Solid Waste at Williams College

A Luce Foundation Report

Katherine S. White

September 2007

Inside a Williams trash can

SUMMARY

Solid waste at Williams College can be separated into three general categories: recycling, compost, and trash. Recycling includes paper (mixed fiber and paper, magazines and books, newspaper, and cardboard), mixed recycling (cans, bottles, and plastic), metals, grounds waste (non-mulched prunings, leaves, etc.), universal and hazardous waste, and some recycled and demolition debris. Compost is mainly pre-consumer food scraps and post-consumer food waste. Trash includes materials that cannot or have not been recycled -- waste from packaging, food-contaminated materials, some demolition debris and construction materials, and waste that could have been recycled but was not.

Based on our estimates, trash accounts for ~80% of the ~1100 tons of the college's regular solid waste; recycling comprises 19%, and compost comprises less than 2%. In 2006, (1) costs for disposal of regular solid waste and recycling exceeded $370,000, including personnel; (2) trash disposal costs were ~ $300 per ton; and (3) recycling avoided ~350 T of eCO_2 emissions. While Williams' recycling efforts are commendable, this study identifies several areas for improvement, e.g. requirements for waste haulers, location and number of recycling containers and other incentives to decrease trash volume and increase the amount of recycling.

Improvements in waste management and recycling will help to minimize negative environmental impacts and could reduce operating costs. Management efforts should focus on reducing the amount of trash generated by the College and expanding efforts to recycle "regular" waste as well as wastes associated with demolition and construction

INTRODUCTION

Williams College is pursuing a five-year project, sponsored by The Luce Foundation to develop educational initiatives focusing on the study of renewable energy and resource sustainability. Part of this grant includes student/faculty research into different ways of increasing the college's environmental sustainability. As a step toward understanding Williams College's environmental impact, I spent the summer of 2007 as a Luce Project intern tracking the disposal and recycling of solid waste from Williams College (Fig. 1).

Figure 1: My fieldwork this summer

Solid waste includes trash, paper (mixed fiber and paper, magazines and books, newspaper, and cardboard), mixed recycling (cans/ bottles/ plastic), metals, food waste, grounds waste (non-mulched prunings, leaves, etc.), universal and hazardous waste, and construction and demolition debris (Figs. 2-4; Appendix A).

My goal was to collect as much information as possible about the amounts, costs of hauling and disposing, and the path that each category of waste takes through and from campus. With these data and with information I gathered from talking with several members of the Facilities Department, I propose improvements in Williams's current system of solid waste management.

Figure 2. Schematic diagram of solid waste at Williams College; construction waste gets recycled

Trash

Trash includes all forms of waste that have not been reused, recycled, or composted, and unfortunately comprises by far the largest section of waste generated at Williams. Construction and demolition wastes from large campus projects typically are managed by project contractors and are discussed in a separate section below. Scott Smith Trucking, based out of Williamstown, removes most of the College's trash on a regular basis. Unfortunately, the firm does not report the volume or weight of trash removed from College properties. Our values for trash are derived from estimates provided by Scott Smith, who hauls from campus and from College rental property using both containers and packer trucks. For efficiency the firm also collects additional trash from non-College sources

until the packer trucks are full and continue to the North Adams transfer station, complicating simple measurements,

Scott Smith has twenty-one dumpsters on campus and forty-three other trash receptacles both inside and outside buildings, which he picks up on two routes: one on Monday, Wednesday, and Friday, and the other on Tuesday and Thursday. While Scott Smith removes trash from the five dining halls daily, he stops at other locations every two or more days. The Williamstown transfer station does not accept trash from commercial haulers, so Scott Smith takes the trash to the North Adams Transfer Station. From North Adams the trash is hauled to the Pittsfield Resource Recovery Facility (RRF), where it is incinerated. Energy from incinerating the trash at the RRF produces steam, which powers a generator and helps provide heat for the nearby Crane Paper Company. Crane makes rag based paper for the Federal Reserve Note and stationary.

The rest of the college's regular trash consists of construction and demolition debris from Facilities maintenance projects throughout campus. Allied Waste removes this material (unsalvageable metal, boards, etc.) every month from an open top container at the Agway site and brings it to the B-3 Transfer Station in Canaan, NY, a division of Energy Answers Corporation. From here, it continues on to the Seneca Meadows Landfill in NY.

