to talk about recycling in classrooms.

Informational posters utilizing eye catching design principles will use pictures to quickly convey information about what material goes in what bin, directly at the waste stations. Because members of the University are confronted with enormous amounts of information every day, it is crucial that these posters not only carry the information of our message, but that they are appealing enough to cut through the clutter and actually deliver that message to members of the University. While the ability to create such powerful visual graphics is beyond the authors of this report, we are fortunate to be located at a world class University with access to thousands of artists and graphic designers. To tap into this large pool of creative talent, a campus-wide contest will be conducted by We Conserve to solicit designs from all members of the University community. The contest description will clearly specify the informational content submissions should include, as well as dollar amounts for a first prize and several second prizes. The contest will be publicized through email via relevant departments, such as Art and Graphic Design, posted flyers, and potentially in the daily student papers. Conversations with graduate students in the Art department suggest that a first prize of \$500 would likely generate many submissions, which would be far less than the cost of hiring a professional designer. The contest will run one month long, after which a pre-determined committee of members of We Conserve and other relevant parties will decide the winners. While the Facilities Department would be under no obligation to use the winning designs, it is quite likely that we would receive many high quality submissions and thus many attractive options for communicating our message. The contest would have the additional benefit of reaching out to students and the University community, and getting them involved with waste reduction on campus.

While the posters will be useful for communicating information about and raising visibility of recycling, studies have repeatedly shown that information is most effective when it is provided as close in time as possible to the moment of decision. For recycling, this means providing information at the bins themselves about what goes in each. A simple implementation of this was tested at Florida State University in 1993. They found that simply placing signs reading “Recyclable Materials” and “Trash Only” directly above bins decreased contamination by over 50%. Similar prompts can be adopted for our recycling program in the form of small decals that will complement the labels already

on the bins and the posters above them, reinforcing the message of proper recycling every time a student or staff member makes a decision about which bin to use.

Education for custodial staff would occur from custodial leads through training, and using pictures/photographs in a reference guide that would show proper handling of recyclables. This education would stress the importance of using the correct bags, as well as orderly lining up trash and recyclables for pickup.

## **More Extensive Changes**

In addition to the recommendations outlined above, which will make substantial improvements to recycling through small changes to current practices, more extensive changes to how the University recycles were also examined. The pros and cons of those potential changes are listed here for consideration.

### Single Stream Recycling

Differences between the way recyclables are collected on campus and the way they are collected by the City of Madison contribute to the public's confusion about recycling. One potential solution would be for the University to adopt the City's simpler policy of single stream recycling. The increased convenience to customers of single stream recycling typically increases recyclable capture by up to 30%, an amount for the UW equal to 720 tons in 2008. Furthermore, single stream recycling would require fewer bins in campus buildings, which would lead to both an aesthetic improvement and a reduction in the number of bags required to line them, resulting in lower bag costs and requiring less labor for collection.

However all of those considerable benefits would be more than offset by the cost of sorting fees. The City of Madison's contract with Waste Management sets sorting fees at \$50.05 per ton, and it is likely the University would pay at a similar rate. Current market prices for recyclable materials are far less than that amount, which would force recycling to operate at a considerable net loss to the University. Detailed cost avoidances from decreased bag use, decreased labor, and increased recyclable capture have not been calculated, but it is extremely unlikely that they would offset an additional cost of \$50.05 per ton. Given the current economic situation in the state and the country it seems eminently responsible to hold recycling costs to the University as low possible.

Considering the increased costs, and the fact that there are other methods available for increasing the capture of recyclable material and diverting it from the landfill, at this time single stream recycling does not seem to be a prudent option.

### Three Streams, No Bag in Mixed-Paper Bins

The amount the University receives per ton of recyclable mixed-paper is currently downgraded because of contamination in the stream from the plastic bags used to line collection bins. This missed revenue is in addition to the cost of purchasing the bags in the first place. A solution to avoid both costs would be to eliminate the use of bags in bins. While this solution is not practical for the bottles & cans stream, with a minor investment it could substantially decrease costs and increase revenue from the mixed-paper stream.

