



2013 Garbage on the Green Waste Audit Report

University of North Florida

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Executive Summary

Acknowledgments

Section 1: Introduction

Every year, Florida's 18 million residents and 80 million visitors create approximately 32 million tons of municipal solid waste. From the total waste, only 28 percent of it is recycled. The Florida Department of Environmental Protection (FDEP) has called this situation "simply not environmentally sustainable."¹

According to the FDEP's Solid Waste Management in Florida 2013 Annual Report, 14,946,113 tons of waste is sent to landfills annually². Landfilling waste has a number of negative consequences, one of which is global climate change. Research has shown that compostable materials, such as food waste and paper, that decompose anaerobically (without oxygen) in a landfill are powerful greenhouse gas (GHG) emitters. They also produce methane (CH₄), which has 23-71 times greater heat trapping capabilities than carbon dioxide. The direct link between waste and climate change is undeniable.³

By significantly reducing the amount of waste landfilled and incinerated, the U.S can conservatively reduce greenhouse gas emissions by 406 megatons of CO₂ equivalents per year by 2030, which is the same as taking 21 percent of the existing 417 coal-fired power plants off the grid.⁴ A key find in the "Stop Trashing the Climate" report has been that a zero waste approach is one of the cheapest and most effective strategies in reducing the impact of waste on the environment.

In order to place strong emphasis on waste reduction and recycling, the Florida Legislature passed the Solid Waste Management Act (SWMA) in 1998. The SWMA set a 30 percent recycling goal for every government-funded institution in the state, including the State University System (SUS). The act encouraged public and private businesses to invest in infrastructure that would increase recycling and reduce waste. The SWMA was a great step in improving recycling in Florida; however, the State hit a plateau of a 28 percent recycling rate a decade after the bill was introduced.⁵

In 2008, the Florida Legislature passed the Energy, Climate Change and Economic Security Act, which established a new recycling goal to reach 75 percent by the year 2020. The new legislation

¹ The Florida Department of Environmental Protection, *75% Recycling Goal Report to the Legislature*, http://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/75percent/75_recycling_report.pdf (June 27, 2013).

² The Florida Department of Environmental Protection, *Solid Waste Management in Florida 2013 Annual Report* http://appprod.dep.state.fl.us/www_rcra/reports/WR/Recycling/2013AnnualReport/AppendixA/5A.pdf (July 30, 2014)

³ The Florida Department of Environmental Protection, *75% Recycling Goal Report to the Legislature*, http://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/75percent/75_recycling_report.pdf (June 27, 2013).

⁴ Brenda Platt, David Ciplet, Eric Lombardi, and Kate Bailey, *Stop Trashing The Climate*, http://www.stoptrashingthecclimate.org/fullreport_stoptrashingthecclimate.pdf (December 7, 2012).

⁵http://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/75percent/75_recycling_report.pdf

required all state agencies, including the SUS, to establish and implement “a solid waste reduction program...designed and implemented to achieve the maximum feasible reduction of solid waste generated.”⁶ In addition, the legislation requires state agencies to “evaluate the amount of recyclables and make all necessary modifications...to ensure that all recyclable materials are effectively and practicably recycled.”⁷

Section 2: Garbage on the Green

Methodology

Garbage on the Green is an experiential research project in which volunteers conduct a campus waste audit. The program was developed by the Environmental Center in 2007, with support from UNF Physical Facilities. The waste audit was designed so administration could gain a better understanding of the university’s solid waste stream and make steps towards improving the overall diversion rate. The program takes its name from ‘The Green’ a popular common space on the UNF campus where the waste audit began in 2007.

Through the audit, we are able to identify and quantify the types of materials in UNF’s solid waste stream. The Environmental Center has set a goal for 2020 establishing that 75% of its waste will be recycled. The program continues to grow each year and brings focus to our society’s need to use natural resources more wisely. The event also serves as an educational opportunity to teach the UNF community (students, faculty and staff) about recycling, litter prevention and waste reduction.