In 2006, Williams College generated approximately 876 tons of trash (Fig. 3), not including construction and demolition debris associated with large projects. This value is based on an estimate of 15 tons of trash per week that Scott Smith hauls as well as 96 tons per year of waste from Facilities maintenance projects. In the past twelve months, Williams College has paid Scott Smith $228,101 and Allied Waste $25,656, for removing its trash, for a total of $253,757 (Fig. 4).

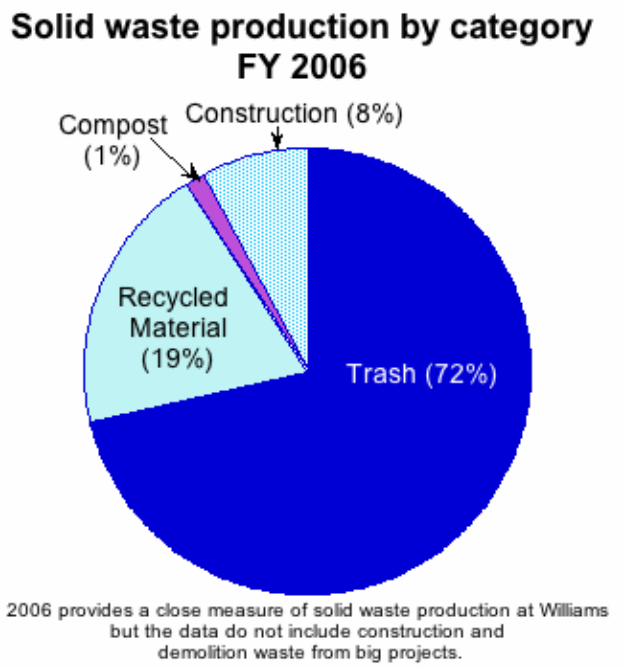

Figure 3. Solid waste in 2006 by weight; does not include demolition debris.

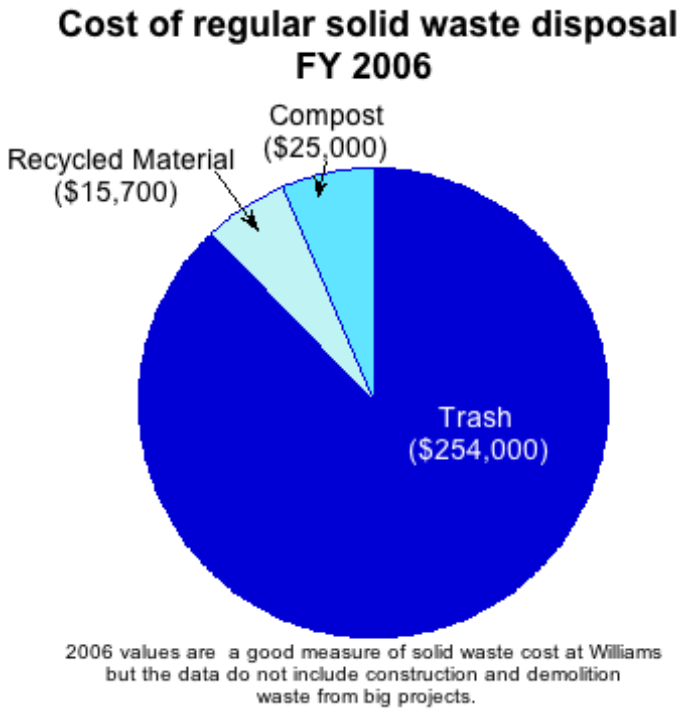

Figure 4. Cost of hauling and disposing of solid waste in 2006, not including demolition debris.

RECYCLING

Williams College recycles paper goods, containers and scrap metal from regular campus operations, from Facilities maintenance projects and from large construction projects; the latter are discussed separately. There has been a recycling program at Williams at different scales for several decades, organized initially by students and institutionalized by Facilities (then B and G) in the early 1990s. Records are most complete and consistent since 2000 (see Table 1). In 2006 the College spent >$100,000 on its recycling program, including personnel costs.

