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Sorting Through the Rubbish: A Case Study of Rollins College Recycling

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SORTING THROUGH THE RUBBISH: 
A CASE STUDY OF ROLLINS COLLEGE RECYCLING

Courtney Banker

A Senior Honors Project Submitted in Partial Fulfillment of Requirements of the 
Honors Degree Program

May 2016

Faculty Sponsor: Barry Allen

Rollins College
Winter Park, FL
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Abstract
This study analyzes the overall state of the recycling program at a private, liberal arts college in the southeastern United States. By conducting a waste audit of four campus buildings, a campus-wide web survey, and two in-depth interviews, the study revealed a 62% contamination rate within the recycling stream and a paralyzing operational obstacle that rendered the college’s real diversion rate close to 0% of the waste stream. This defends the stance that “diversion” does not equate to “recycling.” The study also exposed a disconnect between the lack of campus faith in the ability of the recycling program to capture recyclable materials, and the overall idea of recycling as a solution to the current solid waste problem. Whereas the predominant literature regarding recycling on college campuses generally focuses on increasing recycling rates, these findings suggest that studies should first analyze the contents of the recycling stream to ensure that rates measured account for uncontaminated recyclables. Studies should also investigate what happens to recyclable materials after they are collected and processed to ensure that materials are in fact being “recycled.” Finally, this study suggests that the college, with only some fault of its own, has failed to properly execute a functioning recycling program, and has therefore done a disservice to the college’s mission statement of being “dedicated to…environmental stewardship” (Rollins College, 2016b).

Key words: recycling, campus sustainability, environmental attitudes
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I. Introduction

The Controversy of All Controversies

In 1996, journalist John Tierney published an article in *The New York Times* that would soon break the record for reader hate mail, a legacy not surpassed today (Frezza, 2014). The subject matter at hand: recycling. Evidenced by the title, “Recycling is Garbage,” Tierney’s article criticized recycling as costly and unjustified. Almost twenty years later, Tierney published his second article critiquing recycling, “The Reign of Recycling,” again arguing that the environmental benefits of recycling have been exaggerated and misconstrued. In response, a deluge of articles, editorials, and op-eds defending recycling saturated the Internet. Recycling, both in the 90’s and now, has remained a point of contention.

One of the articles that prompted Tierney to again stoke the recycling flame, “Recycling is Not Dead!,” published by industry specialist Patty Moore in July 2015, appeared on the pro-recycling platform *Resource Recycling*. Even this article, however, admits that something is wrong with the nation’s current recycling system. Most notably, Moore attributes the industry’s inability to adapt to both changes in commodity prices and increasingly heterogeneous materials in the waste stream as the result of outdated sorting technology at material recovery facilities (MRFs).

This tension and surprising consensus around a broken recycling system merits a deeper look, both in the literature and in practice, to understand the debate surrounding recycling and its real-life implementation on a liberal arts campus. In exploring the “fractures” in the current recycling paradigm, this study delves into the implications of the national approach to waste management and the extent to which a college’s recycling program supports its mission of being “dedicated to…environmental stewardship” (Rollins College, 2016b). This study also highlights
the need to evaluate the composition of recycling streams and the actual fate of “collected recyclables” so as to understand the true impact of recycling programs and “diversion rates.”

**Origins and Current State of Recycling**

The “reduce, reuse, recycle” mantra prevalent today is rooted in the 1970s, a decade that was the source of both an unprecedented energy crisis and the environmental movement as it is known today. Recycling began mainly through grassroots organizations that were eager to promote voluntary participation at community recycling centers, and gradually grew to encompass institutionalized curbside recycling programs, statewide bottle bills, and even bans on certain products (MacBride, 2012). At the outset, voluntary recycling initiatives (e.g., community collection centers and curbside collection programs) were supported and funded by manufacturers, who explicitly recognized these voluntary measures as both insignificant in terms of the objective at hand (waste reduction), and as the lesser of two evils when compared to compulsory and punitive producer responsibility laws (i.e., bottle bills) (MacBride, 2012; Schultz, 1998).

According to the EPA (2014), both generation and recovery rates of national municipal solid waste (MSW) have increased significantly over the past 50 years. In 1960, the U.S. produced over 88 million tons of MSW, and recovered (through recycling, reuse, and refill efforts) only 6.4% of this waste. Although total MSW generation has more than doubled since 1960 to over 250 million tons in 2012, recovery rates (which now include composting efforts), capture only 34.5% of MSW (EPA, 2014). While the EPA’s data suggests that recovery rates of MSW have increased steadily over the decades, other sources suggest that conventional recycling rates of beverage containers peaked in 1992 at 52%, and have since decreased to a
national average of 36.9% in 2010 (Gitlitz, 2013, p. 25). In other words, “Americans wasted (i.e., landfilled, incinerated or littered) almost two out of every three [recyclable] beverage bottles and cans sold” in 2010 (Gitlitz, 2013, p. 14). Gitlitz argues these rates are too low, and that capturing only 20 to 30% of recyclable commodities will not amount to sustainable resource management.

In comparison, 12 European countries recovered more than 40% of their municipal solid waste in 2012 through recycling and composting (European Environment Agency, 2015). Germany recovered the most at over 60% of its MSW, closely followed by Austria and Belgium (European Environment Agency, 2015).

To understand the implications of these rates, Gitlitz points out that over $22 billion worth of recyclable beverage containers alone—which does not account for other uncaptured recyclable commodities—were landfilled in the United States between 2000 and 2010 (p. 8). Furthermore, during this same time, “Americans landfilled, incinerated or littered enough aluminum cans to reproduce the world’s entire commercial air fleet 25 times” (p. 9). Many scholars point out that even more perplexing is that as curbside recycling programs have increased, recycling rates have stagnated or even declined (Gitlitz, 2013; MacBride, 2012). Whereas curbside recycling collection programs serviced only 15% of the U.S. population in 1990, by 2010, programs had expanded to serve over 71% of the US population (EPA 2011). Beverage container recycling rates have not increased accordingly (see Figure 1). Gitlitz (2013) attributes this relationship to changing consumption patterns, noting that much of the waste is consumed and disposed of outside the home, and therefore household-centric metrics and systems do not adequately portray nor address recycling behaviors. Other scholars argue that recycling rates remain around 34% due to the fact that recycling behaviors are not subjected to normative regulation or social pressure (Nolan, 2015).
As the percentage of U.S. households serviced by curbside recycling programs has increased, the percentage of containers recycled has decreased (Gitlitz, 2013).