The first Garbage on the Green took place on March 8, 2007 and it has grown in scope and size since its inception. According to steering committee members of the National Recycling Coalition's College and University Recycling Council, the first Garbage on the Green event was one of the largest collegiate waste stream audits done on a campus.⁸ The seventh annual Garbage on the Green event took place on October 23, 2013 with 121 volunteers helping sort 869.1 lbs. of waste.

Procedures for Garbage on the Green were adopted from the Environmental Protection Agency (EPA). A waste audit is a technique used to quantify the weight and volume of campus waste. In addition, the audit helps identify each waste component (i.e. plastic, paper, cardboard) and calculate as precisely as possible its percentage of the total solid waste stream. Due to the university’s large campus and diverse areas, Garbage on the Green was completed in three phases: record examination, facility walkthrough, and waste audit.

2.1 Record Examination

The first step to better understanding UNF’s solid waste stream was to conduct a thorough examination of its waste hauling records and receipts. The goal of the record examination was to show the total amount of waste collected and associated costs. In addition, the examination allowed the University to track and document major contributors to its solid waste stream.

⁶ The Florida Senate, XXIX, Chapter 403, Part IV, 403.714(1)(c-d)(5)(a)),
<http://www.flsenate.gov/Laws/Statutes/2010/403.714>

⁷ <http://www.flsenate.gov/Laws/Statutes/2010/403.714>

⁸ Ibid.

The initial record examination, conducted in 2007, led to the realization that UNF lacked a concrete record keeping method. The method in place at the time for collection and billing of solid waste combined waste from the entire campus without identifying the origin of the collected material. Furthermore, the solid waste collected at UNF was combined with solid waste collected from other sites, which made determining the total amount of solid waste produced at UNF nearly impossible. The initial record examination not only highlighted the need for better record keeping, but it also identified inconsistencies with billing and revenues owed to the University on corrugated cardboard.

The discoveries from the initial record examination were brought into consideration when UNF renegotiated its waste-hauling contract in 2008, which included provisions requiring the waste hauler to state the actual weight of trash and recycling collected on the University's monthly bill. With this increase in available data, the University can now calculate a diversion rate, or the amount of waste diverted from the landfill, for the entire campus on a monthly basis. These changes have allowed UNF to increase efficiency, which has also led to cost savings.

2.2 Facility Walkthrough

The records examination provides valuable data, but it does not provide the whole picture. Touring the University's buildings and grounds allowed staff to identify connections between the types of waste generated and the actual waste-generating activities or processes. Identifying these connections allowed the university to find opportunities to implement improved processes, increase efficiency and reduce costs.

Several representatives from the UNF Environmental Center, Physical Facilities, and Environmental Health and Safety participated in the facility walk-through. The timing of the walk-through was especially important in order to provide accurate information. The walk-through was scheduled before trash pickups to allow for a sufficient amount of waste to accumulate and avoided special events such as holidays, because they would produce waste not representative of a normal workday. Notes were made on the size, placement, and contents of both trash and recycling containers in different locations.

In addition to providing more information about the solid waste stream, the walk-through helped identify collection sites that would serve as sample representatives during the waste audit portion of Garbage on the Green.

2.3 Waste Audit

The physical waste audit is the largest component of Garbage on the Green. A waste audit is a technique used to quantify the categories of materials in the waste stream and calculate their percentage of the total solid waste stream. The UNF Environmental Center and Physical Facilities work together in planning the event and hundreds of volunteers help conduct the audit.

Waste is allowed to accumulate on campus for a 24-hour period and is then collected by Physical Facilities staff from the locations selected from the facility walk-through. The collected waste, which comes from both recycling and trash receptacles, is sorted by volunteers into twelve different categories (see appendix B for more details on the waste categories). Results from the waste audit provide a detailed analysis of the solid waste stream and help University staff make informed



decisions on improving the recycling program.