Table 1. Recycling of solid waste between 2000 and 2006. All values in tons

Year[1]	Mixed Fiber/Paper	Cardboard	Containers[2]	Newspaper	Magazines[3]	Compost[4]	Metal	Total paper goods	Total
2000	57	64	49	54	20			194	
2001	50	65	43	38	15			169	
2002	79	67	43	32	25			203	
2003	59	63	49	26	21			169	
2004	61	63	41	27	21	43	39	173	295
2005	66	50	27	22	21	16	28	158	229
2006	51	58	27	22	12	21	31	143	222

1. Calendar year
2. Bottles, cans and plastic containers; weight estimated from number of containers before 2006
3. Softcover magazines and books
4. Values incomplete for 2005 and estimated from a partial year in 2004

Figure 5. Standard group of recycling and containers used inside buildings

Groups of standard recycling containers (Fig. 5) can be found in most campus teaching and administration buildings and in residential houses. Informal inspection of waste containers shows that waste is for the most part properly separated in the recycling containers, but trash cans scattered throughout the buildings contained a mix of recyclable materials and trash.

Paper and Commingled Recycling--Williams College has recycled paper (mixed fiber and paper, soft cover books and magazines, newspaper, cardboard) and commingled recycling (glass, cans, and plastics) for the past six years (Figs. 6 and 7)

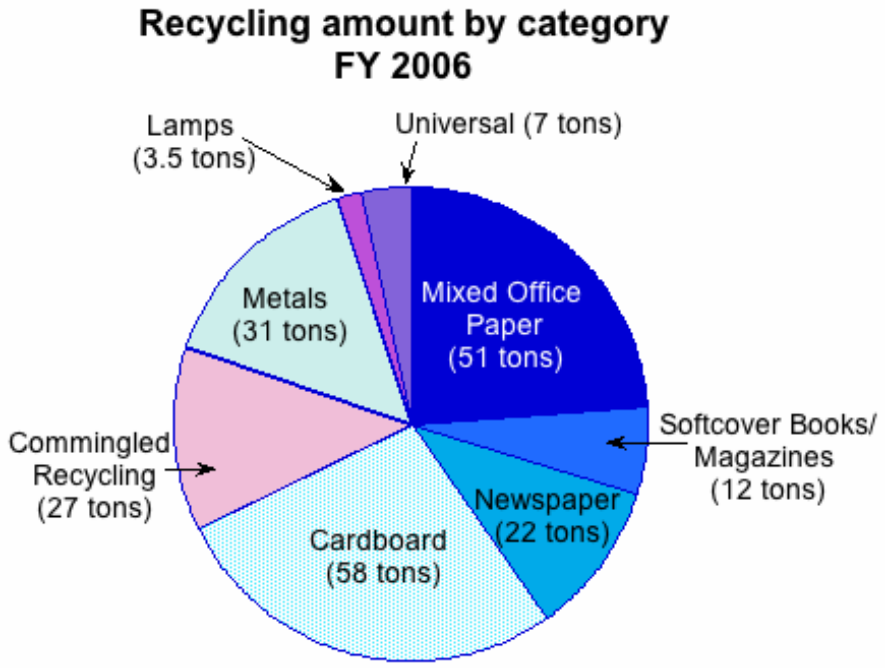

Figure 6. Recycling by category.