**Fractures in the System**

Inarguably, many valuable recyclable commodities remain uncaptured by waste management systems, and instead are landfilled, incinerated, or wasted. Similarly, as Tierney and Moore agree, curbside collection programs and MRFs are strained, expensive, and often subsidized. The reasons why are slightly less clear, and are perhaps due to consumer choices at recycling bins, or perhaps due to regulatory and manufacture responsibility failures. MacBride (2012) classifies the great energy spent on managing and mitigating waste from the confines of the current recycling perspective as “busy-ness,” in which there are relatively few ecological accomplishments to celebrate in comparison to the amount of resources put into recycling. For example, recycling rates can be misleading. While the United States reports an overall 34.5% national recycling rate (EPA 2014), Collins (2012) argues this rate accounts for only the materials that are collected and sent to a MRF. The reality, on the other hand, is that only three-
quarters of recyclable items sent to the MRF in a single stream system actually leave the MRF as commodities prepared for remanufacture; the remaining quarter are landfilled (Collins, 2012, p. 14), a fact unbeknownst to much of the public (Morawski, 2009). The three-quarters of commodities that do in fact leave the MRF are not all necessarily recycled, either. For example, while countries such as the UK boast a 40% household recycling rate, such rates are equally deceptive. One study found that 80% of the country’s recyclable paper that was collected, baled, sold, and exported was unusable; the remaining 20% of high quality paper with reusable fibers was then sent on a multi-thousand mile shipping trek, thus begging the question of whether net gains outweigh net carbon costs (Hou, Al-Tabbaa, Guthrie, & Watanabe, 2012). As one scholar distinguished, “it is important to understand that diversion from disposal is not recycling. Collection is not recycling. A product is not recycled until it is made into another product” (Morawski, 2009, p. 16).

**Figure 2.** Whereas replacing wasted glass with virgin glass represents only 6% of a household’s annual energy costs, replacing wasted aluminum with virgin resources would have been able to supply energy for 55% of American homes in one year (Gidlitz, 2013).
Another necessary point of distinction in the debate regarding the merits and efficacy of recycling is that both economically and environmentally, not all commodities are the same. Aluminum and paper offer the greatest energy savings (Gitlitz, 2013; Kinnaman, Shinkuma, & Yamamoto, 2014; MacBride, 2012). For example, “in 2010, 724 thousand tons of aluminum cans were recycled nationwide, saving 111 trillion BTUs of energy: an amount equivalent to the total residential energy consumption of approximately 1.2 million American homes” (Gitlitz, 2013, p. 17; see Figure 2). On the other hand, “Had the 732 thousand tons of wasted aluminum cans been recovered and made into new cans [in 2010], the energy saved by using recycled vs. virgin aluminum would have been equivalent to 112 trillion BTUs…[an amount] sufficient to supply the total energy needs of 1.25 million American homes for a year” (p. 18). Energy and carbon savings for plastics and glass pale in comparison (see Figure 3).

![Greenhouse Gas Emissions from Replacing Wasted Containers, 2010 (millions MTCO₂E)](image)

**Figure 3.** The manufacturing process of aluminum cans from virgin materials produces almost four times greater the amount of CO₂ than glass and plastic (PET) bottles (Gitlitz, 2013).
Many scholars argue that this fact has been missed by the public. In 2002, for example, New York City removed glass from curbside collection because processing was too costly and did not justify environmental benefits (MacBride, 2012). By 2004, the city reinstated glass to the program as a direct result of strong public backlash rooted in a political, rather than environmental or economic, rhetoric: that removing one commodity from curbside collection jeopardized the whole recycling program by creating a slippery slope in which all commodities could be considered for removal. Further, this policy jeopardized the recycling paradigm readily accepted by many in the environmental community, or the paradigm that all recycling is good (MacBride, 2012). In fact, many pro-recycling studies (Andrews, Gregoire, Rasmussen, & Witowich, 2013; Barker, Fong, Grossman, Quin, & Reid, 1994; Gitlitz, 2013; Haldeman & Turner, 2009; Nolan, 2015; Olson, Arvai, & Thorp, 2011; “Recycling at Work,” 2015; Schultz, 1998) addressed issues of determining how to increase recycling rates, unquestioningly defending the stance of recycling more and focusing on cultivating recycling as a moralism buttressed by shaming. Analysis of materials impacts, on the other hand, suggests that prioritizing certain commodities above others in the recycling stream, and in effect recycling less, is both economically and environmentally justified (Kinnaman, Shinkuma, & Yamamoto, 2014). Similarly, MacBride (2012) highlights that the national focus on some institutionally recycled commodities overlooks other commodities with even larger potential environmental and economic savings. Most notably, MacBride points to the lack of robust recycling for textiles, which are significantly more environmentally costly to produce and landfill than glass, and yet almost entirely removed from municipal recycling systems (p. 26).

Scholars highlight another relatively unknown fact about waste. While metrics, programs, and debates almost always surround issues regarding MSW, waste from industrial and
manufacturing industries is exponentially greater. In 1987, the EPA suggested that the U.S. alone produced over 12 billion tons of industrial waste (MacBride, 2012, p. 88). Although this statistic is outdated, MacBride acknowledges that the inability to find more recent data on industrial waste is problematic. It reveals alarming gaps in the perception of recycling and waste, and highlights the wealth of data for MSW, and the corresponding lack of data for manufacturing waste on an international level. A study carried out by the United Nations Environment Program and International Solid Waste Association estimated global production of total solid waste, including industrial and municipal, amounted to between 7 and 10 billion tons (Wilson & Velis, 2015). The researchers emphasized how the lack of both data and mandatory reporting presented difficulties in estimating global tonnage of waste, and further, in creating responsible strategies to address waste policy and management (Wilson & Velis, 2015). While some manufacturing wastes are recovered, others are turned into sludge and disposed of at the site of production. The toxicity and disposal of this sector of waste is largely unmeasured, unregulated, and undiscussed, which MacBride (2012) criticizes as another fracture in the discussion regarding waste and recovery.

The Recycling Objective

The various fractures in the recycling paradigm, from misleading recycling rates and missing data, to overlooked commodities and consumer tenacity, demand a return to the question of the ultimate purpose of recycling, a crucial prerequisite for designing and evaluating a waste management strategy (Hottle, Bilec, Brown, & Landis, 2015). Thus, according to MacBride (2012), “The whole point of recycling is to privilege ecological rationality over a purely economic calculus so as to spare human health, resource stocks, and ecosystems the physiochemical burden of a linear flow of materials through the human economy” (p. 46).
However, some argue that this premise is inherently contradictory (Amick, 2015; Lucas, 2002; MacBride, 2012). Scholars state that recycling inhibits a deeper look at the root of the problem: the adherence to planned obsolescence and concurrent worship of disposability (Lucas, 2002). Furthermore, recycling reconciles consumer guilt from disposability, while simultaneously permitting a disposable material culture and counteracting the wastefulness in such a practice (Lucas, 2002, p. 15). On the other hand, true resource conservation is not achieved through recycling, but through minimizing, reusing, repurposing, and creating fully closed-loop, long-term systems (Amick, 2015).