A number of factors were considered when making the decision on when to conduct the waste audit, because it is important to collect a sample that is representative of a normal 24-hour period on the UNF campus. Tuesday was chosen as the best representation of a normal day, because it is a mid-week day and most residential and commuter students are on campus. Because Tuesday's waste is audited, the Garbage on the Green event always takes place on a Wednesday.

Choosing a time of year to conduct the audit was equally important. The winter season (December through February) was discarded, because students stayed in dorms more, generating more waste than normal seasonal temperatures. The summer (May-August) was also discarded because the number of students on campus decreases dramatically. The first Garbage on the Green was conducted during March; however, it was later moved to October for a number of reasons. The presence of Spring Break during March was later determined to have significant impact on an accurate data collection and October avoids major events and holidays. Lastly, the weather was more conducive to sorting trash in October than March, which can be hot and humid in Florida.



2.3.1 Waste Audit Collection Sites

Due to the size of the University and the large volume of waste created, it is not possible to audit all of the waste. Instead a sample representation is used to make the audit more manageable. The collection sites were chosen during the facility walkthrough, but are discussed every year when planning the waste audit. They have changed slightly as the campus has expanded. In order to get a representative sample, the collection sites reflect the varied uses of UNF facilities and include academic and administration buildings, residence halls, and dining areas.

The academic and administration areas include the Coggin College of Business and Social Sciences Building. These buildings house a number of different academic and administrative offices, including departmental offices, classrooms and some laboratories.

The residential area used as a representative sample from 2007-2011 was Osprey Halls, which is a traditional dormitory on the core campus. In 2012, the residential area switched to Osprey Crossings because it has a larger, had a more diverse student population and is isolated from the other residential areas.

The dining areas used for the study are the Alumni Square and Student Union food courts. These areas include dining facilities and common dining areas.



Social Science Building (building 51)

The Social Science building was completed in 2007 and is a 68,000 square foot, three-story facility. The Social Sciences Building was the first LEED-certified facility on the UNF campus and was also the first in Northeast Florida. It is home to a number of classrooms and administrative offices for the College of Arts and Sciences and the Departments of Sociology and Anthropology, Political Science and Psychology.



Coggin College of Business (Building 42)

The Coggin College of Business was built in 1996 and is approximately 64,000 square feet. It is a three-story building that houses the Coggin College of Business. The building consists of a diverse set of classrooms and a number of administrative offices.



Osprey Crossings (Building Q, R, S)

Osprey Crossings opened for use in 2001 and is a 500-bed, three-building multipurpose facility. Osprey Crossings is a modified suite-style option in which residents share a room with their own private bath, but do not include kitchens. Each building features indoor space for community activities, cooking facilities and laundry facilities.



The Student Union Courtyard

The Student Union is a 150,000-square-foot facility and consists of two large structures slightly connected, with an open-air walkway in the center. It opened in 2009 and is the first LEED certified student union in Florida. The Student Union houses the campus bookstore, Student Government, a variety of Student Affairs administrative offices, a food court, full-service restaurant, group meeting spaces, auditoriums and an outdoor amphitheater.



Alumni Square Courtyard

Alumni Square is an outdoor courtyard located in the core of the University. The courtyard is a high traffic area and is primarily used by students eating at one of the many surrounding dining service locations.

2.3.3 Waste Audit Team Health and Safety Training

The waste audit portion of Garbage on the Green presented a number of potential safety concerns, including exposing volunteers to sharp objects (e.g., razor blades, hypodermic needles and broken glass), blood borne pathogens, and other communicable diseases. Environmental Health and Safety was consulted during planning to help minimize any risk being introduced to volunteers. From those discussions, a number of measures were taken to protect volunteers from potential hazards.