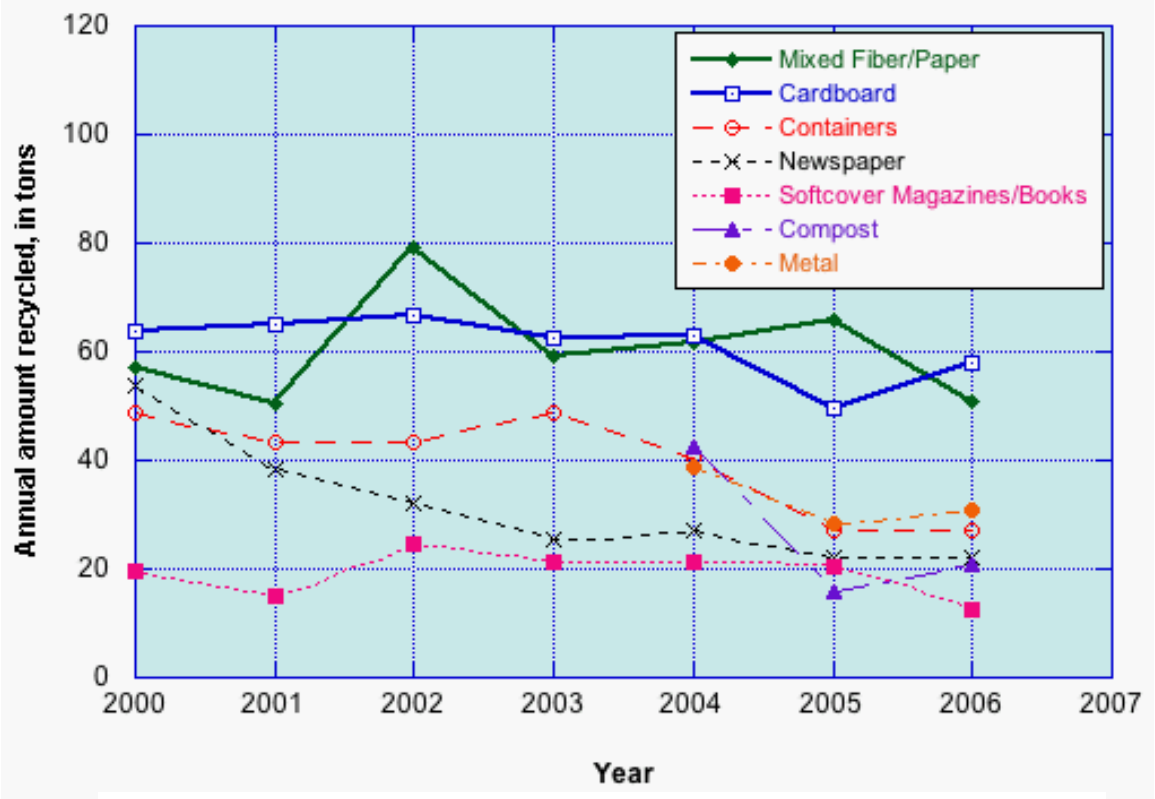

Figure 7. Changes in recycling quantities over time.

The College recycling program is operated by two full-time Campus Recyclers—(Dave Boyer and Rob Bayly; Fig. 8). They follow a semi-regular route five days a week, collecting most of the recycling on campus from basement recycling rooms and outdoor sheds where material is sorted and placed in containers by students and staff (Fig. 9)

Figure 8. Campus Recyclers. From left to right, Dave Boyer and Rob Bayly.

The Campus Recyclers move materials to the Agway site at the bottom of Spring St. and into three separate large containers (Fig. 10): (1) mixed fiber and paper, magazines and books, and newspaper (40 cubic yard trailer); (2) cardboard (roll off container); and (3) commingled recycling (cans, bottles and plastics; roll off container)

Figure 9. Basement recycling room in Williams. Paper goes in bags; commingled recycling goes in bins.

Figure 10. Paper trailer at the Agway site. To the right is the green cardboard roll-off container.

Casella Waste Systems hauls the paper products (mixed fiber and paper, soft cover books and magazines, newspaper, and cardboard) to the Rutland Material Recovery Facility in Rutland, Vt approximately every two months. From there, newspaper and cardboard go to Canadian Mills in Montreal, where the newspaper becomes newsprint again. Cardboard becomes the liner of corrugated cardboard. Books and magazines go to Katahdin Paper Co. in Millinocket, ME, where they become tissue paper. All other paper waste goes to Sunoco, a paper recovery facility in Montreal, which turns them into cores for toilet paper and paper towel rolls.

Allied Waste hauls commingled recycling twice a month to the North Adams transfer station, where Newark America, a hauler based out of Salem, MA delivers the material to the Ulster County Resource Recovery Agency (RRA) in Kingston, NY. From the RRA, glass continues on to the Ontario County Landfill, a division of Casella Waste Systems, in Stanley, NY, where it is processed and becomes other glass products such as car windshields. The Ulster RRA bales (shreds and compresses) #1-7 plastics (excluding styrofoam), and sends it to the Ontario County Landfill as well. Here, the PET is processed and becomes any plastic-based item from ski jackets to test tubes. Our cans are taken to a processing facility close to the Ulster RRA where Kingston Recycling crushes and turns them back into cans.

Casella Waste Systems charges the college a standard fee of $324 that increases by 3% annually for each trailer of paper waste we fill. This fee includes the cost of removal of the full trailer, hauling it to the Rutland RRF, and replacing it with an empty one. The college also receives a rebate from Casella Waste Systems for the returns from recycling. These "returns" vary with the demand for paper products. Williams receives $0-$4,000 per year in returns and spends on average $12,000 for paper. Figure 11 illustrates the effects of variable market prices for recycled paper products on "returns" from 2001-2006.