These critiques often root the conversation in individual patterns of consumption, which some claim is problematic (Kinnaman, Shinkuma, & Yamamoto, 2014; MacBride, 2012). Per capita consumption has significantly increased in the past 50 years, as data on beverage containers and MSW generation demonstrates (Gitlitz, 2013, p.20; EPA 2014). However, scholars argue that the answer lies not in changing consumer behaviors, but in demanding producer responsibility, government regulation, and a shift in the recycling paradigm to the closed-loop, long-term systems Amick (2015) described.

Recycle More, Less, or Differently?

Tierney’s most recent article cited a study with a contentious thesis: Kinnaman, Shinkuma, and Yamamoto (2014) “estimated the average social cost of municipal waste management as a function of the recycling rate.” Their findings suggest that variations in external costs, such as increased external benefits of recycling, or increased landfill and incineration costs, “do not appear important to shaping optimal recycling decisions,” and that no matter these permutations, the optimal recycling rate hovers around 10% (p. 66). Furthermore, when the researchers analyzed recycling rates for various materials (paper, plastics, metals, and
others), they found that municipalities could decrease social costs by focusing recycling efforts on paper, while decreasing recycling of PET plastic and other materials (p. 67). And yet, ample studies analyze a myriad of ways to move the masses to recycle more, because the prevailing consensus remains that recycling more is better (Andrews, Gregoire, Rasmussen, & Witowich, 2013; Barker, Fong, Grossman, Quin, & Reid, 1994; Gitlitz, 2013; Haldeman & Turner, 2009; Nolan, 2015; Olson, Arvai, & Thorp, 2011; “Recycling at Work,” 2015; Schultz, 1998). For example, Gitlitz defends the stance that “recycling rates for all major materials must edge above 90% to be considered ‘sustainable;’ rates in the 20s and 30s will not cut it” (Gitlitz, 2013, p. 10). However, Kinnaman, Shinkuma, and Yamamoto (2014) recommend that governments regulate prices and establish taxes for waste and recycling options so as to encourage efficient disposal decisions, suggesting that the agreement is not to increase curbside collections and MRF technology, but to change the currently inefficient disposal decisions being made, and to somehow capture the valuable commodities currently being landfilled, incinerated, or wasted.

One of the answers many scholars have offered involves a shared vision of national regulation for the commodities too costly or difficult to recycle via curbside programs: glass and plastic (Gitlitz, 2013; MacBride, 2012). Consider the issue of glass, for example. Historically an important packaging material, glass has since become one of the many bottling and packaging options available. “By 1960s, technologies for bottle production and transport had advanced enough to make it profitable to do what in prior decades would have put beverage makers out of business: cease refilling bottles” (MacBride, 2012, p. 37). Lobbyists for bottle manufacturers have been successful in ensuring that very few states pass laws forcing them to maintain responsibility for bottles after the point of sale. As a result, “[glass] manufacturers earn no larger profit if they make their products and packages cheaper to dispose of or cheaper to recycle,” and
are also rarely forced to do so (Porter, 2002, p. 124). Thus, governments and taxpayers have been left to bear the high cost of recycling glass (Collins, 2012; Gitlitz, 2013; Kinnaman, Shinkuma, & Yamamoto, 2014; MacBride, 2012).

On the other hand, container deposit laws (also called “bottle bills”) shift the product responsibility from the consumer back onto the producer, and have profound implications for material recovery rates (MacBride, 2012). The ten states that currently have container deposit laws boast recovery rates more than double or triple those in non-deposit states (see Figure 4).

![Per Capita Containers Recycled in Deposit and Non-Deposit States – All Container Types, 2010](image)

**Figure 4.** States with bottle bills have container recovery rates almost triple the rates in non-deposit states (Gitlitz, 2013).

Furthermore, whereas only 60% of recovered glass from single-stream collection systems is recycled into new glass bottles, over 98% of deposit glass can be made into new bottles; most deposit bottles are often refilled instead of remanufactured (Gitlitz, 2013, p. 24). In other words, deposit systems not only capture a significantly larger volume of commodities initially, but they also reintroduce a significantly larger volume of recycled materials back into the market. Thus, Gitlitz, a representative of the Container Recycling Institute (CRI), offered a national vision for
bottle bills: “CRI has estimated that if a very modest 5-cent deposit were placed on all carbonated and non-carbonated beverages throughout the United States, a 75% recycling rate would be achieved across the board. If the deposit were 10 cents or higher, 80%-90% recycling rates would be achieved” (p. 21).

Concurrently, MacBride (2012) noted that a national bottle bill would necessarily involve vast changes in curbside collection programs. In fact, her premise echoes that of Kinnaman, Shinkuma, and Yamamoto (2014): downscaling curbside collection to paper and metals would remove inefficient overlap with commodities covered in the proposed national bottle bill, thereby increasing the economic stability of the curbside recycling programs, and maximizing energy savings of the most energy-intensive commodities. Furthermore, MacBride recommended the government require mandatory data reporting for MSW and manufacturing waste, thus helping to address the global shortage of solid waste data (Wilson and Velis, 2015), as well as the issue of discrepancies in the metrics between data sources, interpretations, and classifications (Themelis & Mussche, 2014).

MacBride’s (2012) final recommendation for the future of “materials management,” the reconceptualized approach to “waste management,” involved municipal composting programs (also referred to as “organics recycling”). Using analysis from multiple different waste-modeling platforms, one study determined that a mix of recycling and composting streams offer the highest carbon savings of all materials management strategies (Hottle, Bilec, Brown, & Landis, 2015). Yet, according to the EPA (2014), residential food waste collection and composting programs in 2014 serviced only 2% of U.S. households in 2012. Efforts to establish or expand municipal composting systems have been stymied by limited data regarding composting revenues and metrics, lack of compost markets, and community reception of composting procedures and
facilities (Thangavelu, 2013). Interestingly enough, MacBride does not point to the zero waste movement as the answer for materials management, nor does she discount it as the antithesis to her vision. Instead, she warns against allowing the zero-waste movement to fall prey to the blindness of busy-ness, and points out that many zero-waste movements have not in fact closed the local waste loop as they purport to do. In many zero-waste models, waste is still generated, and further, travels outside of the municipality to be reclaimed and remade.