Prior to participating in the waste audit at Garbage on the Green, volunteers are required to attend a 30-minute training session that focuses on proper waste handling procedures and use of personal protection equipment (gloves, coveralls and protective eye wear), which is provided at the event for all volunteers. In addition, all volunteers are required to sign a volunteer acknowledgment and photo release form before participating in the waste audit.

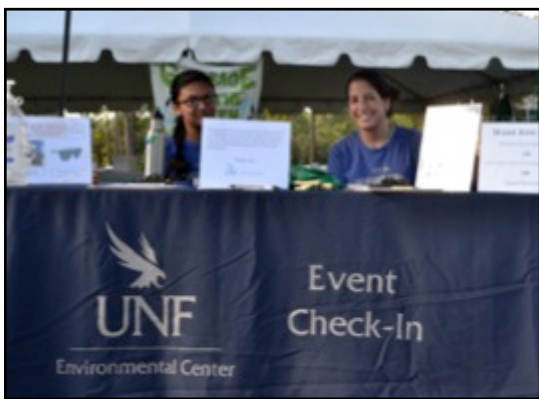
2.3.4 Volunteer Recruitment

In order to have a successful waste audit it is necessary to recruit as many student volunteers as possible. The volunteers help promote the event, recruit other students and most importantly participate in the audit. In order to reach as many students as possible, the UNF Environmental Center utilizes a variety of advertising methods.

The UNF Environmental Center created a page on its website as a dedicated section for the event, which provides students with information about the event and the volunteer application forms. In addition, the official UNF webpage, electronic billboards and Facebook were used to help recruit volunteers and disseminate updates about the event.



Student volunteers created fliers and posted them in high traffic areas. Volunteers also did street chalking at key locations around campus, such as the library, Student Union Plaza and residential halls. The school newspaper published stories on several occasions regarding the event and its impact on both students and the University as a whole.



UNF Environmental Center staff and volunteers also hosted tables at the Student Union Plaza during Market Days, which is a weekly market with a high volume of student traffic. Student contact information was collected and placed into a student volunteer database. Periodic emails were then sent to the recruited students regarding the event.

In addition to volunteers, the UNF Environmental Center hires a few students to act as supervisors during the audit. Supervisors receive additional training prior to the event and help ensure that volunteers are following

safety procedures and conducting the audit correctly. Having additional staff on site to help answer questions about the waste audit procedures helps maintain consistency and reduce error from being introduced.

2.3.5 Waste Audit Procedures

- Step 1:** Trash and recycling containers from the sample locations are emptied on Monday evening. Waste is then allowed to accumulate for 24-hours on Tuesday. On Wednesday morning staff from Physical Facilities collects the waste and spray paint is used to indicate what location the bag came from and whether it came from a recycling, trash or bathroom container. The bags are then transported to the waste audit site.
- Step 2:** As volunteers arrive at the waste audit, they must sign-in and are given personal protection equipment. Volunteers are put into two to four person teams and typically individuals within a team are assigned a specific task. For example, one team member would sort the materials inside the bag, while the other team member would weigh the sorted material and record the results. This approach appeared to be the most efficient way to complete the auditing procedure.
- Step 3:** After the volunteers put on their personal protection equipment, they are given a clipboard and an audit form (see Appendix B). They then select a bag to audit and record what location it came from and if it is from a recycling, trash or bathroom container. For health and safety reasons, bags that came from the bathroom are weighed, but not audited.
- Step 4:** Before the bag is opened, volunteers weigh the entire bag and record the results. The bag is then placed on the sorting table and opened. Volunteers sort the materials into twelve different categories; mixed paper, white office paper, cardboard, plastic, glass, metal cans, compostable materials, reusable items, electronic waste, hazardous materials, food packaging, remaining trash. (For more detailed information about the categories, please see Appendix B.)
- Step 5:** Once all of the materials have been sorted, they are placed one category at a time into a bucket and weighed. Teams are instructed to log the weight of the category minus the weight of the bucket. This process is repeated for each of the twelve categories or until all items have been measured.
- Step 6:** After sorting and weighing each category, volunteers return their audit form in order to receive an additional form. This ensures that all forms are collected and students are not misplacing the forms they have already finished. After the event, results are entered into a Microsoft Excel spreadsheet.