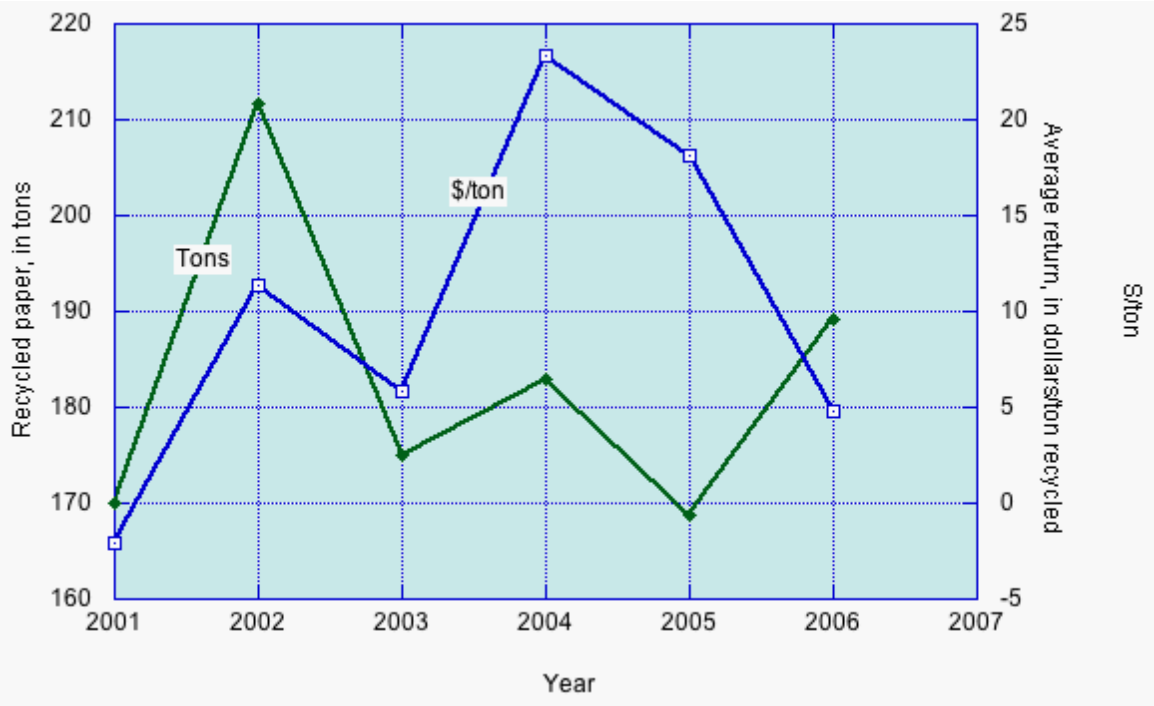

Figure. 11. Cash returns for the college's recycled paper over time

Scrap metals– Aluminum, brass, and copper from Facilities maintenance projects also end up at the Agway site. They remain in a small shed and Facilities hauls them to Apkins Scrapyard in North Adams, Massachusetts to be processed whenever the shed is full. Figure 12 shows the metals storage shed at the Agway site. The college gets no cash return for these metals from Apkins. In 2006, Williams recycled about 30 tons of metal.

Figure 12. Salvageable metal shed at the Agway site.

Universal and Hazardous waste—
Facilities Safety and Environmental Compliance oversees the disposal of most non-laboratory "universal" and hazardous waste on campus. Universal waste refers to materials that can be broken down and reused and includes: light bulbs, lead acid and gel batteries, computer monitors, and televisions (Fig. 13). CRT Recycling hauls and processes Williams College's computer monitors and televisions at no cost to Williams, supported by a federal grant. Northeast Lamp Recycling, committed to reducing the amount of mercury in landfills, collects and processes the college's used compact fluorescent bulbs.

In 2005 CRT Recycling removed 7.1 tons of universal waste from campus, and in 2006 Northeast Lamp Recycling removed 3.5 tons of lamps—both at no cost to the College. Members of Facilities haul lead acid and gel batteries to Apkins Scrapyard in North Adams.

Figure 13. Examples of universal waste: computers and monitors.

Ink Cartridges--Central Office Services oversees recycling of ink cartridges, supplying plastic inkjet bags for faculty, staff, and students, who can then drop their used cartridges in the mailbox. We do not yet know where these cartridges go or how they are recycled. COS places larger cartridges in a box for an independent hauler to take to Pittsfield.