Under such a system, mixed-paper bins would no longer be lined with bags. Instead, during their rounds custodians would lift the stationary bins and dump their contents into a wheeled bin similar to those used by the City of Madison for residential pick up. Wheeled bins would then be placed on loading docks for collection. Two trucks would be retro-fit with arms to lift and dump the bins, minimizing labor and collection

times by allowing bins to be filled more completely than would be possible if drivers were required to lift them.

The benefits of this option outweigh the costs. Discontinuing the use of bag liners in mixed-paper bins would halve the number of bags purchased from 750,000 to 375,000 annually, for a cost avoidance of \$53,000. It would also result in 375,000 fewer plastic bags entering the landfill. Conservatively estimating that 5 of the wheeled bins would be necessary for each of the 250 buildings on campus at \$55 each (retail price charged to consumers by the City of Madison) produces a total outlay for bins of \$68,750. The cost to outfit two trucks for collection would be \$8000 each. Once retrofit, these trucks could also be used for other collection duties, including a proposed composting program. Custodial times to complete routes would likely not change overall; two trips would likely be necessary to separately collect paper and other waste, but time at each collection bin would be substantially reduced by eliminating the need to tie the old bag and line with a new one.

Based on the above analysis, eliminating liner bags from mixed-paper bins would pay for itself within two years, and allow over \$50,000 in cost avoidance after that. In addition, when market prices for mixed-paper increase in the future, the University will be well poised to maximally take advantage of that revenue stream. Despite the required initial investment, we recommend serious consideration of this option.

## Summary

This report has identified four actions that can be taken which will improve recycling at the University of Wisconsin – Madison. First, switching to a heavier mil clear plastic bag will result in fewer errors of sorted recyclables erroneously entering the trash stream. Second, education for university members and visual prompts near bins will reduce the amount of recyclable items placed in trash bins. Third, implementing recycling stations will make recycling more convenient, simpler, and more visible. Fourth, eliminating liner bags from mixed-paper collection bins will reduce waste and avoid costs. These recommendations make the best use of existing resources to reduce the ecological impact of the UW-Madison campus, while protecting the financial sustainability of its recycling program.

## **Action Items List for Increasing Recycling at University of Wisconsin-Madison**

### Students

1. Provide short list/email of what is a recyclable, containing picture of items
2. Market recyclables lists through We Conserve Website and how to dispose of an item
3. Talks in classrooms/lecture halls/SOAR by support staff and student organizations
4. Informational posters, decal prompts at opening of bins

### Faculty and Staff

1. Provide short list/email of what is a recyclable, containing picture of items
2. Market recyclables lists through We Conserve Website and how to dispose of an item
3. Provide Power Point Slide that will be available on We Conserve Website to be used at the end of a lecture reminding students to clean up around themselves.

### Custodial

1. Phase out current clear bags and purchase stronger clear bag
2. Training through leads, using pictures to communicate in a clear fashion
3. Proper placement of waste for pick up
4. Make sure proper bags are used in containers

### Waste and Recycling

1. Confirm what items are recyclable for list
2. First response/notify custodial lead & recycling coordinator when recyclables are found in wrong stream

### Other

1. Confirm bin count and true cost analysis.
2. Confirm bin placement at each facility and grouping, creating stations (Building Manager, Custodial Lead, Recycling Coordinator)
3. Letter to all Building Managers and Custodial Leads with follow-up contact that they need to create stations at all areas where refuse containers are located. Other bins will be available according to the implementation schedule of the Rubbermaid Stations.

**Individuals Involved/ Provided Information**

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Brad Schenkel	(Custodial Department)
Daniel Einstein	(UW-Nature Preserve)
Roy Peterman	(Brigham Young University)
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**REthink Wisconsin Volunteers**

Whose hard work made these recommendations possible

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