**Increasing Recycling Within the Current Paradigm**

The vision for the future of waste management’s transformation to thorough materials management, while useful in terms of understanding the fractures and opportunities in the current paradigm, is only a vision. The reality, on the other hand, involves the present state of recycling in which two out of every three beverage containers are wasted instead of recovered. Thus, many studies have focused on examining and offering methods of increasing recycling rates in the United States and abroad (Andrews, Gregoire, Rasmussen, & Witowich, 2013; Barker, Fong, Grossman, Quin, & Reid, 1994; Haldeman & Turner, 2009; Nolan, 2015; Olson, Arvai, & Thorp, 2011; “Recycling at Work,” 2015; Schultz, 1998). Some studies suggest that many individuals are found to self-report pro-recycling behaviors, while not practicing pro-recycling behaviors (Barker, Fong, Grossman, Quin, & Reid, 1994). Others suggest that this disconnect requires that society increase the social stigma of not recycling (Nolan, 2015).

Overall, many studies focus on how to target a variety of pro-environmental behavioral changes in consumers, and ultimately attribute the power to the consumer to shift manufacturing practices (Marans & Edelstein, 2010; Sussman & Gifford, 2011; Sussman, Greeno, Gifford, & Scannell, 2013). Others would argue these premises are unfounded and contribute to the prevailing
hegemony of covert manufacturing power in the broken recycling paradigm (Gitlitz, 2013; MacBride, 2012). Still yet, some studies focus on the potential repurposing of commodities tough to recycle, such as converting plastic into fuel (Themelis & Mussche, 2014).

Nevertheless, a consensus exists among the various studies that specifically analyze how to increase recycling rates: signage near recycling bins that delineate which materials should be landfilled and which should be recycled is minimally effective, at best (Andrews, Gregoire, Rasmussen, & Witowich, 2013; “Recycling at Work,” 2015). Modeling, or added social pressure via covert researchers who “model” the desired behavior in the public setting being studied, can be very effective at increasing recycling rates (Sussman & Gifford, 2011; Sussman, Greeno, Gifford, & Scannell, 2013). Modeling contributes to the norming process many scholars discussed by creating a social system that fosters pro-recycling behaviors (Nolan, 2015; Schultz, 1998). Similarly, interventions such as personal feedback for households in curbside collection programs, while costly and resource-intensive, can help increase recycling tonnage (Schultz, 1998).

While useful, these studies and suggestions involve many limitations. Some studies boasted increasing recycling rates (Haldeman & Turner, 2009; Olson, Arvai, & Thorp, 2011), but failed to conduct audits of the waste stream to ensure that the changes were indeed due to increases in recyclable commodities as opposed to increases in contamination from non-recyclable commodities. Furthermore, many highlighted the remaining need for increased education regarding recycling, and some even pointed to better signage at bins (Hansen et al., 2008), neglecting studies that demonstrated negligible impacts of signage on recycling rates. Educational efforts to increase pro-recycling behaviors, especially carried out through means other than signage, require money, time, and personnel that not every municipality, business, or
building has. In response to these issues, a Minneapolis-based non-profit, Recycle Across America (RAA) has started a movement to standardize labeling for waste, compost, and recycling bins across the country. While impressive, these standardized labels fail to reduce confusion regarding how curbside collection programs differ by state, municipality, hauler, or even building, because they attempt merely to offer a standardized way of conceptualizing and visualizing different waste streams, rather than standardizing what belongs to which waste stream nation-wide as MacBride (2012) and Gitlitz (2013) suggested.

An Analysis of a Campus Recycling Program

This study seeks to understand the current state of the recycling program at a private, liberal arts college in Central Florida; a program that operates within the parameters of the fractured recycling paradigm and a non-deposit regulatory framework. The objectives of the study are to:

1. Determine the composition of the campus waste stream (including trash and recycling) to establish baseline measurements of contamination and overall diversion rates
2. Examine perceptions of recycling regulations and policies on the campus
3. Assess, through observations, experience, and a case study, the state of the campus recycling program, including an analysis of its shortcomings, successes, and potential areas for change

Located in Winter Park, Florida, Rollins College is a private liberal arts college with annual enrollment of over 2,300 undergraduate and 220 graduate students, 60% of which live on campus (Rollins College, 2016a). Located in an urban setting, Rollins lies just north of Orlando in Orange County. During the time of this study (August 2015 through April 2016), Rollins participated in a single-stream recycling collection program and contracted with Waste
Management, Inc. (WM) to service the recycling dumpsters on campus two to three times a week, and haul the campus’s recyclables to the county materials recovery facility (MRF). Operated by WM, but owned by the county, the MRF services Winter Park, Orlando, and all of Orange County. Prior to this study, an official from Rollins Facilities Management informally estimated that the college produces 37 tons of recycling per year and diverts 30% of the waste stream from the landfill (personal communication, September 21, 2015).

![Figure 5. These side-by-side waste bins for “recycle” and “landfill” streams with the respective Recycle Across America labels are found in most classrooms on campus.](image)

The college also utilizes an on-campus cardboard baler to bale and sell the majority of cardboard that filtered through the campus. Furthermore, the college at the time had 200 Recycle Across
America (RAA) “landfill” and “recycle” labels above the respective bins in most classrooms and labs around campus (see Figure 5). Operationally housed under Facilities Management, campus outreach and education for the recycling program were primarily managed by the Rollins Sustainability Program, a student-led, departmentally-funded program. The recycling program has been active on campus since 1999.

II. Methodology

This study utilizes three main methodologies: an audit of a sample of the college’s waste stream, a campus-wide web survey, and in-depth interviews with two local recycling professionals. The research is also informed by the author’s involvement as a Coordinator with the Sustainability Program and the duties associated with that role.

The waste audit sampled both the trash and recycling streams of four on-campus buildings: Holt Hall, a residential dormitory with single and double rooms servicing approximately 80 students; Orlando Hall, a building with both classroom and office spaces; Bush Science Center, which houses classrooms, labs, offices, and a small food court; and the Campus Center, which includes meeting spaces, offices, and the college’s main dining hall. In conjunction with the Assistant Director of Facilities Management, the Sustainability Coordinators selected these buildings as being fairly representative of the campus waste stream, and further determined the sorting order of the buildings based on which days would provide the most accurate portrayal of waste production in the building (i.e., Monday sorting for the residential hall, versus a mid-week sorting day for the campus center). Teams of four to five Student Sustainability Coordinators from the Rollins Sustainability Program performed the audits between October 19 and 22, 2015, and sampled the waste from one building each day.
Staff from Facilities Management collected the building’s waste as they normally do in the morning, but then set the bags aside in a designated location for the waste audit.