FOOD WASTE AND COMPOSTING

The Williams composting program is overseen by the Director of Dining Services (Robert Volpi) and by the managers of each of the five dining facilities on campus (excluding student coops). Dining staff compost food scraps (pre-consumer materials), and after eating, students, faculty, and staff separate their compostable food scraps from non-compostable waste (plastic forks, etc.) (Fig.14)

When loaded, post-consumer receptacles are taken outside where Paul Laliberte, an independent hauler based in Adams, Massachusetts, picks them up daily. During the school year,

Mr. Laliberte brings all food waste to the Agway facility where it sits in an open top container until Allied Waste hauls it to Holiday Farm in Dalton, Massachusetts. During the summer months, Mr. Laliberte hauls the food waste every two days directly to Holiday Farm in Dalton, Massachusetts and to Caretaker Farm in south Williamstown.

Figure 14. Top left, clockwise. After eating, students, faculty, and staff should place their food waste into the compost hole instead of throwing it away. Under the hole is a receptacle which, when full, is hauled to Holiday Farm for composting.

To better understand the amount of food waste collected for composting from the dining halls, Luce summer interns weighed the food waste every two days over a two week sample period from July 23rd to August 10th (Fig. 13, 14). If, during the college's busiest summer week, the campus composted 430 pounds of food waste every two days for a population of 850, then each person generated approximately 0.25 pounds of compost daily—the waste factor. If these figures are representative of the summer months, ~ 4 to 8 tons of compost are probably generated on campus during that period. As an approximation of quantities during the year with a campus population of nearly 1900 students (plus faculty and staff meals), we used the summer waste factor to calculate 500 pounds of food waste per day, equivalent to >50 tons during the regular school year. This calculated value is ~2x the measured value for 2006.

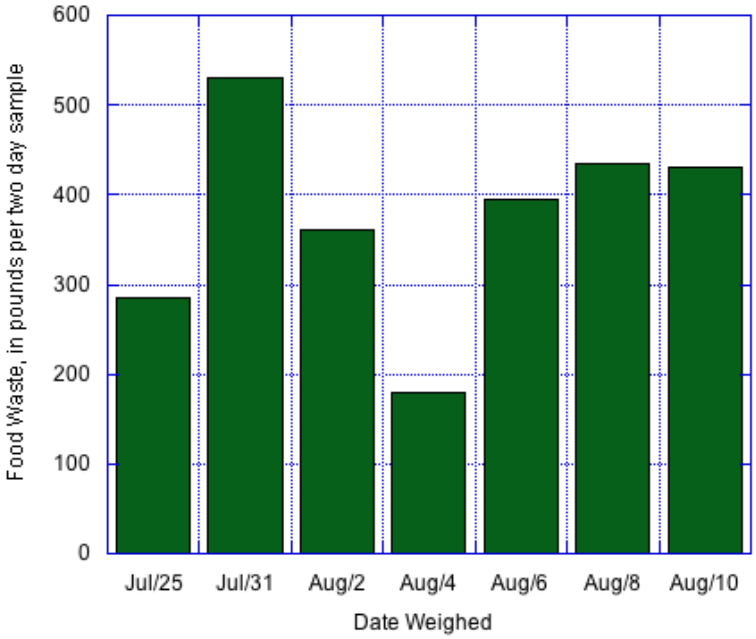

Figure 15. Food waste measurements during summer 2007

Figure 16. The joys of weighing compost. From left to right, Ansel Bubel '08 holding a food bag, Ruth Aronoff '09 weighing a food bag, and Katie White '11 lifting a food bag.

In 2006, the college hauled 21 tons of food waste to Holiday Farm during the regular school year and 4 to 8 tons during the summer to Holiday Farm and Caretaker Farm. The college pays Mr. Laliberte $68.00 per day during the school year to pick up food waste and bring it to the Agway site, and during the summer, Mr. Laliberte receives $68.00 every other day to pick up the food waste and bring it to Holiday Farm and Caretaker Farm. Williams pays Allied Waste $300 per pickup from the Agway during the school year, and Allied Waste makes about five pickups between October and May, totaling $1,500. Combined, the college pays about $25,000 a year for collection and transport of food waste.

Commencement and other special events-- Dining Services is extending a strong commitment to quality and efficiency to reducing the amount of paper waste, composting more efficiently, recycling any cans used during picnics on campus and continuing to purchase locally for the large picnics. During two large, all-campus picnics at the end of 2006, Dining Services was able capture most of the compostable materials and cans, reducing the amount of trash by >80% compared to the same events the year before and removing at least a ton of trash from the waste stream.