For more information on the waste audit procedure see [Attachment XX](#).

Section 3: Waste Audit Results

3.1 Pre-Audit Results

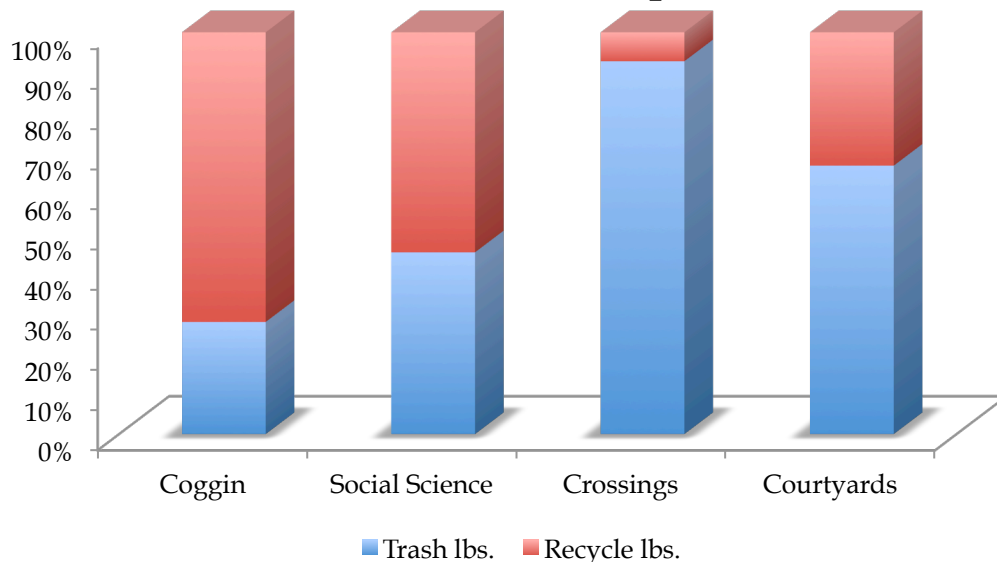
During the 2013 Garbage on the Green waste audit, a total of 869.1 lbs. of waste was collected and audited. As seen in **Table 1**, 51.6 percent of the total waste audited was collected from recycling receptacles and the remaining 48.4 percent of waste was collected from trash receptacles. Note that this is simply the weight of collected material sorted by type of receptacle and it does not reflect the actual materials collected.

TABLE 1: Waste Collected by Location and Receptacle
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Location	Trash lbs.	Recycle lbs.	Total Lbs.
Coggin College of Business	123.8	320.0	443.8
Social Science building	56.5	68.4	124.9
Osprey Crossings	141.8	11.0	152.8
Combined Courtyards	98.6	49.0	147.6
Total	420.7	448.4	869.1

Interestingly there was a relationship between the location materials were collected and the recycling rate. As seen in **Figure 1**, more than half of the materials collected from both the Coggin College of Business and the Social Science building were from recycling receptacles. Whereas trash represented 66.8 percent of the waste audited at the Courtyards and an overwhelming 92.8 percent at the Crossings. It is understandable for both the Crossings and Courtyard areas to contain more trash than recycling, because of high volumes of food waste and other non-recyclable materials.