On average, ten bags of trash and ten bags of recyclables were collected from each building for the waste audit. For ease of operational logistics, waste streams on campus are differentiated by color: blue bags are used for recycling, whereas clear or black bags are used for landfill. Thus, the Sustainability Coordinators differentiated between the two streams during the waste audit, and correspondingly recorded waste metrics, based on bag color. Items in the blue recycling bags were sorted into a 13 categories based on material type. When sorting the seven recyclable materials, items were then sorted into bins for “contaminated” and “uncontaminated” recyclables. For the purposes of this study, contamination in the recycling stream is classified as any non-recyclable item (such as food waste, liquid waste, foam, plastic bags, other special waste, and “true waste”), and any recyclable item with excessive residue (such as soiled paper or cardboard).

Auditors then collected measurements for weight (in pounds) and volume (in gallons) of the sorted materials, and repeated the process with the black/clear trash bags. The Coordinators weighed the items using a household scale, and estimated volume using a one-gallon reference bucket for smaller items and 42-gallon garbage bins for items of higher volumes. Following another study that conducted waste audits on a college campus (Baldwin & Dripps, 2012), materials were minimally compacted prior to measurements so as to mimic dumpster volumes. Furthermore, “[a]ll measurements were made and recorded on-site. Any recyclable materials recovered during the audit were diverted from the waste stream to the appropriate recycling bins” (Baldwin & Dripps, 2012). To accommodate WM’s preferences, all recyclable materials recovered during the audit were placed into the recycling dumpsters without being re-bagged.
Similarly, any contaminants in the recycling stream were removed and placed in the landfill stream once the audit was completed.

In order to determine what should in fact be placed in the recycling stream as opposed to the landfill, the researchers consulted with WM, the college’s recycling hauler. The researchers were unable to determine with confidence a certain list of what should be recycled because of contradictory information provided by WM officials and the subjectivity of the level of acceptable contamination of recyclables. While the college’s WM representative approved aluminum foil as a material accepted in the single stream system, later that same day the representative said it would be best to not put it in the single-stream recycling system due to the likelihood of contamination. Similarly, she argued that the paper coffee cups used by the cafes across campus should be landfilled due to likelihood of contamination. Furthermore, due to the market for recycled plastic at the time, WM had decided to no longer accept plastics 3-7, even though other waste haulers in the region who serviced the same county MRF claimed to accept plastics 1-7. As a result of this confusion, the sorting process during the audit did not remain the same every day; one day, for example, paper coffee cups counted as properly recycled paper, whereas the next day (after hearing WM’s preferences), they represented a contaminant when found in the recycling stream. Unfortunately, this resulted in inconsistencies in the sorting process and therefore in measurements and data analysis. The measurements from the audit are more suggestive than exact, but nevertheless are generally illustrative of the college’s overall waste stream and are thus useful in informing the campus’s waste management strategy.

This study classified the following materials as recyclable on campus:

- Aluminum (foil and cans)
- Cardboard
- Glass
- Paper (including paper coffee cups)
Plastics #1-7

When analyzing the landfill stream, on the other hand, the results focus on the amount of recyclable material present in the stream that could have been diverted according to the campus’s single stream recycling program, as well as the materials that could have been diverted using other management strategies.

Following approval from the Institutional Review Board, this study also conducted a campus-wide web survey and two in-depth interviews. The survey consisted of an explanation of informed consent, an overview of the study, basic demographic information, eight agree/disagree statements, a scored virtual waste sorting exercise of 15 items commonly found on campus (see Figure 6), and a final section for voluntary comments. A financial incentive was offered to increase response rates to the survey: if a participant successfully sorted 10 out of the 15 items in the virtual sorting exercise, his/her name was entered into a raffle to win one of two gift cards. Names and other identifying information were used for this sole purpose and were not released otherwise. The survey was administered through Qualtrics, a survey platform used by the college, and sent out campus-wide to the emails of all staff, students, and faculty by the Rollins Sustainability Program and another student environmental organization, EcoRollins. Altogether, the survey was available to 3,865 individuals. Student Sustainability Coordinators also promoted the survey outside of the main dining hall for one week during lunch hours. The survey was active from November 16 to December 4, 2015, and received 482 completed responses.
Figure 6. These 15 items were used during the virtual sorting exercise of the campus-wide web survey. Items 1 through 7 were classified as “recyclable” and 8 through 15 as “landfill” for the purposes of this study.

The in-depth, semi-structured interviews featured two local professionals involved in the sustainability and waste management industries, and sought to capture their perspectives regarding the success, failures, and future of the existing recycling paradigm and recycling program at Rollins. Carrie Miller, the college’s contact and Total Recycling Program Manager with WM, was able to provide an insider’s view of the company and its national relationship with consumers. Abby Gulden, the Sustainability and Permitting Coordinator for the City of Winter Park, offered insights regarding the city’s approach to and challenges with recycling. The interviews were conducted during January and February of 2015. Participants were selected
using personal contacts, and therefore do not represent a comprehensive view of recycling. Instead, they reflect the perspectives of individuals directly involved in and familiar with waste management. While other topics were discussed, the following questions provided a starting point for the interviews:

1. Why do we recycle?
2. Given Tierney’s recent critique regarding the recycling industry, what do you think are the major challenges for recycling, the corresponding solutions, and the future of materials management?
3. What is going well with the college’s/city’s recycling program? What needs to change? Are these successes and failures unique to the college/city, or characteristic of many places?
4. How likely do you think achieving zero waste is on the campus? On a citywide scale?
5. In an ideal world, what would waste management look like?

It is important to note that during the time of this study, other programs took place on campus and were actively contributing to recycling education and awareness. The Rollins Sustainability Program and Rollins Crummer Graduate School of Business co-hosted a panel on recycling and sustainability in business during the fall of 2015, which featured modest attendance from the campus and fostered dialogue around the current recycling paradigm. EcoRollins, the student environmental organization, also hosted a workshop and discussion session on recycling during this time, from which many ideas arose regarding operational strategies to change recycling behaviors. Simultaneously, as the data gathered from this research came to light, meetings were held with campus administrators to discuss changing the college’s approach to waste management. These meetings likewise informed the research and interpretation of the findings.