Grounds waste—Horticulturalist and Grounds Supervisor David Fitzgerald oversees the disposal of waste generated from the grounds. Williams College mulches its cut grass, but small branches and leaves are taken down to the campus Agway and then to Peace Valley Farm, owned by Bill Stinson, in Williamstown for mulch and compost. Some logs are taken to the Williamstown transfer station where Countryside Landscaping turns them into woodchips and loam for their own use. Some tree takedown wood is cut and for use at the Faculty Club, the Log and Camp Richmond. The town uses wood brought to the landfill to heat the DPW building and Countryside uses wood generated from their tree service to help heat their building. We do not have an estimate of how much grounds waste the college generates annually. There is no cost and no returns for bringing leaves, branches, and logs off-campus.

CONSTRUCTION AND DEMOLITION DEBRIS FROM LARGE BUILDING PROJECTS

Figure 17. View of the initial stages of construction of the North Academic Building—part of the Stetson-Sawyer project.

Large Building Projects—Major building projects produce large amounts of construction and demolition debris that form an irregular and incompletely measured part of the solid waste stream. Big projects on campus in the past few years include the ’62 Center for Theater and Dance, the Paresky Student Center, and the current Stetson-Sawyer project. During the demolition of Baxter Hall to make room for Paresky, 5500 tons of concrete and brick, 325 tons of steel, 3.5 tons of copper and large amounts of building products were recycled; less than 248 tons of construction and demolition debris were taken to the landfill. During construction of Paresky, substantial amounts of plastic, steel and cardboard were separated and recycled, but we do not yet have complete figures. The first five months of the Stetson-Sawyer Project generated a total of 17.18 tons of debris (1.02 tons plastic, 4.63 tons steel, 3.3 tons cardboard, and 8.23 tons mixed materials that were taken to the landfill) of which 62% was recycled. We do not yet know the cost of recycling or of hauling the mixed

material. To attain a LEED credit for Construction waste management practices, builders must recycle at least 50% of the waste generated, and additional points are available for higher percentage of construction waste. -While the goal is to reach 75% recycled construction debris, finding local recycling centers has proven challenging, particularly for wood and gypsum.

MISCELLANEOUS DORM FURNITURE

When students leave their dorms after the school year, Facilities staff collect all clothing and furniture left behind. Salvageable clothing goes to the ABC Tag Sale, a community clothing sale to benefit "A Better Chance" program that places students from underserved areas in New York City in the Williamstown public schools. The college also holds the Cow Barn Tag Sale, a furniture sale for Williams faculty and staff. Although difficult to quantify, the college sold roughly 1500 pounds of furniture, grossing nearly $4,000. Facilities staff brought all metals to Apkins scrapyard; we do not yet know how much. Unsold or non-recycled waste filled three 30 yard dumpsters, weighing roughly 5 tons each, for a total of 15 tons, that ended up in a landfill. This waste is included with the college's total trash.

RATES OF DIVERSION

Williams College recycles about 230 tons of materials each year (including compost) and sends approximately 870 tons of trash to the North Adams transfer station, not including materials from large building projects, ink cartridges, or lead acid and gel batteries. According to these figures, Williams recycles nearly 20% of its total waste per year. While we are fairly confident with our numbers for recycling, we are less sure about our numbers for trash. We need to include values for trash and recycling for large building projects once we have those, because they are probably a large part of the campus footprint. We will also want to include ink cartridges and lead acid and gel batteries.

Williams has a lower recycling rate in comparison to rates cited by several of its peer institutions: Middlebury College's website claims that they diverted 59.4% of their waste from landfills in 2004, with a high percentage of recycled materials (37.3% of their total waste) and compost (22.1% of their total waste). Amherst College recycles 39% of its total waste, excluding compost. In 1997, Bates College recycled 33.47% of its total waste.

AVOIDED EMISSIONS

Using methodology described in the EPA's "Waste Management and Energy Savings: Benefits By the Numbers" (2005), we calculate that recycling in 2006 avoided ~350 tons of eCO_2 compared to incineration or manufacture from raw materials. Recycling of metals is particularly significant. The methodology includes estimates for energy used in transportation.

ONGOING PROJECTS

We are working towards portraying the flow of each category of waste in to and out of campus by creating visuals of hauling routes. With the help of Amy Johns, the Environmental Analyst for the Luce Project, we hope to have a flash movie and interactive map of the campus

recycling route as well as the path that each form of recycling takes to its processing facility on the sustainability website.