FIGURE 1: Waste Collected by Location and Receptacle



3.2 Post-Audit Results

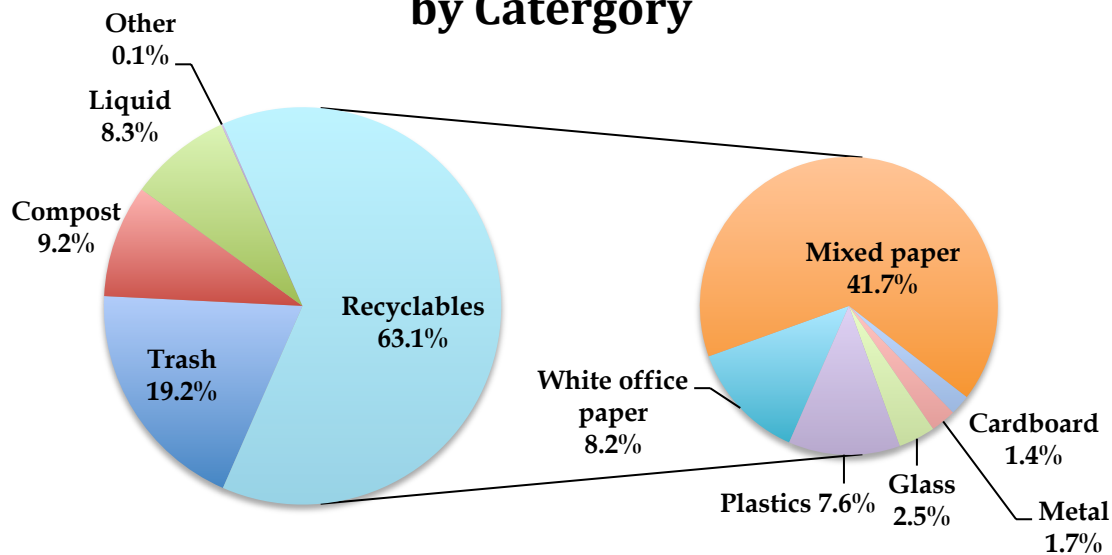
To help make results easier to understand, the 12 types of waste audited were consolidated into five general categories. For more information on the types of materials audited, please see [Appendix XXX](#).

1. *Recyclables* -Items including cardboard, glass, mixed paper, metals, plastics and white office paper.
2. *Trash* - All remaining trash and unrecyclable food packaging. This also includes all waste collected from restrooms.
3. *Compost* - Only includes food waste and paper napkins.
4. *Liquid* - Any liquids found inside containers.
5. *Other* - Includes electronic waste and hazardous materials.

The distribution of materials changed after the audit. Recyclables now accounted for 63.1 percent of all the materials collected and sorted, compared to the pre-audit results of 51.6 percent. This gap in participation must be closed to achieve Florida's 75 recycling goal. As seen in **Figure 2**, nearly half of the recyclable materials collected were mixed and white office paper. One reason for the large quantities of paper was the stacks of unread Wall Street Journals. Since these were unused papers, it would be wise to investigate potential savings associated with the newspapers. Plastics were the next most significant category of recyclables at 7.6 percent and glass, metal and cardboard represented the remaining 5.6 percent.



FIGURE 2: Distribution of Waste by Category



Surprisingly trash represented only 19.2 percent of the total waste audited. Most of the items in the trash were dining related, including food packaging and drink containers. All 47.6 lbs. of waste collected from the restrooms, which was primarily paper towels, is considered trash. Disposable coffee cups were an extremely common type of item, but most likely did not represent a significant percentage of the total weight. Furthermore, there is currently no available recycling program for these types of cups, so it will be important to increase the use of reusable cups on campus.

As volunteers are going through the audit, many drink containers still have liquids in them. In order to achieve the best results possible, the liquids are removed from containers and weighed separately. In total, liquids represented 8.3 percent or 72.3 lbs. of the waste audited.

3.3 Results by Type of Receptacle

After volunteers audited the waste, we were able to take a closer look at what types of materials were actually in the trash versus recycling receptacles. This will help determine contamination rate, or the percentage of materials in the wrong receptacle. Additionally, this information will help identify areas of opportunity to increase UNF's recycling rate.