It must also be noted that prior to conducting the waste audit, campus-wide survey, and interviews, campus members from the Sustainability Program and Facilities Management met with Carrie Miller for a one-hour meeting on October 9th, 2015 during which it was revealed
that WM landfills all materials sent to the MRF in bags. Plastic bags, she reported, not only pose a threat to employee safety and operational efficiency, but they also damage the sorting equipment and were thus targeted as the most pernicious contaminant that must be addressed with all WM clients. The college’s recycling program, which has been active since 1999, has been bagging all recyclables for a significant portion of its operating time. As a result, the majority of the college’s waste that has been sent to the recycling facility over the years has, in fact, ended up in the landfill.

III. Results

Waste Audit

The aggregate waste sampled from the four buildings amounted to 466.9 lbs. or 896.1 gal. Almost all materials were bagged, except for some of the corrugated cardboard that was found loose in the dumpsters. By weight, 46% of the total waste sampled was found in the recycling stream, and 54% in the landfill. By volume, 55% was found in the recycling, and 45% in the landfill. By weight, the three most prevalent items in the total stream sampled were food waste, “true waste,” and corrugated cardboard (see Figure 7).
Figure 7. Illustrates the spatial distribution of the aggregate weight sampled in both the recycling and landfill streams.

In the recycling stream, the three most prevalent materials found by weight were corrugated cardboard, paper, and “true waste,” which were closely followed by food waste and liquid waste. By volume, the three most prevalent items were the same, but were followed by plastics #1-2 and #3-7 (see Figure 8). 62% of all materials were contaminated by weight, meaning that they were true contaminants (i.e. food waste, liquid waste, or true waste) or contaminated recyclables (i.e. plastic bottles stuffed with food waste). However, only 34% of the recyclables in the recycling stream were contaminated.

In the landfill stream, the most prevalent materials by weight were food waste, “true waste,” and liquid waste, respectively; by volume, they were true waste, paper, and food waste (see Figure 9). By weight, 16% of materials found in the landfill stream were recyclable; and by volume, 48% of materials were recyclable.
Figure 8. These graphs illustrate the composition of the recycling stream by weight (above) and volume (below).
Figure 9. These graphs illustrate the composition of the landfill stream by weight (above) and volume (below).
Figure 10. 36% of the materials found in the overall waste stream were recyclable. An additional 1% could have been recycled if processed by another facility, while roughly 39% could have been composted.

By weight, 36% of total waste stream sampled could have been recycled or diverted from the landfill, according to the recycling paradigm at the time. Altogether, 76% could have been diverted from the landfill stream through the current recycling program and an added program to capture compostable materials (see Figure 10).

Campus-Wide Web Survey

Following the results from the eight-agree/disagree statements (see Figure 11), the majority of respondents (84.9%) did not agree that all plastic is recyclable. The majority (81.4%) also indicated that plastic bags are not recyclable on campus, and 68.8% indicated that recyclable items with food/beverage residue cannot be recycled. More than half reported to landfill items rather than recycle them when in doubt, and 67.3% said they look at the number on a piece of plastic to determine if it is recyclable. Almost all participants (92.7%) disagreed with the Statement 6, which said, “Because I put an item in the recycling bin, it will get recycled.” Less than one-fourth felt that recycling is not an effective way of dealing with the solid waste problem.

Whereas 65.8% indicated that Boxed Water, a packaged water sold on campus that comes in a cardboard box lined with aluminum, is accepted in the single stream system during
the section on opinion statements, 72.6% classified it as recyclable during the virtual sorting exercise. Overall, 28% of all materials were improperly sorted during the exercise. 17% of recyclables were improperly sorted, whereas 37% of non-recyclable materials featured in the exercise were improperly sorted (see Figure 12).

![Opinion Statements from Web Survey](image)

**Figure 11.** This depicts the responses from the eight agree/disagree opinion statements from the campus-wide web survey.

While not required, the voluntary comments some participants left at the end of the survey offered other insights about the perceptions of the campus’s recycling. Many participants expressed a desire for larger recycling bins, more signage, and spatial separation between recycling bins and landfill bins on campus. While some expressed appreciation for learning what to recycle on campus as a result of the survey, others expressed unanswered questions and remaining confusion regarding the college’s recycling practices. One commentator’s statements reflected the perception that Rollins is in control of, and therefore limits, what can be recycled:
“When I learned about the recycling program at Rollins I was disappointed by the large amount of items that can not [sic] be recycled.” Another comment specifically addressed Statement 8: “When I answered that ‘recycling is a good solution for our solid waste problem,’ I said ‘disagree’ because I think the best solution is to consumer [sic] FEWER items that come in excessive packaging—we should pack our lunches, use re-usable bottles/hot drink cups, etc.”

Figure 12. 28% of the materials were improperly sorted during the virtual sorting exercise. Items 1 through 7 were recyclable, whereas items 8 through 15 should be landfilled.

In-Depth Interviews

In the formal interview with Carrie Miller, the Total Recycling Program Manager with WM, she confirmed that WM accepts a maximum contamination rate of 10% in the recycling stream, and that ideally, the company would prefer contamination to be zero. She elucidated the numerous barriers to smooth operation of the recycling system. For example, while the county
owns the local MRF, WM operates it, and a handful of other companies haul waste from households and businesses to the property. Thus, WM has limited ability to directly influence or trace recycling behaviors because it often is not interacting first-hand with the consumers. A similar conflict prevented WM from identifying the college’s bag issue until years after the program began bagging recyclables: WM collects recyclables from many other places besides Rollins on its route, and thus struggled to identify the source of the bagged recyclables that were mingled with countless other businesses by the time they made it to the MRF. Miller apologized on behalf of WM for having established a bag-dependent recycling program on the campus, and for not communicating the extent of the bag problem sooner.

Miller also argued that in some ways, recycling less is more: “I’d rather have someone put less and have it be the right thing rather than fill up that volume.” She added, “Don’t worry about the volume. Get the right material in.” Furthermore, Rollins is not alone in its contamination problem, but it still needs to address this issue, and that begins by first acknowledging a problem exists. The focus on diversion goals is great in theory, but not so much in practice. On the other hand, while zero waste events might be possible, she noted that zero waste goals on a college or even city level are “not feasible.”

Gulden echoed the sentiment that diversion rates can be misleading and can result in an unhelpful emphasis on volume at the expense of increased contamination. Although Winter Park claims a 15% diversion rate, this, she argued, does not merit praise: “[15%] is not a passing score on a test.” Her main suggestion for reducing confusion among consumers and increasing recycling rates was to go back to the basic materials of paper, metals, and plastic bottles. She also heralded regulatory changes to help incentivize efficient disposal decisions. The city of
Winter Park, she mentioned, is considering shifting to a “pay-as-you-throw system” rather than a flat fee system, which she hopes will induce more responsible recycling in the area.