With the help of Robert Volpi (Head of Dining Services) and Chris Abayasinghe (Assistant Director of Student Dining), we are analyzing the current composting system and gathering information on other methods of composting, including the company Riccanewmark's compost tanks and Middlebury College and Cornell University's on-campus facilities.

RECOMMENDATIONS

The College should:

1. Make a concerted effort to measure campus waste streams. At present, detailed waste reports are not available. Accuracy of the data reported here depends on many assumptions made regarding waste volumes and weights.
2. Check to make certain that all waste haulers have formal contracts with the College that identify responsibilities and requirements associated with waste removal, including weight measurements and disposal sites.
3. Expand its efforts to reduce the amount of trash generated. Williams pays nearly $230,000 for regular trash disposal each year, or roughly $300/ton. Producing less trash could save the College money and reduce the amount of CO_2 we produce by hauling. (See recommendation 4.)
4. Increase the number and improve the siting of recycling bins, which are greatly outnumbered by trash cans at Williams. For example, in both Sawyer Library and Paresky, trash cans outnumber recycling bins by more than two to one. Trash cans in strategic locations such as doorways may subtly encourage people to throw away their plastic bottle or newspaper when there is no nearby recycling bin.
5. Explore options for recycling additional types of materials: for example, alkaline batteries. However, recycling of other materials is perceived to be expensive and would require proper setup and signage throughout campus to be effective. Additional research is required in this area.
6. Continue efforts to make all members of the campus community aware of how to recycle various materials. Providing more information on the Williams website should include a section detailing where and how to recycle certain units such as ink cartridges, batteries, and light bulbs that are less obvious than paper and glass. I suggest a link such as "What should I do with my _____?" that is accessible and informative. Amherst College's recycling site is a good example.
7. Respond to complaints about poor separation of compostable food waste from non-compostable food waste in the dining halls. Poor separation is due, in part, to poor signage near the openings for disposal of food waste.
8. Make the Agway site a more secure place to store recyclables, food waste, grounds waste, and miscellaneous debris. There is no secure enclosure nor an entrance/exit that prevents animals from getting into the food waste or people from trespassing after hours. Designing a new facility for most of our waste would -encourage more of the campus to think about how much we are generating and how to manage it as a whole more effectively.
9. Consider models for getting more students involved in managing the college's solid waste. Creating student jobs sorting recycling could be a good place to start. As soon as students see their impact on campus from a different angle, they may encourage changes more quickly.

ACKNOWLEDGMENTS

Irene Addison, Associate Vice President for Facilities and Auxiliary Services, and **Richard McMahon** and **Peter Mason**, Supervisors of Custodial Services, provided us with information about the weights and costs of recycled materials on campus dating back to 2000. **Dave Boyer and Rob Bayly**, the Campus Recyclers, answered specific questions about recycling at Williams while I accompanied them on their daily route around campus. **Bob Volpi**, Head of Dining Services, **Michael Cutler**, Paresky Center Manager, and **Chris Abayasinghe**, Assistant Director of Student Dining, provided a tour of the food disposal and composting systems in the five public dining halls. **Joseph Moran**, Manager of Safety and Environmental Compliance, and **Heather Main**, Safety and Environmental Compliance Coordinator, provided us with information on Universal and Hazardous waste including light bulbs, computers and televisions, and lead acid and gel batteries. **David Fitzgerald**, Horticulturalist and Grounds Supervisor, provided a tour of the campus Agway where Facilities and Dining Services store the majority of recycled materials and some trash until outside haulers pick it up. David also provided information on construction and demolition debris from small campus projects. Biology Professor **Hank Art** spoke with us about the history of Williams College's relationship with the town of Williamstown with regards to waste, and **Scott Park**, from the Williamstown Transfer Station, confirmed that the town currently received logs and woodchips from the college. **Bruce Decoteau**, Senior Project Manager, lead a tour through the Stetson-Sawyer building project. **Doug Schalefer**, an employee of Barr and Barr Inc. Builders, provided the first waste report from the Stetson-Sawyer project, detailing what type of materials they were recycling and how much. **Tim Reisler,** Assistant Director for Administrative Services, answered questions on the Cow Barn Tag Sale. **Michael Briggs,** Senior Project Manager, provided the waste report for the Paresky Student Center. **Ruth Aronoff** and **Ansel Bubel** helped weigh leaky compost bags in early August.