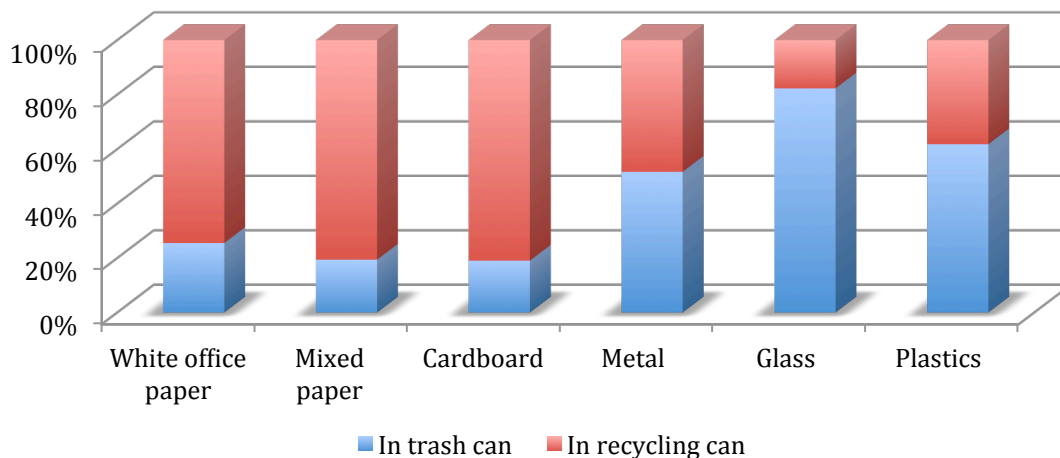
There is relatively low contamination in the recycling receptacles. As seen in **Table 2**, 87.2 percent of the materials collected were recyclable. Trash accounted for less than a tenth of the materials collected from the recycling receptacles. In contrast, 37.4 percent of the materials collected from trash receptacles were recyclable. In fact, by weight more recyclables were collected in trash receptacles than actual trash.

TABLE 2: Audit Results by Receptacle						
Type of Waste	Trash Receptacles		Recycle Receptacles		TOTAL	
	Weight (lbs.)	Percent	Weight (lbs.)	Percent	Weight (lbs.)	Percent
Recyclable	157.4	37.4%	391.2	87.2%	548.6	63.1%
Trash	144.1	34.3%	23.0	5.1%	167.1	19.2%
Compost	65.1	15.5%	14.8	3.3%	79.8	9.2%
Liquid	52.8	12.6%	19.5	4.3%	72.3	8.3%
Other	1.3	0.3%	0.0	0.0%	1.3	0.1%
Total	420.7		448.4		869.1	

The audit results also let us observe which types of recyclables were most commonly found in trash receptacles. As seen in **Figure 3**, more than half of all metal, glass and plastic were collected from trash receptacles. It is important to note that metal, glass and plastic are most commonly found as drink containers in the UNF waste stream.

On the other hand, almost three-quarters of all white office paper, mixed paper and cardboard were collected from recycling receptacles. Because of the disproportionate amount of paper collected, these categories represented 57.5 percent of all recyclables collected in trash receptacles.