**IV. Discussion**

This study revealed two significant fractures in the campus recycling program: alarming contamination rates and the even more alarming bag issue. As the waste audit technically indicated, the college’s “diversion rate,” or the amount of waste diverted from the landfill, was 46% by weight and 55% by volume. Thus, it would seem as though the college sends approximately half of its total waste stream to the MRF. Indeed, most metrics on diversion only evaluate the ratio between tonnages of waste moved from the landfill dumpsters and recycling dumpsters, but fail to analyze the content of either waste stream. As this study demonstrates, understanding the contents of the waste is imperative to understanding the realized impact of waste management strategies, and the truth behind “diversion.” The data revealed a 62% contamination rate by weight within the recycling stream, well above the 10% contamination accepted by WM, which alone is enough to question if the materials were in fact being “diverted.”

Numbers aside, the Coordinators who conducted the audit reported that there was no perceptible difference between the contents of the majority of bags from either stream. The only way the auditors could accurately determine the difference between the streams was based on the external color of the bag. This remarkable resemblance between the two streams speaks even louder to the contamination problem at hand. To make matters worse, only a negligible amount of the waste sampled was not bagged. Some bags even contained multiple other bags of bagged recyclables. Thus, even if the contamination in the recycling stream itself were at acceptable
levels, the recycling would still not even technically be “recycled” because it would be landfilled after reaching the MRF. Ironically, it would still count as having been “diverted” from the landfill simply because it was collected from the recycling dumpster, which strengthens Morawski’s (2009) argument that “collection” and “diversion” are not recycling.

Figure 13. Although the green bin on the left captures the recycling stream, whereas the black bin on the right captures the landfill stream, the contents of the two are strikingly similar.

Nonetheless, the bag issue does not make the data from the waste audit useless (see Figure 13). Indeed, it helped reveal an astoundingly high rate of contamination in the recycling stream, and buttressed MacBride’s argument that much of recycling amounts to “busy-ness” rather than effective change. It also illustrated spatial differences in the waste stream, which
could help to develop targeted waste management strategies centered on specific materials. For example, most of the food waste contaminating the recycling stream came from the Bush Science Center. This allows the opportunity to specifically address waste disposal at the cafe and within the entire building so as to reduce food contamination. Further, it illustrated that the majority of paper found in either streams primarily comes from the Bush Science Center and Orlando Hall, and that the majority of food waste comes from the Campus Center. These findings justify concentrating efforts to capture recycled paper at the first two locations, and composting efforts at the Campus Center.

While both the bag and contamination issues are significant, neither is insurmountable. As a result of this study, the college learned that it must adjust its waste management practices to accommodate a bagless system if it wishes to continue to work with WM. Contamination likewise is not an insurmountable obstacle, but requires deeper investigation to target root causes and opportunities for change. The campus-wide web survey attempted to evaluate both perceptions of the college’s recycling policies and sources of confusion that might lead to contamination. Almost one-third of the 15 materials featured in the virtual sorting exercise were improperly sorted. While the majority of the seven recyclable items in the sorting exercise were recycled properly, items 8 through 15 brought some trouble (see Figure 12). This indicates acceptable knowledge regarding the basic materials accepted by the single stream system, but confusion with regards to the less straightforward items, or rather, the endless permutations of plastic products. Nevertheless, the 28% of materials that were improperly sorted virtually does not align with the 62% of improperly sorted materials found in the actual recycling stream.

One explanation for this is that materials 8 through 15, particularly soiled paper towels, plastic wrappers, plastic utensils, and plastic bags, do not amount to a significant volume or
weight. Therefore, these materials were not as significant contaminants as food waste in the waste audit, the latter of which accounted for approximately 12% of the entire weight of the sampled recycling stream. However, 68.8% of participants disagreed with Statement 3, which stated, “Recyclable items with food/beverage residue can still be recycled.” Even though the majority of respondents knew to not place items with food/beverage residue in the recycling stream, food waste was nevertheless highly present in the actual recycling stream. Perhaps this is due to the fact that consumers are unsure of how much “food waste” on a recyclable constitutes contamination, and therefore dispose of potentially contaminated items in the recycling stream with the expectation that they could still be recycled. Although Miller established the maximum amount of contamination acceptable as 10%, this amount is hard to discern in practice and therefore understandably subjective. Furthermore, individuals might also visually examine the contents of the recycling stream, and determine that because other consumers disposed of products with food residue, they should, too (see Figure 13). Another explanation is that self-reported behavior is different from actual behavior, a result found in other studies (Barker, Fong, Grossman, Quin, & Reid, 1994).

To be fair, it is understandable that recycling could be considered confusing. Even the aspiration to return to the “basics of recycling,” as Gulden wished, seem unachievable given both the increasing heterogeneity of the waste stream and packaging products, and the inconclusiveness and subjectivity of WM’s own policies. For the company, recycling is a business with a bottom line. The recyclability of a material is not contingent upon its salvageability, but rather on its financial impact for WM in terms of resale prices, ease of processing, and potential for contamination. However, it is disingenuous for the college to promote an incomplete list of recyclable materials, such as one that omits aluminum foil, when
WM does in fact process, bale, and sell aluminum. It is also irresponsible for the institution to refrain from recycling aluminum foil when Americans wasted enough aluminum cans from 2000 to 2010 to reproduce the world’s entire commercial air fleet 25 times (Gitlitz, 2013, p. 9).

While aluminum (cans and foil) represented both negligible weight and volume in either waste stream, it is nevertheless important to highlight the inherent contradiction of the premise that certain items should not be labeled as “recyclable” because of the likelihood of contamination. On the other hand, the items should not be advertised by manufacturers as “recyclable” in the first place. By design, many disposable items (such as plastic sushi trays, plastic cups, paper cups, and aluminum foil) almost necessarily result in contamination when used, and therefore more often than not not render the item undesirable by recycling facilities. Ironically, many of those products involve pro-recycling messaging, such as the chasing arrows symbol or explicit messaging. This is certainly confusing, and places a huge burden on the consumer to discern from misleading sources how to properly dispose of an item. To confuse consumers even more, some supposedly “plastic” products on campus consist instead of plant-based materials. While arguably better for the environment, plant-based water bottles actually contaminate the recycling stream, even though they likewise promote recycling behavior on the label. The labels and signage that would be necessary to distinguish these bottles from plastic bottles would not only prompt increased confusion, but would also potentially have minimal effects on disposal behaviors as other studies suggest (Andrews, Gregoire, Rasmussen, & Witowich, 2013; “Recycling at Work,” 2015). Another option could be for the institution to streamline its operational strategies by limiting products sold on campus to only those that can be recycled by the contemporary program, or composted by a future program. Due to the volatility
of resale markets for recycled materials, and the dynamic nature of packaging materials and consumer demand, this might not be a feasible or practical option.