FIGURE 3: Recyclable Material by Receptacle



3.4 Results by Location

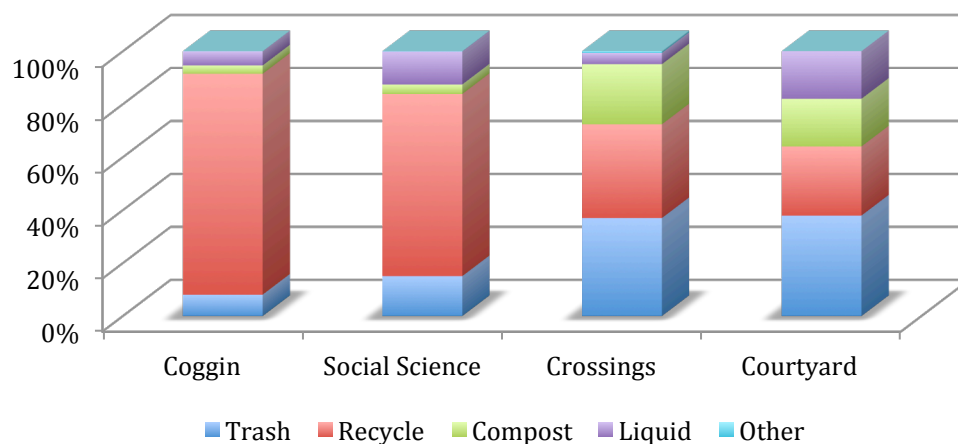
Just as in the pre-audit results, the post-audit results revealed relationships between the type of materials collected and the location they were collected from. In the Coggin College of Business, 83.4 percent of the waste collected was recyclable. Trash represented 8.1 percent of the waste collected with compost, liquid and other representing the remaining 8.5 percent. These results are compared to post-audit results in **Table 3** and show that 86.5 percent of all recyclables from the Coggin College of Business were collected or captured. This is also called the capture rate.

Location	Pre-Audit (lbs.)	Post-Audit (lbs.)	Difference	Capture Rate
Coggin College of Business	320.0	370.1	50.1	86.5%
Social Science building	68.4	85.9	17.5	79.6%
Osprey Crossings	11.0	54.1	43.1	20.3%
Combined Courtyards	49.0	38.5	-10.5	127.3%

The Social Science building's waste stream shared many similarities with the Coggin College of Business. Again the majority of items collected, 68.1 percent, were recyclable. The capture rate for recycling in the Social Science building was 79.6 percent, slightly lower than the Coggin College of Business. A higher percentage of trash was collected from the Social Science building, but it still only represented 15.1 percent of the total. Compost, liquid and other represented the remaining 16.2 percent of the waste collected.

The Crossings and the courtyards had a very different waste stream compared to the academic buildings. More trash was collected than recyclables from these areas, as seen in **Figure 4**, but the types of materials collected were more evenly distributed than the academic areas. Another difference between academic and common areas was the amount of compostable materials. While the waste stream of the academic areas had less than 4.0 percent compostable materials, almost one fifth of all waste collected from the Crossings and courtyards were compostable.

FIGURE 4: Type of Waste by Location



4.0 Conclusion

The 2014 waste audit highlighted a few areas of concern that deserve added attention. For example, the fact that 37.4 percent of all materials collected from the trash receptacles were recyclable is a significant problem. Physical Facilities has instituted an effective and efficient recycling system with trash and recycling receptacles conveniently located throughout campus. Despite this effort, the significant amount of recyclables found in the trash receptacles demonstrates a low participation in the program.

Ensuring everyone on campus has been properly educated on not only how to recycle on campus, but why it is important and it aligns with UNF's values could help increase participation. However, recycling education may not by itself explain the low participation rate. One area of concern often voiced by the UNF community is the absence of recycling receptacles in the classrooms. While Garbage on the Green does not track waste specifically from classrooms, it is reasonable to expect that the majority of items classroom trash receptacles are paper products and metal, glass and plastic drink containers. Expanding the scope of Garbage on the Green to include a detailed analysis of classroom waste could lead to recommendations that would enhance the recycling program.

Garbage on the Green has proven to be a very successful event and continues to provide critical insight into UNF's waste stream. The event utilizes over one hundred volunteers and actively engages the campus community in efforts to make UNF a sustainable leader. Additionally, the event helps educate the campus community about the importance of recycling and waste reeducation. Lastly, the waste audit provides data that helps administration make informed decisions to improve recycling on campus. As the deadline for Florida's 75.0 percent goal approaches, Garbage on the Green will continue to play an increasingly important role for UNF.