Amid the contamination rates and recycling practices, the web survey revealed a fascinating disconnect: unlike Morawski’s (2009) findings, participants were not surprised that a recyclable item’s journey to a MRF does not guarantee its reincarnation as another material. The contradiction, however, is that over three fourths of the participants felt that recycling is in fact an effective solution to the solid waste problem. In other words, the majority of respondents did not have faith that their plastic bottle would successfully make it from the recycling bin to the resale market, but somehow retained confidence in the overall system’s ability to facilitate a circular flow of materials and therefore reduce environmental and social burdens of waste.

This disconnect is at the crux of the Tierney backlash. In an informal conversation about this study, one campus official noted that perhaps this disconnect is, in fact, rooted in an aspirational ethos that circumvents logic and assuages consumptive guilt without requiring drastic lifestyle changes on campus and in a society where plastic is about as ubiquitous as air. It seems blasphemous to accept a recycling paradigm in which not all plastic is recycled. The other more terrifying option is to accept the limits of the recycling system, and to adjust one’s lifestyle so as to accommodate less consumption. Is that not, however, the first tenet of the three-tiered mantra: reduce, reuse, recycle? The first two strategies often fall prey to the last and widely celebrated option, at the expense of a balanced ecological calculus.

After presenting the preliminary findings of the study (most notably, the contamination and bag issues) at an EcoRollins club meeting, many potent ial strategies for influencing consumption behaviors arose. Ideas varied from removing packaged water from the campus meal plan, to establishing a rewards system for bringing reusable tote bags to the campus convenience
store, and to requiring diners to pay extra for disposable to-go dishware. The college’s dining service enacted a policy which changed the default catering option from disposable plastic to durable dishware, and required event planners to pay extra for disposable dishware. Such policies have made significant contributions towards decreasing the waste generated on campus. Based on certain comments from the recycling survey, however, it was unclear to respondents whether Rollins established the on-campus recycling policies, and where they should go to voice concerns and questions regarding recycling practices. This argues for the need for the Rollins Sustainability Program to increase its campus outreach efforts and address these concerns. Nevertheless, the college inarguably has the ability and duty to be responsible stewards of resources within the confines of the predominant recycling paradigm.

The findings from this study required the college to confront the question of recycling more, less, or differently on campus. The broken program consumed ample resources on campus, including funding, time, and space. While it was crucial to the mission of the college and the mission of the Sustainability Program to celebrate the presence of recycling on campus, it is difficult to accept that previous celebrations of “waste tonnage diverted” were in fact contributions to the landfill and manifestations of disappointing “busy-ness.” All considered, the college will likely not renew its contract with WM. Instead, it is considering shifting to a system in which all of the campus’s waste would be collected in one stream and sent to a waste-to-energy plant. At the facility, all metals would be removed from the waste prior to being incinerated. Perhaps this transition is a travesty, a step back, or a blow to environmental stewardship. When compared to a 100% rate of landfilling waste, incineration seems appealing because at least the waste would provide one benefit: electricity to the region’s grid. But, of course, this is a solution with its own set of problems.
The long-term goal after making this transition, as discussed with campus administrators responsible for setting the college’s waste strategies, is to begin small-scale, material-specific recycling programs. Their argument is that less, in this case, truly is more: if the campus can successfully collect only paper in a couple of key locations across campus, such as the Bush Science Center and library, then the college would do a better job of decreasing the campus’s environmental impact than it was doing during the time of this study. These material-specific, small-scale programs would be spatially designed (i.e. focusing composting on food-central locations such as the Campus Center) and would hopefully reduce confusion and contamination regarding collection practices. Ideally, the campus could capture and divert all paper, cardboard, plastic bottles, and organic waste from the incinerator.

V. Limitations & Suggestions for Future Research

The waste audit featured many limitations. Inconsistencies in classifying and sorting materials (i.e. aluminum foil and paper cups recyclable one day, but not the other) and imprecise estimations of material volumes skewed the results and rendered them more suggestive than exact. Furthermore, because the buildings, sorting order, and sampled bags for the waste audit were purposefully selected, the waste audit does not represent a randomized sample of the campus’s total waste stream. Many buildings and some building usages, such as the campus library and the residential apartments with full-service kitchens, were not represented by the sampled waste stream. Although four buildings were sampled altogether, each was sampled only once. Thus, the findings are more useful for generalizations about the aggregate waste stream or significant differences between spatial locations, rather than specific distinctions between building waste streams.
The campus-wide web survey included only one question regarding food/beverage waste, and therefore did not allow for a robust measurement of the perception of those two contaminants in the recycling stream. As indicated by some participants in the comment section, the survey used unclear language at times, which may have influenced interpretations and responses. Furthermore, the in-depth interviews were not a random sample and instead featured admittedly biased views on waste issues.

Future studies should focus on conducting sustained waste audits to measure changes in contamination and composition of waste, and to track the impact of awareness campaigns, signage, and other efforts to improve recycling practices on recycling rates. Similarly, future research should also conduct sustained surveys of the target population. The surveys provide a fairly accessible way to engage the campus without requiring extensive resources from the outreach or researching team. Surveys and other interactive games, both virtual and in-person, could be a powerful educational platform while simultaneously aiding in tracking knowledge of recycling practices. Future studies should also analyze the comparative impacts of reduce, reuse, and recycle campaigns on overall waste streams.

VI. Conclusion

This study sought to highlight the predominant gap in the literature regarding recycling on college campuses: the need to evaluate the actual waste stream in order to understand the true impact of recycling and “diversion rates.” The contamination and bag issues this research uncovered were not readily welcomed by the campus community, and understandably so. Indeed, the head of Facilities Management stated that he certainly did not enjoy hearing that the college’s actual diversion rate was close to zero. Nevertheless, he thanked the researchers for
uncovering the issues plaguing the campus recycling program, forcing the college to adjust to a more efficient and responsible approach to waste management, and prompting a small and necessary step on the road to an ecologically-based calculus. This study also suggests that the significant fractures (both macro and micro) in the current approach to recycling require superhuman efforts to “recycle right,” and that this case study lends weight to the argument that when too much burden is placed on consumers to discern how to properly recycle, an alarming amount of salvageable materials goes to waste.
References


